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Report No: PAD762

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT
FROM THE SCALING-UP RENEWABLE ENERGY
PROGRAM IN LOW INCOME COUNTRIES (SREP)
OF THE STRATEGIC CLIMATE FUND (SCF)

IN THE AMOUNT OF US$7.9 MILLION

TO NEPAL

FOR A

SREP-SUPPORTED EXTENDED BIOGAS PROJECT

August 1, 2014

Energy & Extractives Global Practice
South Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2014)

Currency Unit = Nepalese Rupees (NPR)
NPR 100 = US$1
US$1.543 = SDR 1

FISCAL YEAR
July 15 – July 14

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	LPG	Liquefied Petroleum Gas
AEPC	Alternative Energy Promotion Center	MoSTE	Ministry of Science, Technology and Environment
BSC	Biogas Sub Component	MSME	Micro-Small and Medium Enterprise
CA	Constitutional Assembly	MW	Megawatt
CAS	Country Assistance Strategy	N2O	Nitrous oxide
CDCF	Community Development Carbon Fund	NEA	Nepal Electricity Authority
CFUG	Community Forestry Users Group	NGO	Non-governmental Organization
CREF	Central Renewable Energy Fund	NRREP	National Rural and Renewable Energy Program
DA	Designated Account	PDO	Project Development Objective
ER	Emission Reduction	PU	Procurement Unit
ESMF	Environmental and Social Management Framework	RE	Renewable Energy
GDP	Gross domestic product	RPF	Resettlement Policy Framework
GoN	Government of Nepal	SMF	Social Management Framework
GPOBA	The Global Partnership on Output-based Aid	SREP	Scaling-up Renewable Energy Program
GRC	Grievance Redress Cell	TA	Technical Assistance
IBRD	International Bank for Reconstruction and Development	VCDF	Vulnerable Community Development Framework
IDA	International Development Association	VCDP	Vulnerable Communities Development Plan
IDD	Integrity Due Diligence	WTEP	Waste to Energy Project
IFC	International Finance Corporation		

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Practice Director:	Charles Feinstein
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Task Team Leader:	Mohua Mukherjee

NEPAL
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Nepal

SREP-Supported Extended Biogas Project (P131592)

PROJECT APPRAISAL DOCUMENT

SOUTH ASIA

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Report No.: PAD762

Basic Information			
Project ID P131592	EA Category B - Partial Assessment		Team Leader Mohua Mukherjee
Lending Instrument Specific Investment Grant	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]		
Project Implementation Start Date 15-Oct-2014	Project Implementation End Date 31-Dec-2019		
Expected Effectiveness Date 15-Sep-2014	Expected Closing Date 31-Dec-2019		
Joint IFC No			
Practice Manager/Manager Julia Bucknall	Senior Global Practice Director Anita Marangoly George	Country Director Johannes C.M. Zutt	Regional Vice President Philippe H. Le Houerou

Approval Authority
Approval Authority Board/AOB Decision please explain

Borrower: Government of Nepal			
Responsible Agency: Alternative Energy Promotion Center			
Contact:	Mr. Ram Prasad Dhital	Title:	(Acting) Executive Director
Telephone No.:	(977-1) 425-9820	Email:	Ram.dhital@aepc.gov.np

Project Financing Data(in USD Million)					
[ ]	Loan	[ ]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[X]	Grant	[ ]	Other

Total Project Cost:	35.50	Total Bank Financing:	7.90
Financing Gap:	0.00		

Financing Source	Amount
Borrower	27.60
Strategic Climate Fund Grant	7.90
Total	35.50

Expected Disbursements (in USD Million)

Fiscal Year	2015	2016	2017	2018	2019	2020	0000	0000	0000
Annual	1.00	1.00	2.00	2.00	1.90	0.00	0.00	0.00	0.00
Cumulative	1.00	2.00	4.00	6.00	7.90	7.90	0.00	0.00	0.00

Proposed Development Objective(s)

The project development objective is to promote large off-grid biogas energy generation in Nepal.

Components

Component Name	Cost (USD Millions)
Technical Assistance	1.00
Financing of Investments	6.90

Institutional Data

Practice Area / Cross Cutting Solution Area

Energy & Extractives

Cross Cutting Areas

[ ] Climate Change
[ ] Fragile, Conflict & Violence
[ ] Gender
[ ] Jobs
[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Energy and mining	Other Renewable Energy	100		
Total		100		

☑ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Economic management	Other economic management	70
Financial and private sector development	Infrastructure services for private sector development	30
Total		100

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ] No [X]
Does the project require any waivers of Bank policies?	Yes [ ] No [X]
Have these been approved by Bank management?	Yes [ ] No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ] No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X] No [ ]

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	X	
Natural Habitats OP/BP 4.04	X	
Forests OP/BP 4.36	X	
Pest Management OP 4.09		X
Physical Cultural Resources OP/BP 4.11	X	
Indigenous Peoples OP/BP 4.10	X	
Involuntary Resettlement OP/BP 4.12	X	
Safety of Dams OP/BP 4.37		X
Projects on International Waterways OP/BP 7.50		X
Projects in Disputed Areas OP/BP 7.60		X

Legal Covenants

Name	Recurrent	Due Date	Frequency
1. Recruit a dedicated Financial Management Consultant	No	2 months after signing	Once
2. Revise the Financial	No	September 30, 2014	Once

Management manual. 3. Set up, and maintain, a mechanism, for monitoring and verification of usage of the proceeds of the Grant	Yes	September 30, 2014	Recurrent

Description of Covenants

(1) The Recipient shall recruit a dedicated Financial Management Consultant for the project in accordance with the provisions of Section III of Schedule 2 to the Grant agreement.

(2) The Recipient shall revise the Financial Management manual in a manner satisfactory to the World Bank so as to conform to World Bank specific standards.

(3) The Recipient shall set up, and thereafter maintain for the duration of the Project, a mechanism, satisfactory to the World Bank, for monitoring and verification of usage of the proceeds of the Grant

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Conditions

Name	Type
Independent verification specialist verification of conditions in respect of subsidy payments	Applicable for category 4.

Description of Condition

Withdrawal shall be made under Category (4) on account of subsidy/sub-project after an Independent Verification Specialist has verified the conditions specified in Section I, Paragraph 4 of this Section 2 with respect to such sub-project.

Team Composition

Bank Staff

Name	Title	Specialization	Unit
Mohua Mukherjee	Senior Energy Specialist	Team Lead	GEEDR
Shaukat Javed	Program Assistant	Operations	GEEDR
Ramesh Raj Bista	E T Consultant	Procurement	GGODR
Drona Raj Ghimire	Environmental Specialist	Environment	GENDR
Hiramani Ghimire	Sr Governance Specialist	Governance	SASGP
Parthapriya Ghosh	Senior Social Development Specialist	Social Development	GURDR
Sunita Gurung	Program Assistant	Program Assistant	SACNP
Vinod Kumar Jain	Consultant	Consultant	GEEDR
Satish Kumar Shivakumar	Finance Officer	Finance Officer	CTRLN
Sabin Raj Shrestha	Sr Financial Sector Spec.	Sr Financial Sector Spec.	GFMDR

Ashish Shrestha	Consultant	Operations	GEEDR
Timila Shrestha	Financial Management Specialist	Financial Management	GGODR
Shambhu Prasad Uprety	Procurement Specialist	Procurement	GGODR
Jorge Luis Alva-Luperdi	Senior Counsel	Legal	LEGES
Minneh Mary Kane	Lead Counsel	Legal	LEGES
Sameena Dost	Senior Counsel	Legal	LEGES

Non Bank Staff

Name	Title	City
V. K. Jain	Senior Technical Advisor/Consultant on Biogas	Delhi

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments

I. STRATEGIC CONTEXT

A. Country Context

1. The population of Nepal is 26.5 million in the Census 2011 with a growth rate of 1.4% per annum. Nepal is a mountainous country, and predominantly a rural society with 83% of people living in rural areas; the economy experienced sustained GDP growth at a rate of 3.9% per annum on average over the past 10 years, above the rate of demographic growth of 1.4% per annum. The percentage of people living below the international line for extreme poverty has halved in only seven years, from 53.1% in 2004 to 24.8% in 2011.

2. While the country has achieved good rates of growth over the past years despite its fragile situation and environment, the economy is yet to move towards its full growth potential. Going forward, and in the absence of new endogenous sources of growth, economic activity will remain dependent on consumption (supported by remittances) and will be attributed to weather conditions and external developments. Real gross domestic product (GDP) growth slowed down to 3.6 percent for 2011/2012[1] after a few years of faster economic growth at 4 to 6 percent per year.

3. The country's logistical limitations, mountainous terrain, limited road network and inadequate infrastructure are the most important bottlenecks for growth. In the 2011/12 Global Competitiveness Report, Nepal was ranked 141st in overall quality of infrastructure. It is also among the poorest countries in the world and currently ranks 157th out of 187 countries on the Human Development Index. Poverty is more severe in rural areas (27%) compared to urban areas (15%) and particularly severe in mountainous areas (42%) with ethnicity a dominant factor in these differences. Thus, despite improving standards of living, the country's level of human development remains among the lowest in the world.

B. Sectoral Context

4. Nepal is currently facing an energy crisis of unprecedented proportions. The 706 MW total installed capacity (mainly hydropower) of Nepal Electricity Authority (NEA), supplemented by purchases from India, is inadequate to meet demand. Forced load shedding for prolonged periods has been inevitable, with attendant economic consequences. Individual rates of power consumption remain very low in Nepal, at only about 70kWh per capita, even for urban Nepal where access rates are relatively higher, compared to per capita consumption levels of 733kWh for India and 2,600kWh for China. Nepal's energy sector priorities are to maximize its on-grid energy production and delivery, but also at the same time to modernize its off-grid energy sector on which a large part of the population will depend for the medium term.

5. A recently issued Government document notes[2] that about 85% of the total final energy consumption in Nepal is met by biomass in terms of firewood (75%), agricultural residues (4%)

[1] Economic Survey, 2012, Central Bureau of Statistics
[2] Page 5, National Rural and Renewable Energy Program Document, June 2012

and animal waste[3] (6%). The rest is met by commercial sources, i.e. petroleum products, coal and electricity (around 2%). The low level of commercial energy consumption in the country reflects the very low level of industrial activities. Traditional energy has particularly harmful impacts on women's health through the drudgery of collecting and carrying firewood and indoor pollution from cooking with traditional fuels. Recent studies[4] have indicated that Nepal has very good potential for expanded biogas production. Biogas can be used on-site for cooking, for industrial thermal heating processes (e.g. steam production), and also to produce electricity in retro-fitted generators that can use both diesel and biogas. Frequently identified potential opportunities for commercial biogas production on a larger scale include cow farms, poultry farms, pig farms, slaughter houses, beverage industry, fruit processing, sugar mills, distilleries, hotel and restaurant kitchen scraps and food waste, and food processing establishments such as noodle factories, among others. At present, firewood or coal is mostly used to produce steam during agro-processing, where steam is mechanically injected through pipes to boil and pasteurize food or heat other items, as required. By contrast, on-site availability of biogas (if generated from organic waste byproducts of the same production process) could be used instead, to meet thermal energy requirements for steam generation. This investment in the construction of a biogas plant would (i) provide improved energy security for the owner of the enterprise that is producing organic waste as a by-product; (ii) reduce emissions from his use of coal or firewood; and (iii) assist in improving the enterprise's waste disposal practices that create health hazards, disease vectors, bad odors from rotting organic material, and pollution of nearby land and water—i.e. it could lead to a potential triple win. An optional additional investment in a generator (gas engine or a retrofitted diesel/gas dual fuel generator) would also permit on-site electricity generation from the biogas, and would thereby reduce reliance on diesel to produce captive electricity. There has been no government program to support large biogas so far in Nepal, and there is a lack of awareness about large biogas plants among potential end-users, as well as a risk perception in the market about performance of technologies not yet mainstreamed in Nepal.

6. Recovery of Biogas for Productive Uses also contributes to Climate Change Mitigation. Atmospheric emissions of biogas from natural and man-made sources (i.e. from open air decomposition of cattle dung or other organic waste such as rotting garbage in landfills) contribute to climate change due to methane's potent greenhouse gas properties, which are 21 times as potent as carbon dioxide. Normally, manure that is left to decompose in the open air releases two main gases that cause global climate change: nitrogen dioxide and methane. Nitrous oxide (N2O), another by-product, warms the atmosphere 310 times more than carbon dioxide, and methane warms the atmosphere 21 times more than carbon dioxide. Capturing biogas for productive use rather than allowing it to degrade further and release harmful greenhouse gases is thus an environmental win-win proposition.

[3] Direct combustion of animal waste as fuel in a solid state has nothing to do with biogas, and is polluting and hazardous, particularly to women and children who must inhale the smoke from burning dung

[4] Studies on (i) Potential of Biogas Generation from Waste in Nepal, June 24, 2012; (ii) Gap Analysis of Policy Environment on Waste to Energy in Nepal, April 2013; (iii) Market Analysis of the Biogas for Business Program (B4B), November 2012; (iv) Preparation of Baseline for Domestic and Larger Size Biogas Programmes, November 2012

7. Statement of the Problem, which GoN needs to address: Externalities such as climate change benefits from reduced GHG emissions and reduction in health hazards from avoided pollution are typically not considered when an individual commercial farmer is looking at financial viability of a potential large biogas plant. A private investor calculates his cash outlay on the plant against his energy savings on traditional fuels, to estimate the payback period for the capital to be invested a new technology. A large biogas plant is economically viable when social and environmental benefits are taken into account in addition to the enterprise's own energy savings, but at the moment such cash outlays (for technologies and designs not even tested in Nepal) may not look financially viable from the enterprise's viewpoint alone. The need to better align the economic benefits to society and the financial benefits to the commercial enterprise (particularly when the potential owner has to invest his own funds), creates a case for limited and transitional government support to unlock private investment in large biogas plants through awareness raising, capacity building and cost-sharing. This would allow the country to capture the economic benefits that will not otherwise materialize due to distortions in the cost-benefit calculations by individual owners. Accordingly, GoN seeks to promote private investment in large biogas plants, by providing initial limited TA and cost-sharing grant support from the public sector, with support from external partners.

Organic waste decomposing near a market

Cattle farm producing organic waste suitable for biogas

Cow dung in the open air; methane being released and not captured for energy production

Organic residue from green chilies used in agro processing and dumped in the open; could generate energy

C. Institutional Context

Government's Flagship National Rural and Renewable Energy Program (NRREP) and Central Renewable Energy Fund (CREF)

8. The **National Rural and Renewable Energy Program** (NRREP) is a single-point, multi-donor Sector Wide Approach (SWAp) in which all upcoming renewable energy interventions including the proposed present SREP-funded Extended Biogas project, are housed. The Alternative Energy Promotion Center (AEPC), the implementing arm of the Ministry of Science, Technology and Environment (MoSTE), is a Government institution with the objective of developing and promoting a spectrum of renewable/alternative energy technologies in Nepal, and implementing all parts of the NRREP. NRREP, with a current program size of $184m for five years (2012-2017) promotes investment in solar PV, solar thermal, micro-hydro, wind, household rural biogas, household urban biogas, large biogas plants (for commercial, institutional, community and municipal users), improved cook-stoves, improved water mills, and productive end-uses of energy. The allocation for all biogas support within the NRREP is $32.33m, and some portion of this will be available for support to large biogas plants. The relatively small amount of SREP funding, which is counted within the $32.33 million biogas allocation of NRREP, will introduce new procedures, criteria and transparency and will transform the way the AEPC uses funds for large biogas plants to stimulate adoption of new technologies through public-private investments. For reasons described in detail further below, these investments are unlikely to take place, and/or unlikely to lead to sustainable outcomes, without concerted TA and transitional cost-sharing investment support from AEPC. This means that important economic benefits for Nepal would otherwise remain unrealized.

9. A major design component of NRREP is the **Central Renewable Energy Fund** (CREF), which pools all available funding provided to Nepal for implementing its rural renewable energy agenda, together with government's own resources. Bilateral donors are able to disburse their grant support in advance into the pool, whereas development banks' policies require evidence of expenditures incurred before disbursements can be made. This means that for the SREP portion of NRREP, the AEPC will first disburse its cost-sharing support to sub-projects that meet SREP criteria, and will then claim a reimbursement from the World Bank for the eligible amount, once the large biogas plant has been independently verified to be producing energy.

10. **Proposed Beneficiaries of Large Biogas Sub-Projects.** Private enterprises in Nepal (both large scale formal sector firms and MSMEs) and municipalities are all battling the high costs of imported fossil fuels for thermal process heating, water heating, space heating, cooking, and diesel-fired captive electricity generation, while simultaneously coping with the need for expensive LPG cooking gas cylinders and rising costs of commercially purchased coal and firewood, and also trying to manage their waste by-products in a responsible manner. *Municipalities* also struggle to meet their energy needs and are currently unaware of how to recycle the organic waste available to them, in order to offset part of their current energy costs; they are also unable to afford investment in a biogas plant sub-project on their own and require additional support with sub-project preparation and financing. Experience from the sub-region[5]

[5] Bangladesh Poultry Biogas Projects; Thailand Refuse Derived Fuel Projects; India Municipal Waste to Electricity Projects among many others

indicates that successful use of modern and efficiently operated medium to large biogas plants--for captive use of energy--can generate important savings in avoided purchases of commercial fuels, or in the case of captive electricity generation, can save on diesel usage for backup generation. Prospects of benefitting from large biogas plants are particularly promising for commercial enterprises and municipalities that generate large and regular volumes of organic waste as part of their ongoing business processes and may have to pay to dispose of them due to space constraints; the waste is then removed only to be dumped elsewhere.

11. Despite various institutional difficulties in the public sector, and years of internal conflict, Nepal has managed to maintain a relatively robust private sector as well as a competent commercial banking sector. A number of domestic private sector associations that are relevant for the proposed objective of expanding commercial biogas energy and supporting improved livelihoods include:

- Poultry Farmers, Dairy Farmers, Pig Farmers, Breweries, Hotel and Restaurant Associations (Commercial biogas programs)
- Rural Microenterprise Development Corporation
- Nepal Biogas Manufacturers and Biogas Support Program
- Improved Cook-stove Manufacturers Capacity Building Program

12. The published subsidy policy for large biogas plants is shown in the table below. The cost-sharing support for electricity generation equipment (optional), is in addition to the support provided for construction of the biogas plant.

Biogas Systems	Subsidy Amount in Rs.	
	Thermal Application per cum	Electricity Generation per kW
Commercial Biogas Plants	4,000	65,000
Institutional Biogas Plants for Public Institutions	11,500	185,000
Community Biogas Plants with capacity more than 12 cubic meters	9,000	150,000
Municipal Scale Waste to Energy Systems	50% of the total cost but not exceeding Rs. 50,000 per cum.	50% of the total cost but not exceeding Rs. 250,000/Kw, whichever is less.

Source: AEPC Subsidy Policy Document page 8, para 8.3.2.4, from AEPC website www.aepc.gov.np

13. All large commercial and municipal biogas plants, which are the prime target investment of the proposed SREP project, are entitled to the above subsidy policy of the Government. As mentioned earlier, the GoN subsidy is essentially a buy-down of the capital cost, reducing the remaining amount which must be financed commercially by the sub-project developer. The subsidy policy works out to approximately 30% for commercial enterprises, 50% for institutions, 60% for communities and 90% for municipalities. The initial although limited assistance for commercial sub-projects, combined with TA support, will help to ensure sustainability of biogas

plants built with private investment resources, and will also reduce the private sector's risk perceptions until the technology becomes more familiar. Subsidies to commercial biogas plants will be transitional and for a limited duration, to raise awareness, mainstream the technology and reduce risk perceptions about the performance of plants with different organic wastes as well as payback periods for equity funds invested.

14. SREP will reimburse AEPC partially (on a 1:4 leverage ratio based on agreed total cost), only for eligible sub-projects with commercial or municipal sponsorship, i.e. "approved plants" that have undertaken upfront technical analysis; demonstrated availability of waste; provided information on current energy expenditures on traditional fuels; have provided an environmental and social screening report together with necessary follow-up as required to show ESMF compliance; and have presented a business plan with which commercial funding will be sought to complement owner's equity and AEPC's capital cost contribution. For such plants, *SREP* funding will be provided to reimburse AEPC's contribution after the plant is constructed and operational, and is producing energy as certified by an Independent Verifier. The 1:4 leverage ratio means that SREP reimbursement will always be 20% of the cost (i.e. 80% crowded in), regardless of what AEPC pays upfront.

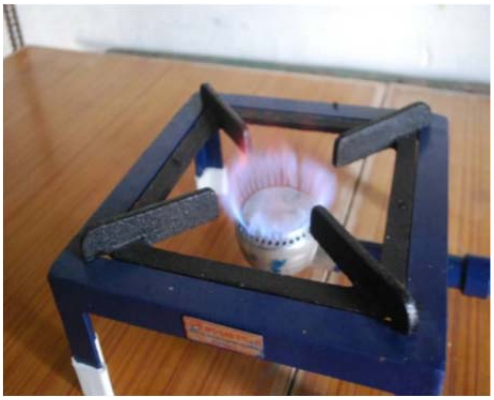
15. To illustrate, therefore, a hypothetical "eligible sub-project" of 100m3 biogas digester size which is only going to produce biogas for thermal application (no electricity), would qualify for different amounts of subsidy support from AEPC depending on whether the sponsor (sub-project owner) is commercial or municipal. Assuming that the sponsor is commercial, i.e. a cattle farm, available information indicates that the total estimated plant cost for such a digester in Nepal is the equivalent of US$13,500. The available public sector subsidy to such a sponsor, from the table above, is US$40/m3 (assuming NPR100=US$1), so for an investment of 100m3 the subsidy is US$4,000. This leaves a total sub-project cost of ($13,500-$4,000=) US$9,500 to be financed from private sources. Again, assuming that equity funding will be one third of the amount to be privately financed, and commercial debt will be the remainder, we would see a private equity contribution of (0.3X9,500) US$2,850 and a commercial loan of US$6,650. Since this sub-project is eligible for SREP, the total subsidy of US$4000 would be divided between SREP and NRREP. AEPC would pay the initial US$4000 from its own resources, and provided that the plant is completed and successfully commissioned, AEPC would draw down US$2,700 from SREP resources to cover the SREP contribution to government support for cost-buy down of the plant. The leverage ratio would be 4:1, i.e. US$10, 650 additional funding is mobilized with a SREP contribution of US$2700.

16. The financing plan for this hypothetical 100m3 biogas sub-project would look as follows:

Owners' equity contribution	US$2,850	22% of Total Cost
Commercial loan	US$6,650	49%
SREP portion of Government support (20% of sub-project cost)	US$2,700	20%
NRREP portion of Government support (remainder of total US$4000 subsidy as per GoN policy)	US$1,300	9%
Total Cost	US$13,500	100%

17. If the same sub-project were to also invest in an electricity generator of e.g. 10kW capacity, it would qualify for an additional capital subsidy for the cost of the generator as per the subsidy policy table above. SREP funds would then contribute 20% of the generator cost as well, in the form of a reimbursement by AEPC to itself for its initial paid out support on the electric generator, again following confirmation by the Independent Verifier that both the biogas plant and the generator are working together. NRREP would finance only the subsidy which is not financed by SREP.

Biogas Digester on Poultry Farm



Clean Cooking with Biogas from Organic waste

D. Higher Level Objectives to which the Project Contributes

18. There is a strong complementarity of SREP goals and World Bank country partnership goals in the activities supported by this proposed project. The project contributes to the Country Partnership Strategy (CPS) pillar of "Increasing Economic Growth and Competitiveness", and in particular the Outcome of "Improved access to, supply of, and reliability of growth-enhancing infrastructure and services in strategic sectors" (ref. CPS No. 83148-NP, discussed at the Board on May 29, 2014). The project also aims to pilot and demonstrate the economic, social, and environmental viability of low carbon development pathways which is a stated impact objective for SREP[6]. Within the overall partnership strategy in conjunction with the *SREP Program Development Objectives*, the project seeks to contribute to (i) overall alleviation of energy poverty in Nepal, by modernizing the off-grid, traditional energy sector; (ii) provide gender co-benefits in commercial and municipal-sponsored sub-projects where biogas production will benefit for groups of women; (iii) greening the growth path for Nepal by reducing possibilities for greenhouse gas production from decomposing organic waste, and (iv) mainstreaming sustainable clean, green energy sources by recycling such waste for commercial benefit.

II. PROJECT DEVELOPMENT OBJECTIVE

A. PDO

19. The project development objective is to promote large off-grid biogas energy generation in Nepal.

[6] Revised SREP Results Framework, June 1, 2012 p.5 para 8

B. Project Beneficiaries

20. SREP seeks to deliver two primary categories of benefits from the use of its financial support: (i) increased access to renewable energy and (ii) increased production of renewable energy. The proposed SREP project will seek to benefit large off-grid biogas plants where sponsors are commercial enterprises or municipalities. Commercial enterprises (farms, distillery, fruit processing plants, poultry hatcheries) that are currently spending large amounts of money and managerial effort in non-core activities such as procuring diesel for backup power generation--due to the dismal state of the grid--will be one sub-group of project beneficiaries. *Municipalities* that are able to partner with private entrepreneurs bringing technology to invest in waste to energy sub-projects, may be able to generate localized biogas for commercial heating applications. Municipalities and the destitute who may be helped by these energies generated from municipal waste will also be potential beneficiaries.

C. PDO Level Results Indicators

21. Key results expected and associated indicators are as follows:

- Results expected are off-grid biogas generated from large plants (over 12 m3) and off-grid biogas based electricity generated.
- Intermediate results expected include (i) Number of large biogas proposals submitted for investment evaluation (prospects); (ii) Number of companies trained to evaluate and appraise large biogas sub-projects; and (iii) Number of Off-grid biogas and/or electricity generation plants created& made operational by the project.

22. PDO Indicators:

(i) Off-grid Biogas generated for thermal application from large scale (>12m3) biogas projects (estimated annual production based on number of plants using biogas for thermal application)
(ii) Off-grid Biogas based electricity generated (estimated annual production based on number of plants using biogas for electricity generation)

III. PROJECT DESCRIPTION

A. Concept

23. The concept of this project is to identify and support existing Nepali private sector sub-project sponsors and entrepreneurs, as well as institutions, municipalities and communities who are prepared to invest resources and effort in entering the large scale biogas business that does not exist today in Nepal. The project will support them to develop, construct and operate individual, sustainable sub-projects meeting the criteria for World Bank funded projects in terms of compliance with technical, economic and financial viability, as well as fiduciary and safeguards policies. The SREP contribution is to introduce and mainstream new procedures to the large biogas component of NRREP that transform the way AEPC funds are used. In particular, AEPC will help the private sector to transparently identify the potential sub-project costs. AEPC will also provide pre-construction technical support to the owner for detailed sub-

project preparation, as well as follow-up reporting and monitoring, thereby ensuring greater likelihood of sustainability of the investment.

24. Private companies interested in acquiring large biogas digester technology will be eligible for technical assistance on a 50-50 cost-sharing basis up to agreed limits, to hire a competent consultant(s) of their choice, in order to prepare a detailed feasibility study and a professional business plan. The consultant (s) shall be involved in the elaboration of the detailed feasibility study and professional business plan alone or in partnership with an expert international consultant. If the feasibility study is of suitable quality, AEPC will provide a commitment letter, to support the sub-project's investment cost as per GoN's published policy. This commitment letter, together with the feasibility study and professional business plan, will be used to seek funding from other sources including among others, commercial lenders and additional private investors, in case the sub-project owner has insufficient funding to close the financing gap with the commitment letter alone. Upon financial closure, AEPC will disburse the amounts of support indicated in the commitment letter, as per GoN policy. SREP funding will not be touched until the sub-project is operational. At that time, AEPC will draw down the SREP funds to partially reimburse itself for the subsidy paid out during construction.

B. Project Description

25. The two project components are as follows: Technical Assistance and Financing of Investments.

Component 1: Technical Assistance (US$1.0m)

(a) **Identification and Pre-Feasibility Studies**—Launch of a transparent, web portal (bilingual in Nepali and English) for applications from existing companies to identify and invest in large biogas sub-projects. Sub-projects should focus on harnessing organic waste. Applicants must agree to follow SREP principles, which permits the import of technology, requires leveraging funds from other sources, and also includes compliance with the Environmental and Social Framework.

The published GoN subsidy policy will apply to sub-projects to "buy-down" the initial capital cost required, with levels of subsidy varying depending on the nature of the sub-project. Regardless of the type of sub-project sponsor, all sub-projects will be evaluated to ensure that the sub-project will perform effectively and sustainably.

(b) **Detailed Feasibility Studies**--Nepali companies' request for TA support to carry out the detailed feasibility study will be supported on a cost-sharing TA basis.

(c) **Post Construction Third Party Verification**--AEPC will appoint a technical review committee (TRC) to meet monthly and evaluate sub-projects received. Minutes of the meetings will be published on AEPC's website. Separate TA support will be provided to AEPC for periodic evaluation of lessons learned from the ongoing large biogas program.

Component 2: Financing of Investments (US$ 6.9m[7])

AEPC will use government funds as per its published subsidy policy, to provide a capital cost buy-down and thereby to achieve financial closure for competitively selected large biogas investments led by the private sector. The plants are likely to be sustainable as the private sector undertakes design, construction, financing, and operation and maintenance. SREP funds will be drawn down by AEPC after the plant is commissioned and operational and will serve to reimburse AEPC for a portion of the capital cost buy-down it has already provided. By this method, SREP is only financing plants that work. SREP funds will be provided as a Subsidy Payment, which will be a partial reimbursement of the eligible subsidy under GoN's Feb 2013 Subsidy Policy.

C. Project Cost and Financing

26. No IDA funds are proposed to be allocated for co-financing the proposed Extended Biogas Project.

27. The project will be supported through US$7.9m of SREP funds. Up to US$1.0m (12%) of the SREP funds would be used for technical assistance (TA) to support market development and private sector entry to this segment. The remaining 88% of the SREP grant (US$6.9m) would be used to catalyze and attract additional sources of funding in a 1:4 ratio for commercial sub-projects (US$4 of external funding for every US$1 of SREP), to support up to a total maximum investment portfolio of US$35m, assuming all supported sub-projects are of a commercial nature (approximately US$7.0m of core SREP funds and approximately US$28m of co-financing).

28. Large scale biogas plant investments are at a zero starting point today in terms of commercially operating ones. Earlier medium to large plants are currently non-functional, for a variety of reasons. By the end of the SREP project it is expected that there will be 400 new commercially viable and sustainably operating plants. Furthermore, the capacity and in-country experience that is expected to be built in the private sector for identification, construction, financing and O&M of large biogas sub-projects, is expected to be sustainable and to continue after the SREP project implementation period ends.

Project Components	Project cost (US$)	IBRD or IDA Financing (US$)*	% Financing
1. Technical Assistance	1.0m	1.0m	100
2. Contribution to Core Investment	6.9m	6.9m	100
3. Co-financing from other sources	27.6m		
Total Costs	35.6m	7.9m	100

*This will be SREP grants administered by IDA

[7] A sum of $100,000 which was used to prepare the SREP Investment Plan for Nepal has been deducted from the available resources of $7.9m, and this reduction has been applied to the Investment component rather than the TA component

D. Series of Project Objective and Phases *(If Applicable)* Not applicable

E. Lessons Learned and Reflected in the Project Design

29. The GoN's subsidy policy is based on payments for installed capacity, and does not focus on subsequent performance or output of energy. The SREP project design seeks to address this gap and provides numerous forms of complementary TA interventions starting from detailed and careful sub-project preparation (through cost-sharing), as well as capacity building at various levels, as well as a deliberate focus on performance and output, for demonstration of economic and financial viability of large scale industrial and commercial biogas plants.

30. The limitations of a subsidy-led, public sector dominated approach have been recognized in the decades-long isolation of large scale biogas technologies, thriving in neighboring countries but not present in Nepal. For administrative and reporting convenience, AEPC has opted for a single indigenous design as the only eligible technology which can attract subsidy. This has worked reasonably for the rural household biogas sector, where households possess one or two heads of cattle. Estimating the amount of total organic waste available year-round in order to calculate the size of the biogas digester capacity required (2, 4 or 6 cubic meters) is still possible. The single design has allowed private companies to be efficiently trained in both marketing and construction, incentivized them to intensively encourage rural households to adopt this single design, and has thereby enabled a nationwide roll-out. But all technological improvements and upgrades that have been occurring elsewhere over the last two decades, have not been adopted in Nepal since they do not come under AEPC's approved criteria and are not eligible for support. The soon-to-be launched large scale biogas program, in order to be successful, must allow for technological diversification and innovation depending on the nature of organic waste, the amount available, and the end-use (thermal energy or electricity). Newer technologies, adapted to different types of waste, provide higher yields than a one-size fits all technology, and can cost less by innovative use of cheaper and lighter materials, some of which do not require an underground concrete tank. While AEPC is currently adopting the existing indigenous design (fixed dome single tank GCC2047, dating back to 1972 Chinese technology) from household size to larger plants, there is also now agreement that the SREP project will support intensive awareness raising about other technologies and designs available for the amounts and types of waste in question. Some sub-projects will be supported with the indigenous design, but others will also be eligible for AEPC subsidy and SREP reimbursement to AEPC, if they choose an imported technology. This is a major breakthrough.

31. **Project Readiness has been emphasized**, since SREP Extended Biogas proposed design is new in Nepal. The bottom-up approach was first tested during the Preparation phase at a Bazaar in April 2013[8]. By the Appraisal stage, AEPC was ready with a batch of ten sub-projects ready to seek funding, and site visits were undertaken by the task team including a specialized, highly experienced Biogas advisor, together with AEPC staff. Following the site visits, AEPC

[8] Through a media campaign, AEPC solicited online applications (based on a template seeking specific information) for proposed private sector biogas sub-projects from qualified companies. There was an unexpectedly high response in a very short time, and the Bazaar resulted in the submission of over 100 good concepts. Ten of these were shortlisted and three final winners were selected.

was provided with suggestions on how to improve the information provided and evaluated for "ready sub-projects". In response to this guidance, AEPC quickly prepared a total of 12 feasibility studies in the new format. This is the pipeline of 12 sub-projects ready to be submitted for review to the Technical Review Committee (recruitment of independent experts underway and the entire committee is expected to be appointed and in place by early March). Annex 9 contains further details on the initial pipeline of ready projects (first 10 of 12 are described in the Annex). AEPC has also prepared an additional list of 50 "prospects" (available in Project Files) that have already expressed interest in receiving help with their feasibility studies, and AEPC is also working on a list of the next 100 companies to which the pre-qualified local biogas consultants will be marketing the large biogas plant concept, as well as the SREP Project's cost-sharing of due diligence TA feature, in order to raise awareness and stimulate further investment interest. The consultant (s) shall be involved in the elaboration of the detailed feasibility study and professional business plan alone or in partnership with an expert international consultant.

32. A government subsidy policy which focuses only on capacity addition but not on how that capacity is used, nor whether it is producing energy in a technically, socially and environmentally sustainable manner over time, will have limited impact. Previously, AEPC has been concerned only with installation, rather than performance. Now that SREP disbursements will require an independent verification that the sub-project is operational and producing thermal or electrical energy as specified in the detailed feasibility study, there will be an important shift in focus on output and outcome, rather than on inputs alone.

33. The demand-driven element, with customized technical analysis of the characteristics of each sub-project had not been included as part of AEPC's original blue-print for the large biogas sector. A stronger engagement of private sector with greater autonomy to decide on technologies, and taking an ownership stake in the success of the sub-project, is believed to be a promising approach to ensuring the operational success of new investments and avoiding the problem of non-operating, abandoned plants that are the legacy of some earlier attempts to experiment with larger plants. Private sector financial contribution to the cost of commercial sub-projects will also help to ensure ownership and motivation of the plant owner to seek help in case of operational difficulties. AEPC has prepared a detailed Project Operational Manual covering the intake, screening, decision-making, notification, disbursement and withdrawal application stages of the sub-project, which is a first for the organization.

34. Another major breakthrough in project design is the proposed set of template Agreements that did not previously exist, to emphasize responsibility and accountability of various parties. These are to be implemented (i) between the construction firm and the sub-project owner, including performance guarantees to limit risks of shoddy construction; (ii) between AEPC and the construction firm, (who will receive the subsidy from AEPC as per GoN's published subsidy delivery mechanism); and (iii) between AEPC and the plant owner, to ensure that the plant will continue to be operated as required, will not be sold, will create an annual reporting obligation by the owner to AEPC on plant performance, and may be independently monitored at regular intervals.

35. The SREP requirement of crowding in other sources of funding (in this case 1:4 meaning that $4 of other money is raised for $1 of SREP investment) is a new feature for AEPC's subsidy driven programs, particularly in terms of attempts to engage commercial banks to support the sub-projects of very creditworthy large investors. For this purpose, some TA funds are set aside to deliver capacity building for banks, as well as to train consultants in business plan writing so that business plans can be submitted to potential investors together with the detailed feasibility studies and the commitment letter from AEPC. Even if all sub-projects do not succeed in attracting commercial funding, there will be a culture change that transfers ownership and responsibility in the direction of the private sector.

36. Last but not least, the SREP project design ensures that private investors will fully include implementation of the Environmental and Social Management Framework governing this SREP project, in their upfront detailed feasibility study that will be submitted to AEPC's Technical Review Committee. The link between responsible safeguards practices and sustainability of the project is a major design feature. Based on policies triggered, project developers will receive cost-sharing support for carrying out a social impact assessment, an environmental impact assessment, an environmental management plan, etc. This SREP project will also raise awareness of how an enterprise's energy security can be improved by utilizing the waste instead of dumping it. Utilizing the waste will permit the company to avoid a portion of the current cash outlay on traditional fuels. Because the full economic benefits (of avoided GHG and reduced health hazards) are not captured by the individual company, AEPC can rationalize the cost-sharing support provided. This too is a lesson learned and incorporated in the SREP project design.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

37. AEPC will establish a Technical Review Committee (TRC) to provide the requisite skills required for screening the proposals submitted to the online portal and subsequent detailed further studies prepared for sub-projects that are selected to receive support. The TRC will consist of AEPC senior staff, an official from the Ministry, an Independent Technical Expert, an Independent Commercial Expert and an Independent Observer who must sign off on the minutes of monthly meetings where applications are discussed. Minutes of meetings will be posted on AEPC's website (firm names and commercially sensitive information will not be disclosed). (Terms of Reference for the Technical Advisory Committee are on file).

- The first stage of screening incoming applications will be done by AEPC alone, and will be a simple fact check to confirm what is presented in the application (name, business address, references, tax identification number, access to the proposed source of organic waste, etc.). In addition, where appropriate, a feasibility study may be undertaken by pre-qualified consultants working for the developer and paid by the developer. If the sub-project is shown to be not commercially viable after the feasibility study, the applicant will drop out and is still eligible to re-apply with a different sub-project proposal.
- Detailed Feasibility Study (covering technical, commercial, and safeguards issues and financing plan and business plan) must be prepared before final investment funding

decisions are sought. In case the applicant requires financial support to do the detailed feasibility study for his sub-project, he will include a request for Cost-Sharing TA Consultancy to do the Detailed Feasibility Study. A pre-qualified consulting firm shall always be involved in this process in partnership with an independent technical expert. AEPC's Technical Review Committee will look at the credentials of the proposed consultant that the entrepreneur is planning to use, and will have to approve or deny the proposed consultant. Once the TA proposal (scope, consultant, timeline, outputs, cost) is approved, the applicant will have to pay the first 50% and show the interim output. The Project will then pay the remaining cost to complete the feasibility study. Safeguards compliance will be an important part of the completed feasibility study.

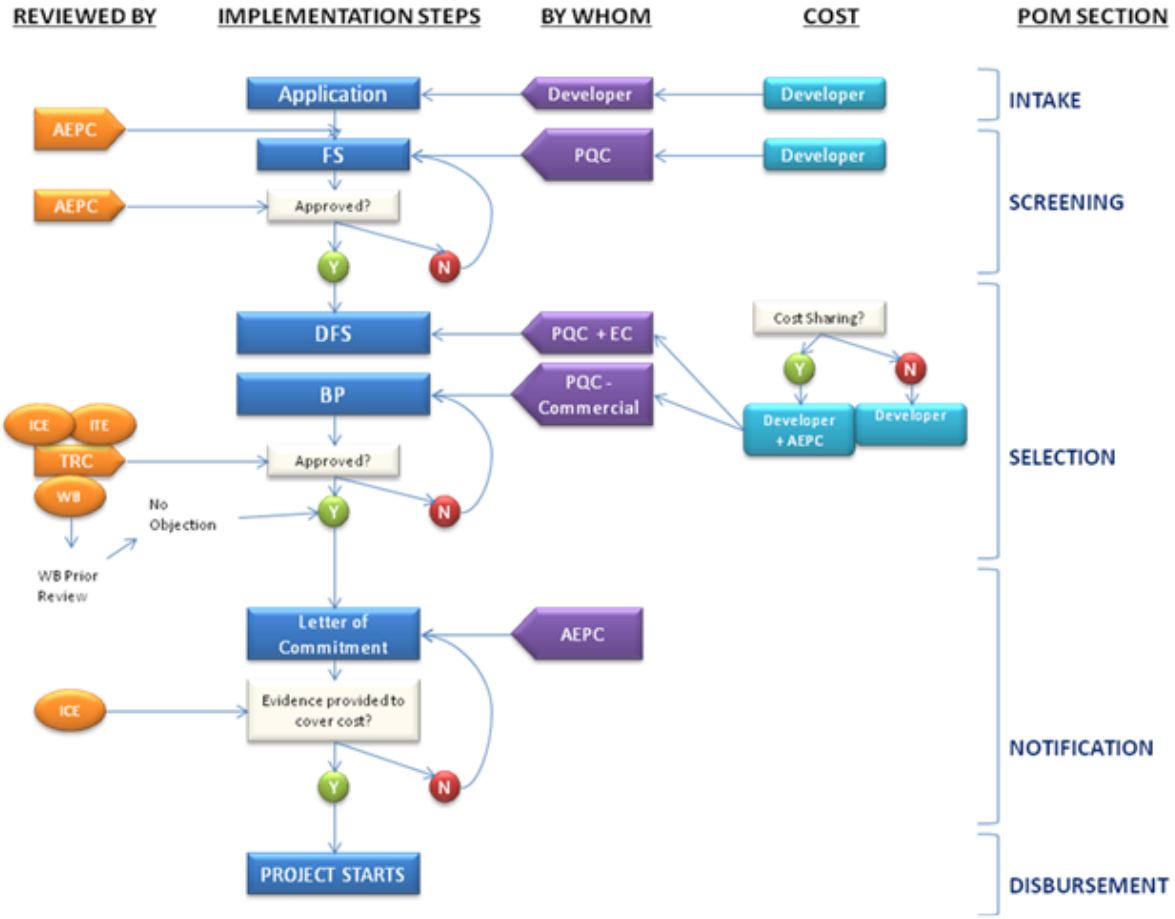
38. For sub-projects above an agreed threshold, the Bank as part of implementation support will perform an independent due diligence on certain detailed feasibility studies and will advise AEPC of its no objection to issue a Letter of Commitment for allocating SREP funds to cover a maximum of 20% of the sub-project cost as per the operational manual. SREP funds will be paid after the sub-project is commissioned and operational. The subsidy will be pre-financed by AEPC using its own resources. [9] Completion of financial closure is a pre-requisite for commencement of disbursement of subsidy as per the Operational Manual.

- The time-frame from initial application to financial closure is expected to take no more than 3-4 months, because the applicant must be initially well prepared before submitting a successful application.
- Monitoring and Evaluation will be an important element of ongoing SREP project supervision (including continued compliance with ESMF, which will be the responsibility of AEPC's ESMF Officer).

39. The diagrams below show the proposed implementation arrangements explained above.

[9] In order to reach financial closure, the applicant will take the detailed feasibility study, the business plan and the AEPC Letter of Commitment, and go and approach other financiers to seek co-financing for the sub-project. The commercial applicant will also have to invest a certain amount of owners' equity, most commonly between 20% and 30% of the capital cost required to be funded after the cost buy-down.

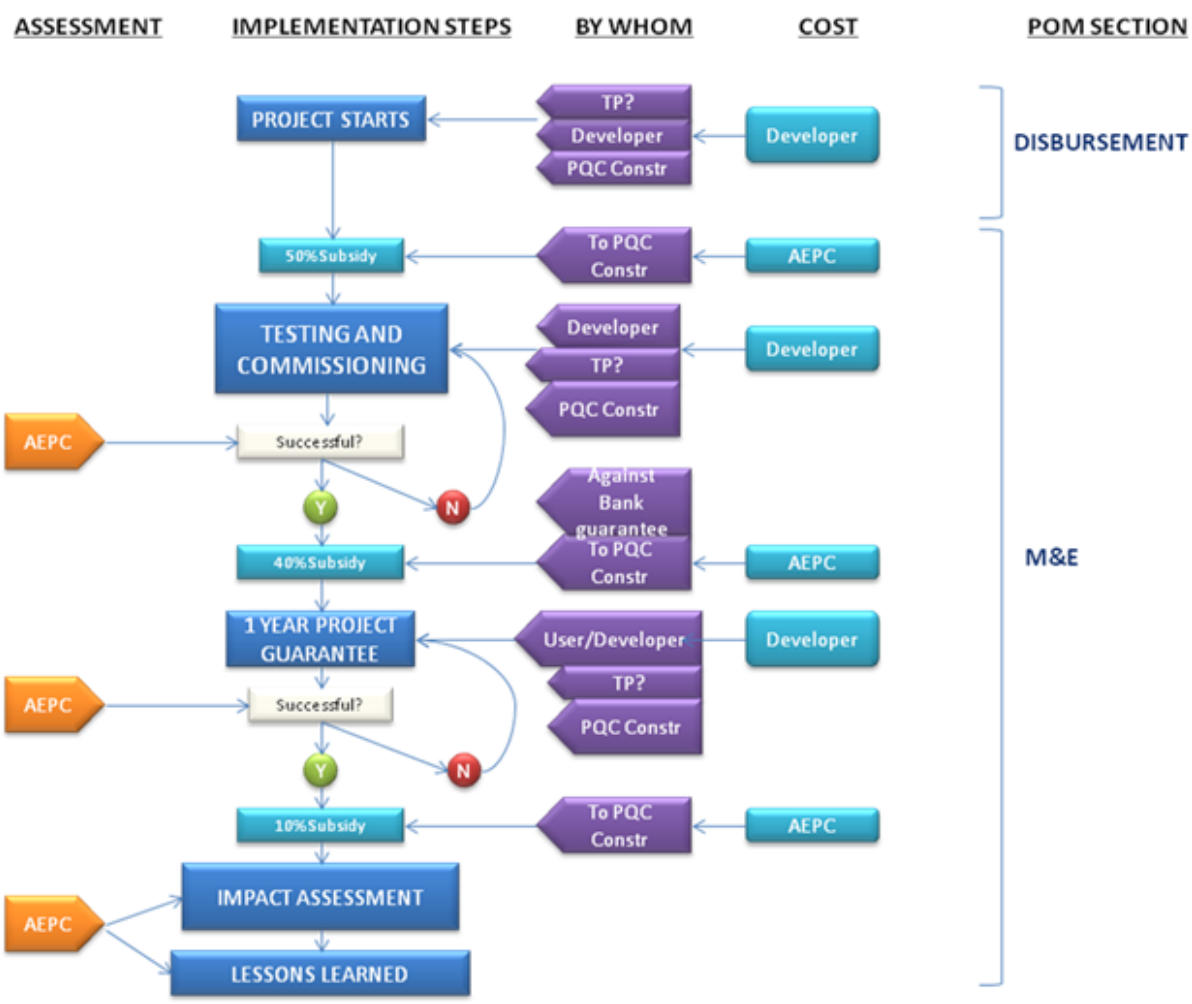
PROCESS FLOWCHART



List of Abbreviations:

- POM: Project Operation Manual
- AEPC: Alternative Energy Promotion Center
- FS: Feasibility Study
- PQC: Prequalified Consultant Firms
- DFS: Detailed Project Study
- ITE: Independent Technical Expert
- TRC: Technical Review Committee
- WB: World Bank
- ICE: Independent Commercial Adviser
- EC: Expert Consultant
- BP: Business Plan
- PQC Constr: Prequalified Construction Company
- TP: Technology Provider

Note: DFS and BP for plants less than 100m3 are a single activity to be carried out by pre-qualified consulting firms in partnership with an independent technical expert.



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- EC: Expert Consultant
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- TP: Technology Provider

B. Results Monitoring and Evaluation

40. AEPC will provide annual reporting on the two PDO indicators, i.e. off-grid biogas generated from large plants, and off-grid biogas based electricity generated. This will be done from SREP project data sources (i.e. incoming applications and supervision reports). Surveys will also be undertaken annually for random samples of supported sub-projects, and results will be shared with Bank implementation support teams. Evaluation of the program will be undertaken once at the 18 month mark following effectiveness, then at mid-term and then at closing, shortly before the ICR mission. Evaluation will be centered around the PDO indicators and the intermediate indicators, and will focus on lessons learned which will lead to course corrections, if required.

C. Sustainability

41. This SREP project's sustainability is one of its fundamental design elements, since its very purpose is to achieve sustainability of sub-projects through involvement of private sector stakeholders. The thinking is that these stakeholders will have the right incentives to remain persistent and solve problems, should any arise, instead of easily abandoning the sub-project and feeling no ownership which has been the previous experience when all costs were covered by government subsidies. A clear and precise definition of the SREP project's components will help to ensure its sustainability, as follows:

- Strengthening of technical and institutional capacities across the board
- Introducing a commercial orientation which is highly performance-based and requires stringent technical due diligence and preparation of a business plan upfront
- Acquiring proven modern technologies which are mature in similar environments outside Nepal, and on which there has been a great deal of experience in order to ensure optimum performance
- Creating conditions for acquiring competent technical advice from consultants who have adequate experience with imported technologies and processes
- Two part support, consisting of TA followed by investment support; if the feasibility studies do not result in a demonstration of viability, the loss is minimized and limited to a learning experience rather than having made an investment which doesn't work
- Furthermore, even for successful feasibility studies, the catalytic investment support is given initially in the form of a commitment letter which the commercial applicant uses to reach financial closure from other sources. Disbursement is delayed until all checks are completed.

V. KEY RISKS AND MITIGATION MEASURES

42. Major risks:

(i) Maintaining clarity in terms of NRREP subsidies and SREP catalytic support; market players should not be confused and incentives should not be distorted in

terms of "chasing NRREP subsidies" since AEPC subsidies in the past have been paid for commissioning capacity only, and not focused on performance;

(ii) AEPC will have to transparently enforce its published subsidy policy and apply it to all large biogas investors, both for the sub-projects which qualify to meet SREP standards, as well as those that will be supported by NRREP;

(ii) Limited capacity and experience of the private sector for large biogas in Nepal;

(iii) Limited data about potential organic waste resources;

(iii) Availability of commercial financing;

(iv) Limited experience of commercial lenders to appraise large biogas project risks;

(v) Governance risk in identification of firms and sub-projects and subsidy distributions

43. Mitigation Measures:

- Professional Communication and Awareness Campaign to explain the Biogas subsidy program to the new market segment of investors; clear distinction of what is supported under SREP (same official GoN subsidy policy; permitted to import new technology, can choose competent technical and commercial consultants and receive cost-sharing support; LoC allows sub-project sponsor to qualify for commercial funding; achieve international standards with AEPC support).
- Training and support program if requested, to local community of pre-approved Biogas consultants and pre-approved Biogas construction companies, if they wish to upgrade exposure and skills
- Regular updates by AEPC and the World Bank to NRREP Donors on the progress of the NRREP supported large biogas program and the SREP supported one, and candid discussion of issues arising, if any
- Initial full technical review by World Bank specialist technical advisor of the full first batch of ready sub-projects submitted for SREP financing; followed by introduction of an appropriate prior review threshold for subsequent sub- projects
- Training of commercial bankers on appraisal of biogas sub-projects and discussion of initial credit enhancement measures required, if any
- Assistance to AEPC with technology exposure visits to neighboring countries to visit commercially operating sub-projects, and formal classroom training opportunities for potential investors in large biogas sub-projects to better understand how to estimate potential gas yields from different substrates
- More frequent implementation support missions in the first half of SREP project implementation (three times a year up to Mid Term Review)

A. Risk Ratings Summary Table

Risk Category	Rating
Stakeholder Risk	**H**
Implementing Agency Risk	**MI**
- Capacity	**MI**

Risk Category	Rating
- Governance	**MI**
Project Risk	**MI**
- Design	**MI**
- Social and Environmental	**L**
- Program and Donor	**L**
- Delivery Monitoring and Sustainability	**L**
- Other (Availability of Co-financing)	**H**
- Other (Optional)	
Overall Implementation Risk	**MI**

Reference to ORAF Guidance Note 7.1.10, page 5: A rating of low (L) corresponds to a risk factor with a *low impact* if it does happen and a *low likelihood* of it occurring. An assessment of high (H) relates to a risk with a *high impact* on the PDOs and a *high likelihood* that it will occur. A medium driven by likelihood (ML) rating indicates a risk that would have a *low impact* even if there is a *high likelihood* that it will happen. On the other hand, medium driven by impact (MI) corresponds to a risk that would have *high impact* if it took place but a *low likelihood* of it occurring.

B. Overall Risk Rating Explanation

- Stakeholder risk is rated High because the project introduces totally new business practices, technologies, contractual practices and accountability standards to the biogas sector in Nepal, and there is expected to be opposition from some quarters who have not faced any competitive pressures for two decades.
- The Implementing Agency risks are rated MI (high impact but low likelihood) because while prolonged political instability has hitherto affected the public sector more than the private sector, the scene is now likely to have changed following the recent elections and it is expected that the instability will diminish and the pace of decision-making as well as alignment within Government will increase.
- The Design Risk is rated MI (high impact but low likelihood). The project design is innovative, inclusive and bottom up nature, selecting entities to be supported through a transparent online portal, which has never been used before by the public sector in Nepal to engage with the private sector. There has been a substantial delay in moving the project forward since the Bazaar, and this may lead to a wait and see attitude by applicants during the actual Call for Proposals. The impact of this on the PDO would be high, but there is a low likelihood since there will be another communication campaign to accompany the Call for Proposals, and most importantly, this time financial support will be offered to winners (during the Bazaar it was only to test the online application system and contestants received honor and recognition but no funding). This mechanism was very successfully piloted at the Waste to Energy Bazaar in April 2013 and generated a large number of high quality applications in a short time frame.
- The Social and Environmental risk is rated Low because AEPC has recently appointed an ESMF officer, who is being immersed in the safeguards business right from the start, and is engaged in the ESMF screening of the first batch of sub-projects ready to be submitted for financing. There is a very low likelihood of sub-projects which are selected for SREP

support not being in compliance with the ESMF, due to full time screening arrangements in place at multiple stages of the vetting process.

- Program and Donor risk is Low due to the high level of grant funds committed to NRREP and the sustained commitment of donors to the biogas sector for many years.
- Delivery and Monitoring Sustainability is rated Low because this is amply supported by every aspect of the design of the SREP project, the Technical Advisory Committee and Bank implementation support.
- Availability of Co-Financing to reach financial closure of potential investment sub-projects and achieve the targeted co-financing ratio (4:1) under the SREP project remains a high risk in a short time frame, but the majority of project activities and resources are focused on mitigating this risk. Also, it is the hallmark of a SREP project to crowd-in commercial funding so again the project design is oriented to support this. Nevertheless, it has been conservatively rated High since it is untested.
- Overall, the project risk rating is MI; activities which require close coordination inside GoN, may take longer than decisions which are to be made inside AEPC alone. Therefore, the ability of AEPC to issue timely policies, or to carry out its selection of qualified investor proposals in the required manner, may present additional risks in the form of delays, but these are not expected to be serious.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

44. A cost benefit analysis was carried out by AEPC's consultants for the pipeline of the ten "ready for financing" sub-projects to determine if the sub-projects would be beneficial from an economic viewpoint. The analysis compares sub-project costs with benefits generated by such an operation for the commercial sub-project applicant. Despite the simplification where carbon cash flows are not taken into account, the results of the economic analysis indicate benefit cost ratios of over 2.0 (monetized benefits are double the cash costs of investment) and economic rates of return close to 30%.

B. Technical

45. Initial assessment of AEPC's capacity to supervise a sub-project involving construction and management of imported technologies that deviate from the standard GCC 2047 design that has prevailed in Nepal for the last two decades, indicated the need to strengthen technical capacity and to develop an innovative sub-project design where this particular capacity would not be required from AEPC. Instead the technical challenge was to set up a SREP project "intake process" supported by a Technical Review Committee, where sourcing the required technical capacity for undertaking the detailed feasibility study and preparation of the business plan would be the responsibility of the sub-project investor who would need to convince the Technical Advisory Committee of the technical and commercial rigor of the proposal, to obtain the cost-sharing grant and the Letter of Commitment.

46. The technical capacity will be further strengthened by having a prior review procedure where the Bank also brings in technical expertise for a second review of the technical studies

(particularly on imported technology sub- projects), to better understand assumptions which are being made about the performance of certain technologies in a Nepali environment where they have not been used before. Such a prior review technical vetting process is currently underway for the first batch of 12 commercial biogas sub-projects which have been submitted for consideration to be financed under SREP.

47. Technical supervision and multiple reviews are built into the design of the sub-project, and will serve a very useful "common learning" purpose where the experience can be shared in order to better understand the parameters for the next generation of sub-projects, and also build the capacity of the domestic community of biogas consultants.

C. Financial Management and Disbursement

48. AEPC has been implementing the World Bank financed projects and hence has gained experience managing the Bank financed projects. AEPC's financial management performance has been moderately satisfactory. The audited project accounts and report for FY 2013 for AEPC implemented projects have been received and found acceptable to the Bank. The submissions of the trimester financial reports were delayed at times with some inaccuracies. The audit reports were usually being received within the grace period of four months. Lack of monitoring was seen in Power Development Project in which disbursements made to the district offices were not verified for actual expenditures made to the beneficiaries from the respective district offices and AEPC. Some internal control deficiencies identified in the supervision missions have been advised for rectification by AEPC. As agreed, the current Financial Management Manual needs to be revised to align with current bank specific requirements. Considering the overall financial management capacity and performance of AEPC, the Financial Management (FM) risk is "Substantial" as was rated previously. (Refer Annex on FM for the basis of risk rating and identified risk mitigation measures). Similar to other Bank financed projects, a separate project account shall be maintained by AEPC for SREP. The existing financial reporting requirements of the Bank shall also apply to SREP. For effective financial management, a financial management consultant as being currently dedicated for the on-going Bank funded projects will also be required for SREP. As per the Cabinet approved Central Renewable Energy Fund (CREF) document, the development partners are required to advance seed capital to the central fund. However as per the Bank's financing policy, it can only fund eligible expenditures after they are incurred, and can be demonstrated to have complied with agreed criteria. Therefore, the Bank cannot be a direct partner to the fund as envisaged in the official CREF document. The Bank has indicated that Government can use its NRREP funds for the expenditures to be incurred, and be reimbursed from IDA funds for eligible expenditures only after the eligible expenditures are actually incurred. AEPC shall set up mechanism for monitoring and verification of the usage of funds, details of which will be provided in the Project Operations Manual. If the project is planned to commence in the current Fiscal Year, AEPC needs to obtain approval of the program from National Planning Commission and of the budget from Ministry of Finance before the effective date accordingly.

49. The same financing mechanism that has been followed for other Bank funded projects implemented by AEPC will be adopted, which includes Direct Payment, Advance and Reimbursement. Disbursements from the Bank will be based on Statement of Expenditures. The eligible expenditures of Component 2 and training of Component 1 shall be pre-financed from

NRREP funds. The expenditures of Component 2 will be reimbursed directly. Other reimbursable expenses can be reimbursed from DA established at the Nepal Rastra Bank, in which the Bank's contributions to SREP will be advanced. If required for Component 1 expenditure other than training, the payment of significant amounts can be requested to the Bank for direct payment to the payees. Disbursements will be made for: a) Consulting services, b) Training, workshops and non-consulting services c) Subsidy payments. Actions to strengthen the financial management capacity of AEPC are identified as follows:

No.	Actions	Due Date
1	Revise the Financial Management Manual to meet the current Bank specific requirements	Dated Covenant Sept 30, 2014
2	Recruit one financial management consultant for SREP as being currently dedicated for the on-going Bank funded projects	Two months from the date of GA signing.
3	Set up mechanism for monitoring and verification of usage of funds in the Project Operations Manual	Dated Covenant Sept 30, 2014
4	Coordinate with the Office of the Auditor General for timely audit	31 July 2014
5	Obtain approval of the program and budget from NPC/MOF	Prior to Effective date

50. Disbursements under this project would be based on sub-grant agreements for component 2, which would contain details on achievement of outputs. Expenditures would be recorded at the end-use point in incurrence/payment. The PIU would enter into a sub-grant agreement with the respective beneficiaries.

a) Disbursement Methods:

In the case of Designated account payments, supporting documentation would be SOE sheets for contracts not subject to the Bank's prior review and invoice/receipts for prior review contracts. In case of subsidy payments using the reimbursement disbursement method, disbursements would be based on customized SOE. Direct payments would require full supporting documentation in the form of invoice.

b) Withdrawal table:

Category	Amount of the Grant Allocated (expressed in USD)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Non-consulting services, consultants' services and Training under Parts 1(a)(i), 1 (c) and 2 of the Project	750,000	100%
(2) Consultants' services under Part 1(b) of the Project	150,000	50%

Category	Amount of the Grant Allocated (expressed in USD)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(3) Incremental Operating costs	100,000	100%
(4) Reimbursable Amount of Subsidy Payments under Part 2 of the Project	6,900,000	100% of amount disbursed
TOTAL AMOUNT	**7,900,000**	

c) Disbursement process:

The project would contain 2 components. Under component 1, the project would finance consulting and non-consulting services, under sub-components b and c and training expenses under component 1. In the case of sub-component b, the financing would be restricted to 50% of the amount paid. Designated account advance of USD 250,000 would be used for this purpose. The Designated account applications would be submitted on a quarterly basis. Direct payments can also be used for payment of consultants services.

51. Component 2 would contain a disbursement condition regarding commission and operationalization of the plant. Upon financial closure of the project, AEPC would make disbursements, based on the milestones mentioned in the operational manual. Once the plant is commissioned and operationalized, the independent verification consultants would review and submit a report to the Bank. Once the bank is satisfied, the disbursement condition would be lifted. Disbursements from the Bank would be made in two tranches after this, since AEPC would make the final payment, once the '1 year guarantee period' criteria is met.

52. The following additional points regarding the disbursement process maybe noted:

- The disbursements under component 2 would be least of the following:
  a. 20% of the project cost as defined in the operational manual
  b. 20% of the incurred and paid expenses under the project
  c. Actual subsidy paid by AEPC to/for the private developer
- As per the project operational manual, 10% of the subsidy would be paid by AEPC after one year after successful commissioning, once the '1 year guarantee period criteria' as mentioned in the manual is met. In such a case, this part of the sub-grant would be reimbursed by World Bank, once this amount is paid by AEPC on the completion of the above period.

53. In addition to the independent technical verification report, there would be an independent financial verification of the sub-projects. The main purpose of this review would be to validate the actual project cost as per the definition in the operational manual.

D. Procurement

54. SREP is a project with innovative approach to implement its activities. The main objective of the project is to support AEPC in creating large scale biogas plants in Nepal, which is at zero level now, based on the Government subsidy policy. There are two components under this project. Component-1 is intended to provide technical assistance to AEPC in identifying investors, building capacity of Nepali companies and conducting 3rd party due diligence of installed large scale biogas plants. This involves selection of consultants, procurement of non-consulting services including training, workshops, etc. and procurement of some goods by AEPC. Component-2 covers entire sub-grants to be implemented as per the Government's subsidy policy. There is no any procurement under this component to be done by AEPC. Because of the uniqueness of the project, separate procurement arrangement has been proposed for Component-1 and Component-2 in the following paragraphs.

Procurement Arrangement for Component-1

55. **Applicable Procurement Procedure:** Procurement for the proposed operation will be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works and Non-consulting services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" published by the World Bank in January 2011 ("Procurement Guidelines"), in the case of goods and non-consulting services; and "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" published by the World Bank in January 2011 ("Consultant Guidelines") in the case of consultants' services, and the provisions stipulated in the Legal Agreement. However, procurement of goods may be carried out adopting National Competitive Bidding (NCB) as per the Public Procurement Act, 2007 and the Regulations made thereunder with additional IDA prescribed caveats and for contracts as agreed in the procurement plan.

56. **Procurement Risks and Mitigation Measures:** The World Bank team carried out procurement capacity assessment of AEPC in October 2013. The AEPC will be the implementing agency for this project. The biogas sub component (BSC) headed by Assistant Director/ AEPC will be responsible to manage the day to day job of the project, with a procurement unit (PU). The BSC will have a staff member who is trained in World Bank procurement procedures and he/she will be responsible to initiate all procurement activities required for the project with support from the PU. One staff designated as the procurement officer in the procurement unit, has some knowhow on procurement of office consumables, however doesn't have hands on procurement experience. In order to expedite the procurement process under this project and also other projects that AEPC is implementing currently, hiring of an intermittent procurement consultant is strongly recommended. Similarly a checklist of procurement process is suggested to be prepared for smooth implementation of the procurement activities.

57. **Procurement Methods and Prior/Post Review by the Bank**: For each contract to be financed under the Credit/Grant, procurement methods or consultant selection methods, the estimated costs, prior review requirements, and time frame will be agreed between the Borrower and the Bank in the procurement plan which needs to be prepared by the borrower for the first 18 months and reviewed by the Bank prior to the approval of the Project. The Procurement Plan will

be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity. All other contracts except under prior review will be subject to post review by the Bank.

Procurement Arrangement for Component-2 (subsidy part for creating large scale biogas plants)

58. There are two types of costs to be borne by AEPC under this component. The first category of cost is 50% of the consultancy fee for preparing detailed feasibility study (DPS) report and 2nd category of cost is 20% of biogas plant installation cost. Risk associated with these costs is the reasonableness of the costs based on the prevailing market. So, procurement due diligence is required for these two types of costs.

59. Before conducting DPS, beneficiaries will select consultants from the AEPC prepared roster of short-listed (or prequalified) consultants for feasibility study (FS) at the intake stage and the cost associated with such consultant at the feasibility stage will be borne by the beneficiary itself. This feasibility study will go through Screening and Integrity Due Diligence (IDD) procedures. FS will be reviewed by Technical Review Committee (TRC) at AEPC. Only TRC approved plans or FS will be eligible for Detailed Feasibility Study (DFS).

60. A Committee within AEPC should assess the reasonableness of the cost of the proposed schemes. Considering the inadequate procurement experience, a procurement consultant will be required to be engaged for initial period of the project and at intermittent basis as needed after one year to expedite procurement process and to provide expert procurement support to the project team and also capacity building of the project staff involved in procurement management. It is equally important to plan a phase-wise procurement training program and provide training to the project staff involved in procurement management.

61. **Due Diligence of 50% Consultancy Fee for DFS:** Beneficiary (Project Owner) will employ consultant (firm or group of individual experts) for the DFS including technical, financial, environmental studies and preparation of business plan. 50% of the costs to the consultants will be borne by the Beneficiary. TRC will review the DFS and decide if the plan is feasible and justified for SREP support (Subsidy). All biogas plants with more than 100 cum digester capacity will be subject to prior review by the World Bank. Once the DFS is accepted and upon verification of payment by the Project Owner of its part of 50% , AEPC will make remaining 50% payment to the DFS consultant. AEPC will also develop norms for preparing cost estimate for preparing DFS. Thus risk of over invoicing is mitigated by applying norms and technical review of the DFS by TRC under AEPC and also by the Bank in case of plants over 100 cum capacity.

62. TRC will be a four member committee headed by AEPC and Independent Technical Advisor, Independent Commercial Advisor who will be selected following the World Bank Guidelines. A Civil Society Member will also be there in the Committee as volunteer.

63. **Due Diligence of 20% of Plant Cost:** On the investment part or creation of large scale biogas plants, IDA will provide subsidy not exceeding 20% of the cost estimates or 20% of the actual costs incurred whichever is lower, after commissioning of the plant and certification by an independent verifier. Contractor will be employed by the Project Owner (Beneficiary/ Developer). Developer may use appropriate commercial practices for the procurement under Component 2.

64. In summary, following mitigation measures have been proposed to reduce the procurement risks in the project:

(i) **Selection of DFS Consultant and its Fee:** AEPC develops norms for assessment of DFS costs for different sizes of plants. TRC ensures that the cost of the DFS consultant is within the norms developed by AEPC. AEPC makes payment after the project is assessed feasible by TRC and accepted to be financed through SREP fund and verification of transfer of 50% consultancy fee to the consultant's account by the Project Owner. IDA reimburses AEPC.

(ii) **Selection of Contractor and its Cost:** DFS is reviewed by the TRC including the reasonableness of the investment cost estimates provided in the DFS. IDA will provide subsidy not exceeding 20% of the cost estimates or 20% of the actual costs incurred whichever is lower, after commissioning of the plant and certification by an independent verifier. Independent verifier will be selected by AEPC, but its consultancy fee will be directly paid by the Bank. This arrangement will mitigate the procurement risks.

E. Environment and Social (including Safeguards)

65. Management of wastes is one of the major social and environmental issues in cities and emerging towns of Nepal. The SREP project therefore is expected to create conducive market mechanism and pilot a series of sub-projects for commercial and municipal waste to energy. Though the exact activities under the proposed project will be identified and prioritized during the further stages of the sub-project design and implementation, it is expected that the activities proposed are likely to be small and will not cause any significant adverse social impact on the community from land acquisition and resettlement. The land acquisition is highly unlikely and discouraged under the SREP project. However, in order to mitigate any adverse impact, the SREP project has prepared a social management framework (SMF). The potential positive environmental impacts from Waste-to-Energy activities to be supported under the project include better reuse of waste, cleanliness and better waste management. The adverse environmental impacts envisaged includes foul odor, air pollution, risks of disease spread, contamination of water bodies, occupational and community health & safety risks in and around the facility, land pollution, and GHG emission. These impacts are likely to be localized around the sub-project (waste to energy) facility. An Environmental Management Framework (EMF) has been prepared to mitigate the adverse environmental impact and to promote positive impacts. The framework approach was adopted since sub-project locations will depend on successful applications through the portal from all over Nepal. The draft SMF and EMF were discussed with the potential developers and community in two rounds of consultations. The feedback from the consultations was incorporated during the finalization of SMF and EMF. The SMF includes Resettlement

Policy Framework (RPF), a framework for Vulnerable Community Development (VCDF), gender development (GDF) and community consultation and disclosure (CCDF). EMF has identified potential environmental impacts/ risks associated with the type of the activities envisaged under the SREP project, and has also suggested general mitigation measures. Each subproject will have to be screened for potential risks and mitigation plan including an EMP needs to be prepared for specific condition. EMF also requires environmental monitoring during implementation by AEPC ESMF Officer as well by an independent agency. The SMF and EMF also include institutional arrangement for implementation. These documents were disclosed in country on December 13, 2013 and in Bank's InfoShop on December 16, 2013. The sub project specific safeguard documents will also be disclosed in country and in Bank's InfoShop.

66. The ESF and EMF have been prepared assuming that in future private investments in biomass-based off-grid energy will also qualify for AEPC support. This is beyond the requirements of the current SREP project, which is only supporting biogas, but the learning process has been important for AEPC and for consultants who will assist investors with preparation of sub-project proposals. The wider-than-currently-required scope of the ESMF is very positive.

67. The key issues of concern in the management of social impacts, which will be relevant to the SREP project, are; (i) National program's lack of focus on vulnerable community (for example, no separate plan for indigenous and other vulnerable community and limited application of vulnerable community development plan); (ii) Nepalese law do not allow assistance to squatters and encroachers for the restoration of livelihoods and replacement cost of their impacted properties; (iii) the treatment of social issues are non-exclusive (for example, social issues are subsumed under environmental screening, assessment and documentation process; and (iv) Grievance redress mechanism is non-existent at the operational level leaving the formal legal system as the only avenue available to any aggrieved person. The SMF and EMF prepared for the SREP project encompasses procedures, practices, mitigation measures and analytical approaches applicable to the project. The SMF and EMF cover national and international legal frameworks that are applicable to the SREP project, potential adverse social and environmental impacts, potential mitigation measures, consultation requirement; compensation and assistance; and treatment of vulnerable community. The SMF is comprehensive in its scope with respect to the sub-project activities and is consistent with the principles and attributes of OP/BP 4.12 on Involuntary Resettlement and OP/BP 4.10 on Indigenous Peoples. The operational policy on involuntary resettlement (OP 4.12) has been triggered as there could be involuntary land taking. In event of involuntary land taking, relocation of PAPs, or loss of livelihood, appropriate safeguard documents will be prepared in line with agreed SMF. The operational policy on indigenous community (OP4.10) has also been triggered as there could be presence of indigenous community in the sub-project area. In case indigenous community is identified during the screening process, social assessment will be carried out and VCDP will be prepared. In the same manner, EMF meets the national environmental requirements as well as World Banks polices. AEPC has already hired an ESMF officer who will be responsible for carrying out screening for the first group of investments considered "ready for financing" to ensure that they meet ESMF criteria.

Annex 1: Results Framework and Monitoring

Nepal: SREP-Supported Extended Biogas Project

Project Development Objectives
PDO Statement: The project development objective is to promote large off-grid biogas energy generation in Nepal.

Indicator Name	Core	Unit of Measure	Base-line	Cumulative Target Values**					Freq.	Data Source/ Method.	Resp. for Data Collection
				Y1	*Y2*	*Y3*	*Y4*	*Y5*			
PDO INDICATORS											
Off-grid Biogas generated for thermal application from large scale projects (>12 m3)	☐	M3	0	500 m3	1000 m3	10,000 m3	30,000 m3	53,000 m3	Annual	Data from the meter facilities	AEPC
Off-grid biogas-based electricity generated[10]				1 GWh	5 GWh	10 GWh	20 GWh	30 GWh	Annual	Data from the meter facilities	
-											
Project Beneficiaries - (% women)			To be conf.								AEPC

[10] A reference conversion rate of 1.4kWh per m3 of biogas is used here.

Indicator Name	Core	Unit of Measure	Base-line	Cumulative Target Values**					Freq.	Data Source/ Method.	Resp. for Data Collection
				Y1	*Y2*	*Y3*	*Y4*	*Y5*			
NTERMEDIATE RESULTS INDICATORS											
Intermediate Result (Component A):											
IR One: No. of large biogas proposals submitted for investment evaluation (prospects)	☐	#	3	40	100	200	300	400	Annual	Project data/	AEPC
IR Two: No. of companies trained to evaluate and appraise large biogas sub-projects	☐	#	0	2	4	5	6	8	Annual	Project data/	AEPC
Number of Off-grid generation plants created & operational by the project - Commercial - Municipalities			0 0							Project data/	
Intermediate Results (Component B):											
IR Three:	☐										

Annex 2: Detailed SREP Project Description

Nepal: SREP-Supported Extended Biogas Project

1. Biogas is generated from recycling widely available organic waste matter (manure, kitchen scraps, sewage sludge, poultry litter, food waste, etc.), and is an under-utilized renewable energy source, like solar and wind energy. Biogas can be recovered using relatively simple technology, from locally and regionally available raw materials, with a rich organic fertilizer (slurry) as the by-product. The importance of biogas as a source of clean energy cannot be over-emphasized. The World Biogas Association emphasizes the great global potential for biogas, pointing to estimates that biogas could consist of around 6 percent of the global primary energy supply, or one-third of the current use of fossil gas[11]. Biogas recovery takes place through anaerobic digestion of an organic feedstock mixed with water, in a sealed container where the organic waste matter is decomposed to a series of gases through bacterial action over a given "retention time" depending on the feedstock; the higher the methane (CH4) content, the richer and more combustible the resultant gas. Sometimes moisture and other gaseous by-products generated with the methane must first be removed to avoid corrosion of metal in gas pipes or electricity generators; this process is known as "enriching" the gas, and there are simple techniques in use in neighboring countries, which have not yet been introduced in Nepal. The biogas can be used directly for heating purposes, or can be sent to an electricity generator/gas engine for production of electricity.

2. AEPC is currently engaged in the promotion of single tank fixed dome technology primarily for energy recovery (biogas generation) from animal manure (dung). However, most of the organic wastes generated in the Industrial Sectors (such as poultry, slaughterhouse, distillery, sugar industry, vegetable & fruits/ food processing wastes) as well as the organic portion of urban wastes in the country are currently disposed of untreated into land and water bodies, resulting in air and water pollution as well as emission of greenhouse gases like methane and carbon dioxide into the atmosphere.

3. This problem could be significantly mitigated through adoption of eco-friendly waste-to-energy technologies for treatment and processing of wastes before their disposal. Anaerobic digestion or bio-methanation technology is environmentally one of the most benign technologies as it leads to generation of energy from wastes, besides rendering wastes suitable for application as a rich source of organic manure. This not only reduces the quantity of wastes, but also improves their quality to meet the required pollution control standards.

4. However, there is so far no successful experience in Nepal with (i) larger-sized biogas digesters and "enrichment" of the gas through simple techniques that are widely available in the region (i.e. cleaning of the gas produced, to increase the methane content), and also no experience of (ii) successful electricity generation from biogas production.

[11] Worldwide, biogas is being used for thermal industrial processes, district heating, electricity generation, and is also being upgraded to fuel quality compressed and liquefied natural gases (about 12,000 vehicles were running on biogas throughout Europe in 2007). Germany and Denmark are leading producers of electricity generated from biogas and injected into the grid, whereas in Sweden entire public transportation fleets are run on enriched, compressed biogas from organic waste.

The National Rural and Renewable Energy Program (NRREP)

5. AEPC's new flagship program document of July 2012 for the five-year NRREP[12] channels support from bilateral financing partners to a range of renewable energy technologies, including biogas. In particular, the biogas component of NRREP seeks to update the country's biogas program and expand its size, product and customer range. NRREP recognizes the importance of introducing and capturing the energy benefits of medium and large biogas plants, (defined as twelve cubic meters and above), as the country struggles with widespread energy shortages. Large biogas plants and associated mature technological upgrades in rates of recovery, enrichment to improve methane content, efficient storage of biogas, and even electricity generation from biogas (where relevant), are all common in Nepal's neighboring countries, but have not yet been introduced to Nepal. This "modernization of the sector" is therefore the biogas expansion agenda of AEPC in the coming five years.

6. At present, NRREP has a mainly technical and engineering focus for the large biogas component. The commercial and sustainability aspects have not yet been spelled out. The NRREP biogas program was also designed to be delivered through a top-down approach that may result in a lower number of plants ultimately being built due to capacity constraints. The SREP project preparation process has substantially strengthened the NRREP biogas program design.

7. The Scaling-up Renewable Energy Program (SREP), which comes under NRREP, is an initiative of the Climate Investment Funds. Nepal has been approved as an eligible SREP-pilot country for receiving up to US$40m in total funds from SREP (that will be channeled through International Finance Corporation (IFC), Asian Development Bank (ADB) and World Bank) to implement a well-conceived and structured program to scale up Renewable Energy (RE) in the country, in small hydro, mini and micro-hydro, solar and commercial biogas technologies.

8. The World Bank-administered US$7.9m tranche of SREP (out of the total US$40m) will deliver support for the establishment of local Nepali enterprises engaging in commercial biogas technologies, under the Extended Biogas Project. The proposed SREP Extended Biogas Project is aligned with the specific NRREP component called "Business Development for Renewable Energy and Productive Energy Use" (p. iv and p.13 of Program Document). The scope of the proposed SREP Extended Biogas Project matches exactly with the sub-objective of NRREP which is "(i) capacities of existing Micro-Small and Medium Enterprises (MSMEs) are enhanced, and (ii) new and innovative MSMEs are created and operationalized; and (iii) appropriate business development services are available to MSMEs in renewable energy catchment areas."

9. **How is the existing "capital cost-sharing" (subsidy) policy applied, and how would SREP fit with NRREP?** The Government of Nepal has published a large Biogas subsidy policy contained within its "Subsidy Policy for Renewable Energy 2069 BS" document; this policy will

[12] NRREP is a five year program for promotion of renewable energy technologies through AEPC, supported by bilateral grants from Denmark, Netherlands, Norway, Germany, United Kingdom and the UNDP, for a total program size of US$170.1m

apply to SREP-supported sub-projects as well as to NRREP supported sub-projects. Four categories of sub-projects are mentioned, with different levels of (increasing) subsidy: commercial biogas plants; institutional plants for public institutions; community biogas plants with capacity more than 12 cubic meters; and municipal scale waste to energy systems. SREP will only support sub-projects from two categories: commercial and municipal biogas plants. AEPC's subsidy amount is provided based on sub-project size, for thermal application (per m3) and, if applicable, also for electricity generation (per kW). The SREP subsidy is based on leveraging additional financing, on a 1:4 ratio, and will therefore never exceed 20% of total capital cost.

10. AEPC will pre-finance its cost-sharing contribution for "approved plants" (sub-projects) by providing the eligible amount of funding support in two installments, as per its currently published Renewable Energy Subsidy Delivery Mechanism. In order to align incentives, manage risks (of poor design or inferior workmanship during construction) and thereby conserve SREP resources to be used only for functioning plants, the SREP cost-sharing grant will be disbursed ex-post, after commissioning, subject to the actual subsidy paid. Upon certification by an Independent Verification Specialist that approved plants are operational and producing energy (thermal/electrical or both) as intended, AEPC will be able to submit a withdrawal application to IDA for reimbursement of a portion of the cost-sharing subsidy that it had previously paid out during construction. AEPC has indicated that this withdrawal application will be set at 20% of the total plant cost in order to maintain the required SREP leverage ratio. However, if actual expenses incurred are lower than 20% of the total plant cost, then the actual expenses will be reimbursed, (i.e. the lesser of 20% of project cost, or actual expenses, will be taken as the SREP contribution). Hence there is no one-to-one alignment between the manner in which AEPC delivers its subsidy, and the basis upon which it claims reimbursement from SREP/IDA. The Disbursement Mechanism is such that a total sub-project cost will be approved when the sub-project is still on the drawing board (excluding land and preparatory civil works, but including plant, machinery and associated civil works for installation and construction). A figure amounting to 20% of this total cost will be determined. When AEPC has disbursed support according to its published subsidy policy, and the plant has been built and verified to be operating, AEPC will present a withdrawal application to the World Bank stating the amount of subsidy it has already provided. The World Bank will compare the actual subsidy paid to the previously approved 20% of total project cost. If AEPC has paid more, the reimbursement will be limited to the 20% figure. If AEPC has paid less, it will be reimbursed for actual payments made.

11. **How does SREP enhance NRREP?** SREP provides support to a number of aspects of the biogas program that will make it more sustainable than the purely technical and "construction focused" approach of NRREP would allow. To start with, SREP requires evidence about availability of waste in all seasons etc. to ensure that the sizing of the plant is done properly. The investment cost of the plant and any associated debt service is weighed against the benefits from cash flow savings on traditional energy sources used today, and an estimated payback period for the capital outlay is calculated. SREP also provides an opportunity for sub-project developers or sub-project owners to apply transparently for support through a website, by submitting key information about their proposed business plan, which also brings into focus the viability and techno-economic aspects. In view of the limited capacity and knowledge about large biogas

plants and their performance in Nepal, SREP offers cost-sharing support for detailed technical financial and commercial evaluation of every proposed sub-project, in case the developer wishes to take advantage of this cost-sharing TA. All of this upfront justification, planning and required compliance with the Environmental and Social Management Framework (ESMF), serves to increase the sustainability of SREP supported sub-projects. Furthermore, once these practices become mainstreamed in AEPC, these are likely to improve the quality of NRREP supported sub-projects as well. SREP is also providing sensitization, training and capacity building to a wide range of stakeholders in the market, from biogas extension agents to commercial bankers, to business plan writers and to policy makers. SREP support is available at the right time, when the large biogas sector does not yet exist but is about to be launched, and therefore the good practices from SREP will ensure that the sector starts off with a professional and capable approach.

12. SREP support will reimburse subsidies paid out by AEPC according to published GoN policy, but reimbursements will only be paid on plants that are independently verified to be operational after commissioning. Furthermore, SREP support will be limited to 20% of sub-project cost, and therefore may not fully cover the subsidy paid out by AEPC which is in some cases higher than 20%. This is important to maintain the targeted leverage ratio of 1:4, as an important objective of SREP is to crowd in other sources of investment.

13. **Why is a Subsidy from GoN needed for large biogas plants that are commercially viable?** Many socially valuable investments will not end up being made if the enterprise has to consider the full capital cost against the limited cash flow savings accruing directly to the business. It is not possible in each case to quantify the externalities and inflate the benefits accordingly, and to factor those in to the investment decision made by the business. So if the numerator (benefits) is lowered because the business cannot capture all of them, but then the denominator (costs) is also proportionally lowered, then optimal rates of investment are more likely to take place. In order to lower costs in the benefit/cost ratio, the usual approach is to offer a "capital cost buy-down" to the business, i.e. in effect implying that the government is willing to cost-share the upfront investment to an extent which represents the benefits to society, and thereby leaving the private entity with a lower financial outlay that will expedite the payback period for the capital invested directly by the business. This approach can be defended on economic grounds and is also likely to lead to the desirable outcome of resulting in more plants being built, (but where, in all cases, the owners are also mindful of their energy savings and cash flow impacts). Additionally, it may be noted that there is no track record or experience in Nepal at present with large biogas plants—neither for the adapted larger version of the household biogas plants nor for imported technology. The first 400 biogas plants that are targeted for support under the SREP program are therefore pioneering investments and hence the capital cost buy-down provided by AEPC and proposed for reimbursement by SREP (in the case of operational plants only), is a risk mitigation mechanism as well.

14. Since AEPC is contributing only a part of the upfront capital cost buy-down, and the rest will be partly financed by owners' equity and debt, the sub-project proponent has a strong incentive to ensure that the investment will offer positive financial returns. SREP will be supporting early adopters, who are by definition risk takers. A major incremental benefit of the World Bank's SREP-supported large biogas digester policy dialogue with AEPC has been to

expand the scope of the policy to include imported, mature biogas technologies as well, for entities who want it. Prior to SREP, the AEPC cost-sharing policy was applicable only for the standard design that AEPC has developed for large biogas digesters, and all adopters would have been confined to a single standard product even though there have been technological improvements and innovations in this sector worldwide. While the majority of large digesters under the program may still end up using the standard AEPC design, it is nevertheless a breakthrough that at least those few establishments who wish to use other technologies, will also be eligible for support. In addition, the possibility of choosing imported technologies under the program will introduce some performance pressure and provide benchmarks relative to the adapted AEPC design.

Annex 3: Implementation Arrangements

Nepal: SREP-Supported Extended Biogas Project

Project Institutional and Implementation Arrangements (please also refer to AEPC's flowchart on page 15)

1. AEPC will implement the project and will adhere to conditions in Schedule 2 of the Grant Agreement to be discussed at Negotiations. AEPC is also implementing the NRREP-funded large biogas program which will operate on a different modality. Both projects will be governed by the same published GoN Biogas Subsidy Policy which is in the public domain but has not yet been implemented.

2. AEPC has prepared a Project Operational Manual (POM) which is available in IDA's Project Files. The POM describes in detail the process for (i) intake; (ii) screening; (iii) selection; (iv) notification of applicants; (v) disbursement and (vi) M&E.

Project administration mechanisms

3. AEPC Biogas unit will authorize a Financial Management officer to operate the Designated Account (DA), and a Procurement Officer to prepare and update a procurement plan. AEPC Biogas staff will be responsible for maintaining the website and convening meetings of the Technical Advisory Committee every month to review the detailed sub-project reports of incoming proposals, or alternatively, to review requests for cost-sharing to undertake detailed technical studies. The Letter of Commitment issued by AEPC will be formulated in standard language, with blanks to be filled in on a case by case basis depending on successfully reviewed and vetted technical studies and business plans. AEPC will not procure any hardware under this project, only TA services. The successful applicants who reach financial closure and are able to "cash in" their Letter of Commitment, will need to self-report the volumes of biogas produced, or electricity generated, as well as the amounts of investment mobilized with the Letter of Commitment. These figures will be maintained by AEPC and provided to the Bank team during implementation support missions, and they will be randomly checked.

Procurement

4. The World Bank team carried out procurement capacity assessment of AEPC in October 2013. The AEPC will be the implementing agency for this project. The biogas sub component (BSC) headed by Assistant Director/ AEPC will be responsible to manage the day to day job of the project, with a procurement unit (PU). The BSC will have a staff member who is trained in World Bank procurement procedures and he/she will be responsible to initiate all procurement activities required for the project with support from the PU. One staff designated as the procurement specialist in the procurement unit, has some knowhow on procurement of office consumables, however doesn't have hands on procurement experience. A separate checklist of procurement process is suggested to be prepared for smooth implementation of the procurement activities.

5. A Committee within AEPC should assess the reasonableness of the cost of the proposed schemes. Considering the inadequate procurement experience, a procurement consultant will be required to be engaged for initial period of the project and at intermittent basis as needed after one year to expedite procurement process and to provide expert procurement support to the project team and also capacity building of the project staff involved in procurement management. It is equally important to plan a phase-wise procurement training program and provide training to the project staff involved in procurement management.

6. "Guidelines: procurement of goods, works and non-consulting services under IBRD loans and IDA credits and grants by World Bank borrowers" published by the World Bank in January 2011 ("procurement guidelines"), in the case of goods, works and non-consulting services; and "Guidelines: Selection And Employment Of Consultants Under IBRD Loans And IDA Credits And Grants By World Bank Borrowers" published by the World Bank in January 2011 ("Consultant Guidelines") in the case of Consultants' Services, and the provisions stipulated in the legal agreement. For each contract to be financed under the credit/grant, procurement methods or consultant selection methods, the estimated costs, prior review requirements, and time frame will be agreed between the Borrower and the Bank in the Procurement Plan which needs to be prepared by the Borrower and reviewed by the Bank prior to the approval of the project. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

Environmental and Social (including safeguards)

7. An Environmental and Social Management Framework (ESMF) has been prepared and submitted to the Bank for review and clearance prior to in-country disclosure. Since the exact activities under the proposed project will be identified and prioritized during further stages of project design and implementation, it is expected that the activities proposed under this project likely be small and cause minimal negative social impacts. Land acquisition and resettlement are unlikely and discouraged under the project. Thus the adverse social impacts of the proposed project are likely to be minimal due to absence of land acquisition and significant loss of income sources.

8. However, as precautionary measure some frameworks have been prepared and will be operational through a Social Action Plan (SAP) in absence of land acquisition and large scale loss of income sources as a result of this project.

9. Thus, Resettlement Policy Framework (RPF), Framework for Gender Development, Framework for Vulnerable Community Development; Community Consultation and Disclosure Framework; Institutional Arrangement Framework have been prepared.

10. These frameworks will provide guidelines to avoid or reduce adverse impacts and enhance positive impacts to the wider project beneficiaries. Due to nature of activities and the approach taken, as well as the exact sites of intervention are not known, the implementing agencies will use the screening procedures outlined in this report to identify, assess, evaluate, mitigate and monitor social impacts of each activity/sub-project. Stakeholder consultations and social screening during the feasibility stage of each activity will identify and categorize the level

of impacts and will guide the modalities to be followed avoiding or minimizing the impacts due to SREP project implementation.

11. The RPF guides the compensation for lost assets, livelihoods, community property, and resettlement and rehabilitation of sub-project affected people in accordance with the GoN's Land Acquisition Act, 2034 (1977) and other relevant acts and World Bank's Operational Policy 4.12 on Involuntary Resettlement and Indigenous People (OP 4.10).

12. The VCDP provides guidance to the implementing agencies to ensure that sub-project benefits are accessible to the vulnerable community living in the sub-project area and to avoid any kind of adverse impact on the vulnerable community to the extent possible and if unavoidable it provide guidelines to ensure that adverse impacts are minimized and mitigated.

13. The gender development framework outlines the specific issues linking with corresponding strategies and activities which will be given due consideration in the sub-project. This will ensure women's participation in the project cycle in order to benefit from sub-project activities.

14. The consultation and disclosure framework is the cornerstone in planning, preparing and implementing the WTEP. For example, to assess the potential impact of the WTEP, such as on the vulnerable communities, *free, prior and informed consultation* with key stakeholders, in particular vulnerable people and their organizations at different levels will help ensure culturally appropriate and collective decisions. Further, public consultations and information dissemination, which ensures public understanding of the sub-project's impacts and allows the vulnerable population—including scavengers, to express their voices, are also important parts of this framework.

15. The institutional framework outlines the institutional structure to implement the WTEP in general and implementation modalities of SMF in particular. The Biogas Sub Component (BSC) of AEPC will be responsible for the overall coordination, planning and implementation of social and community development activities as well as activities proposed under SAP, VCDP and GAP.

16. The participation of stakeholders in project planning and implementation is essential and therefore stakeholders were consulted during the site visit. The consultations were carried out to develop community /stakeholder's ownership and support for the project, and integrate and address their concerns through suitable measures in the project design. Issues raised by the community and potential developers include

- Ratio of the subsidy should be increased to make the project social and environmental friendly
- There is no proper definition of forest wastes as everything in a forest can be used in one way or the other. Therefore, operational definition of the "forest waste" should clearly be defined.
- There is a high chance of overused of the resources/forest waste absent of strong monitoring mechanism in place. Therefore constant monitoring system should be place so as to supervise the proper usage of forest products.

- Ambiguity in regulatory provisions and sate policies to use forest waste for commercial/private production
- Inventory should be done to find out annual allowable amount of forest waste and it should be mentioned in the OP of CFUG
- The perspective developers should guarantee to provide employment opportunity for local people particularly those people who are dependent on forest resources for their major portion of livelihood earning
- Women, Adhibasi/janjati people, Dalits and other disadvantaged groups should be actively involved in the project as well as in the benefit sharing. Their ideas should be considered. Mostly the Adhibasi/janjati people have a good knowledge about the flora and fauna of that area. So their ideas and involvement should be highly encouraged.

17. The SMF has clear mechanism for continued consultation during the project implementation stage.

18. The social accountability mechanisms will be established for all sub-projects. The key approaches that would be adopted for ensuring social accountability would be any or a combination of participatory processes guiding social audit, citizen score card and report card to acquire feedback on performance of the sub projects and record citizens' recommendations for improvement. The social accountability mandate will be further strengthened through a strong grievance redress mechanism.

19. A Grievance Redress Cell (GRC) will be set up at the AEPC level. The head of the cell will be the ED of AEPC. The other members include representative from biogas producers association, social development specialist and representative of national level NGOs working in the field of waste management. The social development specialist will act as member secretary of the cell. A grievance record file will be maintained in the GR Cell where all written and oral grievances will be filed and recorded. The GRC will have its own bye-laws. The functions of the GRC will include: (i) to redress grievances of project affected persons (PAPs) in all respects; (ii) rehabilitation and resettlement assistance and related activities; (iii) GRC will only deal/hear the issues related to R&R and individual grievances; (iv) GRC will give its decision/verdict within 15 days after hearing the aggrieved PAPs; (v) final verdict of the GRC will be given by the Chairman/Head of GRC in consultation with other members of the GRC and will be binding to all other members.

20. The following Checklist has been prepared for ESMF Screening of technically and commercially successful sub-projects that are seeking SREP funding

ENVIRONMENTAL RISKS AND CONCERNS

1.1 RISKS TO THE PHYSICAL ENVIRONMENT

- Contamination of surface water body and ground water
    - Observation of the water bodies/wetlands nearby that can be affected by sub-project components or activities.
    - Disposal of slurry into the water body.
    - Seeping of leachate from the digester or other components

- Gaseous release or air contamination
    - Release of methane from the digester, storage, slurry or incomplete digested slurry, release of excess produced methane
    - Exhaust from the transport as well as dust originating from the roads use for hauling (specially for large scale sub-projects)
- Noise from transportation
- Soil contamination
    - Disposal of slurry etc. into the soil
- Slope instability and erosion
    - Slope and terrain condition of the sub-project components sites
    - Construction of components
    - Removal of vegetation, exposure of soil (soil type), and disruption of local drainage

1.2 RISKS TO THE BIOLOGICAL ENVIRONMENT

- Loss of vegetation and diversity (from collection and management of forest – tendency of maintaining preferred species with higher commercial value from the sub-project will motivate removal of other local species reducing diversity)
- Disturbance to animals
    - Wildlife in and around sub- project area (population, diversity, protection status)
- Loss of habitat
    - Project location in and/or in vicinity of the critical habitats that can be affected such as protected area, habitat of endangered species, important corridors
    - Disturbance of habitat (space, food, breeding ground) from collection of resources (e.g. forest products), disposal waste, noise, etc.

1.3 RISKS TO THE SOCIAL ENVIRONMENT

- Disruption to the existing water use
    - Source of water for the settlement in the project affected area
    - Possibility of contamination due to project component or activities.
    - Demography, economic, cultural and ethnic composition of the water users
    - Effect on vulnerable groups and women

- Foul odor and sanitation condition
    - Location of settlement/houses close to project components
    - possibility of dispersion of foul order from the digester, storage, transportation and other components
    - Possibility of health hazard from the project to the surrounding settlements e.g. mosquito
    - Demography, economic, cultural and ethnic composition
    - Effect on vulnerable groups and women

- Effect of divergence of the resources to the project that the communities were dependent on, e.g. (a) forest products such as litter and fire wood (b) cow dung for cooking, (c) manure, (d) livelihood they are managing to secure through labor for existing management etc.
    - Demography, economic, cultural and ethnic composition of the affected HHs.
    - Effect on the vulnerable group and women

1.4 EXISTING INSTITUTIONAL SETUP TO ADDRESS ENVIRONMENTAL CONCERNS

- Institutions
- Position in the organizational setup
- Human resources (#, qualifications, skills)
- Skill and instruments available
- Experience
- Budgetary allocation
- Necessity of capacity building

Monitoring & Evaluation

21. AEPC will provide annual compilation of all sub-project requests received, and will categorize the number of Integrity Due Diligence checks performed, the number of pre-feasibility studies, the number of detailed technical reviews undertaken (of which the number that sought cost-sharing and the number that did not); the number of commercial reviews and the number of business plans reviewed. AEPC will also keep track of the number of Letters of Commitment issued, as well as the number of sub-projects reaching financial closure (classified by category: commercial, municipal). AEPC will also report on the number of sub-projects that reach the stage of construction, and commissioning, and once commissioned, AEPC will once a year track the volume of energy produced or alternatively will track the amount of electricity generated (to be self-reported by the sub-project sponsor, and randomly inspected by AEPC). Finally, for each sub-project supported by SREP which reaches financial closure and cashes in the Letter of Commitment, AEPC will carefully document the amount of co-financing investment mobilized by the catalytic SREP grant.

Role of Partners (if applicable) NOT APPLICABLE

Annex 4: Financial Management

Nepal: SREP-Supported Extended Biogas Project

Implementing Entity

1. The Alternative Energy Promotion Center (AEPC) has been implementing the World Bank financed projects and hence has gained experience managing the Bank financed projects. The financial management performance of AEPC has been moderately satisfactory. Some internal control deficiencies identified in the supervision missions have been advised for rectification by AEPC. Considering the overall financial management capacity and performance of AEPC, the Financial Management (FM) risk is "Substantial" as was rated previously. The basis of risk rating along with identified risk mitigation measures are outlined below in "Financial Management Risk Rating Summary".

Funds Flow/ Disbursement

2. It has been proposed that funds are to be disbursed through a Central Renewable Energy Fund (CREF) which is to be created with contributions from the Government and the development partners. The fund is intended to be a sustainable and revolving fund for supporting renewable energy initiatives. As per the Cabinet approved CREF document, the development partners are required to advance seed capital to the central fund. However as per the Bank's financing policy, it can only fund eligible expenditures after they are incurred, and can be demonstrated to have complied with agreed criteria. Therefore the Bank cannot be a direct partner to the fund as envisaged in the official CREF document. The Bank has indicated that Government can use its NRREP funds for the expenditures to be incurred, and be reimbursed from the Designated Account (DA) for eligible expenditures only after the expenditures are actually incurred. The same financing mechanism that has been followed for other Bank funded projects implemented by AEPC will be adopted, which includes Direct Payment, Advance and Reimbursement. Disbursements from the Bank will be based on Statement of Expenditures. The eligible expenditures of Component 2 and training of Component 1 shall be pre-financed from NRREP funds. The expenditures of Component 2 will be reimbursed directly. Other reimbursable expenses can be reimbursed from DA established at the Nepal Rastra Bank, in which the Bank's contributions to SREP will be advanced. If required for Component 1 expenditure other than training, the payment of significant amounts can be requested to the Bank for direct payment to the payees. Disbursements will be made for: a) Consulting services, b) Training, workshops and non-consulting services c) Investment Financing.

Staffing

3. There is one Account Officer supported by an assistant. Account Officer is a graduate in commerce. In addition, a full-time financial management consultant is currently handling the financial reporting and accounting requirements of the World Bank funded projects. For effective financial management, similar consultancy service shall be required for SREP.

4. Financial Procedure Regulation has specified the duties and responsibilities of the Office In-charge, Account Chief and Storekeeper.

Accounting Policies and Procedures

5. The AEPC has been following the government accounting system. The AEPC has been maintaining books of accounts as per requirement of the GoN. There is necessary internal control mechanism as per the requirement of Nepal Government. Nepal Government has specified chart of accounts for recording expenditures and also specified maintenance of program ledger for accounting expenditure based on activities. Advance subsidiary ledger is reconciled with advance as per Cash and Bank Book. Cash and Bank Book is cross tallied. The supporting documents are retained for the specific period as per Government policy. Monthly Expenditure Statement, Trimester financial statement, Advance Statement, Monthly Bank Reconciliation Statement, Annual financial statement, Outstanding payment details and progress report are submitted to District Treasury Controller Office (DTCO) and Financial Comptroller General Office (FCGO).

6. As the decade old Financial Management Manual does not meet the current Bank specific requirements, the Bank has been requesting AEPC to update the manual. As Project Operations Manual will be required for the project, the revised Financial Management Manual should be a part of the same.

7. Regarding the Bank financed Power Development Project (PDP), the Bank had requested AEPC to submit detailed project-wise SOE records which has been pending for more than a year. AEPC is required to submit the required details as soon as possible.

Segregation of Duties

8. The separate persons are involved in functional responsibilities of (a) authorization to execute a transaction; (b) recording of the transaction; and (c) custody of assets involved in the transaction. The bank reconciliations are prepared by the staff responsible to maintain account. Storekeeper orders, receives and records the goods purchased whereas payment is authorized by the Office In-Charge.

Budgeting

9. The budget passed by the Parliament (issued through Ordinance in the absence of Parliament) is authorized to the Secretary of the Ministry of Energy (MoE). The Secretary of MoE issues authorization letter to the DTCO and AEPC. Budgets are prepared for all significant activities in detail with justification and to provide a meaningful tool for monitoring subsequent performance. DTCO makes the payment of expenditures on request of the AEPC within the budgeted amounts based on budget authorization letter issued by the Secretary. Actual expenditures are compared to the budget and reported accordingly. Approvals for variations from the budget are required in advance as per Financial Procedure Act and Financial Procedure Regulation. The Planning Section and Financial Administration Section of the AEPC are responsible for preparation and approval of budgets. There are procedures in place to plan

project activities, collect information from the units in charge of the different components, and prepare the budgets. As the project has been planned to commence in May 2014 (current FY) with retroactive financing, AEPC needs to obtain approval of the program from National Planning Commission and of the budget from Ministry of Finance before the effective date including before the retroactive financing date for retroactive financing.

Payments

10. There is a system of issuance of purchase order and making payment after the verification of purchase order and goods receipt note by the Accountant after verifying the calculations. Invoices are stamped with PAID and the vouchers are dated, reviewed, coded with account code and approved. Accounts Unit prepares the payroll and it is approved by the Office In-Charge. Of the samples reviewed in the last supervision mission of PDP, the review team found that the dates of quotations for some of the purchases were earlier to the purchase request. It was found in one sample that the dates of all three quotations were tampered to align with the purchase request. It was also found that necessary details in the purchase request such as vendor name, PO no. etc. were not filled and POs were not linked to Goods Receipt Notes. The team advised the project to fill in all necessary details and systematically follow the procedures of all required documents which are important for effective internal control.

Policies and Procedures

11. Budget release, other income and expenses are accounted on cash basis as per Nepal Government accounting system. There is Financial Procedure Act and Regulation to guide activities and ensure staff accountability. The Ministry of Finance in recommendation of FCGO with consent of the OAG can alter accounting format and principles. The Financial Procedure Regulation is revised by the Council of Ministers. There is no system to check conflict of interest and related party transaction.

Cash and Bank

12. The bank account has been opened in Nepal Bank by the DTCO for payment of expenditures incurred for Nepal Government budget. A designated bank account will be opened in Nepal Rastra Bank for receiving advance from the World Bank required for the project. The government bank account is being operated by DTCO with joint signatures of the Account Officer and District Treasury Controller of the DTCO. The designated account opened for Power Development Project is being operated by joint signatures of the Account Officer and Executive Director of the AEPC. The DA for SREP could also be operated following the same modality. The AEPC is required to maintain an adequate, up-to-date cash book, recording receipts and payment as per government accounting system. The designated bank account is being reconciled on a monthly basis as per existing practice. The unusual items on the bank reconciliation are being reviewed and approved by a designated official.

Safeguard over Assets

13. Expendable and non-expendable registers are maintained and physical verification of non-expendable items is required to be conducted once in a year. The stock books were found yet to be updated in the last supervision mission of PDP. There is provision for conducting physical verification once in a year. The physical verification is normally being conducted. Fixed assets except vehicles are not insured.

Internal Audit

14. There is Internal Audit Unit in the DTCO to conduct internal audit of the government offices of the concerned district offices. This unit conducts internal audit and submits internal audit report to the DTCO and the Executive Director of the AEPC. Accounts officer having graduate academic qualification in commerce and experience with support from assistant accountants are deputed to conduct internal audit. The Executive Director takes actions on the internal audit findings as per Financial Procedure Regulation.

External Audit

15. Audit of the AEPC is conducted by the Office of the Auditor General (OAG) as per INTOSAI auditing standards. Audit is conducted usually after six months from the end of the fiscal year by the OAG. Audit report of FY 2011/12 was issued within nine months by the OAG. Even in prior years, the audit reports were usually being received within the grace period of four months. There is no major accountability issue and internal control weaknesses issue in the audit report. The project has to submit project account with the audit report issued by the OAG in additional to the government external audit. Accordingly, OAG will conduct audit of SREP and submit audit report as per requirement of the World Bank. The OAG conducts audit as per scope of the audit prescribed in the Interim Constitution and the Audit Act.

Reporting and Monitoring

16. The financial statements of the AEPC is prepared and submitted as per Nepal Government accounting system. The financial statements of the AEPC are prepared on monthly, trimester and yearly basis. The reporting system needs to be adapted to report on the project components as per terms of the Agreement to be entered between the Government and the World Bank. There is requirement in the Government system to link the financial information with the project's physical progress. Trimester physical progress reports are prepared. The Financial Procedure Regulation has specified the financial reporting system and also the responsibilities of the concerned staff. The financial management reports are used by management for monitoring expenses. The financial reports compare actual expenditures with budgeted and programmed allocations. The account is computerized. The financial reports are prepared by the computerized system. The submissions of the trimester financial reports were delayed at times with some inaccuracies. Lack of monitoring was seen in PDP in which disbursements made to the district offices were not verified for actual expenditures made to the beneficiaries from the respective district offices and AEPC. This indicates the need for emphasis on monitoring of the usage of funds.

Information Systems

17. The financial management system is computerized. The AEPC is using two accounting software; one for government accounting and other for reporting to the World Bank which are not integrated. The existing computerized system can produce the necessary financial reports as per needs of the Government and the World Bank. The AEPC has one full time financial management consultant for helping to maintain records and prepare financial reports. The staff is adequately trained to operate the system but not trained to maintain the system. The supporting documents and backup of the computer data are retained as per as per Financial Procedure Act and Regulation and maintained to safeguard the confidentiality, integrity, and availability of the data.

Use of Statement of Expenditures (SOEs)

18. SOEs will be used for expenditures other than for the ones qualifying for prior review procurement threshold.

19. During the supervision, the mission will closely review SOE claims to ensure that funds are utilized for the intended purposes. Any ineligible expenditure identified during such reviews will need to be refunded to IDA.

Financial Management Risk Rating Summary

	Risk Assessment				***Previous Risk Assessment***	***Risk Mitigating Measures***	***Residual Risk***
	H	***S***	***M***	***L***			
INHERENT RISKS							
Country level	**X**						H
- Quality of PFM institutions (see PEFA-PMF,CFAA, CPAR, CPIA and other diagnostics), standard of financial accounting, reporting and auditing, quality of FM profession.						Implementation of CFAA, CPAR action plan; PFM sector work and implementation of actions; country dialogue	
Entity level			**X**				M
Independence of entity's management, appropriateness of the organizational structure, impact of civil service rules							
Project level							
AEPC has prior experience of the			**X**				M

	Risk Assessment				*Previous Risk Assessment*	*Risk Mitigating Measures*	*Residual Risk*
	H	***S***	***M***	***L***			
Bank funded projects; fund flow only from the central office/CREF unlike with other Bank funded projects having fund flow from the district offices makes the project relatively less complex and provides more assurance on use of the funds for intended purpose							
OVERALL INHERENT RISK		**X**					S
1. CONTROL RISKS							
Budget The budget approval for FY 2013/14 will be required as the project is targeted to start in May 2013		X			S	Obtain approval of the program and budget from NPC/MOF including for retroactive financing	M
Accounting The decade old Financial Management Manual not updated to align with the current Bank specific requirements		X			S	Revision of the Financial Management Manual (as part of the Project Operations Manual) to meet the current Bank specific requirements One financial management consultant as being currently	M

	Risk Assessment				Previous Risk Assessment	Risk Mitigating Measures	Residual Risk
	H	S	M	L			
						dedicated in the on-going Bank funded project will also be required for SREP	
Internal Controls Although district offices are not involved in SREP, lack of monitoring/verification of the usage of funds disbursed from the district offices in Power Development Project indicates the need for emphasis on monitoring of the usage of funds		X			S	Set up mechanism for regular monitoring of usage of funds	M
Funds flow Fund flow only from the central office/CREF unlike with other Bank funded projects having fund flow from the district offices makes the mechanism relatively less complex			X		S		M
Financial Reporting The decade old Financial Management Manual not updated to align with the current Bank specific requirements The required trimester financial reports are delayed at times with some inaccuracies		X			S	Revision of the Financial Management Manual (as part of the Project Operations Manual) to meet the current Bank specific requirements One financial management consultant as being currently dedicated in the on-going Bank funded project will also be required for SREP	M
Auditing Possible delay in audit as experienced in the past		X			S	Coordinate with the Office of the Auditor General for timely audit	M
OVERALL CONTROL RISK		**X**					**M**
RESIDUAL RISK RATING							**M**

H – High S – Substantial M – Modest L – Low

Agreed Actions to strengthen the Financial Management capacity

No.	Actions	Due Date
1	Revise the Financial Management Manual to meet the current Bank specific requirements	September 30, 2014
2	Recruit one financial management consultant for SREP as being currently dedicated for the on-going Bank funded projects	Within two months of signing of the Grant Agreement
3	Set up mechanism for monitoring and verification of usage of funds in the Project Operations Manual	September 30, 2014
4	Coordinate with the Office of the Auditor General for timely audit	31 July 2014
5	Obtain approval of the program and budget from NPC/MOF	Prior to Effective date

Annex 5: Operational Risk Assessment Framework (ORAF)

Nepal: SREP-Supported Extended Biogas Project

<table>
<tr><th colspan="7">Project Stakeholder Risks</th></tr>
<tr><td>Stakeholder Risk</td><td colspan="3">Rating</td><td colspan="2">High</td></tr>
<tr><td rowspan="3">Risk Description:

1. Local small group of pre-approved biogas consultants and construction firms resist opening up of sector to new technologies and new consultants

2. Lack of familiarity of commercial banks with lending for large biogas projects.

3. Access to waste is contested by third parties in the case of municipal projects.</td><td colspan="6">Risk Management:
1. Training and capacity building support will be provided to local consultants and lessons of experience from new technologies will be shared by AEPC.</td></tr>
<tr><td>Resp: Client</td><td>Stage: Preparation, Implementation</td><td>Recurrent: ☒</td><td>Due Date:</td><td>Frequency:</td><td>Status</td></tr>
<tr><td colspan="6">Risk Management:
2. Training also provided for commercial banks and local communities during the project implementation
3. Mechanisms for technical, operational and managerial support will be agreed, developed and piloted as part of the project design that will ensure continued support to the communities to keep the waste flowing and the schemes functional.</td></tr>
<tr><td></td><td>Resp: Client/Bank</td><td>Stage: Preparation, Implementation</td><td>Recurrent: ☒</td><td>Due Date:</td><td>Frequency:</td><td>Status</td></tr>
<tr><th colspan="7">Implementing Agency (IA) Risks (including Fiduciary Risks)</th></tr>
<tr><td>Capacity</td><td colspan="3">Rating</td><td colspan="2">MI</td></tr>
<tr><td rowspan="3">Risk Description:
1. AEPC effectiveness and capacity to continue to perform effectively in terms of sound technical judgment on project approvals in flux political environment.
2. Balance between commercial and municipal projects and ensuring project sustainability in advance through sound technical and commercial assessment.</td><td colspan="6">Risk Management:
1. Clear agreements on different process to be followed for SREP and NRREP projects and preparation of agreed flowcharts in terms of process for both, as well as Technical Advisory Committee to support AEPC in decision-making.</td></tr>
<tr><td>Resp: Client/ Bank</td><td>Stage: Preparation/ Implementation</td><td>Recurrent:</td><td>Due Date:</td><td>Frequency:</td><td>Status:</td></tr>
</table>

	Risk Management: 2. AEPC will have a separate marketing effort to identify projects which are eligible for SREP support and will take applications through the portal, versus NRREP supported projects that will apply directly to AEPC or through the pre-approved local consultants					
	Resp: Client/ Bank	**Stage:** Preparation/ Implementation	**Recurrent:**	**Due Date:**	**Frequency:**	**Status:**
Governance	**Rating**		**MI**			
Risk Description: This risk is embedded in other risks as detailed in other sections.	**Risk Management:** Mitigated through preparation of Governance and Accountability Action Plan (GAAP) prior to Negotiations					
	Resp:	**Stage:**	**Recurrent:** ☐	**Due Date:**	**Frequency:**	**Status:**
Project Risks						
Design	**Rating**		**Moderate**			
Risk Description: Establishing and institutionalizing a transparent support system for evaluation of bottom-up projects receiving different levels of grants	**Risk Management:** Large pipeline of projects is already available from overwhelming response to the Bazaar; subset of pilot projects has already been technically and commercially reviewed for financing and will be vetted by the Bank's prior review technical and commercial assessment as soon as the Call for Proposals is launched. AEPC is aware that this pipeline of projects will be evaluated completely differently from its other large biogas program using the standard designs, which is initiated by the pre-approved Biogas consultants and the subsidies are claimed by them.					
	Resp: Client	**Stage:** Preparation/ Implementation	**Recurrent:** ☒	**Due Date:**	**Frequency:**	**Status:**
Social and Environmental	**Rating**		**Low**			
Risk Description: SREP supported projects must all be screened for compliance with the ESMF before funding.	**Risk Management:** ESMF Officer of AEPC will regularly seek guidance from Safeguards team.					
	Resp: Client	**Stage:** preparation, implementation	**Recurrent:**	**Due Date:**	**Frequency:**	**Status:**

<table>
<tr><td>Program and Donor</td><td colspan="2">Rating</td><td colspan="4">Low</td></tr>
<tr><td rowspan="2">Risk Description:

Coordination as required may not happen between the donor partners for SREP, especially for support for developing long term institutional support to AEPC to ensure sustainability of the schemes regardless of who funded them originally</td><td colspan="6">Risk Management:
Regular briefings to NRREP Donors and close involvement of Donor representatives in Mid Term Review to allow for course-corrections if needed</td></tr>
<tr><td>Resp:
Client/ Bank</td><td>Stage:
Preparation/ Implementation</td><td>Recurrent: ☐</td><td>Due Date:</td><td>Frequency:</td><td>Status:</td></tr>
<tr><td>Delivery Monitoring and Sustainability</td><td colspan="2">Rating</td><td colspan="4">Low</td></tr>
<tr><td rowspan="2">Risk Description:

Possible technical and operational issues in large biogas schemes may render the schemes unsustainable.</td><td colspan="6">Risk Management:
The schemes selected under the project undergo a rigorous process of pre-feasibility, design check and monitoring during implementation to ensure technical viability of the schemes. A mechanism will also be developed as part of project to provide technical and operational support to the project developers post-approval. Monitoring requirements include information gathering about biogas production and investment mobilized.</td></tr>
<tr><td>Resp:
Client/ Bank</td><td>Stage:
Preparation/ Implementation</td><td>Recurrent:
☒</td><td>Due Date:</td><td>Frequency:</td><td>Status:</td></tr>
<tr><td>Other (Optional)</td><td>Rating</td><td colspan="5"></td></tr>
<tr><td rowspan="2">Risk Description:</td><td colspan="6">Risk Management:</td></tr>
<tr><td>Resp:</td><td>Status:</td><td>Stage:</td><td>Recurrent:
☐</td><td>Due Date:</td><td>Frequency:</td></tr>
</table>

Overall Risk		
Overall Implementation Risk:	**Rating**	**MI**
Risk Description: Stakeholder risks have been well managed; the implementation risk is the expected participation of private sector commercial lenders. This is also being managed by extensive communication and capacity building and better preparation through TA for private sector proposals seeking commercial bank funding.		

Annex 6: SREP Annex for Extended Biogas Project under the NRREP

Nepal: SREP-Supported Extended Biogas Project

Results Framework

Indicator	SREP-funded Extended Biogas Project under NRREP	Transformational Scaled-up Phase indicating 20 year benefits
Annual electricity output from RE as a result of SREP biogas interventions (GWh) Annual thermal energy output from RE as a result of SREP biogas interventions (Gigajoules)	10.2GWh of direct annual electricity output on average 1,182 GJ of annual thermal energy output (which is equivalent to another 10.2GWh of indirect electricity generation) **Total 20.4GWh equivalent**	204GWh Of direct electricity output (additional 204GWh of electricity equivalent)
Number of businesses and municipal services benefiting from improved access to electricity and fuels as a result of SREP interventions	400	2,000
Financing leveraged through SREP funding [$ million]	$28m of which - $9.3m in Private equity - $5.6m in Debt - $13.1m in Public funding	n.a.
SREP leverage ratio [1:X]	1:4	n.a.
Co-benefits	- Tons of GHG emissions reduced or avoided: 16,970 tCO2eq per year, and 339,404 tCO2eq over a 20 year lifetime of the biogas plants - Private sector led models developed to expand deployment of large-scale biogas technologies in Nepal - Increased capacity of the commercial banking sector in assessing and understanding risks of biogas business plans - Gender co-benefits from substitution of harmful cooking fuels for groups of women through community-sponsored projects - Development of local industry of large-scale biogas technologies - Increased energy security - Employment generation in the biogas sector	

1. Introduction

Country and sector context

1. The population of Nepal is estimated at about 26.5 million in the Census 2011 with a growth rate of 1.4% per annum, and is predominantly a rural society with 83% of people living in rural areas. Nepal is currently facing an acute energy shortage, which is likely to be constraining GDP growth. Commercial and industrial entities in particular are dependent on very high cost sources of back-up energy, mostly diesel-generation of power, to meet their own requirements to remain operational. Certain commercial agricultural and agro-processing businesses, as well as large institutions and certain municipalities, may be overlooking a potential alternative, cheaper source of backup energy from organic waste to offset a part of their currently prohibitive "coping costs". If this alternative approach is successful, it would reduce their exclusive reliance on expensive back-up fuels such as diesel, LPG, firewood and coal. The proposed alternative is biogas, which has remained previously unexplored at a larger, commercial scale in Nepal.

2. Biogas, or deliberate capture of methane from decomposing organic waste, is a widely available renewable energy source, like solar and wind energy, and can be recovered using relatively simple technology. Nepal's Alternative Energy Promotion Center (AEPC) currently implements an active and successful government program to support the dissemination of household sized biogas plants (of two, four and six cubic meters) in rural areas, which has been in place for two decades. The program has relied on a single approved design of single tank fixed dome technology for the biogas plant (digester), recovers energy from animal manure (dung) and has been heavily subsidy driven, with successful adoption by around 262,000 households since 1992. However, most of the organic wastes generated in the agro-processing and industrial sectors (such as poultry, slaughterhouse, distillery, sugar industry, vegetable & fruits/ food processing wastes), as well as the organic portion of urban wastes in the country, are at present disposed of untreated into land and water bodies, resulting in air and water pollution, as well as emission of greenhouse gases like methane and carbon dioxide into the atmosphere. These wastes would require large biogas plants which have previously not existed in Nepal but are now planned to be introduced under NRREP/SREP.

3. Nepal's large-scale organic waste problem, combined with the energy shortage problem, could be mitigated through adoption of eco-friendly waste-to-energy technologies for treatment and processing of wastes on-site where they are produced, before their disposal. One such technology is known as anaerobic digestion or bio-methanation technology, which is environmentally one of the most benign technologies as it leads to generation of energy from wastes, besides rendering wastes suitable for application as a rich source of organic manure. This not only reduces the quantity of wastes, but also improves their quality to meet the required pollution control standards.

4. **Sector Wide Approach (SWAp) in the Nepal Renewable Energy Sector**. The Government of Nepal (GoN) and its energy partners have launched a common framework, the five-year National Rural and Renewable Energy Program (NRREP), for all renewable energy interventions in July 2012. The World Bank-administered SREP grant for Extended Biogas

sector development is an integral part of NRREP. AEPC's new flagship program document for NRREP[13], notes the importance of introducing and capturing the energy benefits of large biogas plants, (defined as twelve cubic meters and above), as the country struggles with widespread energy shortages. However, it is silent on introduction of updated designs, technologies and management approaches for improved performance and sustainability of the new sector; this is where SREP-assistance will be complementary to the overall NRREP large biogas intervention. Modern large biogas plants and associated mature technological upgrades in recovery and storage of biogas are very common in Nepal's neighboring countries (India, Bangladesh, China), but these new technologies and plant sizes have not yet been introduced to Nepal, where the market looks very promising for this kind of renewable energy solution.

5. **Central Renewable Energy Fund (CREF), under NRREP**. CREF is a common pool of funding for renewable energy sector support to Nepal, channeled through AEPC, as a complement to the single-point NRREP. Bilateral donors, under their budgeting guidelines, are able to pool resources in advance of expenditures incurred, into the common fund known as CREF. But multilateral and regional development banks are required, by their internal fiduciary procedures, to reimburse the implementing agency only based on presentation of evidence of expenditures already incurred, and are therefore unable to disburse resources into CREF in advance of the agreed activities taking place. However, the World Bank respects the intention of CREF and wishes to participate; discussions are underway to expand the definition of CREF contributions to include the disbursements which the World Bank will make to AEPC upon acceptance of AEPC's disbursement applications presenting evidence that expenditures have been incurred and activities completed. In effect the World Bank will be reimbursing the SREP-funded portion of AEPC's subsidy payments made to the large biogas sector as per GoN's subsidy policy and the subsidy delivery mechanism (both of which are posted on AEPC's website).

6. **NRREP Biogas Program**. The NRREP's large biogas plant program, implemented by AEPC, involves an indigenous upgrading of the existing household plant design (fixed dome biogas digester) to a larger size. SREP Extended Biogas, as a small intervention under NRREP, proposes to be transformational to Nepal's overall large biogas digester program in a number of ways, by substantially upgrading and professionalizing the entire approach to large biogas, and thereby exerting a major influence on the larger volume of investment resources currently available under NRREP (about $13m) for large biogas plants.

7. **Added value (additionality) brought by SREP Biogas to the NRREP biogas program**. Today there is no large biogas sector in Nepal, and therefore no awareness among potential end-users of how large biogas plants are to be used, no track record of performance, no sensitization of commercial lenders, no focus on commercial viability of an investment in large biogas, and limited professional capacity due to lack of prior experience. In designing the AEPC program, emphasis has been top-down and purely technical, i.e. modification of the existing household design to a larger size, and calculation of the amount of cement and other materials required to construct such plants (on the old fixed dome digester design). The focus has been a

[13] NRREP is a five year comprehensive program for promotion of renewable energy technologies through AEPC, supported by bilateral grants from Denmark, Netherlands, Norway, Germany, United Kingdom and the UNDP, for a total program size of US$184m

technical one that has been missing attention to commercial viability; it has emphasized inputs rather than outcomes/performance.

8. The plan under NRREP was for AEPC to go out and identify beneficiaries, conduct their feasibility studies for them (purely on technical grounds), and deliver the subsidy to construct the plants. AEPC's proposed contribution was mainly on engineering aspects of the plants, rather than any other screening methods for commercial viability and sustainability. The entire exercise was proposed to be performed with the limited number of biogas staff in AEPC, and a select number of "pre-qualified consultants". The dialogue concerning proposed market-development support through SREP, and its private sector-focused emphasis on commercial viability and sustainability of any asset created, has made a positive contribution to the overall large biogas program under NRREP.

9. SREP funds will be used partly for capacity development at different stakeholder levels of the large biogas sector (which does not exist yet at AEPC, as there are practically no large biogas plants working in Nepal today). The value added of SREP includes the introduction of a systematic methodology for building professional capacity to undertake the following comprehensive approach to building sustainable foundations for the sector:

i. mapping of potential wastes;
ii. outreach to private businesses who are producing and dumping organic waste, and assessing commercial viability of proposed digester investments to be made by them (that will be supported with a capital cost buy-down from AEPC only if they are commercially viable in the first place);
iii. detailed technical screening of the proposed engineering design in order to ensure proper sizing of the plant according to year-round availability of waste; (iv) acquisition of advanced W2E technologies;
iv. sensitization, involvement and capacity building of private sector stakeholders such as commercial lenders;
v. training and capacity building of business consultants to write business plans for large biogas digester project proposals;
vi. further development and refinement of policy & regulatory frameworks as needed; and
vii. allocation of funds under the project cost to support the setting up of treatment and processing plants, to discharge treated effluents. These activities are all additional to the scope of the current NRREP program, which was engineering-driven and had foreseen a desk-top upgrading of the indigenous digester design from household size to large plant size, and was simply going to roll out the new design all over the country, again heavily driven by subsidies in a similar manner as the household program.

10. Commercial viability and mobilizing or training other biogas stakeholders was not part of the original NRREP plan for the sector. However, the new biogas approach being implemented under NRREP due to the SREP program, will now introduce the agreed good practice approaches to the GoN's overall large biogas program. This is transformational, and totally attributable to the interventions of the SREP project. Another major contribution of SREP is of course the demand-driven approach, with the online application system for those wishing to seek

support for technical assessment and for capital-cost buy-down on their respective project proposals. This itself is transformational, and substantially increases transparency. According to the original design of the program, all decisions related to where large biogas plants were to be built, would be determined on a top-down basis at AEPC, and support would end with commissioning the plant. Targeted sectors by NRREP's large biogas program include commercial, municipal, institutional and community applications of large digesters. Out of these, the SREP biogas program proposes to support commercial and municipal sub-projects only.

Country's SREP Investment Plan: summarize the SREP plan for the country, including financing table

11. The SREP Investment Plan for Nepal (including large biogas) was endorsed by the SREP Sub-Committee in May 2012. Under this Plan, Government of Nepal will utilize US$40 million from the SREP to implement a well-conceived and structured program to scale up renewable energy technologies in the country. The Investment Plan will support the following activities:

i. Small hydropower development (IFC, ADB): this project will support a SHP investment structure to provide systemic support to the Nepalese banking sector to enhance its ability to finance SHP investments and demonstrate the viability of project financing solutions for SHP.
ii. Mini and Micro initiatives - off grid electricity (ADB): this project will support GoN's plans to scale up rural energy access through the development of mini and micro hydro projects, as well as solar home systems.
iii. Extended Biogas Project (WB): this project will assist in the development of a commercial market for large-scale biogas technologies in Nepal. The project will support the development of commercially viable, large-scale biogas plants.

Table 1: SREP Investment Plan for Nepal – Financing Plan (US$ million)

Investment	**GoN**	**SREP Financing**	**RREP** (estimate)	**Other** (expected)	**Private Sector Equity**	**Total** (estimated)
Small hydropower development (ADB, IFC)		20.00		58.75	33.75	**112.50**
Mini and Micro initiative: off grid electricity – Mini and Micro Hydro (ADB)	20.00	7.00	60.40	21.26	22.67	**131.33**
Mini and Micro initiative: off grid electricity – Solar Home Systems (ADB)	18.75	5.00	56.39	19.85	25.00	**125.00**
Extended Biogas Project (WB)	20.00	7.90**	56.70*	19.96*	30.67*	**135.23***
Other RETs	1.50		6.50		2.00	**10.00**
Total	**60.25**	**39.90**	**180.00**	**119.83**	**114.01**	**514.07**

****refers exclusively to large biogas under the SREP Extended Biogas Project, and does not include household size digesters. The $7.9m SREP grant will have a $6.9m investment component which is expected to mobilize a further $28m (1:4 ratio) of additional investment from private and public sources (details further below). So out of the total figure of $135m, (28+7=)$35m will be mobilized by SREP, together with $1m of TA funding for a total program size of $36m.

***all these figures include total biogas support under NRREP, i.e. for small household digesters, in urban and rural areas, as well as the large biogas program. Figures have not been broken down specifically in the document for component-wise support to large versus small.

2. Project description

a. Summarize project, including problem statement, project objectives, proposed transformation and rationale for SREP financing (2-3 paragraphs).

12. **Problem Statement**: Private enterprises in Nepal (both large scale formal sector firms and MSMEs) and municipalities are all battling the high costs of imported fossil fuels for thermal/electricity uses, as well as having to pay to dispose their waste by-products in a responsible manner, or more commonly, are discharging untreated waste into the air, water and land at present due to lack of awareness on alternatives. There is a need to support the sustainable introduction in Nepal of large-scale biogas digesters which would allow private enterprises and municipalities to turn the organic waste they generate as part of their ongoing business process into thermal or electrical energy instead of having to manage their responsible disposal. Many public and private institutions, primarily in the rural areas, depend on fuel wood to meet their thermal needs. At the same time, they do not have adequate arrangements for disposal of bio-waste. Commercial plants involved in food processing for example, usually burn firewood or coal to generate steam that is injected into the processed product (e.g. fruit juice or milk) in order to boil it quickly to kill bacteria and increase the shelf-life. Increasing energy costs threaten the viability of the business. Also, such commercial plants also currently dispose of waste in an environmentally hazardous manner (see photographs in Annex 8 of the PAD). There is a general lack of awareness about what they could be doing instead to use their organic waste for on-site energy generation (and production of organic fertilizer as a byproduct, which can be

used on-site or sold). There is also inadequate enforcement of existing laws on pollution control, regarding discharge of organic waste into rivers, other water bodies, or the atmosphere. The AEPC has no experience with large biogas plants that are mature in neighboring countries, and it is familiar with only one design since the early 1990s (it relies exclusively on the fixed dome digester, a technology which is at least 40 years old). Last but not least, AEPC does not have a network of business consultants (business plan writers) who have any familiarity with large biogas technologies, and neither is there any awareness or appetite on the part of commercial lenders to engage with this sector. All of these challenges would need to be addressed in order to build a market-driven large biogas sector.

13. **Why Should A Commercially Viable Activity Deserve a Subsidy?** Another major and important aspect of the Problem Statement is that an entity which is considering an investment in a biogas plant (plus possibly also electricity generation equipment to run on biogas) must look at the upfront funding requirement and offset the capital cost and debt service expenses against the energy savings cash-flow to the business. If the benefits-to-costs ratio is greater than 1, it is a good investment. But the externality benefits from reduced pollution of the land, air and water by recycling of waste into biogas, instead of dumping it into the open, as well as the indirect benefits to the macro-economy from reduced use of imported fossil fuels, are not captured by the business itself, and it will therefore undervalue the benefits to society. Many socially valuable investments will not end up being made if the enterprise has to consider the full capital cost against the limited cash flow savings to the business. Since it is not possible in each case to quantify the externalities and factor those in to the investment decision made by the business, the usual approach is to offer a "capital cost buy-down" to the business, i.e. in effect implying that the government is willing to cost-share the upfront investment to an extent which represents the benefits to society, and thereby leaving the private entity with a lower financial outlay that will expedite the payback period for the capital invested directly by the business. The denominator (cost) is reduced through the upfront capital cost buy-down in order to make up for the fact that the numerator (benefits) is being undervalued by the firm making the investment decision.

14. This approach can be defended on economic grounds and is also likely to lead to the desirable outcome of more plants being built, but where in each case the owners are also mindful of their benefits from energy savings that translate into cash flow impacts and help their business to grow from freeing up expenses on traditional fuels for the time that they can use the "free" biogas from their investment.

15. Additionally, to continue with the problem statement on justification of subsidy as per GoN policy, it may be kept in mind that there is no track record or experience in Nepal at present with large biogas plants—neither for the adapted larger version of the household biogas plants nor for imported technology. The first 400 biogas plants that are targeted for support under the SREP program are therefore pioneering investments and hence the capital cost buy-down provided by AEPC and proposed for reimbursement by SREP (in the case of operational plants only), is a risk mitigation mechanism as well.

16. AEPC's current objective in upgrading the biogas sector is to introduce large scale biogas technologies in Nepal, and also, where relevant, to promote localized (on-site) electricity generation from biogas. Some of the private sector entities and communities involved in waste

management have sought support from the AEPC in the past, but due to the lack of knowhow and skills regarding the technologies, as well as lack of resources to bridge the viability-gap, AEPC has not been able to mobilize project partners and financial institutions to work in this area. The NRREP as currently designed, is primarily technology driven, although again relying on simply upgrading the existing old-design household size technology to a larger size, without reference to any of the modernization and new materials and approaches that have become mainstreamed in neighboring countries and around the world. NRREP will be greatly benefited from the SREP interventions to build a market and substantially increase capacity and awareness across the board, as well as to introduce improved technologies in Nepal.

17. **Project Objectives, aligned with SREP objectives**: The objective of this project is to promote investment in off-grid large scale biogas energy generation with private partnership. The project aims at paving the way for the creation of a vibrant private sector-led market of large scale biogas technologies in Nepal. The primary beneficiaries will be businesses (about half of the investment will be for commercial biogas plants), leading to indirect employment creation. Greenhouse gas mitigation objectives will be achieved from reduced pollution and a financial incentive to recycle organic waste rather than dump it into rivers or open spaces.

18. The project is designed to contribute to the effective development of a commercially viable biogas sector. The proposed project will have a very important TA component ($1m) to strengthen the capacity of diverse stakeholders involved in the upcoming sector of large-scale biogas technologies in Nepal. It will also have an investment component ($7m) to reimburse AEPC for capital-cost buy-down support provided under GoN policy, and this SREP investment support will be paid only for plants that are independently verified to be working after commissioning. In a nutshell, SREP funds will support the competitive identification of investors and will enhance the capacity of Nepali companies whose proposals are competitively selected. The financial support will be only up-front, but the preceding capacity building (throughout the sector) is designed to ensure that there is no need for further ongoing support, as the projects will be screened at the beginning for reliable commercial viability.

The transformational capacity creation in the sector, through the TA program, (all of which is additional and does not exist today under NRREP) will include:

i) **Capacity Building** - within AEPC and other key stakeholders in the sector and will involve development of – a) structured database for potential wastes available in the country, technology packages for different waste sectors, model agreement / guidelines / documents for waste supply, sale of electricity, training manuals, monitoring & evaluation of performance of plants in the field ; b) training programs and exposure visits abroad; c) training of other key stakeholders – bankers, consultants, NGOs, entrepreneurs, academic & research institutions

ii) **Technology Acquisition** – focus will be on introduction of advanced and efficient bio-methanation technologies already used in similar settings in the region and elsewhere, suitable for treatment of specific wastes which are commercially produced

iii) **Feasibility Study(FS)/Detailed Feasibility Study(DFS)** – Cost-sharing support for preparation of project reports, prepared and reviewed by accredited independent experts outside AEPC

iv) **Awareness Creation** – support for the organization of workshops/seminars, printing of documents, development of project website

v) **Support to Academic and Research Institutions** - for applied research & development, monitoring & evaluation of performance of field installations, and also to train commercially-oriented biogas professionals in a variety of disciplines in order to create lasting capacity that will be available long after the completion of SREP and NRREP programs.

vi) **Hiring of Independent Consultant / Agency** – for yearly Evaluation of Program

19. The primary focus of the SREP Biogas project is to support the SREP objective of increasing the provision of renewable energy generation instead of increasing access to renewable energy sources to third parties. However, the main beneficiaries of this Program include businesses and commercial establishments, which will invest in renewable biogas technology in order to increase their on-site (captive) energy security, improve productivity and indirectly create jobs (apart from the direct jobs related to operation and maintenance of the biogas plant).

20. **Proposed Transformation**. The project will contribute to the transformation of the biogas sector in Nepal, especially given that large biogas technologies are not within the spectrum of renewable energy technologies receiving support under current Government's programs. The demonstrational impact of the project will be essential to contribute to the development of a privately driven market for large-scale biogas technologies in Nepal. The SREP-funded project will pioneer the introduction of totally new business and contractual practices, technologies, and accountability standards will contribute to the scaling-up of large-scale biogas plants, using organic wastes generated from commercial and municipal sources. In addition to infrastructure investments, the project will enhance the capacity and in-country experience that is expected to be built in the private sector for identification, construction, financing, and operation and maintenance of large biogas projects, is expected to allow for the sustainability of this market in the post-project phase.

21. **Rationale for SREP financing**. As Nepal struggles with widespread energy shortages, the proposed SREP-funded project will be instrumental to set the foundation for the biogas expansion agenda of AEPC in the country. The earlier section has described how the full benefits of a plant cannot be captured by the individual investor who is looking at capital payback and also taking a risk on a technique which has no track record yet in Nepal. Both of these reasons would justify a one-time upfront capital cost buy-down, to better align costs and benefits that are relevant for the decision-making entity. Furthermore, SREP will not be providing reimbursement to AEPC for plants that turn out to be poorly designed and non-functional. SREP investment financing will be available only to plants that are independently verified to be operational after commissioning. SREP TA financing will be critical to provide the entire support structure for the

proposed transformation of the sector. Large biogas plants and associated mature technological upgrades in rates of recovery, enrichment to improve methane content, efficient storage of biogas, and even electricity generation from biogas (where relevant), are all common in Nepal's neighboring countries (India, China, Bangladesh), but have not yet been introduced to Nepal.

22. This SREP intervention is designed to add value alongside existing plans under NRREP for the introduction of single-technology/indigenous design large biogas plants with an emphasis on market development and private sector entry to this segment as well. The vast majority of SREP funding will be used to catalyze and attract additional sources of funding, which is essential to kick start the development of a commercial biogas sector. It is expected that the successes of the proposed project will be mainstreamed into the next phase of the NRREP large biogas digester program, based on local biogas experts' familiarization during the SREP implementation period with new imported technologies and their performance in Nepal.

3. Assessment of Proposed Project with SREP Investment Criteria[14]

a. Increased installed capacity from renewable energy sources:

23. Assumptions are as follows:

- The proposed SREP-funded project will support the deployment of approximately 400 large-scale (i.e. over 12 cubic meter capacity as per GoN definition) new biogas plants, of which 320 (i.e. 80%) are expected to be commercial and 80 (i.e. 20%) are expected to be municipal. Plants to be constructed will be of varied sizes and using varied waste materials (organic substrates); plant sizes will vary depending on the project applicant's energy requirement, the waste available, available space to construct a plant, and the commercial viability of making an upfront financial outlay for capital investment in a biogas digester (plus optionally a biogas generator to produce electricity), when these funding requirements are offset against savings on existing energy expenditures.
- About half of the aggregate biogas generated will be diverted to captive electricity generation, which is currently being produced using fossil fuel-based systems, whereas the remaining 50% of biogas produced would be used for "process heat", which is currently done using coal or LPG or firewood. The use of biogas for thermal generation would represent 1182 giga-joules of thermal energy and would create an estimated additional 3.5MW of electricity generation capacity installed.

b. Increased access to energy through renewable energy sources:

24. The main focus of the project is to increase renewable energy installed capacity rather than increasing access to renewable energy sources. However, the market development for biogas technologies may have spillover effects on energy access in the mid- and longer term. As the market for large-scale biogas technologies develops and pioneering companies introduce

[14] For reference: SREP Programming Modalities and Operational Guidelines https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/SREP_Programming_Modalities_and_Operational_Guidelines_final.pdf

modern technologies in the market, these technologies can be mainstreamed and supported by government programs for non-commercial target groups (e.g. communities) who are heavily dependent on subsidy (and hence were not included as a major part of this project due to their inability to attract private co-funding).

c. Low Emission Development:

25. The project will scale-up the deployment of large-scale biogas technologies in commercial, municipal, and residential institutions, which are all depending on fossil fuel solutions for thermal process heating, water heating, space heating, and electricity generation, as well as needing to manage the disposal of their waste by-products in a responsible manner. Commercial enterprises, for example, are the main electricity customer segment that invests in fossil fuel technologies as backup solutions to confront the acute energy shortages prevailing in Nepal. Through this project, companies in this segment will be supported to invest in biogas technologies that either allow them to reduce use of coal, firewood or LPG in case their industrial energy requirement is "process heat", or alternatively, allow them to substantially reduce diesel usage for generators, if these are retro-fitted to operate on biogas when biogas is available, or investment in new generators that run only on biogas, eliminating dependence on diesel through gas engines. By applying the proxy-based method to estimate emissions of CO2 equivalent based on diesel-generated electricity (793.7 tCO2eq per GWh), the proposed project will directly help avoid the equivalent of 8,112 tCO2eq per year and 162,240 tCO2eq over a 20 year lifetime. The Indian reference figure of 22megajoules of thermal energy from one cubic meter of biogas has been used, as well as the Indian figure of 1.4kWh of electricity from 1 cubic meter of biogas. All detailed assumptions and derivation of calculated figures is provided in the next Annex (Annex 7). The GHG figures are very conservative, having been calculated only based on the traditional energy displaced by electricity, as the recovery of biogas for productive uses and removal from open air decomposition itself also contributes further to climate change mitigation. Furthermore, the figure assumes that the 3.5MW of installed biogas generator capacity will only be operating for 8 hours a day, so only 2920 hours out of the annual 8760 hours. This will create a total estimated amount of (0.0035GW times 2,920 hours) 10.22GWh of electricity generated per year from biogas. When the normative estimates of 793.7 tCO2eq per GWh are used, it results in the figures reported above. Another reason this CO2 reduction estimate is very conservative, is that the production of biogas will increase as the business grows and expands over time, and the likely number of hours per day of generator use, as well as the requirement for captive electricity, is likely to increase above the 8 hour figure that has been estimated.

26. If biogas is available in larger quantities when more electricity is needed, the amount of diesel-savings is likely to be proportionately higher. Therefore the figures reported above are minimum estimates. However, this emphasis on CO2 alone is a gross understatement of benefits from biogas. Atmospheric emissions of biogas from natural and man-made sources (i.e., from open air decomposition of cattle dung or other organic waste such as rotting garbage in landfills) contribute to climate change due to methane's potent greenhouse gas properties, which are 21 times as potent as carbon dioxide. Capturing biogas for productive uses rather than allowing it to degrade further and release harmful greenhouse gases is thus an environmental win-win proposition which the proposed SREP-funded project intends to address.

d. Affordability and competitiveness of renewable sources:

27. Affordability is essential for increasing access and for ensuring the long term renewable energy market development. SREP funding should address clearly-defined cost barriers to adoption of renewable energy technologies, such as connection costs for rural consumers, higher capital costs of new technologies, transmission costs related to grid-connected renewables, and risk-adjusted rates of return sought by investors.

28. Depending on the cost of fuel that is being displaced, and the monthly cash expenditures on that fuel, payback periods for investment in large-scale biogas technologies can range between one to four years.

29. Primary sources of biogas feedstock for medium, large and very large scale projects in Nepal would include dairy and piggery-farm manure, poultry litter, sewage, organic portions of municipal waste, green waste, hotel and restaurant kitchen waste, slaughterhouse waste, plant residue material, distillery waste, bagasse, fruit juice processing pulp waste, and other animal and crop residues. Previous heavily subsidized attempts in Nepal have not been successful or sustainable due to unclear assignment of responsibilities and ownership, or possibly due to incorrect usage and lack of maintenance. This need not be the case, if incentives are properly aligned, particularly in terms of having clear ownership and responsibility for maintenance of the asset. All of these biogas recovery and upgrading processes, including on-site electricity generation from enriched biogas, are widely used on a commercial scale internationally, and also in Nepal's neighboring countries, and are "low-tech", locally managed and relatively inexpensive for commercial enterprises, particularly when supported with intense and high quality upfront project preparation (technical studies) to ensure that the plant is sized and designed properly, operates trouble-free, as expected, and can attract commercial funding by presenting a suitable business plan (this is not the culture at present in Nepal within this market segment, but there is tremendous interest in following this approach).

e. Productive use of energy: SREP programs should promote the generation and productive use of energy

30. The development of large biogas plants, which will be designed to produce thermal energy and/or electricity, will have a significant impact on the productivity of commercial, municipalities, and residential institutions. Commercial enterprises (e.g., farms, fruit processing plants) would be able to add value to their own operations by generating biogas as their own source of secure, renewable energy. By doing so, these enterprises would be able to focus on productive and core business activities instead of deviating their attention and efforts to non-core activities such as procuring diesel for backup power generation. Municipalities may be able to generate biogas for commercial heating applications (e.g., providing community cooking facilities for socially marginalized groups). Spillovers from the project will also benefit institutions such as university campuses, army or police barracks, etc., which would be able to direct to the promotion of productive activities those savings from displacing purchases of LPG or firewood, which are used for cooking today.

f. Economic, social and environmental development impact:

31. SREP financing should demonstrate the generation of

a) Economic benefits
b) Social benefits
c) Environmental benefits

- Launching a brand new renewable energy market segment that will lead to the production of up to 10.22GWh per year of decentralized electricity generation from "waste", and development of additional **thermal energy applications** from "waste" (leading to reduced need for firewood and potential savings of e.g. 15-20% on commercial fuels such as expensive LPG), through applications of relevant technologies and business models led by private firms;

- Environmental, social and gender co-benefits, such as reduced GHG emissions, productive use of energy, extended hours for domestic work and children's education, improved access to information and empowerment of local communities, particularly women; and

- Information on best practices and lessons learned will be shared at national and international levels, and opportunities for developing environmentally friendly RE will be fully understood by the public.

- Atmospheric emissions of biogas from natural and man-made sources contribute to climate change due to methane's potent greenhouse gas properties, which are 21 times as potent as carbon dioxide. Normally, manure that is left to decompose in the open air releases two main gases that cause global climate change: nitrous oxide and methane. Nitrous oxide (N2O) warms the atmosphere 310 times more than carbon dioxide, and methane warms the atmosphere 21 times more than carbon dioxide. Capturing biogas for productive use rather than allowing it to degrade further and release harmful greenhouse gases is thus an environmental win-win proposition. The emission of harmful greenhouse gases will be reduced.

- In addition, there are likely to be substantial health improvements from safe disposal of waste

g. Economic and financial viability:

Explain the economic and financial viability of SREP investments. Mention time bound SREP resources

32. An earlier section has elaborated the two step process by which proposed investments in large biogas plants will be screened, i.e first checked for commercial viability from the investing entity's point of view, followed by a technical screening to ensure validity of assumptions to maximize the likelihood of actual energy generation as projected. Commercial viability from an enterprise or institution's point of view will be influenced by the relationship between the upfront investment required and the payback period, which will in turn depend on the current cash outflows on traditional fuels that are saved in return for switching to biogas in order to meet energy requirements. The benefits of the biogas investment to the enterprise do not capture the full benefits to society, and in the absence of support there will be under-investment in socially and environmentally beneficial biogas plants. This creates the justification for providing SREP support to private entities considering an investment in production of biogas, by providing

assistance in buying down the upfront cost of the plant as a proxy for adding to the benefits from the plant (society's benefits from reduced pollution, improved health and climate change mitigation, as well as the enterprise's own benefits in terms of cash flows). This is the economic angle in addition to the financial one. Furthermore, SREP investment support will only be given for biogas plants that are independently verified to be operational. While the mechanism of support delivery to AEPC is on a reimbursement basis (i.e. AEPC pays out according to its published "subsidy delivery mechanism" during the construction of the plant), in the unlikely but possible case of biogas plants being constructed which do not ultimately operate or function, SREP funds will not be accessible to AEPC for reimbursement of subsidies it has already paid out for such plants. This will also raise the burden on AEPC to apply rigorous screening criteria to every plant that it funds, since it does not want to be associated with having supported plants that perform more poorly than those supported by SREP.

33. SREP resources are time-bound, and much smaller than the NRREP biogas program. However, the types of interventions that are being financed, both under TA and investment, will raise the bar for the entire large biogas sector since it is just being launched and does not yet exist. The SREP intervention at this timely juncture means that the program is being launched according to best practices from the start.

h. Leveraging of additional resources:

34. Elaborate on how the SREP funded activities will maximize the leverage of funds from domestic public and private sector resources, carbon finance, GEF, bilateral and multilateral co-financing. Demonstrate that SREP co-financing is "crowding in" other sources of financing. You may want to make an analysis of leveraged funding from different sources and estimate leverage ratio for the proposed project.

35. The proposed SREP project will crowd-in other sources of financing through innovative and pioneer financing mechanisms in the Nepali context. The use of SREP funding will be to reimburse whatever AEPC has paid out for eligible investments, but restricted to a maximum of 20% of total project cost, as per the operational manual with the remaining 80% coming from other sources, including some commercial and private equity funding. The financing leverage ratio for this project is estimated at 1:4 ($1 from SREP leverages an additional $4 from other sources). The proposed use of the $7.9m grant is to allocate $1m for a variety of TA activities in order to build the foundations of a professional sector, while $6.9m will be used for reimbursement of capital cost buy-down for investment in the sector, payable to AEPC based on subsidy payments advanced according to GoN policy, but only for successfully functioning plants. At most, the total investment in the sector will be $35m of which SREP will fund $7m and other co-financing will provide the remaining $28m.

36. The breakdown of the total $35m investment estimate across 400 plants (average cost estimate per plant is therefore $87,500 which is in keeping with regional norms; the majority are likely to be lower, but some will be much higher), is as follows:

> The total $35m investment pool is estimated to be allocated across about 80% commercial; 20% municipal plants, all of which will have different financing

configurations in terms of their ability or inability to provide equity contribution and attract commercial debt, etc.

Co-financing Estimates for Commercial Biogas Plants

The total investment pool of about $35m will have about 80% allocated to commercial plants i.e. about $28.0m total investment in commercial plants. Of this amount, one third or $9.3m is likely to come from private equity contributions, about one fifth or $5.6m from commercial funding sources, and the remainder of $13.0m from other sources (28.0-9.3-5.6=13.0). SREP will finance a maximum of up to $5.5m out of the "remainder" because this represents the ceiling of 20% of the total investment ($28.0m*0.2). This means that $5.6m of "other co-financing" will be mobilized for the commercial biogas plants, in order to make up the residual.

Co-financing Estimates for Commercial Biogas Plants

Private Equity	Commercial Debt	SREP funding	Other co-financing	Total Investment
$9.3m	$5.6m	$5.5m	$7.6m	$28.0m

Co-financing Estimates for Municipal Biogas Plants

Of the 20% municipal, i.e. (0.2*35m) or $7m total estimated investment in municipal plants, there is expected to be a very modest equity contribution by the municipality, because local government formation and resource allocation to local governments has not yet been worked out after Nepal's recent elections and the formation of a new Constitution. It has been conservatively estimated that the equity contribution will be in the form of land and in-kind resources, and there is no incremental cash value provided for equity. Neither is it estimated that there will be any appetite for commercial debt, given the legal uncertainty of municipal finances. We are assuming that all of the municipal projects will be funded by "other co-financing" with SREP amounting to a maximum total of 20% of the investment costs, again in order to maintain the 1:4 leverage ratio.

Co-financing Estimates for Municipal Biogas Plants

Private Equity	Commercial Debt	SREP Funding	Other co-financing	Total Investment
$0	$0	$1.4	$5.5m	$6.9m

Total Co-Financing Mobilized under the program:

Sources of Co-financing within total investment Program of $35m

Private Equity or Corporate Contribution	$9.3m
Commercial Debt	$5.6m
SREP	$6.9m
Other Co-financing	$13.1m
Grand Total of Investments funded	$34.9m
Of which SREP	$6.9m (20%, i.e. a 1:4 leverage ratio)

i. Gender:

SREP investments should seek to strengthen the capacity of women to be active participants in the economic sector and avoid negative impacts on women

37. Gender benefits in the commercial biogas plants may come from increased employment opportunities for very poor women in connection with waste management and collection for plant operations. For municipal and commercial plants, gender benefits may consist of improved safety for women after dark if the biogas is used for electricity to power street lights

j. Co-benefits of renewable energy scale up:

Describe co-benefits included in the results framework. The analysis can be qualitative or quantitative to the extent possible. Elaborate on the development impact of the proposed project.

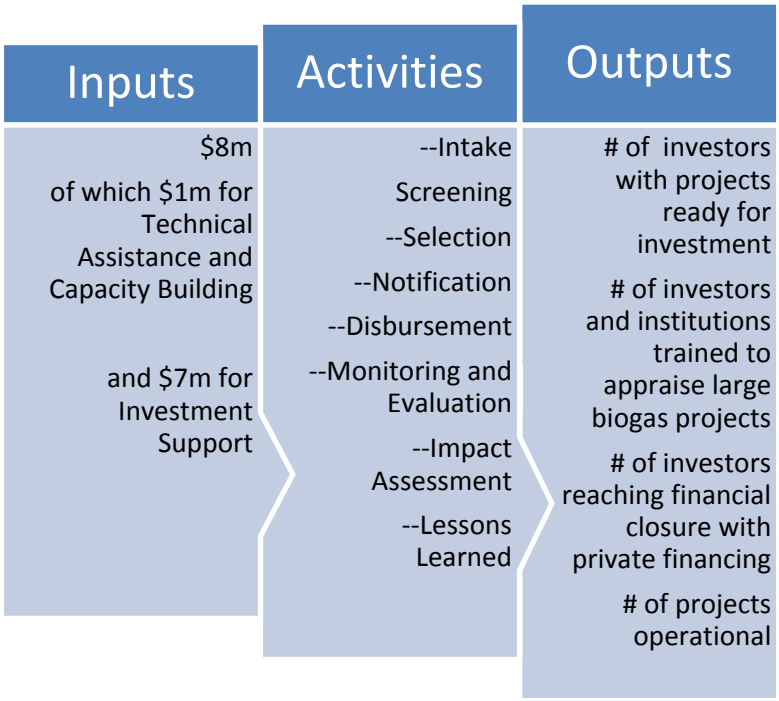
38. Large biogas plants also promote social and gender inclusiveness and cohesion, as construction often involves the local community. They provide opportunities for local youth to build technical competencies in construction, operation and maintenance, more so when additional applications such as power and heat generation are included.

39. The SREP project will provide sensitization, capacity building and technical knowhow to a wide range of stakeholders, and will mainstream awareness of the benefits of renewable energy technologies, as well as the reduction of health hazards through safe disposal of organic wastes and climate change benefits through avoided CO2 emissions (as well as avoided methane and nitrous oxide emissions). The total estimated CO2 avoided has been calculated as 162,240 tCO2eq.

4. Monitoring and Evaluation

Describe indicators, targets, assumptions, and means of verification (incl. institutional arrangements at the country level) for each indicator included in the results framework.

40. The first level of monitoring will be done by an independent verification consultant to ensure that the constructed biogas plant is producing thermal energy and/or electricity as intended. This will be done before the SREP funding is disbursed to AEPC. The overall monitoring and evaluation of the project will be performed by AEPC, which will have responsibility to assess progress in the different component of the project in accordance to agreed indicators. Information for monitoring project indicators will be collected through annual surveys from random samples of supported projects. Results will be shared with World Bank implementation support teams. Evaluation of the project will be conducted 18 months following effectiveness of the project, at mid-term of the project, and at project closing.


Inputs
Activities
Outputs
$8m
of which $1m for Technical Assistance and Capacity Building
and $7m for Investment Support
--Intake
Screening
--Selection
--Notification
--Disbursement
--Monitoring and Evaluation
--Impact Assessment
--Lessons Learned
# of investors with projects ready for investment
# of investors and institutions trained to appraise large biogas projects
# of investors reaching financial closure with private financing
# of projects operational

5. Implementation Readiness

Public policies and institutions that support deployment, diffusion and transfer of low carbon technologies:

- Country/sector strategies
- Institutional arrangements
- Sustainability

41. Policies are in place and ready to be implemented. The availability of SREP support has provided a greater amount of commercial and technical rigor to the implementation mechanism of the biogas program, to ensure sustainability of investments. The country and sector strategies and institutional arrangements are described in detail in the PAD, in the front section and in Annex 2.

2. **SREP Additionality:**

Elaborate how SREP funding is essential for the materialization of the project. Explain why the project would not realize in the absence of SREP funding.

42. The proposed SREP-funded project will contribute to the initiation and establishment of a sustainable and commercially driven sector for large-scale biogas technologies in Nepal. The project will pioneer the identification and support for private sector project sponsors and entrepreneurs who are ready to invest resources and efforts to enter a commercially driven biogas sector. In the absence of the project, the sector for large-scale biogas technologies is likely to undertake an unsustainable pathway of development, being characterized by hefty subsidies and lack of equity and commercial financing.

43. As opposed to the NRREP program, which focuses on supporting mainly community, institutional, and municipal project sponsors who require large subsidies and are unable to attract commercial and equity financing, the proposed SREP intervention will focus on increasing private sector participation in the sector. In other words, the proposed project is essential to shift the development pathway of the large-scale biogas sector in Nepal to seize the vast interest from private investors to enter the sector.

44. The value added of SREP includes the introduction of a systematic methodology for building professional capacity to undertake the following comprehensive approach to building the sector: (i) mapping of potential wastes; (ii) outreach to private businesses who are producing and dumping organic waste, and assessing commercial viability of proposed digester investments to be made by them (that will be supported with a capital cost buy-down from AEPC only if they are commercially viable in the first place); (iii) detailed technical screening of the proposed engineering design in order to ensure proper sizing of the plant according to year-round availability of waste; (iv) acquisition of advanced W2E technologies; (v) sensitization, involvement and capacity building of private sector stakeholders such as commercial lenders; (vi) training and capacity building of business consultants to write business plans for large biogas digester project proposals; (vii) further development and refinement of policy & regulatory

frameworks as needed; and (viii) allocation of funds under the project cost to support the setting up of treatment and processing plants, to discharge treated effluents. These activities are all additional to the scope of the current NRREP program, which was engineering-driven and had foreseen a desk-top upgrading of the indigenous digester design from household size to large plant size, and was simply going to roll out the new design all over the country, again heavily driven by subsidies in a similar manner as the household program. Commercial viability and mobilizing or training other stakeholders was not part of the NRREP's plan. However, the new approach being implemented by AEPC due to the SREP program, will now introduce the good practice approaches to the GoN's overall large biogas program. This is transformational, and totally attributable to the interventions of the SREP project. Finally, there is also the introduction of much greater transparency through the bottom-up approach of asking potential applicants to consolidate their information and apply for assistance to AEPC rather than waiting to be approached.

Annex 7: Providing All Assumptions to show how Energy Equivalents (Thermal and Electrical) have been estimated

Nepal: SREP-Supported Extended Biogas Project

There are no large biogas plants operating in Nepal, so no reference data are available. AEPC has used the reference norms provided by the Indian Ministry of New and Renewable Energy (MNRE) for their own biogas support program, since the organic wastes and ambient conditions are likely to be closest to what is found in Nepal.

1) Since AEPC has expressed its subsidy in capacity terms (per cubic meter and per kW) in Nepali Rupees (NPR), we have converted the entire $7m SREP subsidy amount to NPR and performed all subsequent calculations according to the support provided on a per unit basis. The decision rule is that SREP reimbursement support to AEPC will be based on actual subsidy paid out, BUT limited to 20% of the total project cost, so if AEPC has provided more subsidy, it will be reimbursed only up to the 20% amount.
2) Calculations and Indian reference norms used are as follows:

Expected Capacity Creation and Emission Reductions by Promoting Setting up of Biogas Plants based on different Municipal, Industrial and Commercial Wastes for Generation of Electricity and / or Thermal Energy from the SREP Grant of USD 7.0 million for Investment Support

Input Parameters / Value used are as under -

i) Total SREP Grant for Investment Support USD 7.0 million

Or NPR 7× 99 = **NPR 693 million**

ii) Based on the discussion with AEPC and other stakeholders, it is presumed that the SREP Grant for Investment Support would be used as under –

Type of Projects

- 50 % of the total Investment Grants to support Commercial Biogas Plants;
- 20 % of the Grant to support Municipal Waste Projects; and
- the balance 30 % for supporting Institutional Biogas Plants

End use Application

- 50% of the aggregate capacity created (in each category) would be for electricity generation and the remaining 50 % for thermal application

iii) Indian reference norms: Biogas Production from different wastes and Biogas consumption on various end uses are as under –

Gas Production

Fresh cattle dung - 0.04 m^3 of gas/kg of dung/ day

m^3 [Distillery (spent wash), Sugar Mill Effluent, Milk Processing, Food & Fruits etc.]

Vegetable and Fruits Market Waste - 60 -80 m^3 of gas/tone of waste/day

Gas Utilization

Cooking - 0.3 m^3 of gas (0.28 – 0.42 m^3) / person/day

Biogas Lamps – 011 – 0.15 m^3 of gas/ hr. for 100 candle biogas lamp

iv) For Electricity Generation with 100% biogas engine, approx. 0.70 – 0.75 m^3 of biogas is required to generate 1 kWh of electricity (**or 1 m^3 of biogas can generate about 1.4 kWh of electricity**)

v) Digested manure/ organic manure production is generally 20% of the quantity of input feed (i.e. 200kg of organic manure at 50% moisture is produced if 1000 kg of animal dung is fed to the plant)

vi) In terms of energy content of biogas, 1 m^3 of biogas with average 60% methane content will have Heat Value(Calorific Value) as about **22.0 MJ/m^3** (Mega Joules per cubic meter)

vii) Eligible Subsidy for larger biogas plants as per Subsidy Policy for Renewable Energy 2069 BS issued by AEPC in February 2013 is as follows:

S. No	Biogas Systems	Subsidy Amount in Rs	
		Thermal Application per cum	**Electricity Generation per kW**
a)	Commercial Biogas Plants	**4,000**	**65,000**
b)	Institutional Biogas Plants for Public Institutions	**11,500**	**185,000**
c)	Community Biogas Plants with capacity more than 12 cubic meters	**9,000**	**150,000**
d)	Municipal Scale Waste to Energy Plants	50% of the total cost but not exceeding Rs. 50,000 per cum.	50% of the total cost but not exceeding Rs. 250,000/Kw, whichever is less.

viii) **GHG Mitigation** -The project activity will result in capturing of biogas / methane gas which otherwise released to the atmosphere in the absence of any treatment and the gas so produced then be used for electricity generation and /or thermal applications, avoiding emissions due to burning of fossil fuels. The three major streams for GHG mitigations are –

- Capturing of Methane from Waste by anaerobic treatment;
- Reduction in burning of fossil fuels (emission reduction from thermal power plants); and

- Organic Manure to avoid / substitute of Chemical Fertilizer (urea, DAP)

ix) The total avoided GHG emission due to biogas generation and power generation / thermal applications depend on baseline data [current practice of waste disposal, technology for waste treatment (leakage during the treatment process, and end utilization of biogas]. Average Normative values used for estimation of GHG reduction are as under –

- GHG due to decay of Cow dung that can generate 10,000 cubic meter of biogas – 12300 tCO_2 eq./annum
- GHG emission due to electricity generation – 5500 tCO_2 eq./annum
- GHG emission due to use of organic manure [substitution of chemical fertilizer] - 9700 tCO_2 eq./annum

x) Indian norms on greenhouse gas reduction (these are provided for information only, but the figures used for the Nepal SREP estimation are much more conservative, and are based on the amount of electricity generated only): The values of total GHG Emission Reduction taken for the estimation under Indian norms would have been:

- Generation of 10,000 cubic meter of biogas through anaerobic digestion and use of its digested slurry as organic manure – 22000 tCO_2 eq./annum

- Generation of 1 MW of power from 10,000 cubic meter of biogas through anaerobic digestion and use of its digested slurry as organic manure – 27500 tCO_2 eq./annum

Steps for reaching the values

i) SREP support for commercial plants as per assumption (ii) [50% of the total investment grant]
= NPR 693 million ÷ 2 [NR 693 million/ 2]
= NPR 346.50 million will be used to "buy down" the cost of commercial plants of which half will apply the biogas for electricity generation and half will be kept for thermal energy

ii) End use Application – 50% of the aggregate commercial capacity created would be for electricity generation and the remaining 50% for thermal application [assumption(ii)]

= NR 346.50 million ÷ 2 [NR 346.50 million/ 2]
= NR 173.25 million

iii) As per AEPC subsidy guidelines for the year 2013, eligible subsidy for per kW electricity generation from commercial plants is NR 65000 [assumption (vii)]
Aggregate Capacity in kW that can be created from the available funds for this category of projects [i.e. - NR 173.25 million]

= NR 173.25 million ÷ 65000 [NR 173.25 million/ 65000]
= 2,665.38 kW of generator capacity will be "purchased" through AEPC support
= 2.7MW [1000kW = 1MW]
We assume also (conservatively) that the generator capacity will initially be operated for 8 hours a day with the available biogas. That is one third of the day, or one third of 8,760

hours in a year, so a total of 2,920 hours. This is for commercial generators alone: 2.7MW*2920hrs= 7884MWh or 7.8GWh.

This calculation is repeated for the institutional and municipal investments and results in a total energy generation of 10.2GWh from all types of investments.

iv) CALCULATION OF THERMAL ENERGY: Similarly, as per AEPC subsidy guidelines for the year 2013, eligible subsidy for per cubic meter of biogas for thermal application from commercial plants is NR 4000 [assumption (vii)]
Aggregate Capacity in cubic meter of biogas that can be created from the available funds for this category of projects [i.e. - NR 173.25 million]

= NR 173.25 million ÷ 4000 [NR 173.25 million/ 4000]
= 43312.50 cubic meter of biogas

1 Cubic meter of biogas with an average methane content of 60% will have a heat value of about 22.0 MJ/m^3
= 43312.50 × 22.0 [1 m^3 = 22.0MJ]
= 952875 MJ
Or = 952.875 GJ [Giga joules – 1000MJ]

Total biogas capacity can also be represented in terms of MW [10000 m^3 of biogas can support a 1 MW power plant, but for smaller capacity generators the thermal energy required will be on the higher side – maybe 12,000 – 15,000 $m^3$of biogas because the conversion efficiency for biogas to electricity is significantly lower and varies from 26% for low capacity DG set to 38% for higher capacity DG set]. To continue with conservative assumptions, we will use 15,000 cubic meters per MW in order to derive the earlier result through another method and compare.

So for the total cubic meters of biogas generated, i.e. 43, 312 m3, using 15,000 m3/MW, we obtain 2.887MW of power generation which is close to the 2.7MW estimated by the other method that used the AEPC subsidy payments for purchase of outputs.
The net result for the commercial portion of the investment projects is

Similar steps have been followed for other categories of plants mentioned in the table

v) GHG emission reduction under the Indian reference norms using the values mention at assumption(x) for the 2.7MW is as follows:

= 2.7× 27500 = 74250 tCO_2 eq./annum

HOWEVER, our calculations have been based on GHG reduction per GWh using 793.7tCO2eq per GWh. This counts only the CO2 reduction and not the much more potent greenhouse gases such as methane and nitrous oxide. Also, it does not count the avoided emissions cost from use of chemical fertilizers (whose production also creates GHG).

The figures provided on the next page are therefore very conservative in terms of estimated climate change impact.

Expected Capacity Creation and Emission Reductions by Promoting Setting up of Biogas Plants based on different Municipal, Industrial and Commercial Wastes for Generation of Electricity and / or Thermal Energy from the SREP Grant of USD 7.0 million for Investment Support

S.No.	**Type of Biogas Plant**	**SREP Investment Support, in NR Million**	**Electricity Generation , kW per annum**	**Biogas Generation, Cubic Meters per annum**
i)	Commercial Biogas Plants	346.50	2665.38 (2.70MW)	43312.50
ii)	Municipal Waste to Energy Plants	138.60	277.20 (0.277 MW)	1386.00
iii)	Institutional Biogas Plants	207.90	561.89 (0.562 MW)	9039.13
Total		693.00	3504.47 (3.50 MW $_{electrical}$)	53737.63 (equivalent to 3.83 MW $_{electrical}$ using a conversion rate of 1.4kWh per cubic meter of biogas) Or Equivalent to 1182214 MJ at the rate of 22MJ per cubic meter of biogas = 1182 GJ
Estimates GHG Mitigation / CO_2 Abatement in tCO_2 eq./annum			3.5MW*2920hours= 10.22GWh	3.83MWeq*2920 hrs=11.18GWh
Total			16,970 tCO2 eq./annum using the reference figure of 793 tCO2 eq/GWh	

Annex 8: Photographs of Potential Biogas Plant Owners, and their Organic Waste creating Pollution and GHG emissions in the absence of energy recovery through Large Biogas Plants

Nepal: SREP-Supported Extended Biogas Project

FRUIT JUICE MAKING FACTORY BOILER (uses firewood to make steam, which is injected into fruit pulp to boil it)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Annex 9: Project Readiness and Pipeline of Projects Appraised

Nepal: SREP-Supported Extended Biogas Project

1. Twelve projects were presented by AEPC to the Bank at the time of appraisal, and a pipeline of 50 further projects that were preparing to apply for Extended Biogas support was also presented. All 12 feasibility studies and the excel sheet containing the list of 50 identified projects are available in project files.

The following write-up is taken from the B4B Consultant's Report detailing the initial pipeline of ready projects:

2. Introducing biogas in the business enterprises are not yet started in Nepal with clear strategy. Indeed, there is a necessity to introduce product innovation for enhancing the efficiency, durability and compatibility of biogas technology for new market segments like institutional biogas and+ introducing financial product development which will ensure timely disbursement of credit facilities through financial streams like climate investment and renewable energy insurance, to cover the post installation cares, maintenance of biogas units and thereby, promoting the sector. Besides, issues around equitable distribution, productive end-uses of the gas and slurry, and sustainability of the private sector are also major concerns.

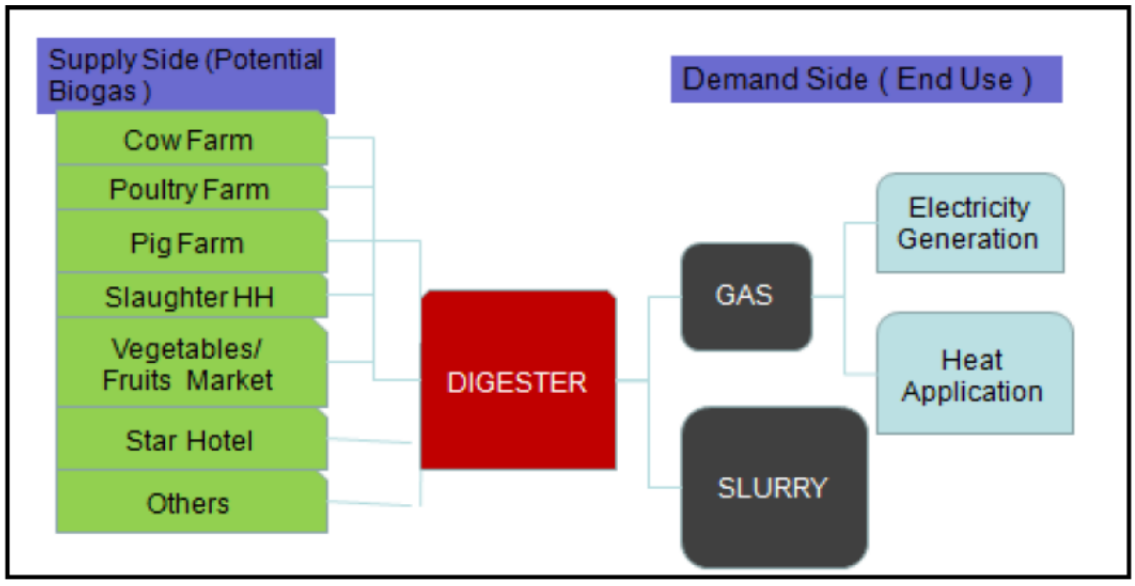

Figure 2: End Use applications of biogas system
(Source: SETM, 2012)

3. So far, little has been done in Nepal, and in the upcoming programmes in the renewable energy sector, viz., National Rural and Renewable Energy Programme (NRREP) and Scaling up Renewable Energy Programme (SREP), these concerns and issues are planned to address.

4. The most significant benefit of biogas plant is the transformation of organic wastes into high quality organic fertilizers as by-product slurry. The output from the biogas digester

(digested feed materials) is actually a high quality organic fertilizer. It is very important for developing countries like Nepal which is dominated by agriculture system. Nepalese farmers do not have enough resources to buy chemical fertilizers regularly. Bio-slurry is a pure organic fertilizer and contains high nitrogen. The composting process is achieved through microbe's activity and contains all required nutrients for crops and plants. Sustainable utilization of bio-slurry in a commercial way has to be established for business farms.

5. As provided information by commercial farms, till date almost all commercial or development banks are unwilling to provide huge amount of loan for biogas development in their farms. The reason behind this, biogas plants are difficult to move and/or sell. It can be seen that the financial crisis has further reduced owners' motivation to finance larger size biogas construction. Almost all business entities were found interested towards loan from BOK for biogas systems in competitive interest rate. BOK is also ready to bridge loan program for potential business entities but they must able to raise a certain amount of equity and prove project viability before providing a loan.

6. Among surveyed 20 larger size biogas plants, 16 plants were found not working properly. The reasons behind the failure of institutional/larger size biogas plants were observed as follows;

- Managerial problem
- Insufficient feeding
- Technology design faults/ no technical standards
- High cost for repair and maintenance
- In case of poultry farm, sedimentation is a major problem
- For community level, there is no responsible person for operation
- No frequently visits by installer companies

7. The survey reveals that the poultry farms and cow farms are the most potential sector for biogas business. Few poultry farms had already been practiced larger size biogas plants in their farms. However, due to sedimentation problem in fixed dome digesters (modified GGC 2047) they faced problems in short time.

8. Nowadays, all surveyed business segments are not only facing waste management problem but are also facing energy crisis for business run. Considering the fact, interested farms having huge potential of waste to convert into biogas and also having high energy demand were primarily considered. Moreover, these farms were found ready to financing the purposed biogas business project with BoK loan product in future.

9. Altogether 50 business companies/farms include 21 numbers of cow farms, 22 numbers of poultry farms, 3 pig farms, 1 slaughter house, 1 juice and fruits industry, 1 large hotel (Star hotel) and 1 other industry were identified.

10. The technological options available today can be optimally utilized to generate electricity by producing biogas in various enterprises and institutions. This can be done in various ways: inject the gas to the diesel generator and replace the fuel or install thermal generator and use the

produced gas as an input fuel. This will serve not only providing electricity services to the farm, it also help to reduce the exposure of greenhouse gases and manage the waste.

11. In order to build on the policy prepared and activities carried out towards utilizing biogas for power generation, a detailed feasibility of some of the interested enterprises is proposed so that the enterprises and the different supporting organizations will come forth with technical and financial propositions to realize the biogas power generation projects.

Table 1: Identification of the "most ready for financing"10 farms from different segments with their daily waste potential which have already completed their detailed Technical studies and show project viability, and owners are ready to put in equity funds for part of the digester costs

S.No	Name of the farms	Address	Owner	Type of Waste	Amount of Daily Waste Production [KG/Day)
1	Lumbini Agro Products & Research Center	Tikuligad, Rupandehi	Mr. Sashi Poudel	Cow dung	3,774
2	Parbatiya Krishi Sahakari Sanstha Limited	Sardikhola, Kaski	Mr. Baburam Acharya	Cow dung	2,250
3	Timilsina Livestock	Patihani-7, Chitwan	Mr. Khemraj Timilsina	Cow dung	1,200
4	Siddibinayak Livestock Farm	Lamatar-6, Lalitpur	Mr. Bishnu Kumar Chand	Cow dung	825
5	Khanal Poultry Farm	Chainpur, Chitwan	Mr. Deepak Khanal	Poultry litter	6,000
6	Subis Poultry Farm	Chainpur, Chitwan	Mr. Sunil Kumar Shakya	Poultry litter	6,500
7	Oli Agro Industries	Dang	Mr. Shreedhar Oli	Poultry litter	3,000
8	JB industries	Itahari, Sunsari	Mr. Ananta Bista	Juice & Fruits waste	550
9	Rastriya Pig Research and Training Centre	Jagate, Bhaktapur	Mr. Chandra Shekhar Sapkota	Pig Manure	1,140
10	Shangrila International (Slaughter house)	Itahari, Sunsari	Mr. Majhar Husain	Slaughter effluents	7,500

Data Source: SETM, 2012

Table 2: Energy demand of the selected 10 farms

S.No	Name of the farms	Electricity Unit [kWh]	Energy Demand (per month)			Total cost NRs/month	Remarks
			Diesel (Liter)	LPG Cylinder	Firewood Kg		
1	Lumbini Agro Products & Research Center	1450	419	6		63,850	
2	Parbatiya Krishi Sahakari Sanstha Limited	630	-	6	2570	32,610	
3	Timilsina Livestock	510	141			18,690	
4	Siddibinayak Livestock Farm	210	-		1000	11,890	
5	Khanal Poultry Farm	2,490	1,000			122,410	
6	Subis Poultry Farm	5,640	609			111,660	
7	Oli Agro Industries	6,240	525			108,660	
8	JB industries	2,520	163			38,980	

9	Rastriya Pig Research and Training Centre	360	160	2		22,220	
10	Shangrila International (Slaughter house)	25,000	6,000	10		839,900	

Data Source: Field Survey SETM, 2012

Table 3: Sizing and cost estimation of biogas system

S.No	Name of the farms	Size of Biogas Digester [Cu. Meter]	Cost for biogas plant installation [NRs)	Size of biogas generator [kW]	Cost for generator and electrical appliances [NRs]	Total Investment cost for biogas system [NRs]
1	Lumbini Agro Products & Research Center	302	3,029,200	60	1,725,000	4,754,200
2	Parbatiya Krishi Sahakari Sanstha Limited	180	110,000	40	1,325,000	3,135,000
3	Timilsina Livestock	96	970,000	20	925,000	1,895,000
4	Siddibinayak Livestock Farm	66	670,000	15	925,000	1,875,000
5	Khanal Poultry Farm	840	8,410,000	140	2,762,500	11,172,500
6	Subis Poultry Farm	910	9,110,000	180	3,225,000	12,335,000
7	Oli Agro Industries	420	4,210,000	80	1,762,500	5,972,500
8	JB industries	154	1,550,000	10	-	1,550,000
9	Rastriya Pig Research and Training Centre	182	1,834,000	50	1,325,000	3,159,000
10	Shangrila International (Slaughter house)	600	6,010,000	150	3,225,000	9,235,000

Annex 10: Documents in Project Files

Nepal: SREP-Supported Extended Biogas Project

1. Procurement Annex

2. Operational Manual and Procurement Plan

3. Terms of Reference of the members of the Technical Advisory Committee, i.e. the Independent Technical Expert and the Independent Commercial Expert.