FINAL REPORT

Financing for Green and Inclusive Energy in Nepal

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PRACTICAL ACTION
Technology challenging poverty

Foreword

In Nepal, more than 25% of the population (7.4 million) mainly in rural areas has no access to electricity and about 74% population are dependent predominantly on solid biomass fuels for cooking applications. Lack of adequate investment in energy infrastructures and services at different level of energy market system is a major barrier towards poor energy access. Adequate investment in energy infrastructures and technologies is a must for achieving energy access targets as per the SDG-7 and SE4All commitments. This research therefore, was carried out by Practical Action under Green and Inclusive Energy (GIE) project implemented by Hivos Energia and funded by The Netherlands Ministry of Foreign Affairs to analyse needs, opportunities and challenges of financing for increasing green and inclusive energy access in Nepal.

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I hope this document will be a valuable entity for planning to manage adequate investment to better achieve the targets of SE4ALL and SDG-7 in Nepal.

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Abbreviation

ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
CBS	Central Bureau of Statistics
CBOs	Community-based Organization
CREE	Community Rural Electrification Entities
CREF	Central Renewable Energy Fund
DAGs	Disadvantage Groups
GESI	Gender Equality and Social Inclusion
FGDs	Focused Groups Discussions
GIE	Green and Inclusive Energy
GoN	Government of Nepal
GRM	Grievance Redress Mechanisms
INGO	International Non-Governmental Organization
KIIs	Key Informant Interviews
MHPs	Micro Hydropower Plants
NRREP	National Rural and Renewable Energy Programme
NTNC	Nepal Trust for Nature Conservation
NEA	Nepal Electricity Authority
NACEUN	National Association of Community Electricity Users Nepal
NGO	Non-Governmental Organization
NPC	National Planning Commission
PHPA	Public Hearing & Public Auditing
PAF	Poverty Alleviation Fund
RESDM	Renewal Energy Subsidy Delivery Mechanism
RE	Renewal Energy
RETs	Renewal Energy Technologies
RERL	Renewable Energy for Rural Livelihood
REDP	Rural Energy Development Program
SE4ALL	Sustainable Energy for All
SDGs	Sustainable Development Goals
UN	United Nations
WB	World Bank

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Executive Summary

In Nepal, more than 25% of the population (7.4 million) mainly from rural areas has no access to electricity and about 74% population are dependent predominantly on solid biomass fuels for cooking applications. To provide electricity access and clean cooking solution to all by 2030, an additional investment of about USD 25 billion is required (SE4All, 2013). Considering the past investment trend of the public and private investment in the sector, an investment gap of about USD 10 billion is estimated in the study. In the business as usual investment scenario, achieving these targets by 2030 seem an uphill task, unless the quantum of private sector investment is scaled up significantly. To achieve this, it is essential that the public investment leverages the private investment in a significant way in the energy sector. However, there exist a number of financing barriers and project related risks. The study conducted an in-depth analysis on private sector investment in mini-grid technologies mainly micro-hydro as a case study to identify problems and challenges for mobilizing investment on RETs. The study findings indicate the need to address the following barriers and risks, to facilitate any significant additional private investment that could be realized.

Financing Barriers

Small Scale of Operation: The cost of processing loans for small-size of lending is expensive for the commercial banks and financial institutions. Additionally, most banks and financial institutions do not have the necessary expertise to perform due diligence on such projects. Most RETs fall on this category. As part of the requirements of the priority sector lending of the Nepal Rastra Bank, the banks and financial institutions are lending in small-scale energy technologies such as Small Home Systems (SHS), biogas and Improved Cookstoves (ICS) through micro finance institutions (MFIs).

Insufficient Preparation of Projects Leading to Uncertain Development Cost: The problem starts from the project preparation stage, in MHPs in particular. Feasibility study (demand assessment, site selection, technical design) is often found to lack in quality. The study is conducted with insufficient field level inputs, as most feasibility assessments are carried out by the consultants at a small fee. As a result, site selection, demand estimation, and other risks are not identified and analysed properly. The projects often face cost overruns and low local demand when the project is completed, resulting in insufficient revenue realization for the project communities to pay back the debt and maintain the system in good order.

Access to Credit: Complicated procedure for loan application, high interest rate and low valuation of land in the rural area as collateral are the key reasons for the low level of interest in applying for the bank loan. Banks in Nepal lend against collateral, which in the rural areas is the agricultural land. However, the value of the land in the rural areas is low, often not sufficient to cover the loan amount. Further, the liquidity of rural assets is low, and the banks often regard it risky to take such land as surety. As a result, securing necessary loans from banks for the community organizations is a challenge.

Project Risks

***Low Level of Demand and End Use Opportunities*:** Low plant utilization factor (as low as 20%) is reflected in low revenue realization by micro-grid based RETs such as the micro hydro plants or solar PV installations. The demand is largely for lighting, typically four hours in the evening. Opportunities for the end-use application are limited in the area where the road access is limited or non-existent.

Low Ability to Pay: Non-payment by the consumers is often found in micro hydro plants owned by the communities. Some of the households do not have ability to pay for electricity or do not feel obliged to pay the monthly tariff as the communities see the plant as a common property with no individual consumer being liable for loan repayment. This has reflected in a number of micro hydro plants not being able to repay the loans. The affordability of rural households for small-scale renewable technologies such as ICS, SHS and biogas is also low.

Financing Instruments to Address the Financing Barriers and the Project Related Risks

The existing financing instruments are not enough to address the financing risks and barriers to promote investment in the RETs sector. An effort was made under Micro Hydro Debt Fund (MHDF) to

address financing risk partly by introducing the partial credit guarantee to the lenders, and under which 26 MHPs were financed. However, the majority of the plants supported by MHDF suffered from poor financial performance due to low affordability for electricity and low productive end use opportunities. The project risks still remained unaddressed while designing the MHDF. Cost overrun, a common financing barrier, was experienced in most of the projects. The revenue realised was not enough to meet the repayment obligations—a common project risk element in RETs in Nepal.

In respect of the small-scale technologies such as biogas, ICS and PV solar financed through MFIs are also facing repayment challenges as they are not able to pay back the loan. To enhance the ability of the households to pay back the loan, linking the MFI loans to income generating activities has shown some good progress.

Designing and Implementing Financing Instruments to Address the Financing Barriers and the Project Risks

Traditionally, public sector has been the principal source of finance in energy sector investment in Nepal, largely in the form of capital subsidies and credit lines. The RET finance consisted of capital subsidy from central government, contributions from local government (VDC and DDC) or other community organizations such as Forest User Groups and partly from the contribution by the local beneficiary community members. The balances are met through loans or line of credit from the commercial banks. One downside of this financing approach is the lack of long-term sustainability, a constraint in scaling up of renewable energy technologies.

Among the line of credits that are currently in effect are the MHDF and Central Renewable Energy Fund (CREF). The MHDF is tied to a single technology—micro hydro, and the CREF targets all RETs, funding the complete the supply chain—from the supplier to the consumer.

In order to move away from the subsidy-based model to a private sector finance model of RETs development, it is essential to design innovative financing instruments which would effectively address the barriers and risks mentioned above, and in which the public finance would effectively leverage the private finance leading to enhance private sector investment in this sector. Some innovative financing instruments which are feasible to implement in Nepal, given the state of the financial market is presented below:

Instruments to address project risks

- Capital grants or subsidies will enhance the financial viability of the project, thus reducing the risk of project which is not otherwise financially viable.
- Senior debt in the form of project loans will help to bring down the overall cost, and at the same time become a source of long-term finance, giving some comfort to the private investors that concessional loans are available from the public source.
- Micro-financing allows the rural households to access finance for small-scale RETs such as solar home systems or improved cook stoves. Since such RETs do not on themselves generate incomes, the micro-finance institutions (MFIs) need to promote income generation activities of the households taking loans for RETs. Although the transaction cost is high in general, MFIs cost of operation is generally lower than other alternative financing such as commercial banks.

Policy Recommendations

The policy needs to be formulated and operationalized to address the financing barriers and project risks through innovative financing instruments such as senior debt, renewable energy bonds (assets-backed securities), result based financing, and credit guarantee facilities, and well-targeted micro financing.

Alongside, linkages of electricity should be established with other productive activities by identifying the possibility of end-use promotion through local enterprise development, and irrigation and drinking water pumping in the areas as part of the project preparation and implementation.

1. Introduction

1.1 Background

In Nepal, more than 25 per cent of the population (7.4 million) mainly from rural areas still have no access to electricity. Geographically, more than 60% of the country is deprived of access to the national grid as current access is limited to mostly urban, peri-urban and some rural areas. Those populations having access have very low electricity consumption (for household and productive uses) due to widespread power shortage and frequent interruptions, and poor quality of supply reflected in low supply voltage. Electricity from off-grid RETs is growing (15% population benefitted) but it is sufficient mostly for lighting only. Grid electricity is unreliable with erratic power cuts especially in the dry season. The annual energy consumption per capita of Nepal is 150 kWh, almost 4.5% of the world average of 3126 kWh. Electricity generation is not adequate to meet the growing demand and is one of the main constraints to economic development.

For cooking and heating applications, the majority (74%) population is dependent predominantly on solid fuels consisting of biomass, and agricultural and animal wastes. It is most polluting fuel, harmful to human health and environment. In Nepal, every year around 22,841 persons (mainly women and children) die prematurely and 746,381 disability-adjusted life year loss due to illness caused by household air pollution (WHO, 2015).

There is need to provide basic modern energy services (in terms of quantity or/and quality) to all population. The Government of Nepal has pledged to provide electricity access to 99 percent households and increase the share of renewable energy to the total energy consumption to 50 percent by 2030 (commitment for achieving Sustainable Development Goal-7 targets). The Government of Nepal is also committed to provide Clean Cooking Solutions for All (CCS4All) by 2022 with a plan to completely stop the use of Tier-0 cookstoves by 2030.

The UN Sustainable Development Goal (SDG) 7 focuses on ensuring access to affordable, reliable, sustainable and modern energy for all. Access to energy is recognized to have a central role in addressing the major challenges facing the world unemployment, income generation, food production, or increasing income. The traditional approach of promoting energy access through centralized grid-based electrification is not always economical in the regions where the population is sparse and the opportunities for productive end use are limited. To achieve universal access to electricity inclusive of all sections of the society including the poor and disadvantaged, it is more pragmatic to pursue a policy of promoting grid-based centralized technologies as well as off- grid decentralized RETs in a balanced manner. Emphasis on transition to clean energy is also strongly emphasized to address the increasing challenge of climate change. Accordingly, the universal access to electricity through green clean energy resource is recognized to be an essential element of sustainable development paradigm.

Economic growth that creates jobs and provides economic opportunities for all is needed to eradicate poverty and for inclusive development. As energy is central to economic growth and has been recognized as development goals, access to clean energy has the potential to bring inclusive growth encompassing communities which are yet not benefitting from the development. To achieve this, it needs to bring together the private sector, financial institutions, governments, and nongovernment organizations to scale up investments in energy access through better knowledge management, capacity building, and project development.

1.3 Problem Statement

There is a huge investment need to increase the access to clean energy (lighting and cooking) to achieve Nepal's SE4ALL targets by 2030 (SE4ALL, 2013). The Rapid Assessment and Gap Analysis (SE4ALL, 2013) report for Nepal has identified an investment requirement of about USD 25 billion by 2030 to achieve the SE4ALL objectives of universal energy access, doubling of the renewable energy portfolio and doubling of the energy efficiency until 2030. To achieve this target, a significant investment needs to be committed and made. The multi-stakeholder approach, involving governments, the private sector and civil society has been proposed as a key implementation strategy. Enhanced multiple stakeholders' participation in the form of public-private-people's partnership (4P) is necessary to achieve the target. To this end, it is essential to design an appropriate

policy framework for public-private-people's partnership to catalyse investment flows to promote inclusive green energy infrastructure. Within this context, the study attempts to assess the current public and private sector investment in the sector, public sector support to leverage the private investment, its impact on? gender and inclusiveness, the level of advocacy and governance in the sector and recommend improvement measures to enhance the investment in the sector.

1.4 Research Objectives

The research aims to analyse needs, opportunities and challenges of financing for increasing investment to increase green and inclusive energy access and to achieve SE4All targets. The specific objectives include:

- To analyse the policy environment (investment policy -- existing and planned, instruments -- existing and planned, issues and barriers) for enhanced investment in green energy sector.
- To analyse the trend of public and private investment in green energy sector.
- To recommend policy options to enhance investment in green energy infrastructure.

1.5 Scope and Limitation of the Study

The study is limited to financing of green and inclusive energy (GIE) technologies. The GIEs include simple to operate and maintain, smart, clean and off-grid technologies like solar power systems, micro-hydro and other mini-grids, improved biomass cookstoves, biogas, etc. The concept of GIE access must be understood against the backdrop of current polluting energy sources from fossil fuels. The increased footprint of GHG which is responsible for the climate change, ecosystem degradation and resource depletion are threatening the basis of life itself, with people who are socially, economically, politically, institutionally or otherwise marginalized especially vulnerable to climate change (IPCC, 2014). It is clear that the continuing depletion of resource stock, ecosystem degradation, and climate change at some point in time may have enormous social and economic costs to humanity. Fossil fuels are a finite resource that take millions of years to develop and will continue to diminish with use and produce pollutants such as greenhouse gases as a by-product, contributing to climate change. In contrast the green energy resources are renewable, meaning they are naturally replenished, and have much smaller impact on the environment than fossil fuels. Technological advances in renewable energy technologies have lowered the cost of solar panels, wind turbines and other sources of green energy, placing the ability to produce electricity at the level rather than depending on large utility companies. At the same time the energy access should be inclusive providing opportunities for all for increased well-being of all sections of the society, thus making the energy system sustainable from welfare and environmental point of view.

In this study, investment need has been calculated for achieving SE4All targets by 2030 for renewable energy technologies such as micro hydro, solar and biomass as well as for grid based electricity. Although grid electricity supplied within the country also has some component of fossil fuel-based electricity, it is expeditious to assume that in the longer run Nepal's electricity will mainly come from hydro and other renewable energy sources.

Investment related problems and challenges are technology specific. The study has conducted in-depth analysis on private sector investment in mini-grid technologies mainly micro-hydro only as a case study to identify problems and challenges for mobilizing investment on RETs. Problem and challenges for investment in other renewable energy technologies like solar power, improved cook-stoves, biogas etc. would be very useful, which this study has not been able to cover. Likewise, challenges, trend and opportunities of investment from public sector and role of CSOs are equally important to be understood, which this study has not been able to cover adequately.

1.6 Research Framework and Methodology

1.6.1 Conceptual Framework

Policy, planning and programming, financing and, implementation are the key strategies to promote green inclusive energy access. This report concerns with the level of financing and related enabling elements for the viability of an energy system. The enabling elements include (i) risk mitigation; (ii) productive end use promotion; (iii) viable business model. Accordingly, the financial flows in the

renewable energy and grid based hydropower sectors from public and private sectors have been assessed. Using the financing requirement figures estimated in the draft investment prospectus for clean cooking solutions in Nepal, the total financing gaps to achieve SE4ALL goals have been estimated. Next, the issues of financing risk mitigation, productive use of electricity and the viable business models were analysed with respect to achieving SEforALL targets for Nepal..

1.6.2 Research Questions

The research aims to find answers of the following research questions:

- Are the existing legal and policy instruments sufficient for increased investment in green energy sector? If not, what are the key barriers/challenges to investment in the sector?
- How effective is the public financing to leverage the private sector investment in the sector?
- What is the possibility of promoting private sector investment to achieve the SE4ALL target? What are the opportunities and challenges for private sector investment?
- Are the existing credit enhancement mechanisms sufficient to enhance the level of FI's comfort in lending in this sector?
- Is there any gender related issues limiting the engagement, particularly of women in market system of RETs?

1.6.3 Research Process and Methodology

The research involved a review of the existing literature on energy finance and regulations and policies related to renewable energy technology financing from Nepal. The desktop review was complemented by interviews with the key stakeholders—financing institution, AEPC, private sector service providers, energy sector associations, and the local communities including the key members of the executive committees of the local energy providing entities (Annex 2). The energy projects reviewed comprise grid and off grid supplying electricity to rural communities. The off-grid projects comprised: (i) community owned Micro Hydropower Plant (MHP) (Annex 3); (ii) privately owned Small Hydro Plant (SHP) and biogas plants. The grid rural electrification projects were managed by Community Rural Electrification Entities (CREEs) registered as cooperatives and as non-governmental organizations, or private companies.

Qualitative methods were used in data collection for the research work consisting of interviews, focus group discussions and observations following ethnographic inductive logic. The in-depth interviews was carried out with the community members responsible for the operation of energy supply entities focusing such issues such as the access to finance, adequacy of subsidy, operation issues of MHPs including constraints on revenue collection. Focus group discussions (FGD) were conducted in 6 places (Annex 4) with total number of 61 participants using FGD checklists (Annex 5). The questionnaire survey (Annex 6) was used to assess the household energy use, household energy use mix, end use application etc. and related information. Household survey was administered in 139 households from 11 districts.

2. Literature Review

Global Scenario: A number of researchers have highlighted the fact that there is a significant gap in funding required for meeting the global SE4ALL targets by 2030. Bazilian, et al. (2011) have estimated yearly average need of USD 11.6 billion over the period of 2011-2030 for the LDCs against the estimated investment flow of USD 2.5 billion. Thus, at the global level, there is a significant gap between the investment flows and the national investment needs, by a factor of about five less than that required for universal household access to electricity. This gap will further increase if the energy needs for productive application is also considered.

SE4ALL (2017a) provides an analysis of the financing needs, and the barriers that need to be addressed for the private enterprises to deliver the energy access solutions. The analysis is focused on energy access solutions in Tier 1-3, which includes solar home systems, solar lanterns, lower capacity mini-grid in the electricity sector, and improved cook stoves in the cooking sector. The study first evaluates the cost of achieving government targets for electricity access, and clean cooking access. This study then illustrates how enterprises delivering access to electricity and clean cooking are being financed in Bangladesh, Ethiopia, Kenya, Myanmar and Nigeria. The volume and type of finance needed to meet the national access goals for 2030 was developed based on accepted cost ranges for energy technologies and fuels for meeting Tiers 1-3 electricity and clean cooking access.

The report has estimated the cost of meeting the government energy access target for 2017-30 for the five countries-- Bangladesh, Ethiopia, Kenya, Myanmar and Nigeria. In the case of Bangladesh the investment requirement is 6.11 billion USD for electricity and 20.93 billion USD for cooking. On annual basis these represent 0.20% and 0.68% of GDP. The investment requirements for Ethiopia is 1.37% for electricity and 2.4% for cooking; the corresponding figures for Kenya are 1.51% and 1.16%; for Myanmar 0.24% and 0.84%; and for Nigeria 0.33% and 0.55%. Considering the annual investment needs as a percentage of the GDP, the investment needs for these countries to achieve the universal access to energy are not enormous.

SE4ALL (2017b) presents a picture of financial flows in the form of commitment and disbursement for access to electricity and clean cooking. The report presents the amount and type of public and private finance committed from both domestic and international sources in the five countries-- Bangladesh, Ethiopia, Kenya, Myanmar and Nigeria. It also explores what types of energy access solutions receive finance—large scale energy infrastructure projects or off- grid RETs projects. The key finding of the study are—(i) finance for energy access is not on track to meet universal energy access objective by 2030; (ii) the international and domestic commitments from public and private sectors fall short by more than half of the estimated requirement to meet the universal electrification by 2030; (iii) the financial commitments to off- grid energy solutions are very small—only one percent of the of total trackable finance for electricity is committed in 2012-14 in these countries. Financial commitments for clean cooking in these countries are very low, and if such levels continue, it will not have impact on closing the cooking access gap.

Investment Need to Achieve SE4All Targets in Nepal: The Government of Nepal with funding from different donors provided subsidy to promote RETs during the last few decades. Despite the significant economic barriers, the subsidy delivery has its positive impacts in RE sector. Due to bottlenecks and challenges to enhance RETs

for productive end use has resulted in slow transition to a market based model. So the RE market is not significantly benefitting from private sector innovative approaches, best available technologies (BATs), and global best practices, free and fair competition. There is still inadequate access to finance and RE projects are not often bankable. Increasing access to finance for RE products and services need increased access to credit, strengthened finance mechanisms, and enhanced capacity of lenders (NREF, 2017).

To achieve SeforALL targets in Nepal, a significant investment need to be committed. There is an investmetn needs about USD 25 billion by 2030 to achieve the SE4All objectives of universal energy access, doubling of the renewable energy portfolio and doubling of the energy efficiency until 2030 (SE4All, 2013). The estimated investment is for biogas production technology, off-grid mini/micro

hydro plants, isolated pico hydro plants, grid connected hydropower plant, grid connected solar PV power plant and isolated Solar Home Systems.

Similarly to achieve the target of clean cooking solutions for all (CCS4ALL) by 2030, an investment of USD 389 million is required (ESMAP/GON, 2017).

Gender and Social Inclusion: Evidence suggests that women's need should be consulted during research, product design and development, as well as included in the market chain, in consumer financing, and in distribution and retail of RETs where possible. When engaged and supported appropriately, women's increased involvement in value chains can lead to increased access to female markets and increased sales (Coleman et al. 2010). But there is lack of adequate women involvement in ICS value chains, due to women's limited mobility, problems to get loan and their low risk bearing capacity. Women lack the skills and flexibility to work in ICS value chains, so that empowerment of women is a key measure that may address the issue (Practical Action 2014). In Nepal, men primarily determine decisions relating to investments and adoption of technologies. There are, however, some notable differences across different caste or ethnic groups (ADB, 2018). Experience in Nepal shows that women, the poor and excluded face multiple exclusions, many of which cannot be tackled solely through sector-based interventions, as the causes are rooted in deep societal structures. For this reason, even among energy sector interventions, social mobilization and facilitation processes need to go beyond increasing access to assets and services and focus on empowerment as well (Energia, 2013).

Research Gaps: Although there are lots of efforts in the past to calculate investment need, there seems gap on identifying barriers for investment and depth analysis on policy environment for investment for RETs promotion in Nepal.

3. Enabling Environment for Financing on RETs in Nepal

3.1 Rural Energy Policy 2006

Rural Energy Policy 2006 defines rural energy as renewable energy that is environment friendly and used for economic and social development of rural households such as mini/micro hydro, solar energy, wind energy and biomass energy (MoEn, 2006). The overall goal of Rural Energy Policy 2006 is to contribute to poverty reduction, environmental conservation by, ensuring access to clean, reliable and appropriate energy in rural areas of Nepal. For achieving this goal, following objectives have been set up:

- To reduce dependency on traditional fuels 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 rural population by integrating rural energy with social and economic activities

The key elements of this policy document with regard to private participation in the financing of renewable energy technologies are: (i) promotion of the involvement of private sector in the provision of services related to renewable energy technologies; (ii) promotion of the use of financial instruments to mobilize capital from banks and financial institutions, internal capital market, and the community for rural development; (iii) encourage economic and industrial activities based on rural energy technologies; (vi) encourage local bodies, cooperatives, private sector, user organizations or community management entities to purchase and distribute electricity from the producers; (v) promotion of off-grid energy system to be integrated into mini-grid and to the national grid. The Policy has also provided for the creation of Central Renewable Energy Fund (CREF) for the development, expansion, promotion of rural energy technologies and assists in rural electrification.

3.2 Subsidy Policy 2016

Although the 'Renewable Energy Subsidy Policy 2016' had prepared a favourable market for RETs with the strategy of mobilizing commercial credit, attracting private sector entrepreneurs and reducing their investments risks, some challenges have prevented in mobilization of private investment in RET

sub-sectors. There was a growing realization that both public and private investment is required to enhance energy access to the remaining rural population. Currently, subsidy from government has not effectively leveraged the commercial credit in RE sector. The revision has been incorporated in the Subsidy Policy 2016, to enable among others, private sector to access subsidy. Further, revision of the subsidy was to encourage very poor households to use RETs with subsidy amounts to vary with the geographic regions, and to encourage private sector and financial institutions to invest in the sector.

The new policy mainly focuses on gradually replacing subsidy by credit in the long-term. Similarly, it focuses on further scaling up of RETs and achieving the objectives of SE4ALL. Long-term goal of the policy is to achieve universal access to clean, reliable and affordable renewable energy solutions by 2030 which is in alignment with the SE4ALL goals. The major objective of the new policy is to reduce dependence on traditional and imported energy by increasing access to renewable energy for improving the livelihoods of people and create employment opportunities especially in the rural areas (MoPE, 2073). The approach taken by the Policy is:

- Although subsidy amount differs according to technology and region, subsidy amount generally covers 40% of the total costs. Out of the remaining amount, around 30% from credit and around 30% from private sector investment or community or households in kind and/or cash can be mobilized.
- Subsidy will be provided to RETs on the basis of availability and appropriateness of natural resources, willingness of beneficiaries to procure and socio-economic benefits of the technology. Mini/micro hydropower will be taken as the basic infrastructure necessity for rural electrification and the Government of Nepal has fixed subsidy level based on Community Rural Electrification Policy.
- Subsidy for RETs will be provided to the least cost to energy output on the basis of technology type, cost and capacity, geographical location and targeted beneficiaries.

As a result, the new subsidy policy is geared towards leveraging the private sector investment in the renewable energy sector in the short-term and replacing subsidy by credits in the long-term.

3.3 Community Electricity Distribution Bye Laws, 2003

NEA with funding from the government has been promoting rural electric cooperatives to promote grid-based electrification in unserved rural areas. For this purpose, the Community Electricity Distribution Bye Laws, 2003 was formulated with the objective of (i) promoting public participation in existing electricity distribution systems for effective management of distribution system by reducing theft; (ii) promoting community in the extension of distribution lines to electrify green field areas, and operate and manage the system; (iii) to attract private investment in rural electrification; (iv) to promote technical and managerial capacity of rural communities in the field of electricity distribution. This approach has been successful in expanding rural electrification in the villages. Ninety (90) percent of the investment required for the construction of the distribution system is provided by the government as grant, the balance 10% is arranged by the community organizations generally sourced from the village or district development committee, forest user groups and some contribution for the beneficiary communities themselves.

Already, there are about 280 such entities (CREE) in operation across Nepal, mostly in the mid-hills and the Terai region. These entities buy electricity at a bulk rate from NEA and sell to the consumers at NEA's retail tariff rates. The surplus is used in billing, operation and minor maintenance of the distribution system in their supply areas. Major maintenance such as repairing the transformers, replacing poles or wires are carried out by NEA.

With 90% of the financing to be provided by the government, the financing is not a major issue in grid-based community rural electrification. The project implementation is also carried out by NEA, taking away the burden of project management. The distribution system in handed over to the CREE once completed. The delay in implementation of the project is an issue, as NEA takes its own time to implement. Often the quality of construction is an issue. However, the principle issue is the viability of

the CREE operation. The CREEs have no latitude in setting the retail tariff themselves and depending on how sparse or concentrated the settlement is, the distribution losses and operation and maintenance costs also vary. As a result, most of the CREEs are in good financial shape.

3.4 NRB Monetary Policy for Priority Sector

According to the Nepal Rastra Bank (NRB) Monetary Policy for 2017/18, commercial banks are required to allocate minimum 25 percent of total credit to the priority sector-1, which include minimum of 10 percent to agriculture, 5 percent to hydropower, and 5 percent to tourism and remaining to other priority sectors. For development banks and finance companies, the allocation requirements to the priority sector are minimum 15 percent and 10 percent of their total credit respectively.

Further, the Monetary Policy has also specified the ratio of loan to be extended by the commercial banks, development banks and finance companies to the deprived sector. The NRB Unified Directive 2074 specified the ratio of loan to be extended to deprived sector and productive sectors as follows:

The banks and financial institutions are required to lend up to NRs. 200,000 per household for the provision of solar home systems and/or biogas plants. In respect of energy facilities promoted by users committees, cooperatives, private sector or promoted under the public-private partnership (PPP) modality targeting deprived sector households and investing at least 50% of the project cost, the banks and financial institutions are required to lend up to NRs 30 million per installation in micro and mini-hydro projects of capacity up to 1000 kW, solar mini grids of capacity up to 500 kWp, gasifiers of capacity up to 200 kW, wind-solar hybrid system of capacity up to 500 kW, and biogas plants of size up to 200 m3. Further the Directive requires the commercial banks, development banks and financial institutions to lend at least 20%, 15% and 10%, respectively, of their total lending in the productive sector (agriculture, energy, tourism, and small and medium industries). The commercial banks are required to lend a minimum of 15% of the productive sector lending requirement to agriculture and energy sectors.

Under the given regulatory regime governing the banks and financial institutions, significant funds will be available for lending to energy sector projects. The World Bank has projected that under the current regulatory regime, about USD 10 billion of debt financing will potentially be available from local banks and financial institutions for financing energy sector projects in FY 2016-2030 (World Bank, 2017). This figure does not include the lending available from insurance companies, employment provident funds, citizen's investment trust and so on.

4. Investment Trend and Needs to Achieve SE4ALL Targets

4.1 Investment Trend and Projection

In this research, we have used the budget allocated in energy sector as a proxy for public sector investment in the sector, although not the entire allocated budget is expended. It is fair to assume that the government budget is the upper bound public sector investment. As presented in Table 4.1, the annual growth of the government budget allocation in the renewable energy sector has fluctuated widely--in some year decreasing by up to 23 percent-- the average growth over the period of 5 (2013-17) years being 8.5 percent per year. In respect of grid-based hydropower sector, the growth rate varies from 5 percent to 38 percent, the average being 26.8 percent (Table 4.2).

4.1.1 Public Sector Investment in Energy Sector: Trend and Projection

Public sector investment has been a significant source of finance for both off- grid RETs as well as in the large hydropower sector in Nepal. The public sector finance consists of Government of Nepal's own source and the grants and credits from the multilateral development banks and bilateral sources. A review of past trend of public finance in off- grid RETs sector shows that over the period of FY 2013/14 to FY 2017/18, the total budget allocation has increased on an average by 8.5%, increasing from NRs 3745 million in 2013/14 to NRs 4818 million in 2017/18 (see **Table 4.1**).

Table 4.1: Government's budget allocation in off-grid RETs sector (NRs. In Million)

Public investment in off-grid RETs	2013/14	2014/15	2015/16	2016/17	2017/18	Average
Government of Nepal	1,644	1,554	2,905	3,337	3,068	2,501
Foreign grants and credits	2,101	2,359	2,642	2,815	1,665	2,316
Total	3,745	3,913	5,547	6,152	4,733	**4,818**
Growth	-	4%	42%	11%	-23%	8.50%

Source: Red Books of FY 2013/14- FY 2017/18, MoF

Compared to the off- grid RETs the public sector investment in large hydropower and associated transmission and distribution is significantly higher. Table 4.2 presents the total budget allocation which has been increasing at an annual average rate of 26.8% over the period of 2012/14 to 2017/18 (from NRs 26,200 in 2013/14 to NRs 66,212 in 2017/18). On average, the government has allocated about USD 440 million per year in hydropower sector.

Table 4.2: Government's budget allocation in grid hydropower sector (NRs. In Million)

Public investment in grid hydropower sector	2013/14	2014/15	2015/16	2016/17	2017/18	Average
Government of Nepal	6,922	13,963	17,874	19,213	29,739	17,542
Foreign grants and credits	19,278	20,209	27,824	28,782	36,473	26,513
Total	26,200	34,172	45,698	47,995	66,212	44,055
Growth	-	30%	34%	5%	38%	26.80%

Source: Red Books of FY 2013/14- FY 2017/18, MoF

From the table 4.2, the budget allocation in the grid hydropower sector is almost ten times higher than the off- grid RETs. The investment from the government and from the bilateral and multilateral sources is increasing over the period of 2013/14-2017/18 in both the off- grid and grid hydropower sectors. In the off- grid sector the annual budget allocation is on the average slight higher than those from foreign sources. In grid based hydropower sector, government's contribution is about 40% of the total budget allocation in the sector, which is a significant figure.

The public sector investment growth of 26.8 percent is too high to be sustained in the long-term. In the face of uncertainity, we propose to present two alternative future investment scenarios—base case scenario (at 5% growth rate), optimistic scenarios (10% growth rate). For renewable energy sector, the projection has been prepared assuming that the public-sector investment will grow at least at the historical average growth rate of 8.5% The projection of investment requirement is presented in Table 3.5, assuming the economy will grow at a rate of 7.2% per year until 2030.

The projection of public sector investment in the energy sector is presented in Table 4.2 with the average rate of growth of public sector allocation of 26.8. WB/AusAid (2016) has estimated that to close the poverty gap, an annual requirement of investment in electricity sector in Nepal until 2020 will

be in the range of 3.34%-4.46% of GDP. It is fair to assume that the investment requirement to close of the electricity access gap will also be in similar range. Accordingly, for the grid hydropower sector the annual investment requirement is estimated to be 4% of the GDP until 2030.

4.1.2 Private Sector Investment in Energy Sector

The information on private sector investment in the energy sector is not available in the public domain. In the renewable energy sector, about 40% of the cost is met by subsidy, the balance is met by equity contributed by the developer (about 20%) and as credit from bank or contribution from village development committee and/or the district development committee (about 40%). In the absence of definitive data on the share of investment from various sources, it is reasonable to assume that about 40% of the investment in the renewable energy sector is invested as equity and credit from the banks.

In the case of grid hydropower sector, in the absence of public information on the actual investment, the total investment has been arrived at assuming a three-year construction period for run-of-the-river hydropower projects, and assuming specific cost including household subsidy of NRs 220,000 per kW of installed capacity (GWP Nepal, 2013). A summary of the estimate of private sector investment in energy sector has been presented in Table 4.3.

Table 4.3: Approximate Private sector investment in energy sector (NRs. In Million)

FY	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Off- grid RETs	1,498	1,565	2,219	2,461
Grid based hydropower	5,513	-	15,136	25,653
Total	**7,011**	**1,565**	**17,355**	**28,114**

Source: Red books, MoF; NEA Year in Review of 2012/13- 2016/17, Annual reports.

Considering both the public and private sector finance, almost 58% of the total finance for the electricity sector is from domestic sources. This compares favourably with the case of Bangladesh where 44% of the total investment in electricity is from domestic sources (SE4ALL, 2017b). The energy sector investment as a percentage of GDP was 1.9% in 2013/14, 1.8% in 2014/15 and 3% in 2015/16.

The private sector investment in the energy sector, particularly in the grid hydropower is quite erratic, as shown in Table 4.3. Difficulty in securing necessary financing for the private sector hydropower development largely explains the erratic investment in hydropower. As a result, no attempt has been made to project the private sector investment in the energy sector. The investment over and above that of the public sector is assumed to be from the private sector.

4.2 Investment Requirements for Achieving SE4ALL Goals

SE4ALL Rapid Assessment Gap Analysis Report has projected the investment requirements for different technologies for electricity supply as well as for demand side management/ energy efficiency technologies. The table below shows the investment requirement for achieving the goals of SE4ALL.

Table 4.4: Investment requirements for achieving SE4ALL goals (million NRs.)

Technology Costs	**2015**	**2020**	**2025**	**2030**
Biogas Production technology	3,217	3,729	4,291	17,141
Mini/Micro-hydro plants, off-grid	1,526	3,256	6,634	-
Pico hydro plants, isolated	199	476	1,038	1,038
Grid connected hydro power plant	463,542	614,121	886,592	1,182,246

Grid connected solar PV power plant		27,053	88,363	289,421
SHS, isolated	7,745	16,523	35,249	79,382
Total supply investment	762,338	1,064,770	1,636,261	2,511,983
End use demand technology costs	9,476	17,548	26,285	40,675

Source: SE4ALL, 2013

4.3 Gaps in Investment

As shown in the Table 4.4, no attempt has been made to project the private sector investment in the energy sector. There is a clear difference between the investment requirements for SE4ALL (see Table 4.4) and the projected public sector investments (see Table 4.1 and Table 4.2), this investment gap is assumed to be met primarily by the private sector. Table 4.5 presents the projected investment gap to achieve the SE4ALL goals.

There is a significant investment gap in energy sector to achieve the SE4ALL goals, to the tune of NRs 1000 billion (USD 10 billion) in the years 2020, 2025 and 2030. This figure is almost 26 times the private sector investment in energy sector in the year 2017. Achieving investment of this scale from the private sector (both local and foreign) is a serious challenge unless there is a significant effort in improving the investment environment in the country by putting in place necessary mechanism to mitigate the risks perceived by the private sector investors (especially the foreign investors) to invest in the energy sector to attain installed capacity of electricity generation of 11,480 MW in Nepal by 2030 as projected by SE4ALL.

Table 4.5: Projection of Investment requirements to achieve the objectives of the SE4ALL (million NRs)

Descriptions (Sources of Financing)	2020	2025	2030
GON own Source-Alternative Energy	2,679	5,799	12,550
GON own Source-Grid connected hydropower	60,608	198,551	650,451
Foreign Grants and Credits-Alternative Energy	3,294	7,129	15,428
Foreign Grants and Credits-Grid connected hydropower	74,331	243,509	797,734
Total	**140,912**	**454,988**	**1,476,163**
Investment requirement as per RAGA:	1,064,770	1,636,261	2,511,983
Additional investment requirement (investment gap)	**923,858**	**1,181,273**	**1,035,820**

Sources: RAGA, 2013 & author's calculation based Red Books of FY 2013/14-17/18.

5. Potential Financing Sources to Meet the Investment Gap

There is a significant investment gap in energy sector to achieve the SE4ALL goals. Achieving investment of this scale from the private sector (both local and foreign) is a serious challenge unless there is a significant effort in improving the investment environment in the country by putting in place necessary mechanism to mitigate the risks associated with the projects and to address the financial barriers faced by the developers. We describe below the sources of financing in RET, including innovative instruments that may potentially be designed and introduced in Nepal in the promotion of off-grid RETs.

5.1 Traditional Financing Sources

In Nepal, the public sector has been the principal source of finance in energy sector investment in the form of subsidies and to some extent some credit lines. The major government initiative consisted of the plans to promote micro hydro in the Sixth National Plan period (1980-85) with the Agricultural Development Bank, a public sector bank, lunching the Rural Electrification Project under which the credits and subsidy provided to the developers of MHPs and other fiscal and regulatory measures such as waver of income tax, deregulation of prices of electricity from MHPs. The role of public sector banks in the provision of credit provided important impetus to the promotion of renewable energy technologies particularly in the early stages for biogas and the micro hydro. In the past, subsidies have been implemented on ad-hoc and intermittent basis through the yearly budgetary allocation-- in some years no funds for subsidy being allocated (Pokharel, 2003). However, following the establishment of AEPC in 1996, support to RETs was provided in a consistent manner guided by a policy framework additionally boosted by donor grant financing and technical advisory support.

In addition to government's contribution, the public sector financing also consists credits or grants from the multilateral development banks or agencies or bilateral sources channelized through the government.

Among the line of credits that are currently in effect are the Micro Hydro Debt Fund (MHDF) and Central Renewable Energy Fund (CREF). The MHDF is tied to a single technology—micro hydro and CREF targets all RETs funding in the entire supply chain of RETs—from business to consumers.

The role of private sector is largely prominent particularly in the biogas, ICS and solar home technology, and limited in case of MHPs and other installations. Biogas, ICS and solar home systems are largely owned by individual households and funding mix consists of subsidy, credits from banks or MFIs and equity contribution from the households. In the case of MHPs, the installations are mostly owned and operated by the community through a Management Committee, members elected from among the community. In addition to the subsidy and loans from the banks, the community members also provide cash and/or labor contribution during the construction of the project. There also exist few cases of private sector investment in micro hydro plants.

The traditional financing instruments were (and are) largely in the form of capital, and the balance of the financing were met through contributions from local government (VDC and DDC) or other community organizations such as Forest User Groups and partly from the contribution form the local beneficiary community members. The balance is met through loans form the commercial banks or through the funds mentioned above. In the traditional approach sustainability was a major barrier in scaling up renewable energy technologies.

5.2 Innovative financing instruments

The innovative financing instruments are designed to leverage private financing through the public funding. These instruments can be divided into following three categories (WB/CIF, n.d.):

(i) Instruments that address financial barriers consist of:-

Senior debt (credit line) consists of loan advanced to the renewable energy projects from the public sources and generally comes as a concessionary fund. The debt may come in the form of senior debt which is the first to be paid back among the creditors. Or as a subordinated debt which is last to be paid back among the creditors, and is almost like the equity capital. The senior debt has the advantage of bringing down the project cost, and the latter has the benefit of increasing the comfort level of the senior lenders, and also reduce the cost of senior debt. The senior debt in the form of credit line may increase the involvement of commercial financing institutions in the RET lending.

Asset-Backed Securities are a type of bond backed up by the cash flows generated by the project, and are generally used in refinancing the projects which are already generating positive cash flows. The project financing is through bond offering rather than through loans. When refinanced, the public funds are freed for future projects. It does not exist till now in Nepal but could be a source of financing in future.

Results-based financing (RBF) typically consists of instruments in which payment is made against the delivery of specified sets of project outputs. Linking payment of grants and subsidies to results creates strong incentives on the developers to deliver the projects. This instrument however does not overcome the financing barriers, as the project developer will still have to arrange for the up-front financing of the project. There is also a challenge in properly defining the output to be achieved.

Another variant of the RBF is providing funds for pre-investment, which may be converted into grants if successfully completed. This will provide the developers incentives to complete that project in a timely fashion.

Carbon financing allows projects to access expected revenue stream from Certified Emissions Reductions (CERs) upon completion. This instrument will effectively secure the upfront financing against projected carbon revenues. However, the process of realizing revenue from carbon financing is complex and takes time.

Credit Guarantees incentivize the lending to RET projects by covering a portion of the losses to the financing institutions for the unpaid principal, if a specified event occur, and is an effective instrument to leverage private financing.

(ii) **Instruments that address project risks**

Capital grants or subsidies will enhance the financial viability of the project, thus reducing the risk of project which is not otherwise financially viable.

Senior debt in the form of project loans will help bring down the overall cost, and at the same time be a source of long-term finance, providing some comfort to the private investors that concessional loans are available from the public source.

Micro-financing allows the rural households to have small scale RETs such as solar home systems or improved cook stoves financed. Since small scale RETs do not necessarily

generate incomes, the micro-finance institutions (MFI) need to promote income generation activities of the households taking loans for RETs. Although the transaction costs is high in general, MFIs cost of operation are lower than other alternative financing such as commercial banks.

There is a lack of awareness on the RET technologies among MFIs, and with proper support, they are willing to provide loans for the RETs and linking such loans to income generating activities so that MFI members are able to pay back the loans taken for RETs (NEF & CTR/N, 2017; CRT/N & SETM, 2014)).

In the Nepal context, as an instrument of addressing barriers, line of credit has been established through the creation of Micro Hydro Debt Fund (MHDF) and Central Renewable Energy Fund (CREF). However they are at par with other debt in terms of seniority. For the risk minimization, capital subsidy and micro-financing are the principal financing instruments in Nepal. The role of carbon financing is very limited.

Other instruments described above can potentially be designed and implemented in Nepal in the given condition of financial market maturity in Nepal. There are other sophisticated financial instruments such as derivatives or securitization to restructure risks of portfolio of RET projects. Since sophisticated markets are required to be able to analyse the price and the risks associated with these types of instruments, we have not considered these instruments in this study.

In the following sub-sections, the financial instruments in place in Nepal have been discussed.

5.3 Current Efforts to Increase Access to Finance through Financial Intermediation Facility

A review of the current efforts to address the barriers to finance and to reduce the project risks indicate that the government has provided for lines of credits under two initiatives, viz., Micro Hydro Debt Fund (MHDF) and Central Renewable Energy Fund (CREF) as described below:

5.3.1 Micro Hydro Debt Fund

A performance assessment of the micro hydro projects (MHPs) supported by the Micro Hydro Debt Fund (MHDF or the Fund) is presented in (GIZ/EnDev, 2016). MHDF was established as part of GIZ/EnDev program with the aim to improve the clean energy access in rural areas of Nepal through the implementation of micro hydro projects. The Fund provides credit support to rural communities on the initial investment for off-grid micro hydro plants of 10-100 kW range. The MHDF while increasing the pace of electrification is expected to stimulate the development of productive uses and income generating activities in the rural areas.

Under the supervision of AEPC, two competitively selected banks--Himalayan Bank and NMB BANK (then Clean Energy Development Bank), administer MHDF. Further, the Fund is an attempt to demonstrate that the financial institutions can manage lending in the micro hydro sector as a commercially sustainable business.

The MHDF has till date supported 26 micro hydro projects by providing loans for their implementation through the two commercial banks (Himalayan Bank and NMB Bank). The financing mix of these micro hydro projects comprises of Government Subsidy, VDC and DDC investments, and community contribution in cash and in kind. The balance of the fund is covered by the loan provided by the above two banks from MHDF around NRs. 55,000 per KW. Under the MHDF loan provision, HBL has provided credit support to 8 MHP and NMB has provided credit facility to 18 MHPs and credit contribution is around 20%.

All micro-hydro projects supported by MHDF are mostly owned and managed by communities through users' committees registered with the District Water Resource Committee (DWRC) in respective districts and in some cases through cooperatives. The credit is made available on the basis of the projected cash flow of the projects, not on the basis of collateral or personal guarantees, as is normally the case, following the concept of project financing. Another notable feature of MHDF is the partial risk guarantee mechanism on which the banks can fall back to in case of non-recovery of the

loan. The community cash equity must be at least 5% of the project cost and MHDF loan can be provided maximum 40% of the total costs.

GIZ/EnDev study has assessed 15 MHPs out of 26 MHPs supported by the Fund in terms of technical, managerial, financial performance, through site visits and interaction with end users. The report also presented the perspectives of the banks managing the Fund on the performance of these loan portfolios. At the time of the field visit, seven MHPs were not operational. Of the 15 MHPs assessed, nine were unable to repay the loan, 5 MHPs were facing some issues, and only one MHP had no problem in loan repayment.

Insufficient income due to low tariff to cover the operational expenditure and the monthly instalment of loan repayment, the costs overrun during construction compelling the sponsors to take loans at higher interest rates from other sources, 2015 earthquake, and the poor management practice are the key factors that have contributed to the poor financial performance of the MHPs. Other issues include plant breakdown, lack of capacity development support, lack of management skills, negligence on repayment of loans, and insufficient bank follow-up.

The GIZ/EnDev study has made following recommendations for improved loan recovery: i) improve technical capacity/skills for improved plant availability; ii) provide capacity development support on management and accounting; iii) institute an alternative arrangement for injecting additional funds to complete the projects, in the event of cost overruns; and iv) institute a provision for rescheduling of loan repayment in the event of force majeure events such as earthquakes and floods.

5.3.2 Central Renewable Energy Fund

The Rural Energy Policy 2006 has recognized financing as a critical factor for the wider promotion of renewable energy technologies in Nepal (AEPC, 2006). The Policy has also envisaged creation of the Central Rural Energy Fund (CREF), which has since come into existence. Unlike MHDF, CREF covers financing of all renewable energy technologies promoted by community/cooperative or private sector, including lending to equipment suppliers.

The CREF was established in February 2013 as a financial intermediation mechanism for the renewable energy sector in Nepal under the National Rural and Renewable Energy Programme (NRREP). The objectives of the CREF are to: (i) channel the subsidy and loan for the development, promotion and expansion of renewable and rural energy technology; (ii) provide the consumer loan at concessional rate through the financial intermediaries; (iii) develop and promote the renewable energy technologies through the private-public partnership; and (iv) encourage the private sector in the development and promotion of renewable energy technologies. The principal activities of CREF are subsidy delivery and credit disbursement for renewable energy technologies.

The CREF has been set up as an autonomous body with its own mandate and management structure. The CREF mechanism consists of the main Handling Bank and multiple Partner Banks which function in coordination with the Investment Committee and the Secretariat. The role of the CREF Investment Committee is to provide overall oversight and guidance in subsidy fund management, promotion of credit services and investment management. The CREF Secretariat provides day-to-day support for the implementation of the CREF mandate and provides secretariat support to the CREF Investment Committee.

The Handling Bank, which reports to the CREF Investment Committee, is responsible for fund facilitation to prequalified Partner Banks, subsidy fund management and management of investments of the CREF unallocated funds. The Partner Banks are institutions through which funds are disbursed to the end users. The scope of CREF includes the following RE components:

- Solar Energy Projects/Systems
- Biogas Projects/Plants

- Biomass Energy Projects
- Community Electrification Projects (Micro and Mini Hydro Projects)
- Improved Water Mill
- Productive energy use

Comparison of Key Provisions of MHDF and CREF

Comparison of the key provisions of MHFG and CREF is presented in table 5.1 below:

Table 5.1: Comparison of Key Provisions of MHDF and CRFF

Key Provisions	***MHDF***	***CREF***
RE technologies supported	Micro hydro (10kW to 100 kW)	All technologies including mini-hydro (upto 1000 kW)
Project types supported	Community based	Community based and private sector
Trade financing	Not supported	Supported
End use promotion	Not supported	Supported
Project review/due diligence	AEPC	AEPC
Subsidy	As per Subsidy Policy	As per Subsidy Policy
Partner banks responsible for lending	NMB Bank (formerly Clean Development Bank) and Himalayan Bank Limited	**One handling banks**: NMB Bank **Partner Banks:** Himalayan Bank Limited, Bank of Kathmandu, Nepal Investment Bank, Tourism Development Bank, Siddhartha Bank Limited & Civil Bank.
Collateral requirement	No	Yes, as per Bank and respective FI's lending policy
Credit guarantee facility	Yes	No

It may be noted that MHDF is tied to a single technology (e.g., MHP) and the support is provided only to projects promoted by community groups. Key features of this Fund are that the commercial banks handling the fund do not require collateral for lending, and the credit risk is mitigated by credit guarantee facility to cover the bank in the event of default. In contrast, CREF financing is available for all RE technologies. In addition, support is available for the productive end uses and for financing the trade for the equipment supply companies. The bank follows its own rules in respect of lending including requirement of collateral. No credit guarantee is available under CREF.

CREF has been designed to support the complete supply chain and load promotion--development of supply system, support the equipment vendors and end use promotion through support in the promotion of productive enterprises. CREF is designed with a view to leverage the private sector finance in RET investment. However, barring one handling bank, most of the handling banks are not keen to lend in RETs under CREF, reflecting the slow progress in lending. The banks regard such projects are risky to lend in the absence of credit guarantee facilities. In terms of lending to the MHPs, MHDF is generally successful in comparison with CREF.

6. Barriers and Risk for Private Sector Investment: A Case Study from Investment on Micro-hydro Power Development in Nepal

Most of the MHPs in Nepal are implemented by community groups utilizing government subsidy, the credit from the local financial institutions, contribution from District Development Committees and equity and in-kind and/or cash contribution from the community members. The role of private sector in financing is minimal and is largely focussed on the technical survey, design, equipment supply chain, installation and other service provisions. High up-front cost, poor revenue realization, and low ability to pay for electricity among the local customers are factors that tend to discourage private sector investment in micro-hydro projects. In an effort to address this situation, the Renewable Energy Subsidy Policy 2073 (AEPC, 2016) attempts to encourage private sector participation in ownership, operation and management of RETs by making the private sector eligible to apply for government subsidy, which was previously available only to community groups or cooperatives. The policy also includes a strategy of encouraging public-private sector participation in the renewable energy technologies.

The interviews with the key informants have shown that there is little or no interest from the private sector to invest in the MHPs. Difficulty in recovering the investment as a result of low volume of revenue is cited as the principal reason for the lack of private sector interest.

6.1 Barriers to Private Sector Participation

6.1.1 Low Level of Demand

The community managed MHPs are facing the following key systemic issues: (i) Management issues, (ii) Ineffective tariff collection and low ability of the people to pay, and (iii) Technical failure. The tariff is often not sufficient to pay back the bank loans and for maintenance. Among the MHDF supported MHPs, out of 15 projects reviewed, suffered from poor management practice (GIZ/EnDev (2016). They range from the poor revenue realization or inefficient tariff collection practices (in 8 out of 15 plants), practice of diversion of the revenue to activities not related to MHP operation. This shows, low plant utilization factor (as low as 20%) is reflected in low revenue realization by the micro hydro plants (UCS, 2016). The demand is largely for lighting, typically four hours in the evening. Opportunities for the end-use application are also limited in the areas where the road access is limited or non-existent. In the accessible locations, where there is an opportunity for increased industry and commerce, most plants are not able to supply the necessary demand even in the day time.

6.1.2 Small Scale of Operation

The cost of processing loans for small size of lending is expensive for the banks. Additionally, most banks and financial institutions do not have necessary expertise to perform due diligence on such projects. Repeated monitoring and other formal processes take as much time as bigger projects and the volume of lending is not worth from financial cost benefit point of view. Most off- grid RETs fall on this category. However, due to the requirements of the priority sector lending of the Nepal Rastra Bank, the banks and financial institutions are required to lend to the energy sector. Many commercial banks are leading to the microfinance institutions (MFI) to finance the stand along RETs such as SHS, biogas and ICS. Moreover, scattered location of the plants makes it costly for the banks to administer the loan portfolio. Migrating to larger sized RETs and building capacity within the banks to evaluate the projects, to assess the risk-return profile may address this situation.

6.1.3 Consumer non-payment Risk

Non-payment by the consumers is often found in micro hydro plants owned by the communities. Some of the households do not have ability to pay for electricity or do not feel obliged to pay the monthly tariff as the communities see the plant as a common property with no individual consumer being liable for loan repayment. This has reflected in a number of micro hydro plants not being able to repay the loans.

6.1.4 Access to Credit

The interviews with the key informants from the MHP community organizations have shown that 27% of the sampled MHPs have received bank loans. Complicated procedure for loan application, high interest rate and low valuation of land in the rural area as collateral are cited as the key reasons for the low level of interest in applying for the bank loan. Those MHPs which have succeeded to take loans are largely because of good relations the executive members enjoy with the bank management. In such cases mostly the executive members' landed properties are pledged as the collateral.

Banks in Nepal lend against collateral, which in the rural areas is the agricultural land. However, the value of the land in the rural areas is low, often not sufficient to cover the loan amount. Further, the liquidity of rural assets is low, and the banks often regard it risky to take such land as surety. As a result, securing necessary loans from banks for the community organizations is a challenge. Thus, the access to credit is constrained for investment in micro hydro plants.

6.1.5 Insufficient Preparation of Projects

In MHPs, the problem starts from the project preparation stage. Feasibility study (demand assessment, site selection, technical design) is often found lacking in sufficient due diligence. The study is done with insufficient field level input, as most feasibility studies are carried out by the consultants at a small fee. As a result, site selection, demand estimation, and other risks are not analysed/ identified properly. The projects often face cost overruns and low local demand after project completion, resulting in insufficient revenue realization for the project communities to pay back the debt and maintain the plants in good order. Interviews with the concerned officials from the banks lending in the renewable sector as part of MHDF and CREF, confirmed this as one of the key issues facing many micro hydro projects.

6.1.6 Risks Perceptions of Financial Institutions

The finance required for small renewable energy systems are often too small for mainstream investors and banks. And the transaction cost for funding the small projects are generally high as cost related to due diligence and loan processing are normally fixed irrespective of the size of the individual lending portfolio. And for the consumers / communities, the process and time taken for applying and receiving funding from government institutions and other investors may be discouraging. Under the new changed federal context, where local municipality is responsible to look after renewable energy technologies, it is expected that the access to public funding and information will be better.

6.1.7 Gender and Social Inclusion related Issues

There is very good participation of women in the executive committees in the surveyed MHP plants. In the micro hydro community organization, almost half of the study entities have at least one woman in the executive committee. However, the women members are not found to involve actively in decision making process, and rather remain a passive member in the meetings. Participation of women's groups in the collection of the electricity bills is not found. However, women are responsible to pay the electricity bills in those households where the male members are in foreign employment. Due to high migration of male in rural areas, for the sustainability of the energy systems it is necessary to capacitate and engange more women in operation, maintenance and management of the systems.

6.2 Approaches to Mitigation of Risks

6.2.1 Credit Guarantee Facilities

MHDF has provided for partial credit guarantee on the loan portfolio of micro hydro projects. However, the CREF does not have a provision of credit guarantee. Despite CREF having improved elements in its design, lack of credit guarantee facilities has been a major issue in lending to the renewable energy technologies, especially in micro hydro projects.

Alongside the credit guarantee facilities, it is desirable for the banks to be able to identify opportunities for renewable energy financing. For this to happen and to ensure sustainable energy finance, assistance in training the staff to improve their skills to evaluate proposals as well as in product

development and marketing, and engineering due diligence for renewable energy projects. It is also necessary to build the capacity of local companies who are dealing in renewable energy sector.

6.2.2 Technical Support and Capacity Building

The quality of feasibility studies of RE projects, especially for micro hydro are generally regarded as not up to the desired standards. Often the initial cost estimates have been found significantly exceeding when the project is completed. It is essential for the AEPC to provide necessary technical support to ensure that the feasibility studies are carried out with sufficient care, and identify the key risks to provide sufficient information to the lenders for them to assess the risks-return profile.

6.2.3 Scale and Size of Plants

The small size of the micro hydro plants (capacity up to 100 kW) precludes their ability to meet the electricity demand growth over a short to medium term. At the same time, making the MHP reliable makes the electricity generation cost go up. Coupled with the low plant utilization factor, small size of the micro hydro plants along with high costs result in high cost of generation. Mini hydro projects (100-1000 kW) may potentially provide better scale resulting in lower cost of generation, higher reliability of supply and larger end-use possibility.

6.2.4 Grid Connection of RETs

One way to improve the reliability of the supply from micro hydro plants and to improve the plant utilization factor and in the process bringing down the cost of generation from micro hydro plants, is to connect the micro hydro plants to the grid. However, interconnection system for grid connection is rather expensive beyond the available resource of the micro hydro entities. Mini hydro plants will be more suited to grid connection.

6.2.5 Energy Service Companies

Micro hydro plants are mostly built as community owned plants, most of which are performing poorly. The role of private sector is limited largely as the provider of technical services and equipment for RET installation. The micro hydro plants are not economically viable due to low productive end use opportunities, low ability to pay for electricity except for lighting applications resulting in low plant utilization. Moreover, many MHPs are suffering from poor management practices, which may be improved with the private sector participation. But the private sector will not be interested to invest unless there is a scope for making profits. For the RET projects which are financially viable, may be developed as a private enterprise with government providing the usual subsidy.

6.2.6 End Use Promotion

As part of National Rural and Renewable Energy Program (NRREP), AEPC has been implementing the productive end use promotion activities since 2012 under the Business Development for Renewable Energy and Productive Energy Use Component. This component seeks to promote productive energy use of RE in order to generate employment and income of the rural men and women by establishing MSMEs. This intervention is a positive step in right direction, as in the past the productive use of energy was often taken for granted, and it was assumed that the once the energy is available people will initiate productive use activities.

A study to assess the impact of Community Electrification by Micro Hydropower Projects (MHPs) installed under National Rural and Renewable Energy Programme (NRREP), has noted limited productive energy use opportunities in the project areas (AEPC, 2017). This is reflected in low plant factor, resulting in inadequate revenue to undertake adequate operation and maintenance of the plants, impacting on the long-term financial sustainably of the plants. In those MHPs where there exist local demand for small scale industries, inadequate supply capacity and low reliability of supply are the major constraints.

7. Conclusion and Recommendations

7.1 Conclusions

The Rural Energy Policy 2006 which is the governing policy of the GoN in Nepal outlines subsidies, promotion of private sector and public-private participation as the key strategies for the promotion for the renewable energy technologies in Nepal. For the administration of the subsidy, Renewable Policy Subsidy Policy has been promulgated and updated from time to time to reflect the lessons learnt, the latest being the Renewable Policy Subsidy Policy, 2073 (2016). This subsidy policy has removed one of the key policy barriers that barred the private sector investors and service providers to access subsidy or credit. It is generally believed that this barrier had resulted in reduced private sector investment in the past, thus avoiding the benefits that private sector would potentially bring in terms of better management skills and technology innovation. Additionally, it is believed that the constraints restricting community organizations do not always apply to firms operating within the private sector, allowing for fresh and creative approaches to business.

RETs such as ICS, biogas, and SHS are associated with significant private participation, nonetheless they are not adequate to achieve SE4All targets. As stated in the foregoing sections, in the case of micro-hydro, most plants are traditionally community owned with peoples' participation. Within the given policy environment, catalysing private investment in MHPs is not yet likely to happen unless the measures to minimize the risks from the private investor's perspective are put in place. Some of the innovative financing mechanisms to attract the private sector investment are:

(i) Enhancing the loan repayment capacity by ensuring regular payment of electricity bills through some mandatory saving mechanisms such as women's cooperatives;

(ii) Putting in place effective credit enhancement mechanism for commercial banks through the way of compulsory investment in more than one RET.

(iii) Promotion of energy service companies (ESCOs) as a way of involving the private sector in MHPs.

The development of micro hydro in a significant scale is constrained by its smaller size precluding economies of scale. At the same time, it is not financially feasible to make the component structure (largely civil structure such as diversion, intake, canal) of the MH plants sufficiently reliable, as this will increase the cost of generation. The larger size MHP plants are generally associated with lower specific cost. Even in the event of extension of the national grid in the service areas of MHPs, larger size MH plants would make it technically and financially more viable to install the necessary interconnection equipment for grid connection of the plants.

The issues concerning the quality of electricity supply, end-use promotion and revenue realization--issues plaguing most MHPs-- can be expected to improve with private sector's participation. However, the remoteness of the location of MHPs, low opportunity for end-use promotion, and high upfront cost of the technology make it less attractive for the private sector to invest in MHPs unless sufficient support in the form of subsidy is available, ideally linking the level of subsidy to the geographical location of the MHP (as the cost of an MHP varies with the location of the plant).

The following conclusions have been drawn with respect to the research questions:

a. Legal and policy environment

The existing legal and policy environment are supportive of promoting increased investment in the green energy sector. Particularly, the policy is focused on leveraging private sector investment by providing subsidy and other support in the promotion of renewable energy sector. The monetary policy has provided support for the sector by requiring the commercial banks and financial institutions to mandatorily invest in renewable energy. However, there still

exist barriers in the promotion of increased access which have been descried in the preceding sections.

b. Public investment and support packages

As mentioned in sections above, public financing has provided significant support in scaling up the RETs. However, it has not been very effective in leveraging the private sector investment in RET. Low demand for electricity and low opportunity for increased economic activities, are hindering private sector to invest in rural energy space. Innovative approach of involving private sector has to be devised to address this barrier and can be done within the given policy framework.

The analysis shows that there is a huge investment gap vis a vis the current investment flows in the sector, to achieve universal access to electricity by 2030. Although Nepal has high electricity access rate (74%) on binary metric, most fall in Tier 1-3. Nepal needs to expend significant effort in elevating the access to Tier 3-4. For this significant investment in putting in place generation, transmission and distribution infrastructure is needed. Assessment of the budget allocation figures indicates that the government is already providing close to 40% of the total investment from its own resources, rest are from the bilateral and multilateral financing agencies, and some from community contributions.

c. Private Sector Investment

Private sector is largely concentrated in small and large scale hydropower development. The present private sector investment is largely led by the domestic capital. Foreign investment is yet to be materialized at a significant scale because of insufficient policy and regulatory set up, key risks for any investor.

In the rural energy space, the private investment on energy provision is largely concentrated in stand-alone, household level installations such as SHS, ICS, and biogas. The community oriented projects are seen as significant risks by, the local banks and FIs. Hence such installations are very much limited in the private sector.

Measures to remove the barriers in private sector investment have been described in the main text of this report.

d. Gender

Women's participation in the provision of energy services is very limited especially in decision making processes. They are however sufficiently represented in the management committees as the executive members.

7.2 Recommendations for Attracting Investment on RETs

Based on the foregoing analysis following policy recommendations are made:

a. Off grid RETs as pre-electrification options: Off-grid RE technologies are good options for pre-electrification of rural communities where the demand is low initially and grid electrification is not feasible. Since sustainability of such projects is not always achieved, once sufficient level of electrification is achieved, more reliable system should be implemented. Such options may consist of mini grid hydropower, or extension of national grid. Mini grid hydro because of its size may be associated with lower cost of generation compared to the MHP. At the same time, the system will be more reliable compared to MHP as project facilities are more robust in comparison.

b. Better project preparation and provide support for project development: There must be mechanism to ensure quality of feasibility and detailed design study of projects. It must be reliable enough to all to take risks for investment.
c. Define the business model for the private sector participation: Absence of a viable business model for the development of RETs by the private sector is felt in the larger RETs such as MHPs or institutional solar PV projects. AEPC should identify and categorize the projects based on financial analysis into those that is unlikely to attract private investment and traditionally to be developed as community or cooperative managed projects and those that are finally attractive and can attract private investment. The former types of projects will have significant social benefits and need to be implemented, but may not be financially sustainable. The later types may attract the private sector. In both type of projects the private sector will have different roles to play. In the former, an ESCO, and in the later, a sole private investor supported by applicable subsidy.
d. The business model of an energy service company (ESCO) which is widely used in energy efficiency financing may be adopted in Nepal. In this model, the government may provide one-time capital subsidy to the ESCO in return for guaranteed electrification of agreed reliability to households in certain communities. The capital subsidy is determined on competitive basis, with the company asking the lowest capital subsidy for electrification is awarded the concession. This approach while providing incentives for the private sector will also be instrumental in introducing the private sector management in the operation of the system.
e. Devise a clear grid extension plan and promotion of grid connection: Consumers have the tendency to migrate to the grid supply when the grid line is extended to the MHP service area. This situation affects the revenue from the existing off-grid projects. One solution is to connect the MHPs to the grid. However, grid connection equipment is expensive for small sized installation. In addition, the NEA may not be willing to connect the MHPs to the grid. Stability of grid with variable power may also be an issue. Some financial support from the government for grid connection is desirable in such situation. A risk fund is also important to cover the cost of systems if grid arrives earlier then planned. Importantly, close co-ordination with local governments and NEA is required to ensure that the MHPs are built only when there is assurance that the grid will not arrive within a specified time period so that financial analysis can be calculated accordingly.
f. Linking with Micro-finance: Micro finance could be an effective medium to promote RETs in the rural areas. The extensive network of micro finance institutions may be mobilized for it. The MFI should be capacitated to design and rollout the loan products for enhanced income of the households.
g. Loan guarantee mechanism designed and implemented: While credit guarantee facility may be a disincentive for the financers in carrying out proper due diligence and pursue loan recovery effectively, the absence of such an instrument to finance RETs which is not the standard loan product of financial institutions, act as a significant barrier to finance. Guarantee programme if exists must be sufficiently tied up with stringent provisions such as rigorous financial analysis (including tariff analysis), strong feasibility reports and consistent monitoring.
h. Promotion of End Use establishing the linkages with other income generating Sectors: End use can be promoted by linking electricity with other productive activities that may be potentially feasible in the supply area. They may include water supply/ irrigation or possibility of supplying the mobile phone towers in the area. Developing strong nexus between energy and agriculture financing may help to promote productive use of produced electricity and contribute to sustainability of energy system.

i. Need to engage CSOs: Partnerships between civil society, private sectors, and government is crucial for building capacity and delivering energy services to the last mile.

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Annexes

Annex 1: Matrix for the Research Work

Research Objectives	Research Questions	Research Method	Sources of Information
I. Assessment of Investment Requirements			
1. To assess the investment required to meet the SE4ALL goals in energy access	1. What are the gaps in investment in green and inclusive energy? 2. What are the likely sources of funds to meet the gap, and are they sufficient?	• Review of literature. • Review of government annual investment plans to assess the present trend and commitment. • Assessment of donor's commitment.	• National Planning Commission (periodic plan, SDG targets), • AEPC reports and publications, • WB/ADB/ and other donors' commitment. • SE4ALL (Gap Analysis for Nepal).
II. Areas of Improvement for Enhanced Investment			
Policy and Regulation:			
2. To analyze the regulatory and policy gaps for enhanced investment in green energy sector.	3. Is the existing legal and policy instruments sufficient for promoting increased investment in the sector? If not, what are the key barriers/challenges to investment in the sector? 4. What are the plans/efforts by the government for removing the barriers/challenges to investment in the sector?	• Review of regulation and directives on energy sector. • Review of subsidy policy • Review of periodic plan documents of the government. •	• AEPC • Ministry of Science and Technology. • NPC • NRB • CREF • MoEn • NACEUN • NMHDA
Access to Finance:			

3. To identify the barriers to energy access finance, and to identify measures to address the barriers.	5. How easy and affordable is the access to finance for investment in this sector? And, what needs to be improved/done differently? 6. What is the possibility of involving the women's savings organizations/ groups for improved monthly electricity bill payment situation, and for enhanced leadership capacity of women in ensuring improved revenue of MHPs and CREEs? 7. What are the opportunities and barriers for women and disadvantaged groups at the community level to participate in the energy access value chain? 8. What are the roles of CSO and Cooperatives in the promotion of RE?	• In-depth interviews with commercial banks officials, management committee members of MHPs & CREEs, and women's groups. • Literature review. • Review of project/program documents.	• AEPC, Ministry of Science and Technology. • NACEUN • NMHDA • NMB Bank, Himalayan Bank • Management Committees of MHPs • Management committees of CREEs • Women's groups from the beneficiary community.

Public Sector Support and Local Governments' Capacity:			
4. To assess the role and level of public finance to leverage investment in renewable energy sector	9. How effective is the pubic investment to leverage the private sector investment in the sector and in adoption of RE? 10. What is the likely level of long-term public-sector support in the form of subsidy and investment in the sector? 11. What are the good practices or mechanisms from other countries in promoting private sector investment that may be relevant for Nepal? 12. What is the capacity of Local Level Governments to promote RE?	• In-depth interviews with members of project management committees of MHPs, concerned officials of the commercial banks and central bank, and multilateral donors, • Literature review.	• Management Committees of MHPs • Management committee of CREEs • NRB • NMB Bank, Himalayan Bank • IME Bank (CREF). • WB • ADB • Chairman or elected members of the Village Council.
Risks Mitigation:			

5. To assess the public financing instruments to reduce the investment risks in the renewable energy sector.	13. What is the investment risk perception of the private sector financial institutions for lending in energy sector? 14. Is the existing credit enhancement mechanisms sufficient to enhance the level of financial institutions' comfort in lending in this sector?	• In-depth interviews with concerned officials of the commercial banks and financial institutions. • Nepal Rastra Bank	• NMB Bank, Himalayan Bank • NRB • CREF (IME Bank)

ADB= Asian Development Bank; AEPC= Alternative Energy Promotion Centre, CREE= Community Rural Electric Entities; CREF= Central Renewable Energy Fund; FI= Financial Institution; MHP= Micro hydro Plant; MoEn= Ministry of Energy, NEA= Nepal Electricity Authority; NMHDA=Nepal Micro Hydropower Development Association; NRB= Nepal Rastra Bank; SDG= Sustainable Development Goals; WB= World Bank.

Annex 2: List of Organizations consulted

S.No.	Organizations	Name of Resource person	Designation
1	Badhigad Khola MHP	Gazar B.K	Secretary
2	Khamari MHP	Keshav Raj Pathak	President
3	Chherangakhola MHP	Ser Bdr Malla	Ex. President
4	Amilichhap CREE	Laxman Katiwada	Chairman
5	NACEUN	Narayan Gnyawali	Chairperson
6	World Bank	Robin Shrestha	
7	ADB	Pushkar Manander	Officer
8	NEFEZ	Sahaj Man Shakya	Chairperson
9	AEPC	Ram Prasad Dhital	Executive Director
10	AEPC	Krishna Chandra Poudel	Senior Officer
11	CRT	Gyanu Bista	
12	NEA		
13	Practical Action	Min Bikram Malla	Project Manager
14	Practical Action	Archana Gurung	Communications Officer
15	Indoor Air Pollution and Health Forum	Madhab Sharma	Coordinator
16	RECON	'Guna Raj Dhakal'	Chairperson
17	RECON	'Purna Ranjitkar'	
18	CRT	Purushottam Shrestha	Director

Annex 3: Sampled Field Survey Sites

Table 3.1: Sample MHPs Site for Field Survey

SN	Name of MHPs	Physical location (districts)	Local level (Municipality/ Rural Municipality)	States Province	Capacity (KW)	HH	Criteria		
							Project scale*	Road access	Ethnicity composition
1	Putpute – II	Sangja		4	98	834	L	Yes	Mix
2	Urja -1	Baglung	Rangkhani	4	26	273	S	Yes	Mix
3	Urja - IV	Baglung	Surkuwa	4	14	133	S	Yes	Mix
4	Malekhu Khola –II	Dhanding	Mahadevsthan	3	18	166	S	Yes	Mix
5	Daram khola	Baglung	Malama	4	50	475	M	Yes	Homogeneous (Magar)
6	Mid Grindi Khola	Baglung	Riga	4	45	337	M		Homogeneous (Magar)
7	Khamari Khola	Surkhet	Babiyachaur	6	55	620	M	No	Mix
8	Badighad Khola	Gulmi	Neta	5	100	912	L	Yes	Mix
9	Chheranga Khola	Tanahu	Baidi	4	35	190	S	Yes	Mix
10	Chane Khola	Kaski	Ghandruk	4	35	250	S	No	Homogeneous (Gurung)
11	Jhumsa Khola	Palpa	Mathagadi	5	30	310	S	Yes	Mix

- Above 75 KW – Large (L), 49-75 KW – Medium (M), Less than 50 KW - Small (S)

Table 3.2: Selected CREEs for Field Survey

SN	Name of CREEs (Cooperative/Company)	District	States	Local level (Municipality/ Rural Municipality)	HHs	Ethnicity composition
1	Nawajyoti samudayik gramin vidhut upaqvokta samuha, Kusmishera	Baglung	4	Tunibot, Kusmisera	185	Magar/ Braman
2	Amilichap	Dhading	3	Siddalek	900	Mix
3	Gramin vidhut upavokta samiti ,	Parbat	4	Kusma Municipality	460	Mix

	pakuwa Pakuwa					
4	Gramin Purbhadhar thata Batabaran Bikash Mancha	Tanahu	4	Khaireni	1400	Mix
5	Naubasta	Banke	5	Naubasta	1300	Mix
6	Bela Gramin Bidhut Company	Dang	5	Bela	480	Mix

Annex 4: List of Focus Group Discussions

Districts	Female Participants	Male Participants	Total Participants
Dhadhing – Amilichhap	5	7	12
Dhadhing – Malekhu II	5	2	9
Shyanja – Putpute	-	14	14
Tanahu - Chheranga Khola	5	4	9
Surkhet – Babiyachaur	1	9	10
Gulmi – Musikot	3	6	9
Total	19	42	61

Source: Survey Data, 2017

Annex 5: Questions for Key Informant Interviews and Checklist for FGD

Questions	Checklist for FGD
RQ 1: RQ 1 What is the gap in investment in green and inclusive energy?	
Entities: AEPC, NPC, WB, ADB. 1) What are the current and projected levels of investment in green and inclusive energy sector? 1) How will be the evolution of the demand trend of green (RE) energy in Nepal till 2030? • Need to look competition and complementarity as well and forecast share of RE energy in overall energy mix. • Assessment of total energy needs in Nepal as per SE4All Objectives & targets • Assessment of the share of RE in energy mix as per the Nepal SE4All targets 2) What is the total investment requirements in the sector? • Investment required to achieve the RE targets business as usual scenario (past trend of investment on RE sectors and achievements) • Different financing modality in practice, changes on donors' priority, and trend of public funding	
RQ 2: What are the likely sources of funds to meet the gap, and are they sufficient?	
Entities: AEPC, NPC, WB, ADB. 1) Government of Nepal's investment plan in renewable energy sector? 2) Multilateral and bilateral development partners' country partnership strategy on renewable energy sector?	
RQ 3: Is the existing legal and policy instruments sufficient for increased investment in green energy sector? If not, what are the key barriers/challenges to investment in the sector?	
Entities: AEPC, MoST, NPC, NRB, CREF, NACUEN, NMHDA. 1) How do you see the RE lending portfolio in terms of their performance? 2) Are the FIs comfortable to lending to RE projects? • If yes, explain the key reasons. • If no, what are the key issues? 3) In the loan portfolio under MHDF, how is the repayment situation? 4) A study on the project's performance has found that more than 50% of the MHPs are defaulting on loan repayment. What do you think are the reasons? 5) Was the assessment of cash flow in the project feasibility and in the due diligence by the bank optimistic compared with the actual cashflow/revenue generation?	

6) What are the key risks associated with RE lending? 7) Are the NRB regulations on lending to renewable energy sector a barrier? • If so, please identify them. 8) In your view what needs to be done at the policy and operation levels to enhance lending to RE sector? 9) How does lending to a community project compare with one promoted by an individual/private sector? 10) What could be best policy options which leverage maximum investment and achieve maximum economic efficiency for promotion of green and inclusive energy technologies development?	
RQ 4: What are the plans/efforts by the government for removing the barriers/challenges to private investment in the sector?	
Entities: NRB, AEPC 1) The commercial banks see high risk in lending to RE sector. Is there any plan for addressing this situation? 2) 10. How has been the government of Nepal ensuring that the subsidy has been used to get the best value for Money? 3) The subsidy procedure is regarded as being cumbersome. Is there any possibility of future simplification?	
RQ 5: How easy and affordable is the access to finance for investment in this sector? And, what needs to be improved/done differently?	
Entities: NMHDA, NBPA, SEMAN, MHP Management Committees 1) How easy is it to apply for a credit from the bank for RET? 2) In your view, how the loan procedure can be simplified? 3) Is the interest rate charged by the banks reasonable? *if not,* 4) What would be the reasonable interest rate in your view? Explain why?	*Entity: MHP Management Committee* • Loan processing time • Documents required by the banks. • Interest rate-- how reasonable? • Issues related to repayment of loan-- able to pay on time, if delay, why? • Any other issues related to loan for RET.
RQ 6: What is the possibility of involving the women's savings organizations in the energy access value chain for improved management and electricity bill collection, and for the enhanced leadership capacity of women in ensuring improved revenue of MHPs and CREEs?	
Entities: AEPC, CREF, NMB Bank, HBL, MHP Management Committee, CREEs 1) One of the problems with the community based MHPs is relatively high rate of default on loan repayment. Of many reasons cited, the key ones are (i) lack of ability of the consumers to pay the monthly bills, and (ii) intentional non-payment by the users, and insufficient social sanctions enforced for non-payment. One of the suggested solutions is to form a	*Entity: MHP Management Committee* • Is there women's representation in the management committee? • Involvement of women in

women's savings group from the households in the community served by MHPs, and assigning the group the responsibility of maintaining sufficient savings to pay for electricity monthly bills. For this to happen, the women's organizations need to be assisted in promoting gainful employment opportunities to their members. a. What is your view on this approach? b. Can such a women's savings group be organized in your MHP supply community?	collection of monthly bills? • Involvement of women in management and operation of the plant? • Any role of women's savings group in the success management of the MHP/CREE?
RQ 7: What are the opportunities and barriers for women and disadvantaged groups at the community level to participate in the energy access value chain?	
Entities: AEPC, CREF, MHP/CREE Management Committee, Women's group in the beneficiary community. 1) Are women and members from the disadvantaged groups in the decision-making level? 2) Are women and members from the disadvantaged groups provided opportunity for capacity building and skill training to be able to participate in the energy supply value chain (other than revenue realization, RQ 6)? If not explain why?	*Entities: MHP/CREE Management Committee, Women's group in the beneficiary community* • Are members from DAGs in the management committee? • Are skills trainings provided to women and their impact in gainful employment? • What is the participation of the women/ members from DAGs in construction, management and operation of the system?
RQ 8: *What is the capacity of Local Level Movements to promote RE?*	
Entities: NPC /MOFALT *1) What is the plan and strategy to enhance the financial and technical capacity of the local governments to implement and operate distribution systems and to promote RET (up to 1 MW), as provided by the Constitution?*	• How interested are they to promote RE? • What is the level of knowledge and information at the local level government? • What is their technical and financial capacity to implement and operate RE systems and grid distribution system?
RQ 9: How effective is the public investment to leverage the private sector investment in the sector and in adoption of RE?	
Entities: Community Managing MHPs, AEPC, NRB, CREF, NMB Bank, HBL, ADB, WB 1) Although the current Subsidy Policy 2073 makes private sector entities eligible for subsidy, yet almost all of the investment in MHPs is by the community groups? Why do you think the	• Is the level of subsidy sufficient? • Are private businesses also interested in building MHPs? • If not, why there is little interest from private

private sector investment is not forthcoming? 2) How do you rank in the order of importance the following factors as reasons for holding back the private sector investment in MHPs? a. Insufficient subsidy ___ b. Cumbersome subsidy policy and administrative procedure_____ c. Complex technology ____ d. Low demand for electricity ___ e. Low ability to pay for electricity___ f. Low willingness to pay for electricity ___ g. High risk of investment from private sector investor's perspective____ 3) How effective do you think is the current level of subsidy for attracting private investment in RET? 4) In grid-based rural electrification, government is providing 90% subsidy on the capital cost, however the subsidy in RET is in the range of 20-40%. Is there a scope for increasing the subsidy? 5) What is the possibility of promoting private sector investment through ESCO mechanism? *(There is good lessons/experience of involving private sector in the provision of access to electricity by awarding a concession to a private entity to electrify a specified community by competitively bidding on, for example, the level of subsidy sought from the government. Such a private entity normally called Energy Service Company (ESCO) have been found to be a viable option to promote private sector participation in RET.)*	group/individuals to build the MHP and CREEs?
RQ 10: What is the likely level of long-term public-sector support in the form of subsidy and investment in the sector?	
Entities: AEPC, MOEn, NEA 1) Is the current level of subsidy as provided under Subsidy Policy 2073 sufficient for RET? 2) How long the government intent to support through subsidy in RETs? 3) Is there any phase out plan for subsidy? If so, what is the time-frame? 4) Is the current subsidy policy effective in promoting private participation in RETs? *if not,* What improvement is necessary to attract private investment in RETs?	
RQ 11: What are the good practices or mechanisms from other countries in promoting private sector investment in RE sector that may be relevant for Nepal?	
Entities: WB, ADB Areas may include: 1) Measures to attract private sector investment, in general	

2) Risk mitigation measures 2) Carbon financing 3) Subsidy policy 4) End-use promotion	
RQ 12: What are the roles of CSO and Cooperatives in the promotion of RE?	
Entities: SLREC 1) What are CSOs' perceptions of and interests in a market based approach to scaling-up of RE? 2) What are the measures to increase the willingness of CSOs to play a role in developing and enabling policy environment for market-based approach to scaling up renewable energy in Nepal? 3) What is the contribution of the cooperatives in RE promotion? 4) What are cooperatives interests and capacity in RE promotion? *5)* How can cooperatives' involvement in RE promotion be enhanced?	
RQ 13: What is the risk perception of the private sector financial institutions for lending to RE sector?	
Entities: NMHDA, NBPA, SEMAN, Commercial Banks (NMD, HB), CREF, AEPC. 1) What are the key risks in lending to RETs? 2) Are the risks related to the technology itself or to other factors? Please Explain. 3) What policy/regulatory changes need to be instituted to address the risks? 4) What is your view on the following financing mechanisms/instruments to be instituted in Nepal for promoting private investment in RE sector: a. Renewable energy bond b. Guarantee and insurance c. Carbon financing d. Viability gap financing e. Capital grants f. Concessional finance (lower interest rate, longer loan terms) g. Convertible loans/grants.	
RQ 14: Is the existing credit enhancement mechanisms sufficient to enhance the level of FI's comfort in lending in this sector?	

Entities: Commercial Banks (NMD, HB), CREF, AEPC 1) Are the high risks perceived by the banks a primary reason for the low level of private sector participation in RE? 2) Is the credit enhancement provided in MHDF sufficient? Please explain your experience. if not, 3) What are the risk management instruments that may be adopted in Nepal? Please give your view. **4)** Which, in your view, are the key credit enhancement mechanisms that may effectively been put in place in Nepal?	

Annex 6: HH Survey Questionnaire[1]

Address of Interviewee

a) Household Number:
b) District:
c) Municipality/Rural Municipality/Ward:
d) Village:
e) Code:
f) Interviewer:
g) Date of Interview:

1. General Information about the Household

1.1 Name of Respondent:

1.2 Gender of Respondent:

1. Male
2. Female
3. Other

1.3 Age of Respondent

1.4 Which caste/ethnic group do you belong to?

1. Bramhin
2. Chhetri
3. Janjati
4. Dalit
5. Chepang

1.5 How many people are in the household?

(Fill in according to age.)

1. 0 - 6 years: ……Persons
2. 7 - 17 years: …….Persons
3. 18 – 60 years: ……..Persons
4. 61 years & over: ……Persons
5. Total:…… Persons

1.6 How many members in your family

1. One
2. Two
3. Three
4. Four
5. Five
6. Six

1.7 Literacy level of Family

1. No of Illiterate
2. No of Literate
3. No of Under SLC
4. No of SLC
5. No of +2
6. No of Bachelors

[1] This household survey questionnaire was designed to collect information for all three separate researches (communication, financing and good governance) so only few questions from this set have been used for analysis in this financing research.

7. No of Masters and above

1.8 Major Sources of Income

1. Agriculture
2. Livestock
3. Service
4. Business
5. Remittance
6. Other (specify)

1.9 Could you please tell us your annual income?

1. Below Rs. 100,000
2. Rs. 100,000- Rs. 200,000
3. Rs. 200,000- Rs. 300,000
4. Rs. 300,000- Rs. 400,000
5. Rs. 400,000 – Rs. 500,000
6. Rs. 500,000 above

2 Energy Related Information

2.1 :Source of Energy and use

Source of Energy	Unit	Rate / Unit	Consumption / Month	Energy Use						Remarks
				Cooking	%	Lighting	%	Heating	%	
Fuel Wood	Bhari									
Kerosene	Liter									
Liquid Petroleum Gas	Cylinder									
Electricity	Unit									
Battery	Pair									
Straw and/or Dung	Bhari/Doko									
Other (Specify if any)										

2.2 What kind of appliances do you use? (Fill in Number and Wattage)

FL/CFL	ICAN	Iron	Computer	Rice Cooker	Radio/VCR	TV	Refrigerator	Pumps/ Tools	Fan	Heater	Other

a) FL=Florescent Lamp, ICAN=Incandescent Lamp, CFL=Compact Florescent Lamp, PP=Power Point

2.3 Would you be willing to pay more for electricity if more reliable service will be provided (yes or no)? : Yes No

2.4 Type of system you would like to buy in the near future:

a. Washing Machine
b. Micro-Oven
c. Electric Sewing Machine

d. Other

2.5 How much did you spend on energy resources last month?

	Fuel Wood	Kerosene	Diesel/Petrol	LPG	Electricity	Others
In Rupees						

3 Information Related to Renewable Energy Technologies

3.1 Do you know about the RETs?

1. Yes
2. No

3.2 What types of RETs you are using at house? (tick all those apply)

1. Electricity
2. Solar PV
3. Wind
4. Bio-gas
5. ICS

3.3 Do you want to shift the technologies from non-renewable to renewable one?

1. Yes
2. No

3.4 If yes, in what technologies?

1. Electricity
2. Solar PV
3. Wind
4. Bio-gas
5. ICS

3.5 What is the problem/barrier to shift from non-renewable to renewable technologies?

1. Information about RETs
2. Finance
3. Availability of Appliances
4. Difficulty in handling

4. Communication in RETs

4.1 Which channels of communications do you use to receive message and information related to Renewable Energy? (tick all those apply)

1. Newspaper/Magazine
2. Brochure/Pamphlets
3. Radio
4. Visual Aids
5. Training/workshops
6. Reports/Case Studies
7. Information Communication Technology (ICT)
8. Information sharing in community

9. Traditional tools

4.2 Have you listen to the following to receive messages and information on Renewable Energy Technologies? (tick all those apply)

1. Public Service Announcements
2. Audio materials
3. Radio drama
4. Radio News
5. Report

4.3 Have you watched the following to receive messages and information on Renewable Energy Technologies? (tick all those apply)

1. TV program
2. TV Commercials
3. Talk show
4. Telefilm
5. Documentary videos
6. Video Projection (Narrow casting)

4.4 Have you used the following tools to receive messages and information on Renewable Energy Technologies? (tick all those apply)

1. Telephone communications
2. SMS messages
3. Internet
4. Website
5. Social media

4.5 What are the existing practices of sharing information within community members related to Renewable Energy Technologies? (tick all those apply)

1. Tea shop chat
2. Women groups chitchat (*MahilaBhetghat*)
3. Information through community leaders, teachers, health workers
4. School students
5. Community meetings
6. Festivals
7. Special events

4.6 What are the traditional tools still in practice in your community for communications? (Traditional tools refer self-styled indigenous methods practiced by the community in reaching out message to people)

1. Sarangi
2. Sankhafukne
3. Katwal karaune system
4. Feasts/Festivals
5. Community meetings
6. Special events
7. Others (specify)…….

4.7 Have you participated in RE related program and Training ?If yes, what , who provided and duration?

4.8 Do you own a mobile phone? (If answer is ‘No’ go to Q. 20)

1. Yes

2. No

4.9 How many phone connections (SIM cards) do you have? (If answer is 'One' escape next question)

1. One
2. More than one

4.10 What type of mobile phones do you use?(Ask them to show the mobile phone/s)

1. Bar phone
2. Smart phone
3. Both

4.11 Do you have Internet access in your mobile phone?

1. Yes
2. No
3. Don't know

4.12 Rank the communication tools which you use mostly as number 1 and least as number 9 in receiving information/message of Energy Sector Program?

1. Newspaper/Magazine
2. Brochure/Pamphlets
3. Radio
4. Visual Aids
5. Training and workshops
6. Reports
7. Information and Communications Technology (ICT)
8. Information sharing in community
9. Traditional tools

4.13 Are you satisfied with the communication tools used by Energy Sector Program to give message and information related to you? If No, Why are you not satisfied, what are the reasons?

5. Gender and Social Inclusion

5.1 Who decide on selection of RETs

1. Household Head
2. Father In Laws
3. Mother in Laws
4. Husband
5. Self

5.2 Do you avail time to read newspapers/magazine? If yes how many hours?

1. Half an hour
2. One hour
3. Two hours
4. More than two hours

5.3 Do you avail time to listen radio program ? If yes how many hours?

1. Half an hour
2. One hour
3. Two hours
4. More than two hours

5.4 Do you avail time to watch Television Program? If yes how many hours?

1. Half an hour
2. One hour
3. Two hours

4. More than two hours

6. Comments and Suggestions

6.1 What types of information you need to have regarding RETs?

6.2 What time is appropriate for you to get information regarding RETs?

6.3 What channel do you thing appropriate for you?

6.4 What frequency of messaging you thing appropriate?

6.5 What further opportunities the RETs can take advantage of?

6.6 What constraints the users should overcome?

Annex 7: List of Participants of Green and Inclusive Energy Access Workshop

Date: 24th January 2018

Venue: Annapurna Hotel, Kathmandu, Nepal

S.No	Name	Organization
1	Anil Shrestha	Smart Power Pvt. Ltd.
2	Bhanu Bhandari	Smart Power Pvt. Ltd.
3	Anocita Pun	Adhibara Neplai Halte Kagaz
4	Hemkumari Pun	Adhibara Neplai Halte Kagaz
5	Bhume Lama	Lama Metal Seat Udhyog
6	Aadit Malla	MinErgy Pvt. Ltd.
7	Guna Raj Dhakal	RECON
8	Asmita Sodari	Husk Power Nepal
9	Nabin Panthi	NMB Bank Ltd
10	Reesab Raj Acharya	NBPA
11	Sahaj Man Shrestha	NEFEJ
12	Min Bikram Malla	Practical Action
13	Madhab Sharma	IAPHF-Nepal
14	Pooja Sharma	Practical Action
15	Prem Sagar Subedi	UNCDF
16	Ganesh Shah	Former Minister
17	Subarna Kapali	ABF
18	Chudamani Joshi	Embassy of Finland
19	Xu Youde	Yunnan Dalitida Energy Techiniuea Research
20	Xiong Ying	Yunnan Dalitida Energy Techiniuea Research
21	Bibek Chapagai	Royal Norwegian Embassy
22	Roshan Manandhar	Practical Action
23	Yadav Shaha	KhokhuG
24	Ganesh Ram Shrestha	ID/CRTIN
25	Kiran Gautam	SEMAN
26	Deepak Bdr. Mahara	RRSC
27	Bharat Khadka	MRC/N
28		
29	Milabh Shrestha	FNCCI
30		WWF
31	Tripeshwar Purbe	NEA
32	Ashish Raumal	OMCN
33	Biruparshya Dikchit	Practical Action
34	Prabhu Buddhathoki	NPC
35	Rago B. Thapa	AEPC
36	Apekshya Shrestha	Practical Action
37	Suvekshya Shrestha	Practical Action
38	Manoj Khadka	DFID
39	Gopal P. Ghimire	Practical Action

S.No	Name	Organization
40	Pal Pasa	Practical Action
41	Sundar Bahadur Khadka	AEPC
42	Padam Dhahal	NBPA
43	Ela Thapa	NBPA
44	Deepak Adhikari	DPA
45	Aryal Niraula	Gham Power
46	Rijan Shrestha	EU
47	Nabaraj Dhakal	AEPC
48	Mahendra Kumari	Nisi Laghu Uddhami Sisno Powder
49	Kumaya Gharti Magar	Nisi Laghu Uddhami Sisno Powder
50	Dhan Kumari Gharti Magar	Nisi Laghu Uddhami Sisno Powder
51	kumari Pun	Nisi Laghu Uddhami Sisno Powder
52	Man Kumari Gharti Magar	Nisi Laghu Uddhami Sisno Powder
53	Bionod Acharya	Nisi Laghu Uddhami Sisno Powder
54	Yogendra Shah	ECCA
55	Tapendra Chand	PEEDA
56	Sunhuli Singh Kunwar	Christian AID
57	Prof. Krishna R. Shrestha	CEEN
58	Mukunda Kalikote	Reporter Club Nepal
59	Dil Raj Khanal	Reporter Club Nepal
60	Dr. Purushottam Shrestha	CRT/N
61	Krishna Adhikari	RSS
62	Dharma R. Bista	Practical Action
63	Prabina Lama	Practical Action
64	Binod Shrestha	GIZ
65	Gaurav Dahal	WWF
66	Keshab Poudel	Spotlight
67	Narayan Guawali	NALEUN
68	Thakur Pd. Adhikari	TP Adhikari & Associate
69	Raj Kumar Adhikari	TP Adhikari & Associate
70	Moushumi Shrestha	Shreenagen
71	Monica Chitrakar	Practical Action
72	Bhoj Kumar Rai	Practical Action
73	Diwakar	HTV
74	Buddha Maharjan	Practical Action
75	Rabindra	Practical Action
76	Dinanath Bhandari	Practical Action
77	Bhairaja Dewali	Practical Action
78	Kriti Bidhya	PAC
79	Umang Bhattarai	PAC
80	Purna N. Ranjitkar	
81	Ayush Acharya	WindPower Nepal Pvt. Ltd.
82	Devashis M. Shrestha	WindPower Nepal Pvt. Ltd.
83	Vabish Karki	WindPower Nepal Pvt. Ltd.

S.No	Name	Organization
84	Ishwor Lal Raj Bhandari	DCRDC-Baglung
85	Lakeshwar Pokhrel	ECCA/Future Now Pvt.
86	Sarmila Rayamaji	NMHPA
87	Gaurab K. Adhikari	Nepachi Wanda
88	Shreya Jhakali	NEFEJ
89	Shisher Shrestha	Sunfarmer
90	Manjari Shrestha	Practical Action
91	Dilli Ghimire	NEF
92	Bal Ram Shrestha	BSP-Nepal
93	Gokul Gautam	REMREC
94	Vishwa B. Amatya	Independent Consultant
95	Biraj Gautam	PEEDA
96	Reshu Bashyal	UNDP/SE4All
97	Shital Regmee	JVS
98	Lisa Shrestha	RW
99	Raja Ram Pote Shrestha	WHO Nepal Office
100	Surya P. Hada	
101	Kiran Gautam	WECS
102	Kushal Gurung	WindPower Nepal Pvt. Ltd.
103	Roshan Parajuli	RETS
104	Suman Thapa	Media
105	Karuna Bajracharya	Global Alliance For Clean Cookstoves
106	Gyanendra Raj Shrestha	CRTIN
107	Tek Bdr Balayar	RDSC
108	Achyut Subedi	Practical Action
109	Shruti	UNDP
110	Nawaraj Sanjel	ENEP/KU
111	Suyesh Rajpati	MinErgy
112	DR. Ramesh Maskey	KU
113	Dilman Singh Basnyat	PAP
114	Prajwal Shrestha	Practical Action
115	Dr. Govinda Nepal	ISSR
116	Ishrat Shabnam	Practical Action Consulting
117	Shristi Kafle	Xinhua News Agency
118	Santosh Neupane	Nagarik Daily
119	Ram Pd. Dhital	AEPC
120	Gopal Pd. Bhhata	NID
121	Mahesh P. Acharya	NEF
122	Prakash Tamang	Nepchiulanda
123	Sambarddha Pradhan	Sunfarmer
124	Devenda Aryal	NEF
125	Indira Shakya	CRT/N
126	Naresh Sharma	MOPE
127	Arjun Dhakal	NEFEJ

S.No	Name	Organization
128	Anita Bohara Thapa	GIZ Endev
129	Archana Gurung	Practical Action
130	Jay Shrestha	OMCN
131	Ahana Shrestha	Practical Action
132	Bhim Kumar Shrestha	Practical Action
133	Sanjib Chaudhary	Practical Action
134	Anuj Dhoj Joshi	Practical Action
135	Sachin Sapkota	Practical Action
136	Yelisha Sharma	Practical Action
137	Nagendra Chaudhary	Practical Action
138	Khommaya Thapa	Practical Action
139	Raju Maharjan	MOEn
140	Niraj Tamang	Himalaya-TV
141	Thirtha Bhatta	Practical Action
142	Dinesh Rai	Practical Action
143	Bipin Basnet	PAC
144	DR. Ram Manohar Shrestha	AIT