

Document of
The World Bank

FOR OFFICIAL USE ONLY

PROJECT PAPER

FOR

SMALL RETF GRANT

IN THE AMOUNT OF SDR 1.6 MILLION
(US\$2.2 MILLION EQUIVALENT)

TO THE
GOVERNMENT OF UGANDA

FOR A

UGANDA CLEAN COOKING SUPPLY CHAIN EXPANSION PROJECT

December 4, 2015

Energy and Extractives Global Practice (GEEDR), Africa Region

This document has a restricted distribution and may be used by recipients only in the performance of their official duties. Its contents may not otherwise be disclosed without World Bank authorization.

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 1, 2015)

Currency Unit = Ugandan Shillings

UGX 3,312.00= US\$1

US\$ 1.38 = SDR 1

FISCAL YEAR 2016

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ACCES	Africa Clean Cooking Energy Solutions
ADALYs	Averted Disability-Adjusted Life Years
AFREA	Africa Renewable Energy Access Program
BDM	Becker-DeGroot-Marschak experiment
BEST	Biomass Energy Strategy
CA	Consumer Acceptance
CAGR	Compound Annual Growth Rate
CAS	Country Assistance Strategy
CO ₂	Carbon dioxide
CREEC	Centre for Research in Energy and Energy Conservation
DCF	Distribution Challenge Fund
EnDEV	Energizing Development
EOI	Expression of Interest
ERT	Uganda Energy for Rural Transformation
ESMAP	Energy Sector for Management Assistance Program
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoU	Government of Uganda
HAP	Household Air Pollution
IPF	Investment Project Financing
ISDS	Integrated Safeguards Data Sheet
IVA	Independent Verifying Agent
KPT	Kitchen Performance Test
LPG	Liquefied Petroleum Gas
MEMD	Ministry of Energy and Mineral Development
MoFPED	Ministry of Finance Planning and Economic Development
MTR	Mid-Term Review
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
PDO	Project Development Objective
RFP	Request for Proposals

SCC	Social Cost of Carbon
SME	Small and medium-sized enterprises
SORT	Systematic Operations Risk-Rating Tool
SSA	Sub-Saharan Africa
UNACC	Uganda National Alliance for Clean Cookstoves
VAT	Value-added tax
WTP	Willingness to Pay

Regional Vice President:	Makhtar Diop
Country Director:	Diarietou Gaye
Sector Director:	Charles Feinstein
Sector Manager:	Lucio Monari
Task Team Leader:	Jan Kappen

UGANDA
Uganda Clean Cooking Supply Chain Expansion Project

TABLE OF CONTENTS

	Page
I. STRATEGIC CONTEXT	1
A. Country and Sectoral Context	1
B. Higher Level Objectives to which the Project Contributes	6
II. PROJECT DEVELOPMENT OBJECTIVES	7
A. PDO.....	7
B. PDO Level Results Indicators.....	7
III. PROJECT DESCRIPTION	8
A. Project Components	8
B. Project Financing	10
Instrument	10
Project Cost and Financing	10
IV. IMPLEMENTATION	11
A. Institutional and Implementation Arrangements	11
B. Results Monitoring and Evaluation	11
C. Sustainability.....	11
V. KEY RISKS.....	12
A. Systematic Operations Risk-Rating Tool (SORT).....	12
B. Overall Risk Rating Explanation	12
VI. APPRAISAL SUMMARY	13
A. Economic Analysis	13
B. Financial Management.....	16
C. Procurement	16
D. Implementation Arrangements.....	17
E. Environmental and Social safeguards	17
F. Monitoring & Evaluation	17
G. Role of Partners.....	18

Annex 1: Results Framework and Monitoring	19
Annex 2: Detailed Project Description.....	20
Annex 3: Summary of the Willingness to Pay and Consumer Acceptance Trial.....	28
Annex 4: EoI containing the criteria and steps to application for the DCF	31
Annex 5: Economic Analysis Details.....	35

DATA SHEET

Uganda

Uganda Supply Chain Expansion Program

Small RETF Grant Project Paper

Sub-Saharan Africa

Energy & Extractives (GEEDR)

Basic Information			
Date:	November 11, 2015	Sectors:	Energy
Country Director:	Diarietou Gaye	Themes:	
Practice Manager/Director:	Lucio Monari / Chas Feinstein	EA	C
Project ID:	P153679	Category:	
Instrument:	Small RETF Grant – Investment		
Team Leader(s):	Jan Kappen		
Recipient Government of Uganda			
Executing Agency: Private Sector Foundation Uganda (PSFU)			
Contact:	Mr. Gideon Badagawa	Title:	Executive Director
Telephone No.:	+25631263850	Email:	
Project Implementation Period:	Start Date: March 30, 2016	End Date:	June 30, 2018
Expected Effectiveness Date:	March 15, 2016		
Expected Closing Date:	June 30, 2018		
Project Financing Data(US\$M)			
☐ Loan	☒ Grant	☐ Other	
☐ Credit	☐ Guarantee		
For Loans/Credits/Others			
Total Project Cost :	\$2.2 million	Total Bank Financing :	n/a
Total Co-financing	n/a	Financing Gap :	n/a

.			
Financing Source		Amount(US\$M)	
BORROWER/RECIPIENT			
IBRD			
IDA: New			
IDA: Recommitted			
Others			
Financing Gap			
Total			
.			
Expected Disbursements (in USD Million)			
Fiscal Year	FY16	FY17	FY18
Annual	\$0.2 million	\$1.2 million	\$0.8 million
Cumulative	\$0.2 million	\$1.4 million	\$2.2 million
.			
Project Development Objective(s)			
The Project Development Objective is to expand both access to and adoption of cleaner and more efficient cooking technologies.			
.			
Components			
Component Name		Cost (USD Millions)	
Distribution Challenge Fund		\$1.85 million	
Implementation of a Quality Assurance & Technical Support program		\$0.14 million	
Institutional Development and Operational Support		\$0.14 million	
Contingencies		\$0.07 million	
.			
Compliance			
Policy			
Does the project depart from the CAS in content or in other significant respects?		Yes []	No [x]
.			
Does the project require any exceptions from Bank policies?		Yes []	No [x]
Have these been approved by Bank management?		Yes []	No []
Is approval for any policy exception 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 Waters OP/BP 7.50				X
Projects in Disputed Areas OP/BP 7.60				X
Legal Covenants				
Name	Recurrent	Due Date	Frequency	
Description of Covenant				
Team Composition				
Bank Staff				
Name	Title	Specialization	Unit	UPI
Jan Kappen	Senior Energy Specialist	TTL	GEEDR	256705
Besnik Hyseni	Energy Specialist	Operational Lead	GEEES	366895
Olivia Byanyima	Consultant	Consultant	GEEDR	490895
Howard Bariira Centenary	Senior Procurement Specialist	Procurement	GGODR	321500
Paul Kamuchwezi	Financial Management Specialist	Financial Management	GGODR	339900
Martin Fodor	Senior Environmental Specialist	Environmental Safeguards	GENDR	109226
Paivi Koskinen-Lewis	Social Development Specialist	Social Safeguards	GSURR	350740
Mazhar Farid	Legal Analyst	Legal	LEGAM	020779
Non Bank Staff				
Name	Title	Office Phone	City	

.					
Locations					
Country	First Administrative Division	Location	Planned	Actual	Comments
.					

I. STRATEGIC CONTEXT

A. Country and Sectoral Context

- 1. About 95 percent of Ugandans still use solid biomass fuels for cooking and although 12 percent have access to electricity, the majority of electrified households continue to use wood and charcoal.**¹ About 73 percent of the population uses firewood while 23 percent uses charcoal as their primary cooking fuel. The use of modern fuels such as Liquefied Petroleum Gas (LPG) is very low at 0.5 – 1 percent and is expected to remain at this level in the short to medium-term. Biomass fuels have become increasingly costly due to the escalating pressure on forest resources. As a result, the share of household expenditures for solid cooking fuels in Uganda is one of the highest across Sub-Saharan Africa (SSA).² While the country's lowest quintile spends an average of 9 percent of household incomes on woodfuels, the highest quintile expends about 15 percent on cooking fuels,³ mostly as a result of ever increasing charcoal prices.
- 2. Uganda's population growth exerts considerable pressure on natural resources, especially on forests.** At present, the country has the second highest birth rate in the world with a Compounded Population Growth Rate (CAGR) of 3.2 percent, further increasing the demand for natural resources especially in and around the largest cities. Pressure on forests in Uganda is mainly driven by forest clearings for agriculture and settlements but also by the escalating demand for woodfuels. From 2000-2010, Uganda had the fifth highest deforestation rate in SSA,⁴ with an average rate of deforestation of 2.46 percent during this period.
- 3. Exposure to household air pollution (HAP) in Uganda is estimated to significantly impact the health of over 20 million people and cause over 13,000 deaths every year.**⁵ About 3.8 million households cook on open fires in enclosed spaces and nearly 1 million additional households are exposed to carbon monoxide from traditional charcoal stoves. HAP is responsible for 8.2 percent of infant deaths due to acute lower respiratory infections including pneumonia. Concentrations of indoor respirable pollutants have been found to be extremely high in households included in a study carried out in three divisions of Kampala District.⁶
- 4. The Government of Uganda (GoU) acknowledges the biomass energy issue as an important development challenge and is taking steps to address it via a joint coordination framework.** The "Uganda Renewable Energy Policy Objectives and Strategies" document broadly emphasized "utilizing biomass energy efficiently so as to contribute to the management of the resource in a sustainable manner" and more specifically "scaling-up the adoption of efficient charcoal fuel stoves from 20,000 currently to 2,500,000

¹ Clean and Improved Cooking in Sub-Saharan Africa - A Landscape Report. The World Bank 2015.

² Ibid.2

³ Expenditure of Low-Income Households on Energy. http://siteresources.worldbank.org/EXTOGMC/Resources/336929-1266963339030/eifd16_expenditure.pdf

⁴ State of the Clean Cooking Sector in SSA

⁵ http://www.cleancookstoves.org/resources_files/uganda-market-assessment-mapping.pdf

⁶ http://fuelsubstitution.energyprojects.net/links/Biomass_health_uganda.pdf

households by 2017 and increase the adoption of efficient fuelwood stoves from 170,000 currently to 4,000,000 by 2017.”

5. **The adverse impacts of household air pollution on health are noted in Uganda’s National Biomass Energy Demand Strategy** including a specific objective to "sensitize women on energy source and technology choices in order to reduce the labor and health burdens associated with biomass energy use."⁷
6. **The GoU is currently strengthening the inter-ministerial dialogue for the sector with the development of a national Biomass Energy Strategy (BEST).** BEST is a joint coordination framework for the Ministries of Health, Housing, Environment and Energy on the development and implementation of national policies and regulations for clean cooking solutions. The BEST under biomass demand interventions recommends to “increase awareness of benefits in the energy (including overall cost) savings related to fuel and appliance (stove and cooking appliance) choice especially in urban areas where the cost of energy is critical.” It also recognizes that biomass energy will remain the primary source of energy for households for the foreseeable future “because biomass will continue for several decades to play a major role in the economy of Uganda, investment in efficient, clean and less polluting biomass energy devices should be a priority if poverty eradication targets are to be achieved.”
7. **The rate of improved cookstove adoption nationally has remained low.** For the past decade, the Ministry of Energy and Mineral Development (MEMD) has been leading the GoU’s agenda on clean cooking, most importantly by running the Modern Biomass for Rural Development program, whose main objective is to promote the sustainable use of indigenous and environmentally friendly fuels derived from biomass to generate electricity for productive use and thermal energy. MEMD currently also manages the Promotion of Renewable Energy and Energy Efficiency program that seeks to disseminate 50,000 household improved cook stoves, 400 institutional cooking systems and to save 350,000 tonnes of fuel wood each year. Finally, the Global Alliance for Clean Cookstoves is working with the MEMD to reach 3 million households or 15 million people with access to clean cooking technologies and services by 2017. However, Despite the GoU’s efforts, high potential demand for clean cookstoves, and a plethora of government and donor interventions⁸, the adoption of improved cookstoves has remained far below 10 percent.⁹ However, with a large and growing number of consumers having the ability to pay for improved cookstoves, and 36 percent of rural households spending a significant and growing share of their monthly incomes on fuelwood,¹⁰ the economic case for efficient cookstoves is stronger than ever before.¹¹ Based on recent analysis, Uganda’s potential market for improved cookstoves consists of more than 4.5 million households in rural areas plus another 1.5 million in the urban centers.¹²

⁷ Uganda National Biomass Energy Demand Strategy 2001 – 2010

⁸ See Annex 6 for the full overview of Ugandan clean cooking stakeholders and initiatives.

⁹ Uganda Bureau of Statistics (UBOS) Household survey, 2009/2010

¹⁰ The majority of rural Ugandan households lives on less than US\$3 per day and spends more than US\$8 per month on biomass fuels.

¹¹ Shell Breathing Space research, 2007

¹² <http://www.energyprogramme.or.ug/wp-content/files/JSRREPORT.pdf>

8. **While Uganda has more than 50 privately-owned cookstove producers, many are operated as non-profit NGOs, most are producing no more than 100 units per month, and only a handful have potential for mass production.**¹³ Apart from a lack of technology transfer and centralized manufacturing facilities, the status quo is also a result of the patchy integration of domestic production into local supply chains. While past sector strategies and resources have been focused on creating supply-push through the scaling of cookstove production volume, the rest of the supply chain has not grown accordingly and lacking distribution networks are constraining further market growth. Most importantly, with stove distribution being limited to a few poorly capitalized distributors, cookstove manufacturers have to shoulder the entire burden of inventory financing and working capital need on behalf of their sales intermediaries. Consequently, the production sector is suffering from continuously eroding margins and lacking resources for reinvestment in production capacity. This impedes manufacturers to build the economies of scale and product innovation needed to remain competitive and meet evolving consumer demand.
9. **The weak supply chain limits the exposure of consumers to more advanced and attractive state-of-the-art technology, chokes demand growth, and ultimately leads to market spoilage.** With lacking point-of-sale feedback from a sufficiently broad network of commercial distributors, manufacturers find themselves “in the dark” with insufficient sales data and market intelligence on consumer preferences and willingness to pay to make informed investment decisions. Moreover, with “traditional” stove support continuing to support an aggressive supply-push of locally manufactured products through non-commercial channels such as subsidized distribution by (mission-driven) NGOs and the manufacturers themselves, negative effects such as market spoilage and oversupply are becoming increasingly prevalent.
10. **Supply and manufacturing capacity lag far behind the magnitude of the public health challenge.** With over 20 million people impacted by HAP-related pollution, and market penetration of cleaner and more efficient stoves stagnating far below achievable target levels, new and more effective private sector led approaches are needed to match the both the magnitude and urgency of the public health issue. Given the current limited number and capacity of stove manufacturers, reaching the GoU’s above goals would require (i) a more than 100-fold scale-up in the adoption of cleaner and more efficient stoves in combination with (ii) a significant upgrading of both quality and performance of stoves currently on the market. Annex 7 illustrates that the change from “improved” stoves, that only produce very limited (if any) health benefits, to “clean” solutions is not a gradual one, but necessarily involves significant technology transfer and thus a far-reaching adjustment of policies and incentives in the sector.
11. **Even with a radical scale-up of support for domestic manufacturing, it is highly unlikely that Ugandan cookstove producers alone will be able to reach the necessary scale** within the required (2-3 year) timeframe. Even more so, since local manufacturers simultaneously have to catch up with international producers to reach the required stove

¹³ <http://community.cleancookstoves.org/files/132>

performance standards in terms of durability, efficiency and the “aspirational appeal” needed to drive consumer demand.

12. **Supply-side transformation - need to foster private sector-led centralized production and technology transfer.** Significant investments are needed to design and manufacture clean and state-of-the-art efficient cooking technology, including robust production processes to ensure consistent quality control and performance. This is particularly important given the GoU’s focus on health benefits. In order to deliver reductions of household air pollution at scale, centralized manufacturing models will be prerequisite to securing the needed minimum quality and performance. Consequently, the most suitable way to reach economies of scale is to provide targeted assistance to a limited number of larger, more established manufacturers and foster technology transfer through partnerships between Ugandan and international industry leaders, rather than to extend more generic support to a large number of local artisans. Within this context, local assembly of imported high quality stove components can be a powerful catalyst for speeding up technology transfer. Many of the best stoves available globally can be imported “flat-packed”, thus enabling high local labor content for their assembly, and increased local component production over time, once demand is established at critical minimum levels.
13. **Insufficient demand to trigger needed sales growth and momentum.** National stakeholder consultations and a recent market survey commissioned by the Bank¹⁴ revealed a persistent lack of awareness among consumers of the many benefits of clean stoves and fuels. While significant analytic efforts have been undertaken to better understand and influence consumer behavior, past public awareness campaigns were often underfunded and poorly coordinated with actual stove availability. Moreover, instead of supporting the commercial marketing of aspirational stove products, awareness raising efforts were mostly focused on the important, yet abstract advantages of clean cooking solutions including their health and environmental benefits. A plethora of market research shows that this strategy is clearly at odds with consumer perceptions: households typically attribute much greater value to monetary savings from reduced fuel use and to the ease of use and aspirational appeal of modern cookstoves. As a result, even though overall consumer awareness has grown somewhat, past engagement efforts have not triggered significant additional sales, and willingness to pay for stoves that would save time, money and may, to a certain extent, also improve health outcomes, remained largely unchanged.
14. **Sustainable demand-side transformation - Boosting demand through commercial sales campaigns, instead of “buying temporary behavior change” through subsidies.** A recent survey of Ugandan households and experience with the Bank’s recent “Lighting Africa” project, show that to create an effective product experience and boost sales, trial periods and direct marketing are often far better tools than subsidized prices and donor-led awareness building. Study results in Uganda show that a free stove trial followed by a rent-to-own offer increased uptake by between 45% and 57% compared to a traditional cash and carry sale.¹⁵

¹⁴ See Annex 3: Summary of Willingness to Pay and Consumer Acceptance Trial.

¹⁵ Levine/Cotterman (2012). What Impedes Efficient Adoption of Products? Evidence from Randomized Variation in Sales Offers for Improved Cookstoves in Uganda.

When consumers in Kenya were left with a solar lamp for five days, their willingness to pay for the product increased by up to five times, indicating that customers need to build a personal level of trust with the product before committing financially. The beneficial effect of such trial periods is particularly strong with poor populations who are often especially suspicious of advertising and prefer to rely on their own direct experience of new products. However, within the Ugandan context, large free-trial campaigns, generating direct exposure at sufficient levels, represent a prohibitive cost and risk to the large majority of poorly capitalized distributors. Moreover, a sufficiently powerful market-pull through commercial sales can only be achieved if taxes and duties on imported components allow so. Otherwise, local assemblers and manufacturers of high quality stoves will not be able to produce and import stoves and components at competitive cost, and demand will continue to stagnate.

15. **Missing supply chain linkages hampering the reconciliation of supply and demand.** Results from the abovementioned survey show that patchy supply chains and costly distribution logistics remain the key barriers for the Uganda market for high quality, high benefit cookstoves to reach scale. Inefficient supply chains limit growth by hampering the efficient matching of supply and demand and imposing narrow limits to the access of customers to stove products in the first place, thereby making awareness raising efforts virtually pointless. Moreover, due to the lack of suitable distribution channels and sufficiently capitalized intermediaries, stove manufacturers and importers have to bear the entire cost burden of making their products available locally. As a result, consumer prices for advanced cookstoves are bound to remain high, with producers having neither the resources nor the incentives to further stimulate demand or grow production.
16. **Supply chain integration - relieving manufacturers of the working capital burden.** Successful large-scale stove distribution models are always unique in their respective market segments, with the cost of their development and scale-up “from the ground up” often far exceeding the resources of individual manufacturers. More specifically, building efficient sales channels require jump-starting demand and distribution simultaneously to achieve the minimum sales volumes necessary to support the cost of inventories, working capital and the aggressive marketing of products new to consumers. Consequently, helping undercapitalized Ugandan distributors take on working capital risk, will immediately free up resources for distributors to invest in marketing and delivery channels, and for manufacturers to focus on driving product quality and innovation.
17. **Aiming at the most accessible urban and peri-urban market segments.** In order to rapidly foster market growth and economies of scale, the project will primarily focus on the two largest and most accessible market segments (i) of urban and peri-urban charcoal users and on (ii) peri-urban households using firewood or looking to convert from the increasingly expensive charcoal to firewood. By design, this opportunistic approach to foster private sector growth by harvesting the “low hanging fruit” first is likely to have little if any impact on rural “base-of-the-pyramid” populations during the duration of the project. However, by virtue of promoting commercial distribution and large-scale, centralized production models, this approach is expected to drive the necessary economies of scale to progressively reach lower income segments and rural households in the medium term.

18. **Simultaneously working on both ends of the spectrum.** Taking into account that the proposed approach will likely be slow to “trickle down”, the Bank is implementing a number of complementary activities to more directly target the poorest and most vulnerable populations that typically benefit most from improved stove technologies. Within this context, a Bank-executed activity is currently ongoing in Uganda, Kenya and DRC, to develop innovative Base-of-the-Pyramid business models for private sector-led cookstove dissemination in the largest refugee camps and slums throughout SSA.¹⁶

B. Higher Level Objectives to which the Project Contributes

19. **The proposed additional financing is well aligned with the Uganda Country Assistance Strategy (CAS) for 2010-2015.** Among other essential challenges identified, “Arresting environmental degradation and natural resource depletion” has been identified in the CAS as a key development issue. The document acknowledges that despite efforts to improve institutions for environmental management and sustainable use of natural resources, the depletion of Uganda's natural resources and degradation of the environment is constraining growth. The document also recognizes that “there is a high level of deforestation and forest degradation in Uganda while household expenditures for these fuels that are the principal sources of energy have doubled during the last 15 years.”
20. **As part of its strategic objective to promote inclusive and sustainable growth, one of the CAS outcomes is to improve conditions for private sector growth.** The Bank will support government efforts to improve land registry, streamline regulations, and deepen the financial sector. IFC’s work has also focused on collaboration with intermediaries for SME finance.

¹⁶ “Private Sector-Led Approaches for Cookstove Dissemination – Trialing Innovative Base of the Pyramid Business Models in Refugee Camps and Slums”

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

21. The Project Development Objective is to reduce both (i) the economic burden on households and (ii) the negative impacts on the environment, of the inefficient use of solid biomass fuels for cooking by fostering sales and adoption of cleaner and more efficient cooking technologies.
22. Furthermore, the successful implementation of the activity will make the case for mainstreaming cleaner and more efficient cooking solutions into energy sector investment in SSA by demonstrating how to efficiently leverage local and foreign private investment with scarce IDA and other public resources, and build gradually towards technologies that can achieve substantial health improvement outcomes.

B. PDO Level Results Indicators

23. **The key results** expected from the proposed project will be:

- (i) Increase market penetration of improved cookstoves that meet the minimum performance standards as defined by MEMD¹⁷ by at least 100,000 households (measured as incremental sales of stove models supported under the project);
- (ii) Reduce household expenditures on cooking fuels (kg/household/month for sampled households in comparison with control group) of verified incremental stove buyers by an average of at least 20 percent.
- (iii) Reduce climate impact of household emissions resulting from the inefficient use of biomass (tons of CO₂ emissions/household/year) by an average of at least 20 percent.
- (iv) Increase the number of new enterprises in the clean cooking sector by at least 7.

24. The above results are to be compared to the following baseline:¹⁸

- (i) With an estimated total of 830,000 households in project area, the current market penetration of improved cookstoves that meet the minimum performance standards as defined by MEMD is 14 percent for charcoal users and 6% of firewood users.
- (ii) With an estimated average fuel consumption in the project area of 620 kgs per household per year for charcoal users and 4,950 kgs per household per year for

¹⁷ Approved products are determined in accordance with results of performance tests carried out with assistance of the Bank's ongoing ACCES initiative.

¹⁸ All of the below baseline values have been extracted from the "Willingness to Pay and Consumer Acceptance Assessment for Clean Cooking in Uganda" by Rebel Group Consortium (10/2015)

woodfuel users, the current average household expenditure on solid cooking fuels amounts to UGX 413,000 or USD 127 per household per year.¹⁹

III. PROJECT DESCRIPTION

A. Project Components

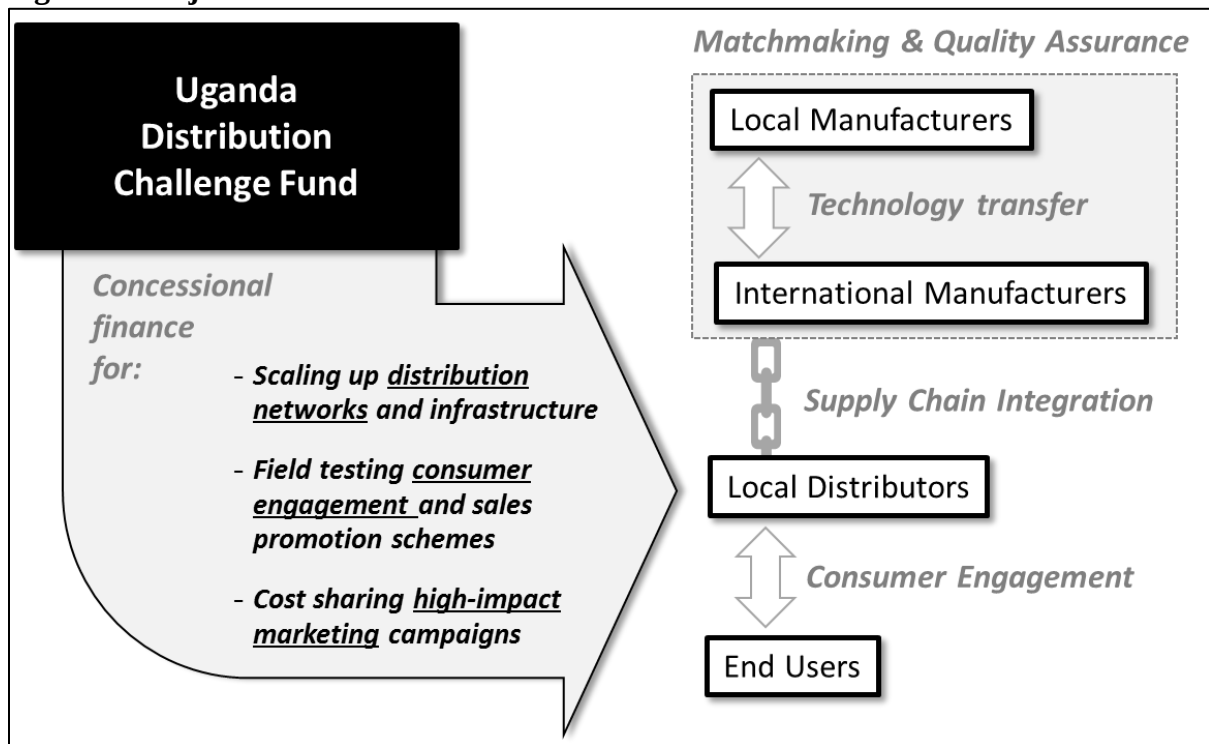
25. The proposed project will: (i) foster the large-scale dissemination of cleaner and more efficient stoves through commercial distributors, (ii) facilitate the integration and strengthening of local stove supply chains through “matchmaking” between manufacturers and distributors, (iii) support the development and field testing of high-impact marketing and consumer engagement schemes; and (iv) roll-out a rigorous quality assurance and technical support program in support of local manufacturers.
26. Component 1 – “Distribution Challenge Fund (DCF)” (US\$1,850,000). Under this component, the Private Sector Foundation Uganda (PSFU) will provide working capital and transaction cost support in the form of competitive grants to help both existing and new commercial distributors expand the supply chain for improved cookstoves eligible under the program, carry out high-impact marketing and sales campaigns, and build partnerships with international manufacturers. The provision of competitive grants and incentives will reduce working capital cost and risk for manufacturers, including stove importers and local assemblers of internationally sourced components. This will boost market penetration and free up manufacturers’ resources to expand and upgrade their production capacity. The grant support will only be available to distributors of approved stove models that comply with minimum performance levels to be determined by MEMD.²⁰ The structure of the grant mechanisms, including eligibility criteria of beneficiaries, has been developed and will be finalized in close cooperation with MEMD, PSFU, the Uganda National Alliance for Clean Cookstoves (UNACC) and other local and international industry stakeholders. Considering the Ugandan sector landscape, the grant will be targeting a small number of domestic distributors and incentivize (i) the development of partnerships between distributors and international and local manufacturers as well as (ii) technology transfer through investment in local assembly and production by international industry leaders.
27. Component 2 - Quality Assurance & Technical Support (US\$140,000). The project will help establish a framework for enhancing market transparency and consumer confidence through: (i) product testing in the lab and/or field to determine whether minimum performance requirements are met and ensure the consistent quality of stoves manufactured by beneficiaries of the DCF throughout the duration of the project, and (ii) monitoring and verification of stove adoption and performance.
28. Component 3 – Public Sector Outreach and Demonstration (US\$140,000). Throughout many parts of Uganda, the rising demand for woodfuel has significantly increased pressure on

¹⁹ This value accounts for the effects of both multiple fuel usage (aka “fuel stacking”) and partial substitution of costly charcoal through more economical firewood through the use of imported gasifier stoves in a limited number of households.

²⁰ For component details including grant disbursement trigger details and the EoI describing the selection process, please see Annex 2 and Annex 4.

forests and the overhead cost of many public institutions relying on firewood for the provision of process heat and cooking energy. The primary education sector is particularly affected by this development with escalating fuelwood prices continuously increasing the cost of running and operating public schools, and resulting in a steadily growing cost burden on student parents and the GoU. Within this context, component 3 will support the MEMD as the implementing entity, to demonstrate both the economic and environmental benefits of modern combustion technology for public schools relying on woodfuel for their daily cooking needs. The activity will draw on MEMD's prior experience with improved cooking technologies in 24 public schools throughout Uganda.

Figure 1: Project Overview



B. Project Financing

Instrument

29. Investment Project Financing (IPF)

Project Cost and Financing

30. The recipient-executed grant provided to the GoU will be funded by the Africa Renewable Energy Access Program (AFREA) under the Energy Sector for Management Assistance Program (ESMAP) of the World Bank.
31. All project preparation activities have been financed from a separate allocation under the Bank-executed Africa Clean Cooking Energy Solutions (ACCES) umbrella program.

Figure 2: Project Cost and Financing

Project Components	Project cost	Grant Financing	% Financing
1. Distribution Challenge Fund (including procurement, administrative and operating costs)	\$1,920,000	\$1,920,000	87
2. Implementation of a Quality Assurance and Technical Support program	\$140,000	\$140,000	6
3. Institutional Outreach and Development (including operating costs)	\$140,000	\$140,000	7
Total Project Costs	\$2,200,000	\$2,200,000	100

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

32. Implementation arrangements: The proposed project will be implemented by the Private Sector Foundation of Uganda (PSFU) for components 1 and 2, and by MEMD for component 3. Moreover, MEMD will define the project's key policies with regards to level of incentives and stove performance thresholds.
33. Flow of Funds: The grant financing will be provided to the Ministry of Finance, Planning and Economic Development (MoFPED) who will transfer the funds for the implementation of all the project components to PSFU (project implementing unit). PSFU will sign a subsidiary agreement with MoFPED and will subsequently submit withdrawal applications with MoFPED for approval and signing. The funds will flow to the designated account for PSFU for the management of funds. The funds will include provisions for operational expenses for PSFU and MEMD to carry out the project.

B. Results Monitoring and Evaluation

34. All activities, disbursements and results related to component 1 will be closely monitored by an Independent Verifying Agent (IVA), while the monitoring of components 2 and 3 will be ensured by PSFU in conjunction with MoFPED. The behavior change and technical aspects of the project's results framework including the monitoring of household stove usage and adoption, stove performance, household fuel savings and emission reductions will be derived from data provided by the IVA and corroborated through spot checks, lab testing and field visits by a team of specialized local consultants and the Ugandan Centre for Research in Energy and Energy Conservation (CREEC). The mid-term review (MTR) of the project will be undertaken by the Bank team while the final evaluation of the project will be carried out by an independent consultant.

C. Sustainability

35. The project's primary activities are all designed to ease market barriers and contribute to the overall development of the sector by easing working capital constraints and fostering technology transfer. In addition to removing market barriers, the project is expected to contribute to the further mainstreaming of cleaner and more efficient cooking activities into the Bank's and other development partners' activities in the energy and environment/climate sectors in Uganda. The mainstreaming of innovative and targeted clean cooking support will reinforce project sustainability in the short to medium term. However, the project's long term sustainability will hinge on the ability of the project's private sector beneficiaries to reinvest the resources provided by the project into building the economies of scale and product innovation needed to remain competitive and meet evolving consumer demands.

V. KEY RISKS

A. Systematic Operations Risk-Rating Tool (SORT)

Risk Categories	Rating (H, S, M or L)
1. Political and governance	M
2. Macroeconomic	M
3. Sector strategies and policies	H
4. Technical design of project or program	S
5. Institutional capacity for implementation and sustainability	M
6. Fiduciary	M
7. Environment and social	L
8. Stakeholders	M
9. Other	n/a
Overall	M

B. Overall Risk Rating Explanation

36. The overall risk rating for the project is moderate with most categories not representing any major risks to project implementation and desired outcomes. However, the technical design category has been rated as substantial since the project is based on a first-of-a-kind innovative approach yet untested in the clean cooking sector. Consequently, although the approach is a result of substantial preparatory activities including extensive willingness to pay and consumer acceptance trials, there are considerable residual risks associated with the readiness of cash constrained consumers to adopt more advanced technologies.
37. Moreover, risks related to sector strategies and policies have also been rated as substantial, since current import duties and VAT applied to imported cookstoves could significantly hamper the effectiveness of the project's grant and incentive payments. Within this context, project success and market growth will greatly depend on the GoU's commitment to lowering trade barriers for imported cleaner cooking technologies, also the rationale for rating the risk of sector strategies and policies as high. During project preparation, MoFPED expressed its commitment to discuss and review the application of tariffs and taxes on relevant stoves, components and equipment for stove manufacturing with the relevant authorities. ACCES has recently produced a trade barriers study, which examines the role and the level of import duties and other taxes on the clean cooking sector and plans to use the data from the study as a tool to present to GoU in order for duties to be slashed or reduced so that the sector can grow and open up employment opportunities along the entire value chain.

VI. APPRAISAL SUMMARY

A. Economic Analysis

38. An economic analysis is presented below based on a discounted cash flow analyses of the assumed and recorded economic values of defined benefit streams and full disbursement of the proposed IDA grant. The results are presented in terms of Economic Internal Rates of Return, and Net Present Value at a discount rate of 10 percent. To provide for a more detailed view of economic value creation of the project, the aggregate project-wide return is reflected as the NPV of each major benefit stream. Wherever values are estimated, the team chose the most conservative values compared to the available literature. Notes on the quantification of each parameter leading to benefits valuations are provided in Annex 5.
39. On the cost side, it is assumed that project funds are disbursed on effectiveness (year one), and at the end of year two and three as follows: US\$250,000, US\$750,000, and US\$700,000. The key performance metric for the project is that 100,000 improved cookstoves will be sold through the provision of project-funded incentives for distribution and sales by the end of year two of the project. Given the project's emphasis on shifting the national stove fleet profile to higher average thermal efficiency and better emissions performance, the profile of stoves sold per this analysis is necessarily dominated by imported charcoal and wood stoves. Stove distribution by type and year assumed in the analysis is as follows, with half the imported woodstoves in use in urban areas, displacing both charcoal and firewood, and half in rural areas displacing gathered firewood only.

Figure 3: Sales Forecast by Stove Type and Fuel

Stove Type	Sold in First Year	Sold in Second Year
Imported Charcoal Stove	19,250	35,750
Local Charcoal Stove	10,500	19,500
Tier 3 Efficient Wood stove: Urban Use	2625	4875
Tier 3 Efficient Wood stove: Rural Use	2625	4875
Total	35,000	65,000

40. The stoves are assumed to deteriorate at a speed of 5 percent per annum for each stove and to have lifetimes of 3 years for imported wood stoves²¹, 2 years for imported and local charcoal stoves. For certain of the benefits streams, data on the performance of specific stoves in the ACCES-funded Willingness to Pay and Consumer Acceptance (WTP/CA) Survey conducted between April and August, 2015, have been utilized as representative of the category, but with no implication that these stoves will be the beneficiary of project-funded incentives for expanded distribution and end-use.

²¹ For the analysis, the minimum performance tier for imported wood stoves was set as IWA Tier 3, in line with the performance standard established by MEMD for the purpose of this project. For an overview of stoves and performance tiers, please see Annex 7.

41. Benefit streams have been separated into (i) household expenditure savings; (ii) productivity and health improvements; and (iii) climate change mitigation benefits. Values for these benefits have been derived as follows:²²

- Household Expenditure Savings: Prior to project appraisal, the Bank funded a WTP/CA survey to assess the performance of seven different stoves in 385 Ugandan households including the fuel savings for each stove compared with the baseline. Translating these measured fuel savings into US dollars at current exchange rate and fuel prices yields the daily average expenditure savings across sampled households. These data points are aggregated in the economic model as annual household savings per stove by type of stove. These aggregated indicators reflect savings achieved at the household level after injecting the new stove into the mix of existing stoves. For the purpose of a conservative analysis, all calculations assumed the continued use of existing traditional stoves (aka “stove stacking”) alongside the new models. If each new stove were used exclusively for all cooking, realized fuel expenditure savings would have been much higher.
- Productivity and Health: Productivity estimates apply only to rural wood stove use derived from estimates of the reduced fuel needs of higher efficiency stoves and the resulting time savings on gathering firewood. Time savings from reduced fuel gathering needs are then quantified using an estimate of the shadow value of women’s labor in Uganda. For the purpose of conservative assumptions and given the lack of robust data on health impacts, health savings are computed only for the imported wood-burning stoves as Bank-commissioned prior lab testing of relevant stove models²³ has shown that these are the only stoves likely to achieve household air pollution reductions at a meaningful scale. Furthermore, health benefits are only computed for reductions in direct use of firewood, and not for the case where these stoves replace charcoal stoves and charcoal use. Values for Averted Disability Adjusted Life Years are derived from recent World Bank measurements of fuel savings and emissions reduction using the same gasifier stoves to replace open fire cooking in Laos PDR²⁴. They are likely conservative estimates given that baseline wood consumption in rural Uganda is at least double that in rural Laos.
- Climate Benefits: Emission reductions of Greenhouse Gases and Black Carbon are computed in CO₂ equivalents and valued at a “social cost of carbon” (SCC) of \$20/tCO₂e.²⁵ Carbon emissions reductions are computed from primary wood savings, directly as firewood, and as reduced feedstock requirements for charcoal production by

²² All details of the below analysis and related assumptions and computations are provided in Annex 5.

²³ Centre for Research in Energy and Energy Conservation (November 2015): “Stove Performance Report for World Bank Project Willingness to Pay and Consumer Acceptance Assessment”

²⁴ The Lao PDR Cook Stove Initiative and Health Project

²⁵ The SCC value chosen can be considered conservative as values applied by governments of up to \$100/tCO₂e are common in the OECD.

traditional earthen kilns, conservatively estimated.²⁶ Carbon emissions reductions are computed from primary wood savings, directly as firewood, and as reduced feedstock requirements for charcoal production by traditional earthen kilns, conservatively estimated. Conservative values are applied to carbon emissions savings in reduced charcoal production per se. As opposed to United Nations default factors of 82 percent non-renewable biomass in Uganda, a more conservative factor of 20 percent fraction of non-renewable biomass has been applied in this economic analysis given the level of uncertainty. Black carbon is the second largest contributor to climate change after carbon dioxide (*Ramanathan V, Carmichael G (2008) Global and regional climate changes due to black carbon. Nature Geoscience 1:221-227*) but the science around determining the global warming potential of black carbon emissions on a specific project site or region is still beset with uncertainty. Hence an estimate of the CO₂ equivalent value for Black Carbon has been made for this project but not included in the discounted cash flow analysis.²⁷

42. The results of these analyses are provided below in summary form. It is evident that that the project is highly economic and well justified on the basis of the welfare improvements associated with reduced household expenditure alone.

Figure 4: Summary of Economic Analysis²⁸

Expenditures	Year 1 \$ (700,000)	Year 2 \$ (1,000,000)		
Benefit Stream			NPV (at 10% discount rate)	Internal Economic Rate of Return
Household Expenditure Reductions			\$2,929,051	80%
Climate Mitigation Benefits			\$493,643	26%
Productivity Benefits			\$496,046	42%
Total			<u>\$3,918,740</u>	

²⁶ Conservative values are applied to carbon emissions savings in reduced charcoal production “per se”: As opposed to United Nations default factors of 82 percent non-renewable biomass for Uganda, a more conservative factor of only 50 percent non-renewable has been applied.

²⁷ The estimated NPV of black carbon reductions from use of Tier 3 forced draft wood burning stoves is ~US\$425,000.

²⁸ For the purpose of a conservative representation, health benefits were not included in the computation of NPV and IERR.

B. Financial Management

43. Financial management and disbursement arrangements with PSFU are deemed adequate based on the implementing entity's previous engagements with WB projects. The financial management function will be managed by the current staff and benefit from fully operational office infrastructure including accounting software provided through former and ongoing Bank projects. PSFU will open a Designated Project Account in an acceptable bank through which the grant proceeds will be processed. PSFU will be expected to submit quarterly IFRs in a form and content acceptable to the Bank within 45 days after the end of the quarter. All withdrawal Applications will be submitted through E-Signature and E-Disbursement. PSFU will ensure that the audited financial statements together with the management letter are submitted to the Bank six months after the end of the Financial Year/Project. Financial management arrangements, including compliance with the legal covenants related to the financial management of all ongoing projects, are satisfactory and the time of project appraisal, there were no audit reports outstanding or past due. The project's financial management systems comply with generally accepted accounting principles and thus provide reasonable assurance that the project funds are used for the intended purpose.

C. Procurement

44. Procurement under the project will follow the Guidelines: Procurement under IBRD Loans and IDA Credits (January 2011 and revised July 2014) and *Guidelines: Selection and Employment of Consultants by World Bank Borrowers* (January 2011 and revised July 2014).
45. Procurement under the Grant shall be executed by PSFU through the existing Project Coordination Unit for the IDA funded Competitiveness Enterprises Development Project. The largest share of funds under the Grant shall be disbursed through competitively awarded grants managed by PSFU and monitored by an Independent Verifying Agent. Procurement activities under the grant will be limited to the selection of consultants and a contractor / supplier as shown in the below procurement plan. PSFU has successfully carried out similar activities including procurement of consulting services under both ERT and ERT2 projects, and for all categories under the ongoing CEDP.

Figure 5: Project Procurement Plan

Agency responsible	Consultancy Services Description	Estimated Cost	Selection / Procurement method	Review by Bank
PSFU	Grants Management Officer	\$80,000	ICS	Prior
PSFU	Independent Verifying Agency (IVA)	\$50,000	CQS	Post
PSFU	Contractor for stove demonstration models	\$120,000	Competitive Shopping	Post
PSFU	Quality Assurance & Technical Support	\$100,000	CQS	Post

D. Implementation Arrangements

46. Implementation arrangements have been set up with PSFU at the core of project activities. This prevalent role is deemed adequate given PSFU's significant experience with Bank projects and as implementing agency for the Uganda Energy for Rural Transformation (ERT) phases I and II. PSFU consists of over 160 business associations, corporate organizations and government agencies. Having established the Business Uganda Development Scheme (BUDS) as a specialized unit for the management of matching grant programs for a variety of donors and government, PSFU is well suited for the management of the Distribution Challenge Fund (DCF) under component 1. PSFU will recruit a dedicated Grants Management Officer responsible for the management of the DCF throughout the entire duration of the project. While MEMD will be overseeing the implementation of Component 3, PSFU will carry out the procurement aspects of the institutional stove demonstration models. Component 2 will be carried out by PSFU in consultation with the Center for Research in Energy and Energy Conservation (CREEC).

E. Environmental and Social safeguards

47. While the Distribution Challenge Fund (DCF) will support the expansion of distribution networks and supply chains for clean and more efficient cooking products, the project will not be supporting the construction of new physical distribution infrastructure such as warehouses and handling facilities. Rather, the DCF will help manufacturers tap into the large existing infrastructure of national and regional distributors of consumer durables to sell their products. As eligible expenditures for grants will be defined in detail in the operations manual for project implementation, an Integrated Safeguards Data Sheet (ISDS) was not deemed necessary or appropriate at the appraisal stage.

F. Monitoring & Evaluation

48. All activities, disbursements and results related to component 1 will be closely monitored by an Independent Verifying Agent (IVA), while the monitoring of components 2 and 3 will be ensured by PSFU in conjunction with MoFPED. The mid-term review (MTR) of the project will be undertaken by the Bank team while the final evaluation of the project will be carried out by an independent consultant. Data for monitoring and evaluation the project's outcome and results indicators will be generated by the IVA for component 1 and PSFU and MEMD for components 2 and 3.
49. As data collection for component 1 will merely involve orders, sales and accounting data which can all be easily obtained through auditing of commercial contracts, financial statements, as well as spot checks and telephone calls, any of the local top-tier auditing firms can be considered able and sufficiently competent to ensure the needed data collection for a reliable monitoring of project activities. Given that the activities for components 2 and 3 are of very limited scale and scope, the combined expertise of PSFU and MoFPED can also be considered adequate to ensure a sufficiently dependable data collection and analysis.

50. The cost of monitoring and evaluation is fully embedded in the project components. Given the pilot character of the project, additional funds can be made available for an in-depth final evaluation if deemed necessary.
51. Data generated by the IVA, in particular on sales, orders and inventory turnover, will be used to periodically assess the project's effectiveness during implementation and to accordingly adjust incentive payments delivered through the grant mechanism.

G. Role of Partners

52. The Bank team will closely coordinate and collaborate with the Energizing Development (EnDev) initiative, Gesellschaft fuer Internationale Zusammenarbeit (GIZ), Foundation of Netherlands Volunteers (SNV), the Global Alliance for Clean Cookstoves (the Alliance) and the Uganda National Alliance for Clean Cooking (UNACC) to ensure that project activities are complementary and mutually reinforcing. During the project design and appraisal stages, the agreed modus operandi between the key players on the Ugandan cookstove market was established as follows:
- a. EnDev is focusing on reaching the poorest and most vulnerable populations by building capacity of local micro-industries and the artisanal manufacturing sector to build and commercialize low-cost, locally produced stoves;
 - b. SNV is focusing on improving the last-mile distribution of improved stoves in the eastern region of Uganda through awareness campaigns, support to suppliers through results-based incentives and building networks of youth sales agents;
 - c. The WB team is working with UNACC to provide targeted assistance to a limited number of larger, more established Ugandan manufacturers and foster technology transfer through partnerships between domestic and international industry leaders.
53. The Centre for Research in Energy and Energy Conservation (CREEC) regional testing center has been supporting the project with preliminary laboratory testing of all stoves participating in the Willingness to Pay (WTP) and Consumer Acceptance (CA) trials. During project implementation CREEC, will work with the Bank team to implement the Quality Assurance and Technical Support (QA/TS) program for cookstove manufacturers. The (QA/TS) program was established under the ACCES program with the goal of piloting modern quality control procedures adapted to the context of local stove manufacturers, and combines periodic random batch testing of production output with a set of simple production streamlining and quality management measures .

Annex 1: Results Framework and Monitoring

Country: Uganda **Project Name:** Uganda Clean Cooking Supply Chain Expansion project (UCSEP)

Project Development Objective (PDO): The Project Development Objective is to expand both access to and adoption of cleaner and more efficient cooking technologies.												
PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
Indicator One: Households that gained access to more energy-efficient cooking and/or heating facilities (Number) - (Core)	X	Number	0	5,000	65,000	100,000			Annual	Bi-annual sales and adoption audits	PSFU	Households that gain access by switching their existing solution to one of the technologies promoted through this project.
Indicator Two: Average reduction of household expenditure on cooking fuels (percentage on average)		Percentage (average)	0	20%	20%	20%			Annual	Data derived from prior field testing and sales and adoption audits	PSFU	
Indicator Three: Reduction of CO2 emissions (percentage on average):		Percentage (average)	0	30%	30%	30%			Annual	Data derived from prior stove performance testing and sales and adoption audits	PSFU	
Indicator Four (intermediate indicator): Number of enterprises entering the clean cooking sector		Number	0	3	4	0			Annual	Results will be derived from project beneficiaries	PSFU	

*Please indicate whether the indicator is a Core Sector Indicator (see further <http://coreindicators>)

**Target values should be entered for the years data will be available, not necessarily annually

Annex 2: Detailed Project Description

Component 1. “Distribution Challenge Fund (DCF)” (\$1.85 million)

Support Lines and Disbursement Mechanisms

The following is a note on the design, sizing, and administration of each of the incentive payment lines to be provided under the Distribution Challenge Fund (DCF) component of the proposed project. The levels of support were determined based on stress testing and scenario analysis for each line of support carried out independently by contracted consultants.

Ugandan stove distributors (hereinafter “distributors”), as well as local and international stove manufacturers (“manufacturers”) will be the main “beneficiaries” of the DCF. Participating manufacturers and their stoves (hereinafter “project stoves”) will be asked to form a consortium with one or several distributors for the commercial distribution of a minimum of 50,000 state-of-the-art cook stoves in Uganda. The three consortia to be granted access to the DCF will be selected based on the two-stage selection process outlined in Annex 4.

The selection process of the beneficiaries as well as the disbursements of funds from the DCF’s four different support lines outlined below will be administered by the Private Sector Foundation of Uganda (PSFU) with the support of an independent verification agent (IVA).

Support Line #1 – Start-up Working Capital Grants (one-time)

Objective: Incentivize distributors to share the initial working capital risk and cost of the first major order of stoves with their manufacturers by making a significant upfront payment. The upfront payment is expected to improve the working capital and cash flow performance of manufacturers and enhance their ability to more rapidly fulfil large orders.

Grant beneficiaries: stove distributors and manufacturers; *Grant recipients:* stove manufacturers.

Obligations of distributors: The distributors shall commit to an upfront payment for the first order of [1000] stoves within [1 week] of the purchase order of a minimum of [3,000] and up to [5,000] project stoves from their designated manufacturers.

Obligations of manufacturers: The manufacturers will be responsible for the timely production and delivery to the consortia’s agreed warehousing facilities of a minimum of [5,000] project stoves over [5 months].

Administration of grant disbursements by PSFU: PSFU will buy down the distributor’s cost for the first order of [5,000] stoves by paying a non-reimbursable grant of [50 percent] of the wholesale price for all stoves delivered to the consortia’s agreed facilities during [5 months] following the first purchase order. The grant will be disbursed on a monthly basis and will amount to [50 percent] of the total wholesale price of stoves delivered until the end of each month. All disbursements will be made directly to the manufacturer.

Monitoring and verification by IVA: The accuracy of all orders, payments and deliveries will be monitored by an IVA. All disbursement of incentives by PSFU will be subject to prior confirmation by the agent of distributors and manufacturers having fully complied with all of their above obligations.

Levels and limits of support line: The provision of grants from this support line will be capped at US\$ [100,000] per manufacturer. Grant disbursements for the same project stoves delivered to different distributors will be cumulated towards this limit.

Support Line #2 – Inventory Replenishment Grants (revolving)

Objective: The reinforcement of supply chains, acceleration of sales and market growth, and progressive improvement of the quality and performance of stoves sold on the Ugandan market, through targeted and competitively provided working capital support.

Grant beneficiaries: Stove distributors and manufacturers; *Grant recipients:* Stove distributors.

Obligations of distributors: Distributors shall submit bi-monthly sales reports to PSFU in order to claim grant disbursements. Sales reports must include product serial numbers and customer contact phone number for each stove sale reported.

Administration of grant disbursements by PSFU: For the duration of 12 months after project effectiveness, PSFU will disburse bi-monthly inventory replenishment grants to the distributor to the amount of [20 percent] of sales reported for the preceding [2 months].

Monitoring and verification by IVA: The accuracy of sales reported by distributors will be verified by an IVA through both through phone calls, random household visits and audits of stove ownership. All disbursement by PSFU will be subject to prior clearance of sales report by the IVA.

Levels and limits of support line: The amount of bi-monthly grant disbursements to distributors will be computed as a percentage of stoves sold at wholesale cost. During the first year of operations, this percentage will be [20 percent] of sales reported for the preceding [2 months]. At the end of the first year of operations, this percentage will be reduced by 5 percentage points every 2 months (i.e. to 15 percent after 12 months, and 10 percent after 14 months). Stoves with a proven fuel use efficiency of IWA Tier 3 and above will benefit from a performance bonus of an additional [10 percent] of sales added to each disbursement.

Based on project results and disbursement progress, and subject to non-objection by the World Bank PSFU can decide to:

- (i) Slow the progressive phase-out of the subsidy;
- (ii) Extend the duration of the support line by up to [6 months];
- (iii) Increase the disbursement percentage for any of the above stove types by up to [10%];
- (iv) Increase the initial overall allocation of funds of US\$ [1 million] of the support line.

Inventory replenishment grants will be disbursed on a first-come-first-served basis until the minimum overall allocation of US\$ [1 million] will be exhausted.

Support Line #3 – Consumer Engagement Grants (revolving)

Objective: Enhance consumer acceptance and sales growth of project stoves by accelerating the introduction of commercial marketing and promotion campaigns as well as sound warranty and service agreements.

Grant beneficiaries: Stove distributors and manufacturers; *Grant recipients:* Stove distributors.

Obligations of distributors: Distributors shall submit bi-monthly marketing expense (including supporting documentation) to PSFU in order to claim grant disbursements. Supporting documentation for each expense shall include the amounts, dates, places, brief descriptions, and proof of payment. Documentation has to clearly show the specific purpose of claimed marketing and sales expenses. Expenses for project stoves from different manufacturers can be claimed jointly, but shall be reported separately.

Administration of grant disbursements by PSFU: For the duration of 12 months after project effectiveness, PSFU will disburse bi-monthly consumer engagement grants to the distributor to the amount of [50 percent] of marketing and sales expenses reported for the preceding [2 months].

Monitoring and verification by IVA: The accuracy of marketing and sales expenses reported by distributors will be verified by an IVA through random spot checks, investigations and audits as needed. All disbursements by PFSU will be subject to the prior clearance of bi-monthly expense reports by the IVA.

Levels and limits of support line: For the duration of [12 months] after project effectiveness, PSFU will disburse bi-monthly cost sharing grants to the distributor to the amount of up to [US\$50,000] of marketing and sales expenses.

Based on project results and disbursement progress, and subject to non-objection by the World Bank PSFU can decide to:

- (v) Extend the duration of the support line by up to [6 months];
- (vi) Increase the initial overall allocation of funds of US\$ [300,000] for the support line.

Consumer engagement grants will be disbursed on a first-come-first-served basis until the minimum overall allocation of US\$ [300,000] will be exhausted.

Support Line #4 – Twinning Grant (one-time)

Objective: Facilitate the creation of a strategic partnership between a local and an international manufacturer for the manufacturing of best-in-class cookstoves in Uganda.

Grant beneficiaries: Local and international manufacturers; *Grant recipient:* A single consortium constituted by a joint venture concluded between an international manufacturer with a local partner.

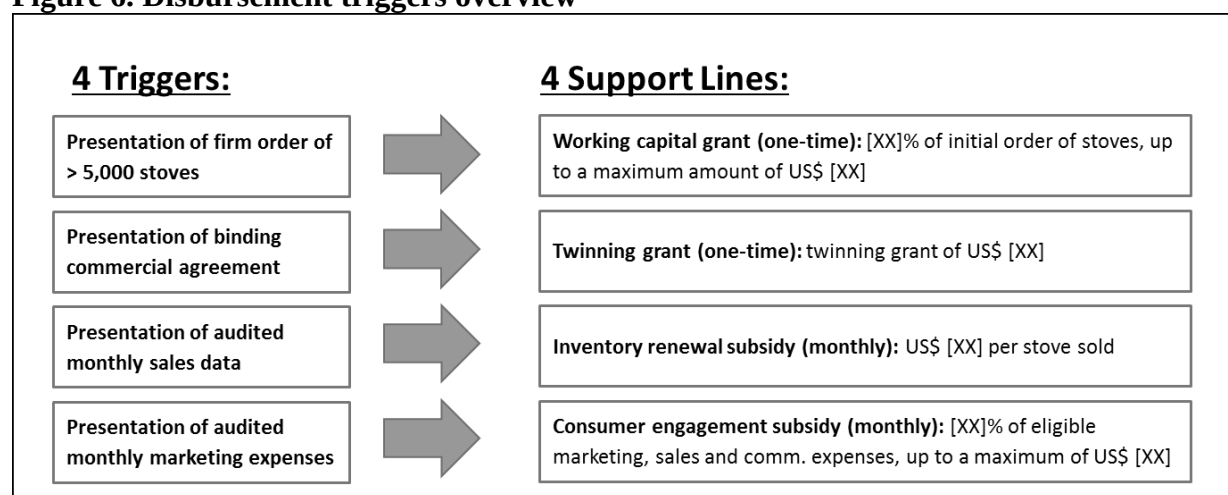
Obligations of beneficiaries: Beneficiaries will have to provide PSFU with a fully-fledged business plan and documentation of a legally binding commercial agreement between a local partner and an experienced international manufacturer for the production of cookstoves in Uganda. Furthermore, beneficiaries will have to provide documentation demonstrating that stoves to be produced will perform at least at IWA Tier 3 in terms of fuel use efficiency.

Administration of grant disbursements by PSFU: For the duration of 12 months after project effectiveness, PSFU will reserve a total amount of US\$ [150,000] on a designated account for equipment purchases on behalf of the first consortium of a local international manufacturer to conclude a joint venture for the production of stoves in Uganda. Upon presentation and review by PSFU of a legally binding commercial agreement between the parties of the joint venture, PSFU will provide the consortium with letters of credit for the purchase of equipment and machinery. All payments and letters of credit will be made and provided directly to suppliers of equipment and machinery. Legal ownership of the equipment purchased through this support line shall initially remain with PSFU and will only be transferred to the consortium after [12 months] of operations and the production of a minimum of [5,000] stoves.

Monitoring and verification by IVA: All legal and financial documentation of the above joint venture will be subject to auditing by the IVA. Subsequent to a satisfactory audit, all purchase orders of equipment and machinery will also be subject to verification and clearance by the IVA.

Levels and limits of support line: The support line will fund the first US\$ [150,000] of initial seed capital expenses for the purchase of eligible equipment and machinery of the above mentioned consortium. The support will only be available to a single consortium constituted of a selected manufacturer and a local partner and will be made available on a first-come-first served basis.

Figure 6. Disbursement triggers overview



Component 2. Quality Assurance and Technical Support (\$140,000)

The project will help establish a framework for enhancing market transparency and consumer confidence through: (i) product testing by a qualified lab and/or field testing institution contracted by PSFU to determine whether minimum performance requirements are met and ensure the consistent quality of stoves manufactured by beneficiaries of the DCF throughout the duration of the project and (ii) monitoring and verification of stove adoption and performance according to the quality assurance and quality control aspects of the ACCES program.

Implementation will be carried out in line with the recommendations from the ACCES QA&TS program, which provides a roadmap for incorporating quality aspects into national programs including quality control measures for manufacturers and distributors incorporating these measures along the value chain. The program has generated a baseline assessment of technologies in order to recommend (i) a minimum performance threshold to be endorsed by MEMD in order for stoves to be considered as candidate products under the program, and (ii) technical evaluation of the CREEC lab for carrying out the recommended testing. ACCES has also carried out both lab and field testing (efficiency as measured by KPTs) of seven stove models that were competitively selected to participate in the Willingness-to-Pay and Consumer Acceptance trials.

Component 3. Institutional Outreach and Development (\$140,000)

This activity will support the Ministry of Energy and Mineral Development (MEMD), as the implementing entity, to demonstrate the economic and environmental benefits of modern “gasification” combustion technology for “heavy-duty” institutional stoves. MEMD will be targeting a minimum of five public schools in three different regions of the country that are suffering from escalating scarcity of firewood and have been linked with a range of adverse environmental consequences.

The following activities are planned to be carried out:

- (i) Construction of demonstration units is done in schools that meet the criteria to be defined in the operations manual;
- (ii) Training of stove artisans in areas where the stoves will be constructed;
- (iii) Sensitization of head teachers, managers and catering staff on the advantages of the stoves;
- (iv) Production of promotional materials and easy-to-use illustrated manuals of how to operate and maintain the stoves.

To maximize both demonstration effects as well as economic and environmental co-benefits, the activity will be targeting public schools in densely populated areas that are consuming a minimum of 100,000 m3 of commercial woodfuel p.a., and are thus heavy contributors to local fuel scarcity and very frequently, local deforestation.

The performance and technical specifications for the selection of suitable gasifier stove models for demonstration, as well as the responsibilities of the contractors to be selected for the

installation of stoves, instruction of users and training of local artisans will be detailed in the project operations manual.

Procurement Arrangements

Procurement under the project will follow the *Guidelines: Procurement under IBRD Loans and IDA Credits* (January 2011 and revised July 2014) and *Guidelines: Selection and Employment of Consultants by World Bank Borrowers* (January 2011 and revised July 2014).

Procurement Thresholds and applicable methods to be applied in the Procurement Plan

Expenditure Category	Contract Value Threshold (US\$)	Procurement / Selection Method	Contracts Subject to Prior Review (US\$)
1. Consulting Services ²⁹	With firms up to US\$ 200,000 With Individuals up to US\$ 100,000	Consultants Qualifications Selection Individual	As specified in PP As specified in PP
2. Goods	Below US\$ 50,000	Shopping	As specified in PP

Procurement Plan and Procurement Packages

A procurement plan has been prepared. A summary covering consultant contracts is indicated below.

Agency responsible for Procurement	Consultancy Services Description	Estimated Cost	Selection method	Review by Bank
PSFU	Grants Management Officer	\$80,000	ICS	Prior
PSFU	Independent Verification Agency (IVA)	\$50,000	CQS	Post
PSFU	Contractor for stove demonstration models	\$120,000	Competitive shopping	Post
PSFU	Quality Assurance & Technical Support	\$100,000	CQS	Post

Procurement Risks and mitigation measures

Procurement under the project will be conducted by PSFU including on behalf of the Ministry of Energy and mineral Development.

Capacity for procurement in PSFU has already been strengthened under the CEDP and additional measures are planned under the Skills Development Project. The Procurement Unit of PSFU has been strengthened with the recruitment of two Procurement Specialists and the establishment of

²⁹ A shortlist of consultants for services estimated to cost less than US\$ 200,000 equivalent per contract may consist entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

a Project Contracts Committee under the Competitiveness and Enterprise Development Project. As such, relative capacity exists to conduct procurement; and will hence be conducted by the same team until an additional Procurement Specialist is hired under the Skills Development Project upon which he/she shall have primary responsibility for procurement under this grant. The PSFU Accounting Officer, the Executive Director will sign all contracts. The detailed arrangements will be specified in the operations manual.

On the Technical side, given the relatively limited procurement planned under the project, the existing staff the Project Coordinator will be adequate to prepare terms of reference and support technical aspects of procurement as needed.

All procurements under the project shall be subject to post review and the bank shall conduct at least 1 annual procurement supervision mission in a year and only one post procurement review over the life of the grant unless changed circumstances warrant additional reviews.

The overall risk to procurement is rated low.

Annex 3: Summary of the Willingness to Pay and Consumer Acceptance Trial

Methods

The report presents the findings of a four-month in-depth study of consumer acceptance, willingness to pay and impacts of improved biomass cooktoves in the Kampala and Wakiso districts of Uganda carried out during May-August 2015. Seven stove models were tested during the study: 5 charcoal- and 2 wood-burning among a population of 379 households (272 whose primary fuel is charcoal and 107 whose primary fuel is wood and that were allocated the 2 wood-burning models) distributed in 17 parishes.

Stove use

Acceptance of the new cookstoves was measured through displacement of baseline stove use. All stoves show statistically significant displacement of baseline-stove use despite small sample sizes. Differences in displacement between stove models were not statistically significant, however larger sample sizes may provide a different picture. In general, charcoal intervention stoves were more likely to be used exclusively, but traditional stove use remains high: only 21 percent of households reported using the intervention stove exclusively. However, more than 80 percent of charcoal-using households reported adopting the intervention stove as their primary stove. The story was different for wood-burning stoves where less than 30 percent of households reported using intervention stoves as their primary stoves.

Fuel consumption

Energy savings were assessed with using 3-day kitchen performance tests (KPTs) where fuel measurements were made prior to intervention stove dissemination (baseline) and 5 weeks after the stoves were disseminated (post-intervention). Results show modest savings in fuel use after dissemination of the charcoal stove, with the highest savings seen in the Burn Jikokoa group, which saw a 22 percent reduction in charcoal consumption per household per day.

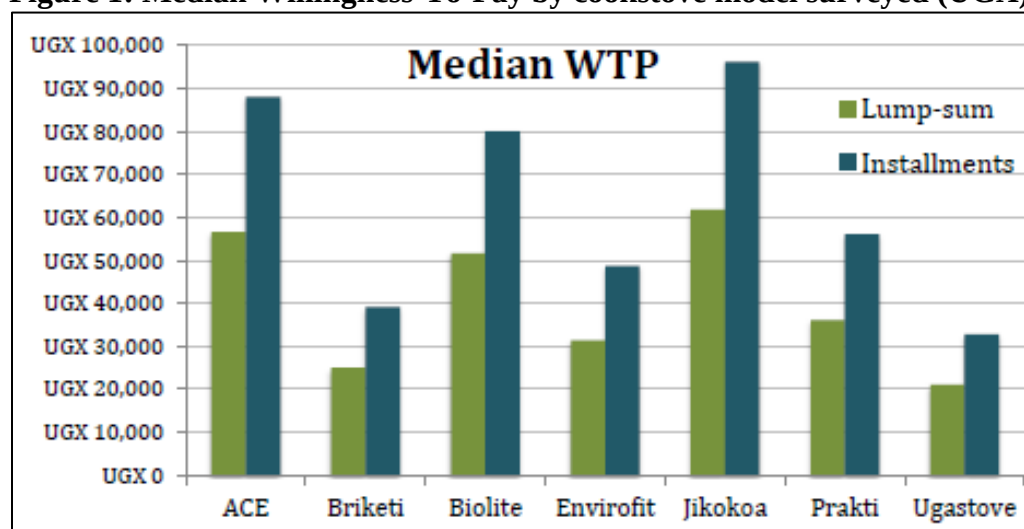
The savings were similar with both wood-burning stoves. Due to the occurrence of fuel swapping in some of these homes, the total energy is a more representative figure of the changes in fuel consumption. The savings in total energy use per household per day for the ACE1 and Biolite HomeStove was 27 percent and 21 percent respectively.

Willingness to Pay

At the end of the post-intervention KPT, the project investigated willingness to pay (WTP) and willingness to accept (WTA) for the intervention stoves. WTP was first assessed using Becker-DeGroot-Marschak (BDM) experiments with an option to reinstate bids if the outcomes of the experiment indicated that the participant could not purchase the stoves. This option remained unknown to the participants until after completing the BDM experiments to prevent biasing the experiments. This second bid allowed assessing the actual demand for improved cookstoves. Demand is predicted by income levels, prices, the stove model, and stove usage behavior in light of price uncertainty during a trial period. Overall, Jikokoa and ACE1 present the highest WTP and the Briketi and Ugastove the lowest, but these two local models also cost less. The demand models accurately predict 80 percent of the time whether the participant will buy or not the stove under the experiment conditions.

The WTA assessment revealed that participants would not accept to sell the stoves for prices significantly above the WTP, cost of stoves and demand. We hypothesize that the discrepancy between demand and WTA is due to liquidity constraints. Participants do not have the cash at hand to pay for the full value they ascribe to the stoves; hence, WTP is mediated by cash constraints and is lower than WTA.

Figure 1: Median Willingness-To-Pay by cookstove model surveyed (UGX)



Study limitations

We measured differences in fuel consumption at *the household level* and not at the stove level to obtain more reliable measure of the impact of a single intervention stove in the entire household. In the study design, we were also bound by the definitions of our target populations.

Charcoal stoves were distributed among primary charcoal users, but those who already owned an improved cookstove were included in the sample as well and given a more advanced model. Wood stoves were distributed among a population of wood users that often collected fuelwood. These advanced wood models may require steeper behavioral changes among this population. In terms of measuring actual stove use, the sample size for the stove use monitoring systems (SUMS) was relatively small (less than 20 per stove model) which inhibited making statistically robust conclusions about displacement of baseline stoves.

For the WTP assessment, we were bound by experimental conditions that do not necessarily reflect real stove commercialization scenarios. For instance, the study duration did not permit to increase the number of installment payments, although increasing these may have resulted in higher WTP estimates.

Overall conclusions

The different intervention stove models presented important differences in fuel savings and willingness to pay. Although the SUMS-derived baseline stove displacement is not conclusive between the different stove models, every single model displaced – to an extent—baseline stove use. No stove saved more than 32 percent of cooking fuel energy at the household level, evidencing fuel stacking behaviors and actual field performance of stoves. The WTP estimates

are based on actual demand for stoves under the experiment conditions. The Becker-de-Groot-Marschak method failed to capture accurate demand estimates and WTA estimates do not reflect the population's purchase capacity. Hence, the actual purchase stoves using randomized prices was used to more accurately measure demand. Median WTP for stoves are sold under three equal monthly installments and when participants are presented an installment price (versus a full price to then divide in installments) is UGX 63,000 (US\$ 19.39), but important differences exist between stove models.

Annex 4: EoI containing the criteria and steps to application for the DCF



Uganda Clean Cooking Supply Chain Expansion Project (UCSEP)

Request for Expressions of Interest

The World Bank proposes to provide a grant to the Government of Uganda from the Africa Renewable Energy and Access (AFREA) program of the World Bank which will be disbursed through the Uganda Clean Cooking Supply Chain Expansion Project. Part of the grant will be used towards the Distribution Challenge Fund. The Private Sector Foundation Uganda (PSFU) is the designated grant administrator. This is to inform you that PSFU is now requesting for Expressions of Interest (EoI) from manufacturers of improved cook stoves, to participate in the Distribution Challenge Fund (DCF).

THE DISTRIBUTION CHALLENGE FUND (DCF)

The DCF is a US\$1.7 million grant mechanism under “the Uganda Clean Cooking Supply Chain Expansion Project,” a recipient executed project aiming to expand both access to, and adoption of, cleaner and more efficient cooking solutions.

Ugandan stove distributors (hereinafter “distributors”), as well as local and international stove manufacturers (“manufacturers”) will be the main beneficiaries of the DCF. Participating manufacturers and their stoves (hereinafter “project stoves”) will be asked to form a consortium with one or several distributors for the commercial distribution of a minimum of 50,000 state-of-the-art cook stoves in Uganda. The 3-4 consortia to be granted access to the DCF will be selected based on the two-stage selection process outlined further below. The selection process of distributors, manufacturers as well as the disbursements of funds from the DCF’s four different support lines outlined below will be administered by the Private Sector Foundation of Uganda (PSFU) with the support of an independent verification agent (IVA). The DCF comprises four lines of grant support that will be disbursed over 18 months. The lines are listed below and detailed in Annex 1.

1. Start-up Working Capital Grant (one-time)
2. Inventory Replenishment Grant (continuous)
3. Consumer Engagement Grant (continuous)
4. Twinning Grant (one-time)

The application process for the Distribution Challenge Fund is **a two-step process** involving an Expression of Interest (EoI) stage and a Request for Proposals (RFP) stage.

STEP 1: EXPRESSION OF INTEREST (EOI)

This EoI is an open call for expression of interest to local and international manufacturers who in order to be eligible for the program will each be required to form a consortium with at least one but up to three local distributors for commercial distribution of project stoves³⁰. The candidate consortia will be evaluated by the selection committee³¹ based on the criteria listed further below. The selection committee will select a shortlist of six consortia of which three shall be formed with local Ugandan manufacturers and another three with international manufacturers, each with their respective Ugandan distribution partners. For the purpose of the EoI, each consortium shall be documented with signed Memorandums of Understanding (MoU) between the parties. Key criteria for the shortlisting of consortia will be the scalability and plausibility of the outlined business models and the well-documented performance of project stoves.

SELECTION CRITERIA FOR THE EXPRESSION OF INTEREST

The EoI submissions will be evaluated based on the relative strength of applicants of the following components expected to be supplied by the manufacturers with this EoI:

1. **Advanced negotiations for the creation of consortia:** Documented relationship between the manufacturer and at least one but up to three local distributors e.g. by means of a signed Memorandum of Understanding (MoU) of preliminary agreements with each entity and/or written exchanges with qualified potential commercial distribution partner(s) with a legal presence in Uganda, including evidence of relevant marketing, distribution and sales experience in the Ugandan consumer durables sector. Additional partnerships, in particular with financial intermediaries and other complementary service providers bring will be considered as an advantage. Submissions that credibly document efforts aimed at establishing a local manufacturing presence including the establishment of a joint venture (twinning) between a local manufacturer and an international manufacturer will be given preference and eligible for additional support under the twinning grant line of support (see Annex 1).
2. **Business Model and Marketing Strategy:** The outline of a business model for the commercial distribution of a minimum of 50,000 cookstoves in Uganda within no more than 18 months, including a description of (i) the target market e.g. by geography, fuel type, household income profile, local cooking preferences, etc.; (ii) the proposed marketing, distribution and sales approach e.g. mechanism for tracking of sold products, provision of warranties, commitment to product trials, consumer financing schemes, etc.; and (iii) a projection of monthly sales volumes and working capital needs for inventory over the proposed timeframe.
3. **Documented market potential:** Applicants should provide evidence for the market potential of their stoves documented by certified sales reports, Willingness-to-Pay and Willingness-to-Accept assessments, and provide a range for the planned retail price of the

³⁰ For stoves to be shortlisted for the next stage of the selection process they will have to meet a minimum performance equivalent of Tier 3 in fuel efficiency and have demonstrated market potential as defined in the criteria for the EoI.

³¹The selection committee will consist of PSFU and MEMD

proposed stove. Seven competitively selected stove products have undergone extensive field testing through the World Bank Commissioned Willingness-To-Pay and Consumer Acceptance (WTP/CA) trials carried out during the last several months.³² For these products, the above information has already been collected and will thus yield important information that will be used in the shortlisting process as far as this criterion is concerned. Applicants that did not participate in the above mentioned trials were encouraged to use the WTP/CA information collected as benchmarks and points of reference to estimate market potential of their respective project stoves.

4. **Lab and field product performance evidence:** (i) Lab stove performance results under the ISO-IWA testing framework (efficiency, total emissions, and safety) per third party independent testing from an internationally recognized stove testing lab; (ii) field performance in the form of trials including but not limited to average fuel savings as collected from kitchen performance tests (KPTs), and (iii) evidence of stove durability and that the product performs as advertised. Stove models that were part of the aforementioned WTP/CA trials do not need to supply additional lab test results. For project stoves that have not participated in the above trials, other evidence of stove durability and field performance such as historical data on product returns, maintenance, service and/or warrantee claims will be accepted as proxies.
5. **Utilization of the DCF lines of support:** A description of how the consortium-forming members intend to utilize the different DCF lines of support to enhance their marketing and distribution strategies to achieve their targets will also be taken into account. Please see Annex 1 for a full description of DCF support lines.

STEP 2: REQUEST FOR PROPOSALS (RFP)

Following Step 1, six shortlisted consortia will be invited to submit full proposals. The proposals shall be prepared over the course of 3 months with the previously selected partners as applicable. Each consortium will be able to nominate one stove model which has been extensively tested for performance and market potential.

In order to strengthen the partnerships between manufacturers, distributors and other partners, the six shortlisted candidates will be invited to attend a **matchmaking and networking workshop** funded by the World Bank. The workshop will take place on **January 20th 2015** and will provide opportunities for the six manufacturers, interested distributors and other relevant partners such as financial intermediaries to further explore ‘best fit’ arrangements with each other and discover synergies that would strengthen the proposal development. The workshop will consist of breakout sessions and networking exercises to help lay the ground for establishment of commercial agreements among the participants and help them think through plans to utilize the DCF lines of support to enhance their proposed business operations.

³² Subject to consent by all the participating manufacturers, the report will be made publically available and searchable on <http://www.worldbank.org/reference/>

Finally, once the selection committee has collected and carefully evaluated all the RFPs submitted by the manufacturer-distributor consortia, it will make a **selection of 3-4 winners** to benefit from the DCF lines of support throughout the course of the project. The selection criteria will be transparent and designed to select those entities that have the highest potential for optimal utilization of the project support to scale their respective operation

Annex 5: Economic Analysis Details

Charcoal Stoves			
Mitigation Value of Direct Carbon Emissions Reductions			
Imported Charcoal Stove			Notes/References
Savings in Charcoal Use per Household	22%	From Project Household Surveys	1
Reduction in Charcoal Use per Household per day	0.39 kgs/day		2
Reduction in Charcoal use per Household per year	0.142 metric tons		
Reduction in Charcoal Processing Emissions	0.107 t/CO ₂ e	Used 0.75 tCO ₂ e/t Charcoal	3
Value per Stove	\$2.14		
Wood Carbon Equivalent in Saved Charcoal	2.61 t/CO ₂ e	Used 10:1 overn dry wood to charcoal	4
Non-Renewable Biomass Fraction	20%	cf 82% fNRB for CDM	5
Avoided Wood Carbon Losses	0.52 tCO ₂ e		
Value per stove	\$10.45		
Local Improved Charcoal Stove			Notes/References
Savings in Charcoal Use per Household	18%		1
Reduction in Charcoal Use per Household per day	0.34 kgs		2
Reduction in Charcoal use per Household per year	0.124 metric tons		
Reduction in Charcoal Processing Emissions	0.093 t/CO ₂ e		3
Value per stove	\$1.86		
Wood Carbon Equivalent in Saved Charcoal	2.28 t/CO ₂ e		4
Non-Renewable Biomass Fraction	20%		5
Avoided Wood Carbon Losses	0.46 tCO ₂ e		
Value per Stove	\$ 9.11		
Global Economic Value of Avoided Carbon Emissions	20 USD		
Direct Cash Benefit of Efficient Charcoal Stoves			
Imported Charcoal Stove			Notes/References
Household Expenditure Savings			6
Uganda Shillings per Day	264.26 average		
USD to UGX Rate when measured	3250 UGX/USD		
USD per year savings per stove in use	\$ 29.68		
Local Improved Charcoal Stove			
Household Expenditure Savings			
Uganda Shillings per Day	229.03 average		
USD to UGX Rate when measured	3250 UGX/USD		
USD per year savings per stove in use	\$ 25.72		

Tier 3 Wood Stove: Urban Deployment						
Mitigation Value of Direct Carbon Emissions Reductions					Notes/References	
Savings in Charcoal per Household by Fuel Switching		0.17 Kg/Day 0.062 mt/year			6,7	
Reduction in Charcoal Processing Emissions	0.047 t/CO2e					
Value per stove	\$0.93					
Wood Carbon Equivalent in Saved Charcoal	1.14 t/CO2e					4
Non-Renewable Biomass Fraction	20%					5
Avoided Wood Carbon Losses	0.23 tCO2e					
Value per stove	\$ 4.55					
Household Expenditure Reduction						
Household Expenditure Savings: Charcoal						
Cost of Charcoal	671 UGX/Kg					
Saved Charcoal Use per day	0.17 Kg/day					
Uganda Shillings per Day	114.07 UGX/day					
USD to UGX Rate when measured	3250 UGX/USD					
USD per year savings per stove in use	\$ 12.81					
Household Expenditure Savings: Wood						
Wood Saved per day	1.57 Kg/day					
Uganda Shillings per Day	51.025 UGX/day			At \$100 USD/ton equivalent		15
USD to UGX Rate when measured	3250 UGX/USD					
USD per year savings per stove in use	\$ 5.73					
Combined Annual Wood and Charcoal Savings	\$ 18.54					
Health Benefit						
ADALYs per Household and Stove	0.0058 per year	per stove	50% discount over rural, 6 years	ADALY Proxy	1740	11
Value of ADALYs	\$1,392.00		2 times GDP			
GDP per Capita		\$ 696.00	USD			12
ADALY value per Stove/year	\$8.07					

Tier 3 Wood Stove: Rural Deployment					
Mitigation Value of Direct Carbon Emissions Reductions					
Baseline Wood Consumption per Household		4.97 mt/year			8
Reduction through use of Tier 3 Wood Stove		50%			9
Avoided Firewood/Fuel use		2.49 mt/year			
Non-Renewable Biomass Fraction		50%			5
Avoided Wood Carbon Losses		2.28 tCO ₂ e			
Value per stove		\$45.60			
Black Carbon Equivalent Reduction		0.488 tCO ₂ /TCO ₂ e			10
Value per Stove		\$ 22.25			
Health Benefit					
ADALYs per Household and Stove	0.0116 per year	per stove	ADALYs	ADALY Proxy	1740
Value of ADALYs	\$696.00		1 times GDP		11
GDP per Capita		\$ 696.00	USD		12
ADALY value per Stove/year	\$8.07				
Productivity Value					
Reduction in Hours per Day gathering Firewood/Fuel		2 hours/day			13
Equivalent Days per year		91.25 days/year	Assuming 8 hour days		
Minimum Wage for Rural Women		1 USD/day			14
Value of Labor Savings per stove/household		\$ 91.25 year			

Notes:

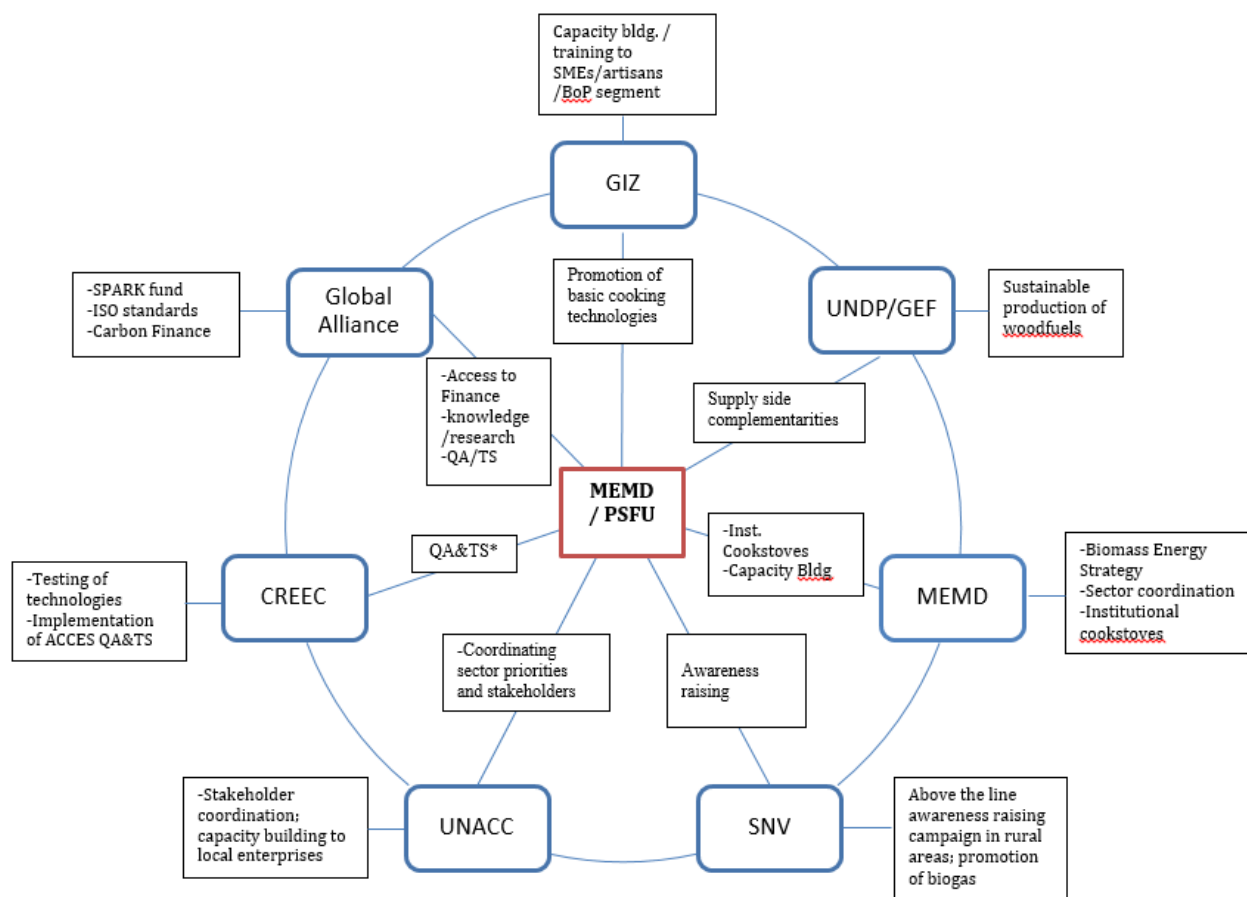
1. The source of data for these calculations on fuel savings is the draft final report commissioned by the World Bank: "Willingness to Pay and Consumer Acceptance Assessment for Clean Cooking in Uganda", November 4th, 2015. The specific stoves data utilized under each category of stoves are as follows: International Charcoal Stove, Jikokoa; Local Charcoal Stove, Ugastove; Imported Tier 3 Wood Burning stove, ACE-1
2. Dito.
3. United States Environment Protection Agency, EPA-600/R-99-109, December 1999: Greenhouse Gases from Small-Scale Combustion Devices in Developing Countries: Charcoal Making in Thailand. This paper quantifies CO₂ equivalent emissions factor from products of incomplete combustion from a range of charcoal making kilns. Findings are that for every ton of

charcoal produced, 0.65-1.41 tons of CO₂e are produced. In this Ugandan analysis, to be conservative, 0.75ton CO₂e is used per ton of Charcoal produced. Given the predominance of very low efficiency (dry wood in to dry charcoal out) of traditional earthen kilns in East Africa, the emissions factors are more likely to approximate 1.41 tCO₂e/t Charcoal.

4. Nahayo. A., et al, Comparative Study on Charcoal Yield Produced by Traditional and Improved Kilns: A Case Study of Nyaruguru and Nyamagabe Districts in Southern Province of Rwanda; Energy and Environment Research, Vol 3, No. 1, 2013. Yields of traditional well-tended earthen kilns were 7.5 percent charcoal of dry wood utilized. In this analysis the yields are assumed to be higher at 10 percent by weight of charcoal of weight of dry wood in.
5. The proportion of non-renewable biomass in total biomass fuel use is controversial with widely varying assessment of sustainability. The United Nations Clean Development Mechanism has adopted a default factor for Uganda of 82% non-renewable (fNRB). For conservatism, in these analyses a 50 percent non-renewable biomass factor is utilized.
6. As per Note 1.
7. Personal Communication. M. Toman, DEC, World Bank on global damage function of short term carbon emissions per ton CO₂e.
8. United Nations CDM web site, CPA Design Document of Uganda Efficient Cookstoves PoA, citing rural baseline firewood consumption of 4.97 mt/Household/year (from POA "Up Energy Improved Cookstove Programme, Uganda:https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/WRL90IO62SKX4BD5CYJT8E1HVZ7QUM/view
9. Measured fuel savings using the same stove in World Bank Cookstoves and Health Initiative in Laos in 2015 compared to baseline consumption of open fire wood-burning.
10. Personal Communication, Michael Johnson, Berkeley Air Monitoring Group, on measured Black Carbon reduction in tons CO₂e per ton of CO₂e reduction for gasifier stoves compared to burning firewood in three stone fires.
11. Extrapolation from estimated ADALY production from sustained use for half of all cooking in Laos using the ACE-1 gasifiers stove compared to cooking on an open fires. This is a conservative estimate of ADALY production as baseline firewood consumption is higher in Uganda, and utilization is likely to exceed 50 percent of all cooking based on the observation of Philips gasifier stove uptake in rural Malawian households.

12. Derived from WHO CHOICE estimates of Cost-Effectiveness of for cost of ADALY production. Value applied is twice GDP per capita which is in the "cost-effective" range of 1-3 times GDP/capita.
13. Mid-range value of reduction in time savings in fuel gathering with use of a rocket stove cf open fires from studies by Washington State University in Central Region of Malawi, with tree cover similar to Uganda.
14. Assumed minimum rural wage of US\$2/day as a proxy for shadow value for labor in gathering firewood.

Annex 6: Overview Clean Cooking Stakeholders and Activities in Uganda



*ACCES Quality Assurance & Technical Support program

GIZ implements the **Energising Development (EnDev)** program in Uganda which focuses on increased access to improved cookstoves and electrification for households. EnDev's primary approach supports local stove enterprises to (a) improve their production infrastructure, capacity, and quality and (b) strengthen their business skills. The enterprises are assisted to expand their stove distribution network to reach the Ugandan BoP and middle-income population. Through these partnerships, EnDev promotes the procurement of new modern machineries, the standardization of products, and the creation and safeguarding of workplaces. In rural areas, EnDev trains the locals in building standardised energy efficient stoves from locally available material. In addition to working for increased access directly, GIZ/EnDev also works to strengthen the sector's enabling environment.

SNV Uganda is supporting the implementation of the Uganda National Domestic Biogas Program, a nationwide program that is being implemented by Biogas Solutions Uganda in the context of the Africa Biogas Partnership Program (ABPP). The program focuses on the development of a sustainable & commercially viable biogas sector. In 2014, SNV Uganda started implementing Uganda Domestic Renewable Energy Solutions (UDRES). Under this initiative,

SNV has an integrated approach reaching rural household with energy saving solutions including improved cookstoves. SNV also runs an awareness program on renewable energy solutions via events and radio called “SWITCH To Clean Energy,” a grassroots marketing campaign in Eastern Uganda.

Uganda National Alliance for Clean Cooking (UNACC) is the local cooking energy sector coordinating organization and as the national coordinating body ensures the overall coordination of priority interventions aligned with government objectives. UNACC provides capacity building support to its members and is funded by the Global Alliance for Clean Cookstoves.

The Global Alliance for Clean Cookstoves (the Alliance) is a public-private initiative led by the UN Foundation for creating a thriving global market for clean and efficient household cooking solutions. Alliance focus areas in Uganda include:

- Coordinating sector knowledge and awareness raising– Providing support to UNACC for coordinating stakeholders, advocating for policies/regulations; and funding an above-the-line awareness raising campaign.
- Developing and promoting standards – Funding to establish a testing center with trained technical staff capable of providing testing services and supporting UNBS to adopt and implement international cookstove standards.
- Access to finance – Alliance activities in this area will focus on development of funding mechanisms to support businesses across the value chain such as through its Spark Fund (awarded to enterprises globally) and the catalytic small grants targeting local enterprises that are in early stages of development.

United Nations Development Programme (UNDP). UNDP with support from the Global Environment Facility (GEF) is working on improving efficiency and sustainability of the charcoal production, transportation and sale in Uganda by as outlined in the Nationally Appropriate Mitigation Action (NAMA) study.

GVEP International has been working on mapping of the existing stove distribution channels by in Uganda funded by the Energy SME (ESME) trust fund to help local cookstove manufacturers develop distribution channels and distribution capacity to enable them to increase their market reach to underserved areas of Uganda.

Annex 7: Overview of “clean” and “improved” stove technologies and their performance

	“Improved” solutions		“Clean” solutions		
	Legacy and Basic ICS	Intermediate ICS	Advanced ICS	Modern fuel	Renewable fuel
					
Key features	Small functional improvements in fuel efficiency over baseline technologies; typically artisanally produced	Rocket style designs with focus on highly improved fuel efficiency; includes both portable and built in models	Fan or natural draft gasifiers with high fuel and combustion efficiency; often designed for pellet/briquette fuels	Stoves that rely on fossil fuels or electricity, have high fuel efficiency and low emissions	Derive energy from renewable non-woodfuel energy; often used as supplementary stoves
Technologies	- Legacy biomass and coal chimney stoves¹ - Basic efficient charcoal - Basic efficient wood	- Portable rocket stoves - Fixed rocket chimney - Highly improved (low CO₂) charcoal stoves	- Natural draft gasifier (TLUD or side-loading) - Fan gasifier / fan jet - TChar stoves	- LPG - Electric (incl. induction) - Natural gas stoves - Kerosene stoves²	- Biogas - Ethanol - Solar - Retained heat cookers
Efficiency	Tier 0-2	Tier 2-3	Tier 3-4	Tier 4	Tier 3-4
Emissions ³	Tier 0-1	Tier 1-2	Tier 2-3	Tier 3-4	Tier 3-4
Overall benefits	Moderate				High

¹ Legacy stoves categorized as improved within typology but actual performance of many legacy stoves likely falls below provisional ISO/IWA standards

² Controlled tests of good quality kerosene pressure stoves show low emissions, but field data suggests that many kerosene stoves are actually highly polluting

³ Particulate matter (PM 2.5) emissions at point of consumption; research suggests that high rating (Tier 3+) needed for significant health positive impacts