



June 2020

TERMS OF REFERENCE

CONSULTANT SERVICES REQUEST: OFF-GRID COOLING APPLIANCES KNOWLEDGE BRIEF

OVERVIEW

Sustainable Energy for All (SEforALL) will develop a short policy brief (8-10 pages) that reviews the best available cooling technologies and their capacity to be supported at different capacity levels of off-grid energy systems, defined in the multi-tier energy access framework on Energy Access.

SEforALL is accepting proposals to provide background data and content for the knowledge brief. The cooling appliances addressed are fans, refrigerators, and ACs

The assignment will include review of available data (primary or secondary review of available appliance efficiency levels for off-grid cooling) to assess best practices for the use and adoption of off-grid cooling appliances in high impact countries for access to cooling¹. The goal of this assessment is to identify energy efficient off-grid cooling solutions that can be used at various levels of energy access and build on these approaches, together with partners, to develop a methodology that links available appliances with the Multi-tier Framework for access.

Using its advocacy and convening power, SEforALL will share these best practices as recommendations to development finance institutions supporting cooling investment programs. These recommendations will also lay the groundwork for deeper technical work related to off-grid appliance standards definition.

BACKGROUND

The world is getting hotter and drier. Climate impacts are being universally felt, most tangibly in the volatility and frequency of extreme weather events, and every year the situation becomes more dire. In 2019, the International Panel on Climate Change (IPCC) reported that at 1.5°C of warming, 2.3 billion people could be both exposed and vulnerable to heatwave events,ⁱ a threshold that could be reached as early as 2030.² It also reported that food loss and waste account for 8-10% of annual GHG emissions and that food security, particularly the production of nutritious fruits and vegetables, is vulnerable to climate change.ⁱⁱ The World Health Organization (WHO) reported that global vaccination rates remain at a stubborn 86%, and that 19.4 million infants were not reached with routine immunizations, including the temperature sensitive DPT vaccine.ⁱⁱⁱ

The “Chilling Prospects: Tracking Sustainable Cooling, 2019” report found that across 52 high-impact countries 1.05 billion people remain at high risk from a lack of access to cooling. This includes 365 million people living in poor, rural settings who have no access to electricity. Many of them are likely to engage in subsistence farming and lack access to an intact cold chain enabling them to sell their products further afield at a higher price. Medical cold chains may also not be intact, putting lives at risk from spoiled vaccines.

¹ Chilling Prospects Series, SEforALL, <https://www.seforall.org/publications/chilling-prospects-2019>

² Allen M., *et al.* (2018) [SUMMARY FOR POLICYMAKERS](#), in IPCC (2018) [GLOBAL WARMING OF 1.5 °C](#), 6 (“Human activities are estimated to have caused approximately 1.0 °C of global warming above pre-industrial levels, with a *likely* range of 0.8 °C to 1.2 °C. Global warming is *likely* to reach 1.5 °C between 2030 and 2052 if it continues to increase at the current rate. (*high confidence*)”).



June 2020

Access to sustainable energy is key for this group to gain access to sustainable cooling. Energy-efficient cooling appliances, that can be used off-grid are necessary for enabling a wider spread and utilization of the necessary appliances, such as refrigerators, fans and ACs.

Distributed off-grid renewable energy systems, including solar home systems and micro-grids powered by renewables, are becoming the most economically viable for households, communities, and businesses in poor rural settings to access sustainable energy services. In warm climates, the cooling provided by a fan, refrigerator or air conditioner is an essential energy service increasingly necessary for comfortable sleep, productive classrooms, and adequate health facilities among other productive uses. Conversely, appliances that can be supported by off-grid systems can help drive their sales, as has been demonstrated in the case of televisions.

According to the Efficiency for Access Coalition, the off-grid appliance market remains nascent and disorganized, suffering from a lack of data and the fact that most appliances currently available in off-grid retail markets draw too much power to be supported by solar home systems. At the same time, significant efforts have been made to improve the efficiency, quality and affordability of cooling appliances, including for off-grid settings. These include:

- J The Global Leap Awards (CLASP and Efficiency for Access) for off-grid appliances: inclusive of competitions for efficient fans, refrigerators, and cold chain technologies to stimulate markets and provide actionable signals for product performance
- J The Global Cooling Prize (Rocky Mountain Institute): A USD \$3 million prize to stimulate the development of a 5X more efficient room air conditioner at no more than 2X the cost of current baseline units.
- J Chill Challenge: Affordable, Off-Grid Refrigeration (Engineers without borders USA): the objective of the challenge is the development of refrigerators and icemakers that are significantly more affordable for off-grid communities than currently available units. As many as ten teams will be awarded grants of \$25,000-\$50,000 to build and test prototypes.
- J VeraSol: together with Efficiency for Access, pilot a quality assurance framework for standalone off-grid fans. Building on the appliance testing and data-sharing process of Equip Data, VeraSol and Efficiency for Access developed a set of quality criteria, evaluated products using the quality criteria, and shared findings and data with stakeholders to promote quality products.

Multi-tier framework

The Multi-tier framework is a framework that redefines energy access to fill the gaps in the Global Tracking Framework binary access measurement (“having/not having an electricity connection”)³. It acknowledges that access is a spectrum of service levels experienced by households. The Framework has therefore identified the key attributes that together determine the “usability” of service. For electricity, this includes:

- (i) how much capacity the electricity solution can deliver,
- (ii) how many hours does the household receive electricity service every day, and in particular in the evening,
- (iii-iv) is the service reliable and of adequate quality (e.g. outages / voltage fluctuations),
- (v) is the service affordable,
- (vi) is it provided legally, and
- (vii) is it safe.

³ <https://www.worldbank.org/en/topic/energy/publication/energy-access-redefined>

Figure 1: Multi-Tier Framework for Electricity

	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Capacity		Capacity (from 3W to above 2kW) and ability to power appliances (applicable for off-grid solutions)				
Duration - day		From at least 4 hours a day to over 23 hours a day				
Duration - evening		From at least 1 hour in the evening to over 4 hours				
Reliability					Number and duration of outages (applicable for Tier 4 & 5 only)	
Quality					Voltage problems do not affect the use of desired appliances (Tier 4&5)	
Affordability				Basic service less than 5% of a household income (Tiers 3-5)		
Legality					Service provided legally (Tier 4&5)	
Health and Safety					Absence of accidents (Tier 4&5)	

The tier level is determined by the lowest tier for which all applicable attributes are met. For example, electricity Tier 2 requires a combination of capacity and hours of supply. However, higher tiers, such as Tier 4 and 5 require meeting additional attributes such as reliability, quality, affordability, safety and legality.

The Multi-Tier Framework on energy access try to define what Tier is necessary for different appliances to be run (e.g., depending on the specific model, a minimum of Tier 2 energy access is generally required to run a fan reliably, a minimum of 200 Wh or Tier 3 access is needed for a refrigerator, while 2 kW, or Tier 5 energy access is needed to support an air conditioner).

As multilateral development banks, bilateral donors, and climate funds assess their opportunities for access to cooling, standards for off-grid cooling appliances have not yet emerged as a central focus. Creating a set of criteria to help financiers to identify best in-class products would help in the development of more targeted financing/incentive/lending programs. There is an opportunity to create a meaningful link between the Multi-Tier Framework and off grid cooling appliances in order to ensure access to cooling and access to energy investments are mutually reinforced and beneficial. Moreover, a survey of best-in-class products can reveal how current efficiency rates bring cooling services up the energy ladder, at a lower tier of energy access.

In a warming world, access to cooling for those living in poor rural settings is no longer a luxury, it is an issue of equity. As governments and development financiers work to bring energy and the services it delivers, including cooling, to off-grid communities, the Multi-Tier Framework has emerged as the authoritative standard for service levels delivered. Yet, the Multi-Tier Framework does not reflect technological advances in cooling appliances that have yielded higher efficiency levels, nor that delivering access to cooling is an essential energy service in a warming world.

Through a qualitative review, best available technology for off-grid cooling appliances can be identified and those technology standards can be reflected in the Multi-Tier Framework service levels. As a result, a best practice for financing off-grid cooling appliances will be identified.

OBJECTIVE AND PURPOSE OF THE ASSIGNMENT

The purpose of this work is to identify the energy efficiency levels of the best available cooling appliances (fan, refrigerator and ACs) and their suitability to be supported with off-grid energy services. Once identified, these technologies will be mapped to the Multi-Tier Framework for Energy Access to determine the quality and reliability of energy services required to run them. Through this process, best practice and qualitative standards for finance, for example through lending and procurement, will be developed to support development banks, bilateral donors, and climate funds to deliver cooling services off-grid to vulnerable groups.

SEforALL will transmit standards and best practices as recommendations to development finance institutions developing cooling investment programs. This will support new best practices in cooling-related lending from bilateral donors, Multilateral Development Banks and relevant climate funds, while making sure



that suitable appliances would be utilized. These recommendations will lay the groundwork for deeper technical work related to off-grid appliance standards.

The chosen Consultancy will be responsible for providing data and content for the knowledge brief in close collaboration with the Cooling for All team at SEforALL, and where relevant, a wider group of stakeholders drawn from the Global Panel on Access to Cooling (responsible for peer review, where necessary).

SCOPE OF WORK AND DELIVERABLE

The selected Consultancy will deliver on the following scope of work/content:

1) Off-grid appliance standards

Qualitative review of current efficiency levels of off-grid cooling appliances (fans, refrigerators, ACs), including review and provision of data on actual efficiency levels.

Best practices for the utilization and adoption at scale of off-grid cooling appliances.

2) Link of efficiency standards with Multi-Tier Framework

A methodology that links best available cooling technology with the Multi-tier Framework for access to energy to determine the quality and reliability of energy services required to run them.

3) Key Findings, Recommendations and Conclusion

Develop recommendations for best practices and qualitative standards for finance to deliver cooling services off-grid to vulnerable groups for DFI's, bilateral donors and climate funds

The selected Consultancy is expected to be under contract by August 2020 and conclude contract by 30 November 2020.

TIMELINE

The Consultancy should adhere to the following schedule of deliverables:

Activity	Indicative Timeline
Consultancy to present annotated workplan and methodology/approach	By or before August 30, 2019
Draft of review of current efficiency levels of off-grid cooling appliances and best practices for their utilization and adoption at scale	By or before September 27, 2020
Draft of a methodology that links existing practices to identify best available cooling technology with the Multi-tier Framework for access to energy	By or before October 25, 2020
Draft of Recommendations for action based on the developed content as well as conclusions on areas of action and/or study	By or before November 8, 2020
Submission of a revised Drafts, incorporating feedback/comments from peer review process	By or before November 15, 2020



CONFIDENTIALITY

Confidentiality Statement

All data and information received from SEforALL and different partner organizations, provided to the Consultancy for the purpose of this assignment is to be treated confidentially and are only to be used in connection with the execution of these Terms of Reference (a specific separate confidentiality agreement may be agreed between the Consultancy and SEforALL, if needed to provide information more freely). All intellectual property rights arising from the execution of these Terms of Reference are assigned to SEforALL. The contents of written materials obtained and used in this assignment may not be disclosed to any third parties without the expressed advance written authorization of SEforALL and the Advisory Group.

SCHEDULE OF PAYMENTS

Payments will be structured following receipt of outputs as follows:

-) 20% Upon receipt and approval of annotated workplan and methodology/approach (August 30, 2020)
-) 30% Upon receipt and approval of draft on qualitative survey of current efficiency levels of off-grid cooling appliances and best practices for their utilization and adoption at scale (Sept 27, 2020)
-) 50% Upon receipt and approval of final drafts, incorporating feedback/comments from peer review process (Nov 15, 2020)

The Consultancy should send an invoice to SEforALL. The invoice shall include the contract number, date of delivery, unit price and total amount. SEforALL will process the payments within 30 days of receipt of the invoice.

QUALIFICATIONS AND EXPERIENCE REQUIREMENTS

Organizations Requirements: The organization must have a minimum of 7-10 years' in business with a deep understanding, and demonstrated knowledge of and experience working on electricity access issues in developing countries and:

International recognition and proven expertise in producing energy access analysis and research in the sector;

Over ten years' experience delivering high-quality, independent research and knowledge products; Demonstrated experience in partnering with the international organizations and multiple partners on assignments;

A deep understanding of and expertise in collaborating with multiple data providers and data sources;

Demonstrated experience in off-grid appliances and appliance standards

Experience in working in sub-Saharan Africa and Asia is preferable.

Demonstrated convening power that transforms information into action, particularly in developing countries; and

Experience in operating across multiple time zones and with multiple stakeholders, and/or experience working with international organizations such as the World Bank and the United Nations and other non-governmental organizations.

The organization must be responsive and prompt in their correspondence.



June 2020

Consultant Lead Requirements

A designated project team lead with a minimum of:

- 8-years' experience leading a team of consultants in delivering high-quality, independent, multi-country research reports.
- Educational qualifications of at least Master's level in economics, business, finance, law, public policy or a related discipline.
- A minimum of 5 years' experience working with and understanding off-grid appliance implementation in developing countries.
- A minimum of 5 years' experience in appliance standards analysis and research in the sector.
- A deep understanding of expertise in collaborating with multiple data providers and data sources.
- Sound experience working across multiple time zones and with multiple stakeholders.
- Strong analytical skills/experience.
- Strong written and oral communications skills; proficiency in written and oral English required.

Additional Consultant(s) Requirements:

Each proposed additional team member with a minimum of:

- 5-years' experience in research and drafting of high-quality research reports.
- Educational qualifications of at least Master's level in economics, business, finance, law, public policy or a related discipline.
- A minimum of 5 years' experience working with and understanding off-grid appliance implementation in developing countries.
- Sound experience working across multiple time zones and with multiple stakeholders.
- Strong analytical skills/experience.
- Strong written and oral communications skills; proficiency in written and oral English required.

BID PROCESS

Applications must include the following:

Cover page, including the organization's name, address and contact information

Your organization's understanding of the assignment, including any proposed changes to the scope of work

Brief background about your organization

Relevant experience

Project plan, including your proposed approach and methodology, and a plan for addressing data gaps

Management plan, including information about key personnel CV's and roles of partners (subcontractors), where applicable

Proposed Budget in USD or EUR

An explanation of any conflicts of interest, if any

Link to two previous knowledge briefs/blogs/articles produced by the offeror that are similar to the deliverable required in this assignment. Reports may also be attached to the offeror's proposal

References (at least 3)

The budget must cover all expenses, and should be itemized according to the following categories:

Personnel (name / position / daily rate / estimate level of effort - # days)

Fixed costs



June 2020

Travel

The consultant is expected to be home-based. No travel will be needed.

Bid Submittal Deadline

Bid submittals will be accepted no later than **Monday, July 20th, 2020 10:00 a.m. Eastern Daylight Time (EDT)/16:00 CEST**. Email your proposals to the SEforALL Procurement unit at procurement@seforall.org.

Please be advised SEforALL will be hosting a pre-bid video conference, if you would you like to join please send an email to procurement@seforall.org.

Topic: Off-Grids Cooling Appliance Knowledge Brief Pre-Bid Conference Call

Time: **Monday, July 13th, 2019 10:00 a.m. to 11:00 a.m. Eastern Standard Time (EST)/16:00 to 17:00 Central European Summer Time (CEST)**

The Project Manager for this assignment will provide participants an overview of the assignment and answer any questions you may have. If you're not able to participate in the pre-bid conference call, please send your questions to procurement@seforall.org

ⁱ Byers, E. et al., 2018: Global exposure and vulnerability to multi-sector development and climate change hotspots. Environmental Research Letters, 13(5), 055012, doi:10.1088/1748-9326/aabf45 from Hoegh-Guldberg, O., D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K.L. Ebi, F. Engelbrecht, J.Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S.I. Seneviratne, A. Thomas, R. Warren, and G. Zhou (2018). Impacts of 1.5°C Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I.Gomis, E. Lonnoy, T.Maycock, M.Tignor, and T. Waterfield (eds.)]. In Press. Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter3_Low_Res.pdf

ⁱⁱ Mbow, Cheokh, Rosenzweig, C. et al (2019, IPCC Special Report on Climate Change and Land, Chapter 5, Executive Summary. Available: https://www.ipcc.ch/site/assets/uploads/2019/08/2f.-Chapter-5_FINAL.pdf

ⁱⁱⁱ World Health Organization (2019). Immunization coverage factsheet. Available at: <https://www.who.int/news-room/factsheets/detail/immunization-coverage>