EFFICIENCY FOR ACCESS

Efficiency for Access Design Challenge

University Guide

UK ENGINEERS WITHOUT BORDERS

1. Overview

Efficiency for Access is a coalition of 13 public funders, foundations and international agencies which together support programmes spanning three continents, 44 countries and 19 key technologies all aimed at scaling energy access globally.

The Efficiency for Access Design Challenge is an invitation to universities across the globe to be part of this movement. As part of the DFID-funded £18 million Low Energy Inclusive Appliances Programme, it is an opportunity for universities and their students to work at the forefront of energy access, by designing affordable, super-efficient appliances for people living with limited or no access to the grid.

The Efficiency for Access Design Challenge aims to raise awareness and inspire student engagement in the off-grid sector. Through shining a spotlight on energy access and providing a programme of curated support for students, the Efficiency for Access Design Challenge will forge strong relationships between universities, their students and the industry. Ultimately it aims to promote talent and innovation in the off-grid appliance sector globally.

The Efficiency for Access Design Challenge is a unique opportunity for students to:

- Work at the forefront of energy access;
- Better understand the users' needs in off- or weak-grid settings;
- Gain experience considering the ethical, environmental, social and cultural aspects of engineering design.

A dozen universities from the UK and sub-Saharan Africa will take part in the inaugural year of the Efficiency for Access Design Challenge, which will run during the 2019/2020 academic year. Each university will enter up to three teams of up to five students and it is free to participate.

The Efficiency for Access Design Challenge is being led by the Efficiency for Access coalition with support from Engineers Without Borders UK.

Universities must confirm participation by completing this sign up form by 30th June 2019 to participate in the 2019/20 Efficiency for Access Design Challenge

2. About the Design Challenge

Who is this for?

The Efficiency for Access Design Challenge is open to students who are in the last year of their Bachelor degree or in their Masters or integrated Masters degree*. They might already be inspired by the potential of user led engineering in international development or entirely new to it as a potential career path. They could be excited about horizon technologies or interested in applying their skills to real world design challenges of today. Or all of these!

Students can participate in teams of up to five. Each university may nominate up to three teams to participate in the Challenge. Whilst it is expected that the majority of team members will be studying engineering, those studying other relevant subjects can be included at each university's discretion.

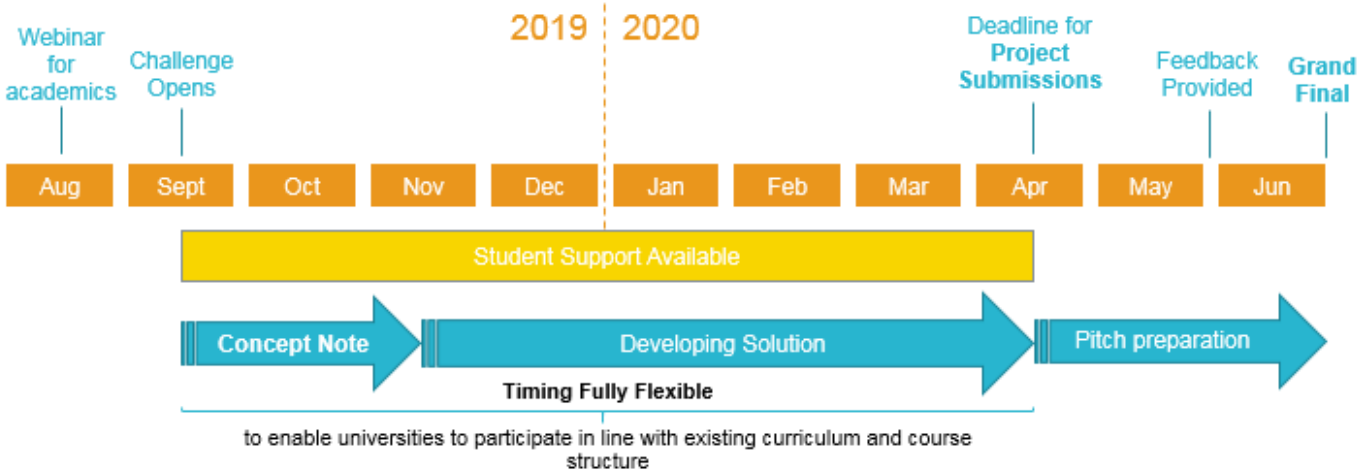
*This typically refers to 3rd or 4th year university students in England, Northern Ireland and Wales (i.e. Level 6 or 7 under the RQF), 4th or 5th year university students in Scotland and equivalent international qualifications. This Challenge is also open to those that meet these levels through vocational apprenticeships.

When does this happen?

The timing of the Challenge is deliberately flexible to enable universities to participate through existing curriculum and course structure. For example, universities might choose to schedule the project to run over several terms (e.g. from launch in September to submissions in April) or condense the participation period (e.g. to an intensive module of a week or two).

It is anticipated that students will receive credit for participation. Engineers Without Borders UK have experience of a range of approaches to this. Do not hesitate to contact us for further information.

Key Dates



Sign up to register your university: complete **this form** by **30th June**. The form asks for key contact details and estimates of number participating students in either the 3rd or 4th year of their academic degree (or equivalent). Please note, there will be opportunities later in the year to verify any assumption you have made about numbers of participants. If you have any questions please get in touch with Engineers Without Borders UK by emailing **challenge@ewb-uk.org**.

Before September:

- Academic training webinar;
- Challenge briefs will be shared;
- Further guidance including the detailed assessment framework.

Projects begin: Projects can commence at any point from September and should start with students submitting their **Concept Notes**. Concept Notes should outline where students plan to focus and should be no more than four A4 pages. Students will not be assessed on their Concept Note and it will not be used to decide whether the team can participate or not. When submitting Concept Notes, students will also sign up to the Terms and Conditions of the Challenge.

Throughout the year, key contacts at universities will be supported with regular check-ins with the Efficiency for Access Design Challenge team.

Student support: During the project the Efficiency for Access Design Challenge team will provide a curated programme of support for students. See section 6 – Student Support

Project Submission Deadline: All teams should submit their Project Submission (a 4000 word report and 3-minutes video) by Wednesday 15th April 2020. See section 5 – Assessment.

Feedback: Students will receive feedback on their submission in May.

Grand Final: All students participating in the inaugural year of the Efficiency for Access Design Challenge are invited to the Grand Final in June 2020. See section 5 – Assessment.

3. Challenge Brief

The Context

The **UN Sustainable Development Goals** recognise that access to modern energy services such as electricity is crucial for the eradication of poverty, the provision of basic health-care services and human development. Enhancing access to modern and reliable energy is widely regarded as a prerequisite for economic development.

Distributed energy solutions hold enormous promise to unlock life-changing modern energy services for the world's poorest people. The International Energy Agency **predicts** that more than 600 million people in Africa will need to be served by off-grid renewable solutions by 2030 to meet the UN goal of universal energy access.

Efficient appliances enable telecommunications, cooling, mechanisation, refrigeration and cooking, which play a key role in enabling access to clean water, nutrition, health care and production of food.

However, relatively little attention and financial investment has gone in to this new industry. More research and development is needed into energy efficient, high quality, **market appropriate** end-use **appliances** for off- and weak-grid consumers, for both households and businesses.

If properly supported and deployed, efficient appliances could be as **transformative** as LED lighting.

The Efficiency for Access Design Challenge aims to unlock this opportunity.

The Challenge

We are looking for teams to design or improve appliances that can be used in an **off- or weak-grid** context in **UK aid priority countries**.

We are interested in **affordable** and **efficient** appliances that **improve people's lives** by either **improving quality of life in their home** or **increasing productivity of their microenterprise**.

We want students to identify an opportunity for an appliance to **make a difference to people's lives**. We want their designs to be a **significant improvement** on solutions that are currently available, and to **have the potential for scale impact**. (See Section 5 - Assessment)

The focus is on **energy consumption**, and the appliance's primary source of energy should be **electricity (DC current)**. Energy generation is out of the scope.

Improving quality of life in homes

The Problem:

Despite the proliferation of off-grid electricity supply, off-grid homes are still vastly different to on-grid homes. Affordable and efficient appliances that run off solar DC electricity are limited. People either keep themselves comfortable, safe and healthy, with the support of expensive and polluting fuel or they go without.

The Challenge:

Design an affordable and efficient appliance, or an improvement to an existing appliance, that could help increase productivity of microenterprises based in an off- or weak-grid setting in developing countries.

Increasing productivity of microenterprises

The Problem:

Despite the proliferation of off-grid electricity supply, affordable and efficient appliances that run off solar DC electricity are limited, and many income generating activities that could be undertaken with the usage of appliances are still done manually or with the support of expensive and polluting fuels.

The Challenge:

Design an affordable and efficient appliance, or an improvement to an existing appliance, that could help increase productivity of microenterprises based in an off- or weak-grid setting in developing countries.

4. Example Projects

The Challenge is open as to which appliances students choose to focus on, as long as they have clearly identified a user need that their design will seek to address.

Here are some examples of projects to bring to life what students could come up with.

Agriculture

40% of the global population rely on agriculture as a main source of income, many without energy access. Tending crops through time-intensive physical labour, their yields are inconsistent and weather-dependent compared to farmers with access to energy and agricultural appliances.Solar water pumps offer a promising option for farmers living in off- or weak-grid areas. Likewise, recently developed solar mills consume far less energy than diesel mills, while increasing productivity, and supporting financial growth.

Project example: Increase productivity of microenterprises by designing a more efficient head for a solar water pump.

Cooking

The **WHO reports** that 3 billion people currently cook with polluting fuels, such as kerosene, coal or biomass, in poorly ventilated areas. Of that 3 billion, around 3.8 million people a year die prematurely from illness attributable to household air pollution.Manufacturers in the off- and weak-grid sector have designed super-efficient cook stoves, but challenges remain for cooking appliances to be affordable, efficient and considerate of traditional cooking methods.

Project example: Improve quality of life in homes by improving a domestic electric pressure cooker.

Refrigeration

Refrigeration provides a wide range of benefits, from improving health and productivity, to reducing the domestic burden on women and children, who are usually responsible for food gathering and preparation. It also enables income-generating activities through the cold storage of drinks, food, and other perishable items for later sale.Refrigerators, however, are one of the most challenging off-grid appliances to design and develop to be both energy efficient and cost-effective. Therefore, the global market remains in the early stages of development.

Project example: Increase productivity of microenterprises by retrofitting a refrigerator compressor for use in a small milk chilling refrigerator.

Cooling

Beyond basic comfort and productivity, access to cooling appliances like fans can reduce mortality and morbidity during severe heat waves and increase overall wellbeing.Fans are in high demand among off- and weak-grid consumers. However, mainstream off- and weak-grid fans still consume too much energy – sometimes over 10 times as much energy as lighting technology in the same setting.

Project example: Improve quality of life in homes by designing an appliance that can maintain a bedroom comfortably cool for two children.

Power Management

The high cost of batteries is a significant barrier to the uptake of appliances in off- or weak-grid settings. To ensure a constant and consistent electricity supply to large appliances like fridges, distributors often oversize these, consequently increasing cost and reducing efficiency.Improved power management helps reducing the size of batteries required, making it more likely for people to be able to afford larger appliances.

Project example: Improve quality of life in homes by using smart algorithms to optimise power output of a battery and increase an off-grid appliance's efficiency and lifetime.

These are only examples, and students should come up with their own ideas.

5. Assessment

Submissions

Teams will need to submit their Project Submission by 15th April 2020. It will consist of a 4000-words report and a 3-minutes video. Detailed guidelines for Project Submissions will be provided to universities in August. Other supporting documentation e.g. posters or prototypes can be photographed or included within the submission if deemed useful.

The students shall retain the Intellectual Property of their work but are required to give permission for the Efficiency for Access Design Challenge team to have the ability to use the research outcomes for a wider benefit. This is achieved by students agreeing to licensing of their work under Creative Commons license **CC-BY 4.0**.

Assessment Framework

The Judging Panel will apply a detailed Assessment Framework to assess Project Submissions. This framework will be provided to universities in August, and will be based on the following high level criteria:

IMPACT	**What difference does your design make to people's lives?** We will be assessing: • Understanding of the end user • Inclusivity
INNOVATION	**How does your design improve on solutions that are currently available to your end user?** We will be assessing: • efficiency • affordability • useability • product lifecycle
SCALABILITY	**How feasible is it that solutions could get to market and achieve scale impact?** We will be assessing: • The business model

The Judging Panel

The Judging Panel will be made up of funders, industry experts and investors in the sector. The Judging Panel will assess the students' Final Submissions and provide feedback to the teams in May.

The Grand Final

For the inaugural year, all students participating in the Efficiency for Access Design Challenge will be invited to The Grand Final, to be held in June 2020 in London. The Grand Final is a one-day event with many opportunities for networking to forge continued links for future student briefs and the opportunity to view all of the submissions from the year. Many experts and investors from the sector will be invited to the event.

Throughout the day, each team will pitch to a panel of technical experts and investors and showcase their work. Remote participation will be available to students not able to attend in person. The Judging Panel will make several awards during the Final, and at the end of the day these awardees will be asked to pitch to everyone attending the event as a final showcase.

6. Student Support

The Efficiency for Access Design Challenge team will provide a curated programme of support for students, including:

Resources

Universities participating in the Challenge will be given access to a comprehensive **digital library** of reports, market surveys and research papers from the Efficiency for Access coalition to support students in the development of solutions. The student teams will also have access to the **off-grid appliance data platform**.

Mentoring

The Efficiency for Access Coalition has a deep network of specialists from the off-grid industry. Each student team will be introduced to relevant industry mentors to support them in their project.

Learning & Networking Opportunities

The Efficiency for Access Design Challenge team are developing a programme of webinars, invitations to events and on-campus visits to enhance learning and networking opportunities for students and their departments. This will include sessions to help students to understand the context and ensure the end-users are at the centre of their designs.

The Efficiency for Access Design Challenge team will use the Concept Notes which teams submit when entering the Challenge to assess specific needs of each team, and will look to enhance and adapt the programme of activities specifically to meet these.

> **The Efficiency for Access Design Challenge is an exciting opportunity for us. We want top-talents to join the off-grid industry and bright students to think about the problems we are facing.**
>
> Jon Ridley, Director
> M-KOPA Labs

M-KOPA SOLAR

7. Partners

The Challenge is being led by the Efficiency for Access coalition with support from Engineers Without Borders UK. The Efficiency for Access coalition is jointly coordinated by the Energy Saving Trust and CLASP.

The **Efficiency for Access Coalition** is a global initiative that aims to harness the power of energy efficiency to accelerate universal access to modern energy services suited to off- and weak-grid situations in developing countries. The Coalition includes:

The **Department for International Development (DFID)** uses aid to tackle the global challenges of our time including poverty and disease, mass migration, insecurity and conflict. It co-chairs the Efficiency for Access Coalition and funds its flagship programme LEIA (Low Energy Inclusive Appliances). Hence, it is the funder of the Efficiency for Access Design Challenge.

Engineers Without Borders UK's engages and galvanises the engineering community to serve all people and our planet better than ever before. An example of their work is the award-winning Engineering for People Design Challenge. Every year Engineers Without Borders UK educates over 6,500 students so that they understand their responsibility and develop the skills to act on this. They are creating a generation that are entering the workplace ready to tackle our global challenges.

Energy Saving Trust is the UK's leading independent and impartial organisation in the domestic energy sector. EST specialises in energy efficiency product verification, data and insight, advice and research. Its internationally renowned services are underpinned by the best evidence, research and evaluation, and delivered by highly skilled and experienced specialists in the field. EST is now co-managing the DFID-funded LEIA programme, facilitating knowledge sharing, activity coordination, and broader engagement with, and support to, key market stakeholders in the nexus of energy efficiency and energy access.

CLASP is an international and impartial nonprofit organisation, first established in 1999 to mitigate the growing energy demand from the use of appliances, lighting, and equipment in the developing world. Since then, CLASP has worked with partners in nearly 100 economies to cut carbon emissions and improve lives.