PATHWAYS TO SUSTAINABLE & INCLUSIVE ENERGY

INSIGHTS FROM THE 2019 AE4H INNOVATION LAB

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PREFACE

Access to energy is a powerful catalyst of sustainable development. Energy access has large impacts on 13 of the 17 Sustainable Development Goals, ranging from alleviating poverty through the creation of micro-enterprises, to improving health by limiting indoor air pollution created by traditional cooking fuels, to strong climate action by creating decarbonized energy systems. Approximately a third of humanity (2.5 billion) does not have access to affordable, reliable, and sustainable sources of energy and a billion of this population has no access to electricity. In order to meet this basic need at the core of human sustainable development, innovative solutions that address the technical, political, and economic challenges of energy access must be carefully developed and implemented.

It is with this understanding that in 2015, the Affordable Energy for Humanity (AE4H) global change initiative was created by Dr. Jatin Nathwani and Dr. Joachim Knebel from the Waterloo Institute for Sustainable Energy (WISE) and the Karlsruhe Institute for Technology (KIT) respectively. The goal of AE4H is to build a committed network of energy access researchers and practitioners from around the world to develop innovation solutions to energy poverty.

From June 19-21 2019, 52 members of the AE4H consortium representing 18 countries attended the 2019 AE4H Innovation Lab in Waterloo, Canada, to meet and discuss solutions to energy access. This Innovation Lab was a forum for true innovation – instead of being passive listeners, participants were challenged to actively contribute to new ideas to scale and improve the provision of global energy access. The purpose of the Innovation Lab was to leverage the expertise of the dynamic and diverse experts in the room to create tangible energy access solutions.

Through the Innovation Lab, participants first went through a series of brainstorming exercises to ascertain the most pressing energy access challenges of the day. They then self-arranged into diverse groups and developed the basis for a solution to one of the brainstormed challenges. These solutions were then developed further for several months after the end of the Innovation Lab, into a series of Innovation Briefs that outline the structure and merit of the proposed solutions. This document is a compilation of the Innovation Briefs developed through the 2019 AE4H Innovation Lab. The Briefs outline current problems and solutions regarding energy access, and represent the strong global collaboration and commitment from AE4H members to ensure affordable, reliable, and sustainable energy for all.

September 1st, 2020

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IDEA: INCUBATING DEVELOPMENT THROUGH ENERGY ACCESS

BY

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EXECUTIVE SUMMARY

Energy in its various forms and uses is crucial for pursuing personal and social well-being. Electricity is a particularly liberating form of energy due to the versatility of ways in which it can be produced and utilized. Thus, it has the potential to make human progress more inclusive, enabling a greater number of homes, businesses and communities to participate in the entire electricity value chain. However, nearly a billion people still lack access to any form of electricity and approximately three billion people live with unreliable sources of electricity at prohibitive costs. Exclusion from electricity access coincides with exclusion from socio-economic opportunities, heightened ecological decline and political marginalization.

Therefore, it is imperative that the goal of clean and affordable energy for all (SDG7) is achieved in inclusive, fair and equitable ways. Electrification projects cannot be simply based on creating access to electrons at affordable cost, but have to be cognizant of their place and function in generating pathways for 'Energy – Well-being'; the processes and outcomes that produce safe, productive, prosperous, ecologically harmonious and supportive conditions for people and societies to pursue increasingly higher quality of life, enabled through energy utilization and unburdened by the energy system at the same time.

Incubating Development through Energy Access or IDEA is a proposed procedural framework for thinking about and identifying catalyzing interventions that can be undertaken by an energy project in an underserved community. The objective of such catalyzing interventions would be to actively create three kinds of enabling soft infrastructure(s), Knowledge, Skills and Capacities, Structures for navigating change; to accompany energy projects, in order to generate pathways for materializing energy – well-being in the community. IDEA offers a sequence of steps to identify non-energy 'catalyzing interventions' that can be undertaken by energy

project developers to ensure that broad well-being ambitions of the communities are achieved, which in the process sustains the energy project in a symbiotic relationship.

Off-grid energy projects and mini-grids are relatively new sectors, with a still forming body of evidence on best practices for social and economic success. Experience from grid access has limited relevance at this scale and diversity of social, economic and ecological dynamics. It is worth noting that the electricity grid in its present form has been a major contributor to the ecological and economic stresses on the potential beneficiaries of off-grid energy. Hence, practitioners and all other stakeholders need to adopt an experiential learning mindset, beginning with a shift to thinking about energy and well-being instead of simple access.

There is less than a decade left for the world to achieve the Sustainable Development Goals, which expedites the need for taking deliberative and prompt action. The room for errors and misdirected projects is shrinking fast and has consequences that slows down the progress trajectory. This paper is a call to action for all stakeholders invested in energy access, socio-economic development of marginalized communities and environmental action. IDEA outlines a set of rationales for them to act and empower those at the grassroots to make decisions based on evidence.

INTRODUCTION

Humanity's ability to adapt to the surrounding environment and transform inhospitable conditions into habitable ones has been closely correlated with the ability to harness and utilize energy to create safer, more nourishing and comfortable living conditions. The exploration for more powerful sources of energy, and experimentation on energy's uses has been a continuous process of discovery throughout history. The First Industrial Revolution precipitated large scale energy conversion in the service of mechanized economies, industrial population centers, and modern warfare; also characterized as the geo-politics of energy. Subsequent transformations have happened to make energy conversion and distribution more efficient, enabling large scale public infrastructure for health, communication and transport. In addition, it has been a major driver of the knowledge economy which has breached planetary frontiers, by powering large scale connectivity (the internet) while making energy production possible at smaller scales (solar panels) and portable (batteries). However, alongside this progress, growing energy consumption has significantly contributed to pushing the planet towards (and perhaps beyond) environmental tipping points. All of it has been made possible by human societies engaged in the imaginative pursuit of knowledge, incentivized by diverse forms of social organization and values, and by the creative use of energy to power imaginations. Electricity has catalyzed this progression; on one hand, making human progress more accessible and inclusive by enabling participation of a larger and diverse number of households, while on the other hand becoming one of the chief contributors to climate change, gentrification and economic burdens [1]. An alternative reality is that nearly a billion people lack access to any form of electricity. Moreover, approximately three billion people live with unreliable sources of electricity at prohibitive costs [2]. It is no coincidence that these people with little to no access to electricity are the farthest away from socio-economic inclusion and access to opportunities for well-being. Therefore, it is imperative that the goal of clean and affordable energy for all (SDG7) is achieved in inclusive, fair and equitable ways.

In this article, we argue the initiatives to bring electricity to all should be cognizant of their place and function in generating 'Energy – Well-being'. We broadly describe energy-wellbeing as the processes and outcomes that produce safe, productive, prosperous, ecologically harmonious and supportive conditions for people and societies to pursue increasingly higher quality of life, enabled through energy utilization and unburdened by the energy system at the same time.

To accelerate and sustain pathways to energy-well-being we propose the concept of Incubating Development through Energy Access (IDEA). In the following sections, we deconstruct the dynamics of the interlinkages between energy systems and well-being, identify enabling conditions that catalyze virtuous interlinkages, and explore how energy businesses, funding agencies, governments and policy agencies can capitalize enablers to reinforce positive well-being and energy demand growth.

BOX 1: ACCESS AND WELLBEING

"…while the poor feel empowered by their (free) access to education, they don't have any of the other necessary institutions in place to support them and therefore spend their incomes on items (i.e. health insurance, transport, and so on) that the government would usually subsidize." (Source: Watum, Marc. "Would free and equal access to education end poverty?" September 28, 2017 in The Erudite.)

Amartya Sen [16] has described the negative impact of well-intended actions as 'Friendly Fire', where benevolent institutional actors fail to see the interlinkages and capabilities required for translation of the opportunity to outcomes, resulting in negative consequences in other spheres of life cumulatively lowering overall well-being. So, why is the amelioration of human well-being seemingly difficult to achieve and giving rise to consequences despite well intended efforts?

The Millennium Ecosystem Assessment report [18] has described human well-being as the achievement of fundamental needs for human biology (food, water, clean air, shelter, health and relative climatic consistency), conditions that sustain social life (income, livelihood, food production, energy production) and avoidance of negative pressures (migration, conflict etc.). It emphasizes on the role of ecosystem services (intact watersheds, genetic diversity and complement of species, forests etc.) as the key to sustaining the above, and thus being essential conditions of well-being. Beyond these measurable and tangible aspects, there exists a far broader set of non-material conditions for human well-being. Quality of life, welfare, communal life, living standards, utility, life satisfaction, prosperity, needs fulfillment, development, empowerment, capability expansion, human development, poverty, land and, more recently, happiness – are associated to this aspect of human well-being [17]. Interestingly, the seventeen UN Sustainable Development Goals (SDGs) identify similar objectives towards achieving a sustainable world by 2030.

Actions aimed at a narrower set of parameters for well-being are more likely to produce consequences akin to 'Friendly Fire'. There certainly are limits to the scope of any planned action in terms of addressing the various aspects of human well-being. However, if the definition of scope follows from a broad, evidence supported assessment of the possibility and is designed to be progressively inclusive, design of solutions become far more anticipatory and adaptive to emerging risks and opportunities.

ENERGY - WELL-BEING

It has always been intuitive that human and social well-being are deeply interlinked to the availability of energy. More recently, research has offered evidence for a more nuanced view on the ability and knowledge to utilize energy as the key determinant of well-being creation [13]. The field of research on the social dimension of energy has put forward three major arguments:

- 1. Access to electricity is a necessary but not sufficient condition for socio-economic development [3].
- 2. Attainment of higher income, education, socio-political stability, improved communication, higher quality of leisure and socio-cultural engagement, better health and healthcare infrastructure result in higher demand for electricity services [4, 14].
- 3. Energy services that enable functionings inside the home, at the workplace and in the community increases the ability to use and pay for higher electricity demand [5,6,7]. In his landmark book 'Development as Freedom', Amartya Sen describes functionings as the states and activities that constitute a person's being. Examples of functionings can vary from elementary things, such as being healthy, having a good job, and being safe, to more complex states, such as being happy, having self-respect, and being calm. These are crucial to an adequate achievement of capability and the freedom to pursue well-being [15].

Although there is no established equation that relates Kilowatt hour (kWh) or Kilocalories (Kcal) of energy consumed and units of well-being achieved; it is quite clear that access to energy services, infrastructure for social development, and the individual's ability to productively utilize the former in tandem, are the necessary conditions that need to co-exist for achieving well-being outcomes [Box 1]. The lack of any one of the three will result in sub-par outcomes [8,9,10,11].

For an energy system to be self-sustaining while generating continuous value for its users, it needs to provide a sufficient amount of reliable energy at an affordable price, while facilitating progressive utilization and user capacity (Box 2).

Discovering Energy – Well-being pathways

Energy enterprises struggle in communities which have historically not used electricity as a major driver in their lives. This could be attributed to numerous reasons like high income variability of users, not being accustomed to formal transaction mechanisms with service providers, or users simply being unaware of the use value of electricity. Such a group of users need support to 'intentionally discover' ways to utilize energy in productive and optimum ways, and clearly understand the connections between energy use and enhancement in well-being. For energy enterprises, the initial hurdle would be to promote direct use, which would then broaden to a more challenging 'plateauing effect' where demand stagnates and eventually declines due to the lack of improvements in capabilities, and conditions for meaningful energy utilization – well-being outcome pairings.

BOX 2: ENABLERS OF ENERGY - WELL-BEING

A simplified representation of the energy and human development relationship can be in the form –

> **Socio-Economic-Ecological Development**
>
> $\propto$
>
> ***Access to Energy*** AND ***Energy Utilization Opportunity*** AND ***Energy Utilization Capability***

In this relationship, access to energy is the only hard energy infrastructure parameter. The opportunity and capability to utilize this access, is what we describe as the 'enabling soft infrastructure'. It is that set of necessary conditions (Section 2), functionings and abilities that will determine whether the availability of energy results into an improvement in the well-being status or has a detrimental effect. Communities in different geographical, political and cultural situations will require different kinds of enabling soft infrastructure and to a varying degree depending on their current situation.
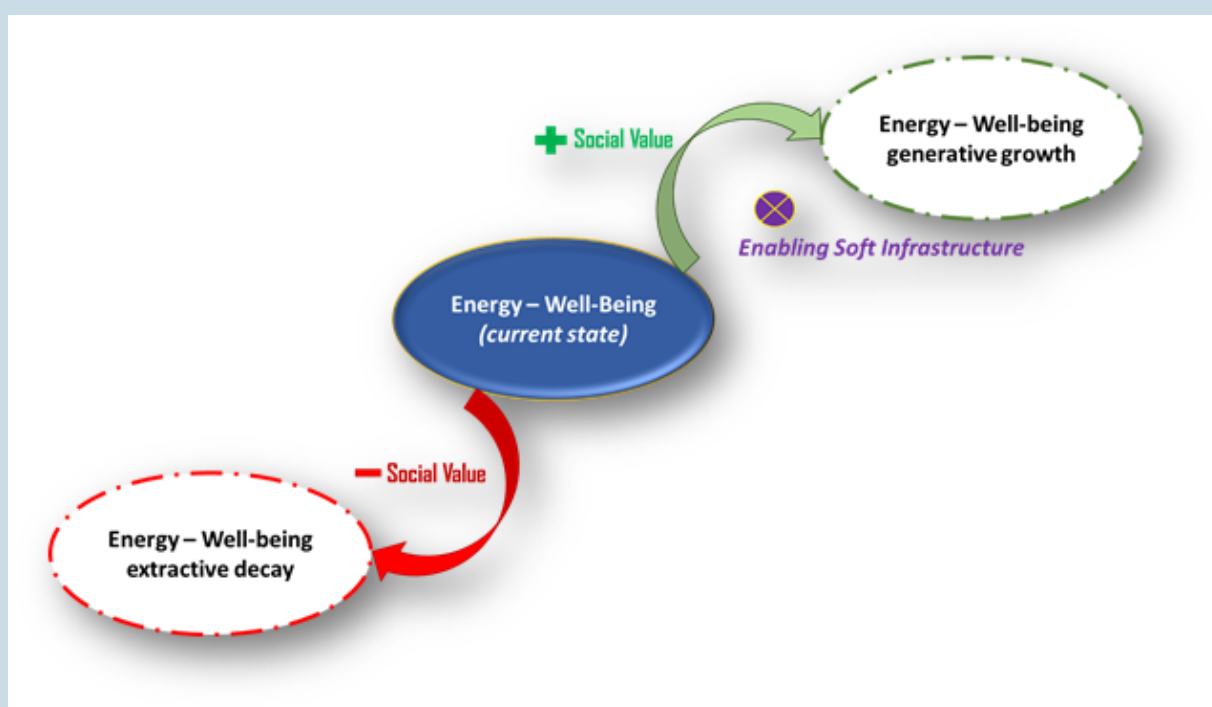
Enabling soft infrastructure can play a significant role in adding social value of energy to communities, transitioning them towards a generative pathway, where energy services and the well-being of user communities form a symbiotic relationship [8,11]. Weak or a lack of enabling soft infrastructure, on the other hand, can rapidly transfer the burden of energy services to its users, undermining any benefits a.k.a. friendly fire. The system becomes extractive and retracts to survival mode; i.e. the use value of good quality energy service is minimal and becomes dispensable in favor of low or no cost energy. Also, since the need for enabling soft infrastructure capabilities modify and evolve, the energy-well-being state is never static. Hence, it will either transition to a generative pathway or deteriorate to the extractive one.

THE CHALLENGE

While the concept of enabling soft infrastructure or enablers may seem intuitive, their proper identification is not so and can easily be misjudged. It requires a place-specific inquiry to uncover the precise nature of enablers and their relationship to the social-ecological-economic well-being pathways.

In practice, the conceptualization of enablers is generally based on successful or unsuccessful precedents situated in a different context or in the past (that no more represents present and future society) or usually a combination of both. This usually results in blind spots in the socio-technological design of projects that are intended to facilitate a drastically different future for communities it serves. Hence, the challenge for designers, planners, investors, policy makers is two-fold: (a) Acknowledge and recognize the need for enabling soft infrastructure, and (b) Explore the right mix of enablers by overcoming traditional barriers to place-based inquiry.

3.1 Recognizing enablers

The path to solutions for a problem begins with acknowledging and discarding the lock-ins or path-dependencies of "business as usual" knowledge and practices. This is especially true in the off-grid energy access space where there is a serious lack of evidence of the interlinkages, and where practices are based on assumptions derived from the century old experience of the electrical grid. Thus, the first challenge to overcome is:

Recognizing that for energy systems to contribute to socio-economic and ecological well-being, translational mechanisms are required. Our knowledge of such mechanisms is limited and therefore filling this gap requires honest and scientific efforts.

3.1.1 Barriers to place-based inquiry
If the acknowledgement of a need for soft infrastructure creates a spirit of inquiry instead of

determinism (optimistic or pessimistic, detrimental either way!), there are a set of procedural barriers to overcome. Over a hundred participants at the Innovation Lab 2019, of diverse geographical and cultural contexts, narrated experiences and anecdotes about challenges they have encountered in energy projects. A simple analysis reveals the following categorization of factors that impede proper identification of enablers in communities:

a. Socio-Cultural unfamiliarity – social practices, inhibitions, ambitions and values as a community are deeply rooted characteristics of a place and its people. Such socio-cultural dynamics tend to go unarticulated due to differences in socio-cultural, educational and knowledge vantage points, between the community and project planners. This leads to unaligned expectations and fundamental differences in the outcome visions.

b. Design as a rigid technological process – energy production and distribution infrastructure (and investment) primacy in energy systems induces inflexibility in technological design and underarticulation of social design needs. The most well intended solution interventions, therefore, can end up being at odds with its recipients and insensitive to social aspirations. Consequently, energy systems can become resistant to acknowledgement and adaptation to the demands placed by fluid social complexity landscape.

c. Short-term impact horizon – returns on investment and impact on beneficiaries are project goals, often set for the short term. Projects are thus pressured to maximize returns through a limited, deemed to be safe set of offerings. This narrows the opportunity for recipients to experience and explore pathways through which electricity can generate value in different spheres of life. As a result, an over reliance on basic services (like lighting or television sets) creates a binary failure mode for both the project and the recipients.

d. Project/Investor mandates obstructing co-production – All of the above is reinforced by project methodologies and guidelines for electrification; which too often dictate and incentivize the infrastructure of electricity and not its utilization, governance, supporting institutions or integration of enablers for sustainable development needs.

Investment in establishing a mini grid requires sustained operation for an extended period of time for projects to be financially successful. During this extended period, the consumer landscape keeps

evolving in terms of needs, expectations and ambition of human and community development. For the energy enterprise to remain relevant to the larger canvas of development and improvements for the local economy, it needs to keep pace with, anticipate, and at times shape the change. This would mean not only changes in demand and quality of energy, but services that facilitate constructive utilization and capabilities to lower disruptive practices. In other words, lower the probability of vicious cycles and setting off virtuous cycles.

BOX 3: LOCAL ECONOMY & ENERGY ENTERPRISES – A SYMBIOTIC RELATIONSHIP

Building healthy, equitable local economies isn't the work of a single leader or organization: it requires local ecosystems of individuals and institutions to come together, understand their relationships to each other, and choose to collaborate. By co-creating strategies these different stakeholders can align and accelerate the positive impact they seek in their local communities.

In the outer ring, find the roles and sectors that represent who comes together to create healthy, equitable local economies. The inside circle of this graphic illustrates the eight strategies of the Local Economy Framework: these represent how these individuals, organizations and sectors take action to build an economy that works for all of life."   - The Business Alliance for Local Living Economies, BALLE

Local energy enterprises are best suited to becoming the embedded stakeholder in the community's growth and self-determination by:
a. Playing an active and constructive role in directly creating some of the enablers in the outer ring,
b. Providing skill assistance and operational support to initiatives that strengthen the action principles in the inside circle.

As discussed in Box 2, sustained growth in energy demand and the user's capability to comfortably afford the increased usage, increases sharply with better conditions and opportunities for the community to pursue well-being. Facilitating a variety of enablers required to pursue such well-being pathways, is therefore a sound business strategy for growth. Additionally, integrating the energy enterprise into socially relevant and valuable practices, inculcates greater trust and sense of ownership in the community, develops operational protocols through consensus and collaboration, which ultimately results in greater customer compliance. Such an approach creates what is known as "shared value", through which businesses gain competitive advantage by including social and environmental considerations in their strategies [12].

INCUBATING DEVELOPMENT THROUGH ENERGY ACCESS: AN IDEA FOR CATALYZING WELLBEING

The discussion above summarizes the challenge landscape of impediments identified by several participants at the AE4H Innovation Lab. To dive deeper into understanding the particular challenge and to brainstorm on innovative solutions, Group #8 at the innovation lab came together over two days of deliberations. This resulted in crystallizing the concept of Incubating Development through Energy Access (IDEA), as a potential step up in the design and planning of off-grid projects.

IDEA proposes a procedural framework for thinking about and identifying catalyzing actions that can be undertaken by an energy project in an underserved community. The objective of such catalyzing interventions would be to actively create the enabling soft infrastructure(s) to accompany the energy projects, in order to generate pathways for materializing energy – well-being in the community.
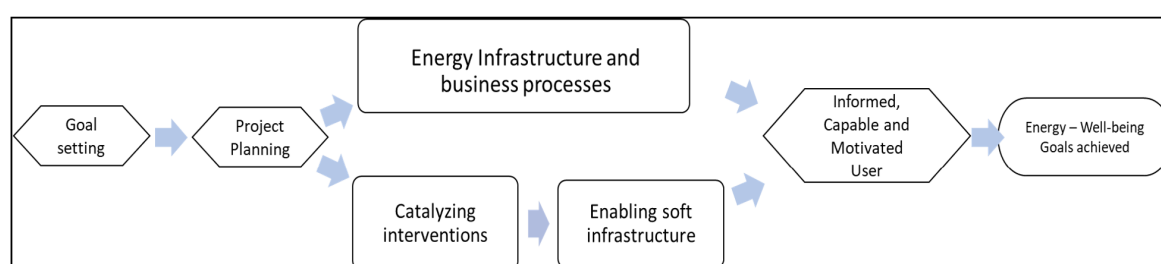
IDEA process flow

It is important to note that the integrity and effectiveness of the process is dependent on setting energy-well-being goals at the outset, in a participatory consultative spirit. As discussed in Box 1, the broad scoping of goals in any given context is crucial to avoid negative consequences and eventual failures of interventions.

Once the goals have been articulated, they become inputs for the project planning stage. Here, in addition to planning the technological infrastructure

and the business processes, planners can now look at alignments and positive interlinkages between the goals and project objectives, compare that to the existing situation and identify accompanying interventions to catalyze the identified interlinkages.

We identify the following types of catalyzing interventions based on a review of past successes and failures:

- a. Assist communities in the process of discovering productive use, prudent resource management and optimal utilization of the energy services.
- b. Facilitate translation of the access to energy into income generation and savings by assisting existing and new economic activities with capacities and skills
- c. Initiate and support efforts to mitigate and overcome challenges associated with individual and collective adaptation to the changes triggered by access to energy.
- d. Present a platform for engaging on social, economic, and environmental challenges, helping drive positive change in them by leveraging the energy projects' inherent position, skills and infrastructure, becoming an invested actor in the overall well-being of its community.

The catalyzing interventions then materialize into the following types of enabling soft infrastructure:

i. Knowledge: Information and practices that supplement the existing understanding on utilization, management and planning of resources (not only energy).

ii. Skills and capacities: Transfer and sharing of skills that supplement, upgrade and eventually help innovate individual and collective capacities to leverage energy services and financial resources to enhance living standards.

iii. Structures for navigating change: Assistance in the form of physical and soft infrastructure that promotes community cohesion, local governance and collective action for positive change.

The process and actions identified by the group strongly ties into the sustainability of an energy project, since these were deficiencies recognized as factors which have collectively undermined the impact and business success of past projects implemented by the group participants. We also drew from cases and experiences where some of these actions resulted in improved outcomes for the community as well as enhanced project sustainability. The analysis reveals that a proactive approach by the project developer towards the identification, implementation and support of enablers for positive interlinkages between energy and well-being, is a potential best practice for overall growth and sustainability of any project.

The table below summarizes the practiced and potential catalyzing actions linked to successes or deficiencies in outcomes experienced by the group of participants in several of their project communities:

CATALYZING INTERVENTIONS	EXPECTED OUTCOME	ENABLER TYPE
Building capacity in local institutions to harmonize the energy project and community development goals, like: - Representative body of customers for providing feedback and suggestions on energy system operations. - Conflict resolution and revenue collection support.	- Improved customer relationships and expectation management - Anticipation of emerging challenges and opportunities for the system operator. - Amicable dispute resolution and solidarity among users and service providers.	Structures for navigating change

CATALYZING INTERVENTIONS	EXPECTED OUTCOME	ENABLER TYPE
Entrepreneurial and productivity enhancing skills/capacities: • Training and awareness for efficient and productivity enhancing uses of energy in homes, traditional forms of livelihood and new productive use possibilities. • Accounting and personal/business finance management skill. • Technical trainings (energy system specific and auxiliary possibilities like electrician, mason, Agri-transformation etc.) • Entrepreneurship training and support • Creating access to markets for example through communication technology and/or business networks.	• Improved incomes and reduction of physical labor. • Greater savings and productivity/comfort enhancement from informed acquisition and use of appliances. • Financial literacy for managing personal finances. • Skills for jobs and new businesses. • Supporting entrepreneurs through training, facilitating access to capital and market.	• Skills and Capacities • Knowledge, Skills and Capacities • Knowledge • Skills and Capacities • Knowledge, Skills and Capacities
Enhancing community life: • A multi-use physical space for social gatherings, daycare facilities, education and communications etc. • Facilitate conversations on community development pathways and services e.g. public space lighting, transportation and other public services.	• Promoting community cohesion and building trust relationships. • Enabling better local governance to catalyze visualizations of social-economic growth pathways Incorporating energy services and service provider as key partners.	Structures for navigating change

BOX 4: OPERATIONALIZING IDEA - ROLES, FUNCTIONS AND CHALLENGES

The operational forms of IDEA can be diverse. It can be a physical space used as an incubator for training entrepreneurs (for example see ENVenture https://www.enventureenterprises.org/) or used to provide services needed by the community (see https://www.solarsolutions.ph/3s-solar-service-station-tondo/ where Solar Solutions Inc. collaborates with a local charity to run a daycare center out of their solar lantern rental space, for the children of daily wage workers in a Manila slum).

Alternatively, they can be embedded programs within communities around key socio-economic or environmental challenges (for example, see how Alsol http://alsolenergia.com.br/alsolcial/ is initiating educational and conservation programs in communities where they build solar power

plants, in collaboration with Universities and other institutions OR how Hy Brasil energia http://www.hybrazil.com/ is using its engineering resources to help a community run a waste management program https://rioclaro2020.wordpress.com/)

Operating Model: The group advocates for the catalyzing initiative to be operated in similar ways to the community governance model. This creates a participatory and goals-oriented momentum to achieve targets for the overall socio-economic improvement of the community. The spillover effects of such an initiative leads to higher public spiritedness, participation and principle driven action.

Functional Roles: We envision the energy project developer to take on the lead role in proposing, planning and providing IDEA leadership. The community representatives, through an appropriate forum (associations, local body etc.) will work closely with the developer to oversee and provide contextual inputs. Non-profits, charitable agencies, government departments implementing social development programs can align with these efforts, in turn increasing their effectiveness. Financing agencies can help by setting evaluation parameters and impact assessment guidelines to provide guidance, which would ultimately lead to desired impacts and sustainability.

Challenges in operationalizing IDEA can emerge from:
- Lack of finance or patience among funders for the process of discovery and maturation of catalyzing interventions.
- Low turnouts and attrition among participants, creating an impression of a failed initiative in quantitative terms.
- Insufficient evidence, institutional and programmatic support or the lack of partnerships to deliver well designed programs. It may burden the developer by placing a skill demand that is not their forte.

Financing IDEA can happen through diverse routes as well, suited to the situation:
- Subsistence revenue – generate revenue to cover operational cost of initiative.
- Capital expenditure – Earmarked capital expenditure for identification, design and implementation of catalyzing actions and enablers. Ideally, this investment should be viewed as risk mitigation for the larger investment in project infrastructure.
- Grants – as social development initiatives, enablers would qualify for a variety of grants.
- Expense and revenue sharing – between the developer, partners and community.

CONCLUSION: A CALL TO ACTION

The challenge of subpar outcomes from electrification, struggling energy enterprises and billions of people living in poverty despite having access to electricity should be a cause for alarm to all concerned. Especially now that there is broad consensus on the Sustainable Development Goal 7 (SDG7) of access to clean and affordable energy for all, as one being intertwined with a variety of other SDGs. There is barely a decade left for the world to fulfill this ambition, which would take deliberative and prompt action. The room for errors and misdirected projects is shrinking fast and has consequences that slows down the growth trajectory. This paper is a call to action for all stakeholders invested in energy access, socio-economic development of the marginalized and environmental action. We outline few rationales for them to act and empower those at the grassroots to make decisions based on evidence.

STAKEHOLDER	RATIONALE FOR ACTING ON ENABLING INFRASTRUCTURE
Energy project developer	Selling energy services and products cannot be a sustainable business unless social and economic capabilities of communities do not grow proportionate to the cost of energy. This capability is diminished by external pressures like climate events and stressed economies. Investing in enhancing capabilities and building a safety net for communities translates to building a safety net for the business.
Non-profits and charities	Social development of marginalized communities is deeply tied with inexpensive access and productive utilization of energy. Thus, to magnify the impact of social development interventions, it is imperative that they are integrated with energy services.
National and local governments	Socio-economic development will always be incomplete and skewed towards a minority unless local economies are resilient and thriving. To increase the efficiency of different programs and development policies, communities and local businesses (including the energy enterprise) must be empowered.
Financing agencies	In addition to all of the above, it is also financial prudence to safeguard the investment against unquantifiable uncertainties.
Research entities	Can play a key role in making research useful by directing efforts to generate localized evidence and assisting practitioners accelerate the process of discovery and design.

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PRINCIPLES OF INCLUSIVITY IN ENERGY ACCESS: PROCESSES THAT PROMOTE EQUITY

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ABSTRACT

In the energy access sector, local community members are often not given the opportunity to be heard and voice their concerns. Proper consultation and accommodation is infrequent, traditional or community knowledge is often not valued or used, and the benefits of the projects are inequitably distributed and communicated to the intended beneficiaries. This lack of inclusivity contributes to the creation of inefficiencies and inequities in energy access projects. We believe that the local community is the most important actor in energy access, and that all energy access stakeholders should move in the direction of creating a culture of inclusivity. This paper proposes a set of principles of inclusivity in the energy access sector. Our list is not exhaustive – it is a starting point for discussion, introspection, and building a culture of inclusivity.

INTRODUCTION

Providing access to modern and affordable energy services is expected to advance progress in social and economic terms for individuals and communities, especially in rural areas of developing countries (Karekezi et al., 2012; World Bank, 2017). For example, the use of electricity can aggregate value to agrarian and non-agrarian economic activities that can be performed in less time, with less human or animal force and with less residual losses, increasing productivity and family incomes while changing the economic dynamics of local communities. Sustainable, affordable, reliable, and secure energy services can contribute to better learning environments, enhanced opportunities, and individual and community health and general well-being. For example, access to appropriate, clean, fuel efficient, affordable and sustainable cooking energy services has the potential to mitigate the social, health, economic, and environmental risks and burdens currently being experienced by over 3 billion people, especially in Sub- Saharan Africa and Asia (OECD/IEA, 2017). Thus, energy has the potential to improve the quality of life of local people and, once integrating people in an active way, energy can be a driver of greater equity, cohesive and sustainable communities in the long term.

Nevertheless, the potential benefits of energy towards inclusive and sustainable societies with no poverty and less inequalities often do not resolve automatically once people have access to modern energy services or the needed infrastructure. Moreover, people from different social and economic groups (e.g. young, gender, age, ethnic and upper and lower classes) are frequently impacted by energy in different ways, based on their needs, abilities and the set of opportunities available to them (which are directly influenced by the amount of economic, social and cultural capital that people possess or have access to). Consequently, in several cases, energy access benefits certain groups or individuals that are already in a better social and/or economic position, while enhancing the vulnerabilities of other groups (François, 2019). For example, Squires (2015) highlighted cases where electricity has contributed to increased opportunities for child labour, leading children to drop out of school. In this case, one can suggest that electricity improved the conditions for those able to invest in economic activities to the detriment of the time that children could spend studying. In other cases, based on our experience, the access to energy can maximize internal tensions among people from the same group. For example, a group of women inside a community that excludes other women from participating in an economic activity boosted by electricity that was supposed to benefit all women in the community. Another example given by Makonese et al. (2012) is evident in South African, where low-income households can access free electricity to a certain extent, made

possible by the Free Basic Electricity (FBE) policy instituted by the government in the year 2000. While the policy was intended to enable low-income households to meet their basic energy needs, the energy provided to most households through the program is thought to be inadequate for its purpose. To address the energy deficit, low-income households are known to continue their familiar use of biomass and kerosene for cooking and candles for lighting. While the FBE policy is a good example of government intervention to address the needs of the poor and the vulnerable, the impact of such a policy is minimized by the lack of awareness of user diverse needs and energy use patterns. Such limitations could be minimized, for example, by the inclusion of the main beneficiaries in naming their needs, willingness to accept the preconditions for connections stipulated in the policy, and abilities to access available opportunities.

While there is evidence of efforts to single out certain marginalized and vulnerable groups for inclusion in energy access processes, for example based on gender and location (Practical Action, 2017), the inclusion of marginalised and vulnerable social and economic groups as producers, stakeholders, beneficiaries, and stewards of energy access projects is not the norm. This lack of meaningful and on-going inclusion contributes to the maintenance of societal patterns that reproduce poverty and high inequalities frequently found in developing countries. In contrast, the inclusion of marginalised and vulnerable people in energy projects without a critical and systematic reflection of the causes of marginalisation and vulnerability can fail to deliver the just distribution of energy benefits in rural communities, and beyond. Therefore securing inclusive energy futures calls for serious consideration of not just the kinds of policies, infrastructure, and technologies necessary, but also for how these processes will be implemented in an inclusive manner. With this approach, intended beneficiaries are fully informed and partake in creating opportunities, taking necessary responsibilities for their effectiveness and sustainability.

This paper proposes a set of principles designed to provide the opportunity for inclusion in energy access, and advocates for the importance of inclusivity in energy projects as a mechanism that can lead to more equitable, cohesive and sustainable rural communities in the long term. Our working definition of inclusivity in the energy access sector is the dynamic process of ensuring opportunities to include in an active way not only targeted communities, but also all identified groups living in those communities, seeking equity in the design, decision-making and governance of energy projects.

The following points illustrate this definition:
- Opportunity to include all people and groups (with different cultures, ideas, ways of thinking, voices and needs) living in community in an active way in the process of getting access to and using modern energy services;
- A holistic perspective of energy access and the social and economic dynamics of rural communities, looking for energy projects that promote equity and that give special attention to vulnerable and disadvantaged social groups;
- Envisioning the energy access space in an inclusive way that can reduce social and economic inequalities;
- Project narrative has an inclusive message by appealing and referring to the various groups in the community, so that all members feel it is their project;
- Local people are frequently included as passive actors in energy projects. This is the reason why our definition advocates for an active participation and engagement. That means that the local people and groups should be the main actors in energy projects, taking the decisions in an inclusive and democratic way in which no one is left behind.

In this sense, inclusivity in the energy access context is a dynamic process of providing equitable opportunities for the meaningful participation of diverse peoples, cultures, ideas, and perspectives, with particular focus on vulnerable and

disadvantaged social groups. We understand that equitable participation needs to occur in all phases of energy access processes, including in the needs definition phase, identification of available opportunities and abilities within the community and beyond, design, implementation, governance, and maintenance of identified solutions.

LITERATURE REVIEW

According to the Webster Dictionary, inclusivity is "the quality or state of being inclusive" (Merriam Webster, 2019). In much of the broad literature, inclusivity, inclusion and inclusiveness are used interchangeably. For this paper, we use the term inclusivity as it has a more dynamic connotation and is sometimes used in the energy literature to bring attention to the need for diverse voices in energy policy (Sovacool and Brown, 2015). Inclusivity could also include the principle of procedural justice, which is described in the work of Sovacool and Dworkin (2015) as the presence of "free prior informed consent for energy projects, representation in energy decision-making, and access to high quality information about energy" and due process. This seeks to ensure that all potential stakeholders are provided with an enabling environment to allow and encourage them to participate at every level of energy decision-making processes.

Inclusivity as a term is used frequently in the literature on education, particularly in the realm of development and the need to include all social classes, genders, those with disabilities, etc. in the educational process (Ferguson et al., 2018). However, neither inclusivity nor inclusion used frequently in the energy poverty and energy access literature. Overall, there is more literature on community participation and energy democracy, with a focus on energy projects in Europe and the United States. Some of this can be applicable to the developing world. For instance, research from the Global North has shown that despite good intentions, community energy projects often result in entrenched unequal power dynamics and lack of inclusivity, even when its goal is to reverse marginalization (Burke and Stephens, 2017; Grossman and Creamer, 2017; Van Veelen, 2018). Infrastructure projects historically and inherently are not inclusive, with top down, centralized state and expert control, and there is no reason to assume energy transitions to renewable technologies will be any different (Jones and Reinecke, 2017; Krupa et al., 2015).

The literature on energy access and projects among Indigenous and marginalized communities in the Global North also emphasizes the historical top down implementation and management of infrastructure, exacerbated by the post-colonial contact (Hoicka and MacArthur, 2018; Krupa et al., 2015). This has resulted in serious issues of trust between communities and governments, and there is a lot of variability in ownership arrangements across national contexts. Even projects that seek to utilize "Indigenous knowledge" tend to be directed from external authorities with little sense of involvement from the local communities. One theme that comes out of this literature is that engagement and participation must occur on multiple levels to ensure community representation (Fraune and Knodt, 2017; Krupa et al., 2015). Other insights offered are the need to include equitable representation from the beginning (Osunmuyiwa and Ahlborg, 2019). It has been noted that communities already organized in an inclusive way for other projects stand a better change to manage energy projects more inclusively (Sperling, 2017). In other words, if a community has a proven record of effective organization for managing projects, it is more likely that future projects, energy or otherwise, will be effectively managed. Van Vreelen (2018) recommends focusing on three essential elements for inclusions: decision-making, accountability and conflict-resolution, while Young and Brans (2017) emphasize design and decision-making. Involvement in design and decision-making can also be addressed by the private sector and business entrepreneurship; for instance, gender research has noted the importance of including

women in business start-ups (Osunmuyiwa and Ahlborg, 2019). An interesting note on entrepreneurship, shared by Singh (2017), states that in India it has been observed that entrepreneurship often benefits only a few, marginalizing the rest of the community. Thus, no single activity and point of participation can ensure inclusivity; rather, it is an ongoing and dynamic process, in need of monitoring, evaluation and adaptation to different contexts and changing dynamics.

PRINCIPLES TO FOSTER A CULTURE OF INCLUSIVITY IN ENERGY ACCESS

Based on our own experience working in the energy access sector in poor rural communities around the world, we advocate that the inclusivity of different people, cultures, ideas, and perspectives is essential to promote more equity, healthy, sustainable and cohesive communities. Inclusivity and equity reduce the potential for social conflict, and hence promote project efficiency and success. It is the authors' view that the local community hosting an energy access project is the most important actor. It is the community who will, through daily interaction, feel the greatest impacts of the project. Communities also hold important local social and environmental knowledge, critical to the success of any project. Therefore, it is both unjust and inefficient to exclude the local community in energy access projects. In this paper, we propose a number of principles, in no particular order, to promote and encourage a meaningful and productive culture of inclusivity within the energy access sector.

1. Access to sufficient, timely, accurate, useful and accessible information

Information is an essential factor for meaningful and effective development of the culture of inclusivity in the energy access context. However, the kind of information we propose does not only mean more information, but sufficient, timely, accurate, useful, and accessible information to all whenever needed. As noted by the authors of the Limits to Growth, access to information does not mean "more information, better statistics, bigger databases, or the World Wide Web, though all of this may play a part. It means relevant, compelling select, powerful, timely,

and accurate information flowing in new ways to new recipients, carrying new content, suggesting new rules and goals." (Meadows et al., 2004: p. 269-270). Indeed, while we live in an era of the Internet and Social Media where sufficient information is available for those who can access it, this also means that people can manipulate such information to serve their own interests. Therefore, large gaps remain and inequalities with access to information persist. Specifically, how to communicate available knowledge on the role of unsustainable energy production and consumption practices on the long-term viability of humanity and the planet, to a global audience with diverse goals and needs remains a difficult issue to resolve. Moreover, the reconciliation of the many sources of knowledge is also something that needs to be taken into consideration in order to ensure diverse voices are represented and valued. For example, there is a great deal of Indigenous knowledge that is either not recorded, or not known to the mainstream society. It is therefore important to ensure all sources of relevant information are sought and encouraged. Moreover, it is important for all relevant stakeholders to find a compromise and commonly agreed upon ways to communicate, preserve and use the information.

2. Financial commitments

We propose a culture of inclusivity at all levels of the energy access processes and society. To facilitate such processes, sufficient finances are necessary. Such funds are especially crucial for creating awareness, financing engagement and participation activities, and where necessary, for providing

incentives for individuals to take part. For example, while some actors might like to participate in energy access processes, they might lack the financial capabilities to do so. In such cases, covering such costs could enable them to be part of the process. Others might fail to participate because of the risks of losing their livelihoods. Targeted funds could be instrumental in addressing such gaps as well as for the development of facilitators' capacities. Governments as well as private and public funders could be instrumental in providing such funding opportunities, as it is evident with a recent UK Research and Innovation grant to foster international collaborations in energy related activities, among other research and innovation activities within the UK and beyond [1]. Such national funding opportunities and show of leadership from the national level can be instrumental in the promotion of research on sustainable and inclusive systems in the energy sector.

3. Adaptable, flexible, and enabling environment to account for all stakeholder needs and preferences

It is important to have in mind the diversity of needs and preferences of potential participants, and whenever necessary and possible, to make efforts to accommodate them. Moreover, while having a structure and a timeline for inclusivity processes can be valuable in moving certain parts of the process forward. In this instance, rigid schedules could demotivate interested actors from getting involved. We propose therefore the cultivation of an enabling environment where actors have the opportunity to participate whenever they feel the need to do so. It is also important to take into account the shape and nature of such processes should be oriented to the context of application, and the issue(s) addressed.

4. Rules and regulation plus matching incentives/penalties.

While adaptability and flexibility are key principles that could ensure that no one is left unheard or excluded due to certain pre-existing or emerging

challenges, rules and regulations are essential parts of a productive process. However, the nature of how the rules are put in place and the processes of enforcement could hinder or help such processes. Democratic processes are thought to be one way inequalities in energy access process could be minimized (Trotter, 2016). However, it is also important not to ignore that many parts of the world have their own ways and forms of governance structures and engagement processes that have been functional for over many years. Such diversity of forms of governance can be an asset or liability. Therefore, the success or failure of the inclusivity process also rest in the abilities and willingness of the facilitators to get in touch and to understand how people manage their day-to-day activities and to find a common ground on the best and effective way to carry on an inclusivity activity.

5. Training and capacity building and awareness creation to cement the culture of inclusivity into the mindsets and actions of all actors at all levels of society

Meaningful and productive inclusivity processes also necessitates the development of capabilities for both the facilitators and the participants. For example, it is virtually impossible for individuals to discuss the role of energy production and consumption patterns on climate change and their health and wellbeing if they are not able to make the connection between the two phenomena. Training and capacity building for facilitation and communication processes are also crucial for ensuring that all the needs and preferences of participating actors are taken into account. Training and capacity building and awareness creation could be used as an avenue for fostering social and cultural sensitivity and understanding.

6. Transparency and trust

Trust and transparency are important factors for the development of a culture of inclusivity in the energy access context. This is particularly important if social

and institutional issues are to be addressed in a sector that has predominantly focused on technological development and economic transactions. Building strong and on-going relationships among all relevant stakeholders through regular public meetings is one way of building trust. Moreover, using a diverse set of views to inform emerging and existing energy access discourse and processes could be a way of building trust and fostering on-going transparency processes. Transparency is also key to effective and productive inclusivity process. For instance, making it clear from the onset in whose interest the process is designed and whose voices and ideas count or will count, is a key component for building trust and ensuring transparency. Such efforts might involve a level of discomfort, especially when they challenge the status quo. However, as highlighted in a recent blog: Using discomfort to prompt learning in collaborative teams by Rebecca Freeth and Guido Caniglia (Freeth and Caniglia, 2019), "discomfort has the potential to prompt efforts to enhance communication, mutual understanding and integration for more robust research outputs" [2] and in this case, effective inclusivity processes that promote just and equitable energy access solutions. However, for levels of discomforts to be effective in the energy access context, it would necessitate the confrontation of entrenched assumptions and vested interests by various actors about the energy needs and preferences of local communities and the effectiveness and sustainability of current and proposed solutions.

7. Time and persistence

The adoption of inclusivity principles in practice is a social construction involving people with different views and experiences. Thus, the adoption of such principles requires time and persistence to be implemented, and then to further flourish. As Paulo Freire writes in his book, Pedagogy of the Oppressed: "knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world,

with the world and with each other" (Freire, 2000:p.72). Hence, time and persistence are not only important for establishing trust. Quality time investment and persistence have the potential of improving energy services and solutions that people truly want.

8. Free, prior, and informed consent of local community

The culture of inclusivity in the energy access context has the potential to accrue positive benefits, mainly enhancing social value by enhancing social inclusion; thus creating more equitable societies. However, the nature, quality and sustainability of such processes also depend on how they are envisioned, instituted, and managed. Hence, laying a strong foundation to any such processes through obtaining a free, prior, and informed consent of local community is crucial. Both Paulo Freire and the authors of Limits to Growth address free and informed consent. In this, stressing the importance of understanding the visions, needs and preferences of the target audience of any process or activity by visioning with and not for the people. More specifically (Meadows et al., 2004) note that "Visioning means imagining, at first generally and then with increasing specificity, what you really want. That is what you really want, and not what someone has taught you to want, and not what you have learned to be willing to settle for." (P. 272). This also touches on the principle of procedural justice and due process that is described in the work of (Sovacool and Dworkin, 2015) on energy justice.

LIMITATIONS AND CHALLENGES TO ENSURE INCLUSIVITY IN ENERGY ACCESS

There are potential challenges that may hinder the effectiveness and reach of the inclusivity principles outlined in this paper, but we believe that these challenges can be overcome. Challenges include ensuring attractiveness for stakeholders, adaptability to different contexts, evaluation of success and building a culture of inclusion in energy projects. For inclusivity principles to be widely adopted, each stakeholder in the energy access sector (e.g. local communities, government actors, non-governmental organizations (NGOs), civil society and the private sector) must find them beneficial in some way. However, one should be aware that not all potential benefits from inclusivity are economic, which may not be attractive for actors prioritizing an economic agenda. Moreover, there are often different interests and opinions within communities and some members or groups may not support inclusivity principles. This is possible because the adoption of such principles can implement a mechanism to change power relations, and possibly decentralize power, in and outside the communities, as they seek more equity among societal members. In this sense, those (internal or external agents) that hold and concentrate power (e.g. political, social, familiar, economic power, etc.) inside the communities can find their power treated by new ways of thinking that are more inclusive and just for all community members. Dialogue involving as many actors as possible to promote a critical reflection in and outside the communities can prove essential to avoid or minimize the impacts of internal and external structures that marginalize vulnerable groups inside the communities. In addition, involving the community since the beginning of energy projects with regard to the principles here discussed and having flexibility in their application may help ensure support from communities.

Government actors are also important players and have several interests in energy access, including economic and rural development, providing energy security, generating rents, and bolstering international reputation. While governments would ideally support inclusivity principles since they have citizens' interests at the centre of their governmental plans, these interests may be overridden by others such as rent generation. NGOs and civil society are, in several cases, diverse in their interests, but in general they support ideas of sustainable energy, social inclusion and rural development. A common challenge that can be faced by NGOs and civil society supporting inclusive energy projects in rural communities is the time required for the adoption of inclusivity principles, which can vary significantly from one community to another according to different realities, engagement and organizational level of community members. In this sense, the conception of energy projects that consider more time for monitoring, adapting and evaluation is important to promote positive results in the long term.

The private sector's interest in energy access is largely to generate profit. Thus, we identify this sector as the most critical to adopt the principles discussed in this paper, as applying these principles will take more time and money to be implemented than business as usual projects. In this sense, the support of civil society and governments to inclusivity principles may be a driver for the private sector to operate more inclusively. The creation of a certification scheme for inclusivity in the energy access sector could be an additional measure to increase the perceived benefits of inclusivity and the willingness of the private sector to promote inclusivity in energy projects.

Another challenge is how to ensure inclusivity principles are adapted to different communities and contexts. This is of importance because cultures, structures, interests, needs, and other things will vary

depending on locations and contexts. The purpose of these inclusivity principles is to offer equity opportunities for different groups to be involved with energy access according to their realities. Thus, our understanding of inclusivity in the energy access sector means a dynamic process of ensuring opportunities to include all community members and the principles should not be interpreted as "one solution fits all". The principles discussed in this paper should be interpreted as general enough to be beneficial to all communities and yet specific enough to foster meaningful inclusion, especially of marginalized social groups. In this sense, the principles discussed in this paper should be discussed and adapted to the reality of each community, and the community members together in a constant and progressive dialog, as proposed by Paulo Freire (Freire, 2000), should decide what inclusion means to them.

We also identify that the use of evaluation methods to measure the success of these inclusivity principles is limited. We have consciously avoided the use of quantitative metrics in this paper, as we feel that quantitative metrics cannot portray the full picture of inclusion, and thresholds are extremely difficult to create. In this sense, additional research is of importance to give a horizon to the matter. Finally, we recognize that the provision of these inclusivity principles does not guarantee the creation of a culture of inclusion. In a true culture of inclusion, stakeholders as normal practices in their daily lives, which represents a big challenge, would internalize the principles proposed in this report. A culture of inclusion is one where inclusion of local community members and demographics within it is understood by all stakeholders to be important and crucial for the success of the initiative towards more equity, cohesive and sustainable communities in the long term.

CONCLUSION

The current reality is that community members and other small actors, especially disadvantaged and marginalized social groups, are often not included in energy access projects, even in well-meaning projects. This lack of inclusion can lead to conflict and inefficiency, as shown in the examples highlighted in this paper. Our motivation through this paper is to help build a culture of inclusivity, where inclusivity is integrated into the energy access ecosystem and it becomes a social, political, cultural, and business practice norm. Inclusivity is not simply a series of boxes to check – it is a dynamic process and frame of mind that impacts all aspects of energy access.

The lack of research and practical application of inclusivity in energy projects, particularly at the local community level is a missed opportunity. People at the local level or for whom the project is intended, are the ones most likely to be impacted by energy access processes. Therefore, their meaningful inclusion or lack thereof can make or break a well-intended energy project. While we have presented these principles of inclusivity that we believe could make a difference in more equitable outcomes in

communities, further research must be done to provide contextualized guidance, measure, and analyse these outcomes. We know that policy can be well intended and well-constructed, but either remain disconnected from reality, or result in negative consequences once implemented due to social and political power structures and relations. Through this discussion, we hope to begin a conversation and catalyse action to promote inclusivity in energy access. Research in inclusivity should include analysing how the dynamics of exclusion and inclusion actually work, how this works in relation to the various sectors present in a community (private and public sector, government, association, formal and informal sectors etc.), and how to identify and engage stakeholders for inclusion. In the end, inclusivity does not mean that everyone has to be a part of an energy access processes but all the people impacted by energy projects should have the opportunity to participate in the projects. In this sense, participation at all levels of the energy access project must be encouraged and facilitated by creating appropriate conditions that support and promote energy access systems that end beneficiaries truly want and value.

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NOTES

[1] For more information on this funding opportunity please visit: UK Research and Innovation at https://www.ukri.org/

[2] For the original quote used here please see "Using discomfort to prompt learning in collaborative teams by Rebecca Freeth and Guido Caniglia available at: https://i2insights.org/2019/09/03/discomfort-in-collaborative-teams/

ACKNOWLEDGEMENTS

BREAKING BARRIERS: CREATING MUTUAL UNDERSTANDING AND EMPATHY BETWEEN DEVELOPERS & BENEFICIARIES

BY

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1 CHALLENGE: WHAT IS STIFLING PROGRESS ON ENERGY ACCESS & PRODUCTIVE USE?

Among the many factors that impact the success or failure of an energy access project, the relationship between project developers and beneficiaries may be most frequently overlooked. For a community becoming newly electrified, they are not only adopting a new infrastructure, they are interacting with new institutions, learning new rules and norms for resource use, and potentially changing their lifestyle and modes of economic production. Building trust, understanding and empathy between a project developer and a community of beneficiaries is critical to navigate such a substantial transformation. When these factors are lacking, a number of negative consequences commonly arise (Table X; Box 1).

Therefore, this innovation brief focuses on articulating and proposing a solution to this core issue: A lack of understanding and empathy between project developers and beneficiaries can lead to failed or underperforming projects, causing reduced social and economic benefits to intended beneficiaries.

Ultimately, the negative consequences of a poor relationship between developers and beneficiaries can lead to reduced benefit, fewer positive outcomes, and even negative outcomes for the End User. For developers, under-performing projects substantially hinder their ability to recover costs, satisfy their obligations to project sponsors, and raise funding for future projects.

NEGATIVE CONSEQUENCE	ELABORATION
Unsuitable technology design	• Product or service is less desirable or useful than anticipated (Box 1: Flour in Kenya) • Intended means of use for product/service clashes with local norms (Box 1: Stoves in India)
Unsuitable business model	• Inappropriate pricing due to poor understanding of ability/willingness to pay • Overestimation of demand growth • Misunderstanding of productive use needs
Unsuitable methods used to engage End User in the development process	• End Users are made to feel uncomfortable or are asked to participate in ways that are not culturally appropriate (Box 1: Focus groups in Ghana) • End User views are not adequately represented in the development process
Lack of trust between external provider and End User	• Theft or underpayment for product/service • Vandalism or sabotage of provider's equipment or facilities • Abandonment of product/service
Limited involvement of local actors in governance, management and/or operational activities	• No local body for resolving disputes among End Users • No local actors to perform operational roles (e.g., bill collection, O&M) • No local adaptation/innovation of product/service (e.g., for productive use) • Project abandonment when original product/service provider leaves

BOX 1: CASE STUDY WHERE UNDERSTANDING AND EMPATHY WAS LACKING:

In Kenya, a community consultation was carried out to discover what services community members aspired to have access to in the village. A high priority service was a grinding machine for maize to make flour. A grinding machine was sourced from Indonesia that was suitable for the DC micro-grid installed in the village, but when this machine was installed in Kenya it was the laughing stock of the village. The community members informed us it was only suitable for chicken feed as it produced too coarse a flour than was suitable for Kenya, but which is preferred in Indonesia. A lack of understanding of the detail around what characteristics were important about the flour caused this mistake, and caused the project to fail.

2 DEFINING THE STAKEHOLDERS

Key:
Communication flow: strong/frequent, weak/infrequent
Flow of resource
Tensions in the system

Tension between funder's perspectives and desires and what is best for system development/ end user: lack of support for iterative approach, timelines not appropriate for end user capacity building and engagement

Funder

Tension: developer wants to maintain community's dependence on them, while also wanting to support community capacity building and development

Project developer/ service provider

End user

Education/Information /Understanding

Presence or lack of trust

Flow of education, information, understanding should be bidirectional between project developer and end user:
Provider/designer needs to learn:
- Culture   - Practices   - Community structure
End-users:
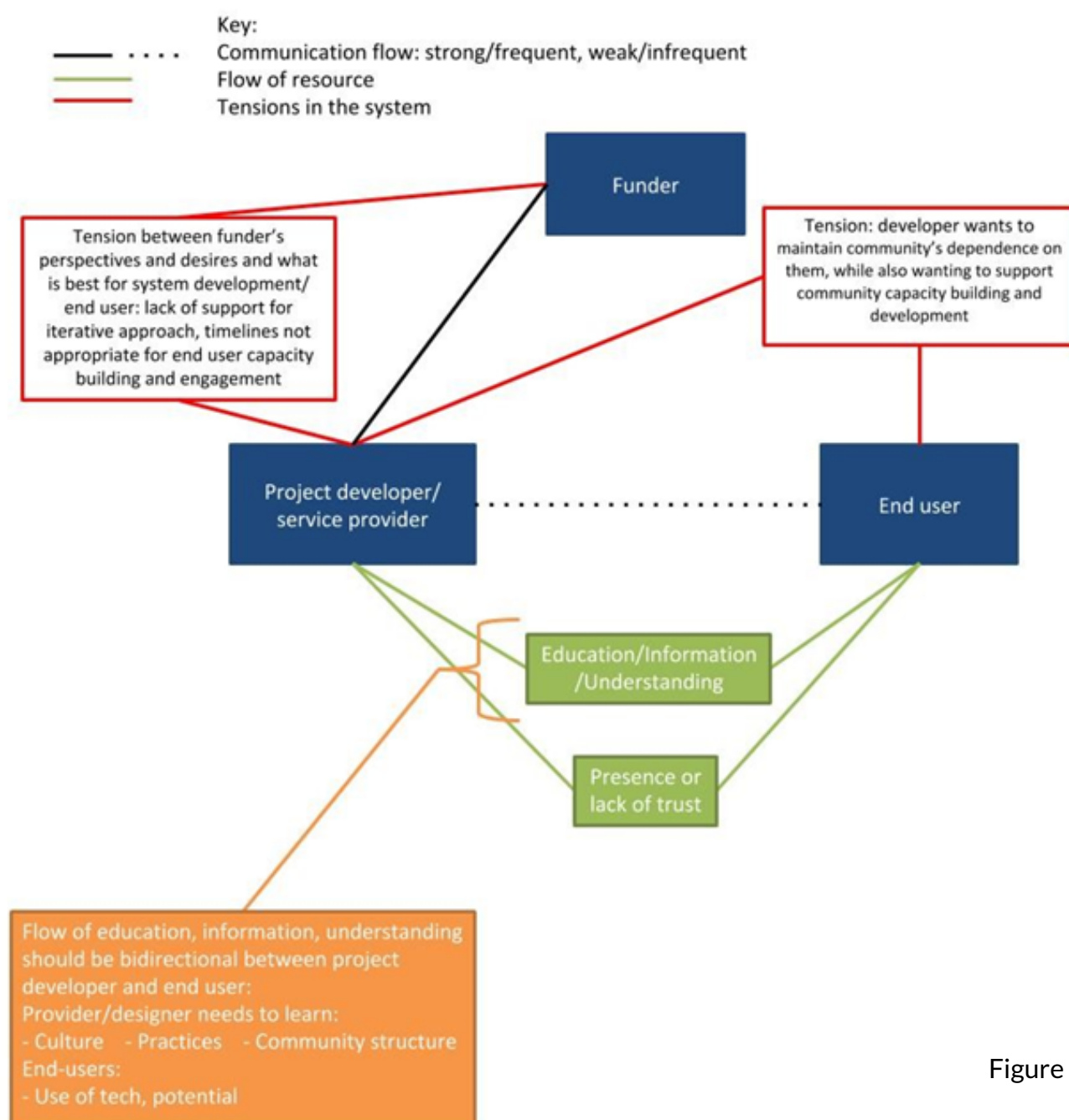- Use of tech, potential

Figure 1

Three main stakeholder groups are identified in Figure 1, along with flows of information and resources, and the tensions between the different actors. The groups include: (a) End User (also referred to elsewhere as beneficiaries); (b) Project Developer / Service Provider (hereafter termed "Project Developer" for brevity); and (c) Funder. There are additional actors in the stakeholder network, but these three have been isolated for simplicity and due to their pivotal roles in determining whether and how energy access projects are carried out. The map in Figure 1 is by no means representative of all energy access projects. However, it does illustrate typical relationships that may exist that lead to the central challenge addressed in this brief.

A key insight from the stakeholder map is how and why the flows of information and resources generate tensions between the different actors. In terms of communication, Figure 1 shows that the Funder and Project Developer are typically tightly coupled. Frequent and formalized reporting ensures that the project developer must not only understand the Funder's requirements, but must also demonstrate if and how those needs are met. Funders are typically not in direct communication with the End User, so this link is absent from the diagram. The communication link between Project Developer and End User is shown as weak and infrequent because this is commonly the situation for projects conceived and implemented by project developers external to the community context. Ideally, this link presents an opportunity for the Project Developer to learn about the local context (culture, institutions, norms, knowledge and assets) and for the End User to learn about the technology; its physical manifestation, its costs, its potential, and the rules of use. The nature of the exchange can also help the two groups build mutual understanding and trust.

Typical communication between the Project Developer and End User could include the following:
- Initial project briefings presented to the whole community
- Surveys issued to estimate demand, typically a sampling of the community

Direct or indirect briefings (perhaps through community governance structures) throughout installation and commissioning

These are characterized as weak or infrequent as they provide little opportunity for concurrent exchange of information or repeated interaction. They are typically one-way exchanges that are not effective at building a relationship and trust between the two groups.

A few tensions are presented in Figure 1. The project developer can face a tension between the perspectives of the Funder and what they desire in outcomes and process, and the process and activities that are in the best interest of the community and the End User. If a Project Developer is attuned to both groups, they have to navigate carefully between what may be conflicting interests. Examples could include allocation of land or other local resources, where a Funder prioritizes their own interests (e.g., energy), while a community places greater interest on other activities (e.g., agriculture or water supply). This tension can also manifest in energy service delivery models, which also tend to follow what a Funder believes is most suitable as opposed to the interests and norms within a community. The Project Developer must also deal with approaches and timelines set by the Funder that may be too short for iterative development and the incremental capacity building needed by the community. The real constraints on fund disbursement for a Funder make this difficult to avoid, but it very frequently prevents the Project Developer from undertaking substantive community engagement work that would improve the project developer – End User relationship.

Between the Project Developer and the End User there is a tension that often exists as a direct result of the delivery model employed by the developer. It is in the Project Developer's interest for the End User to remain somewhat dependent on them in their role as a service provider, to ensure continued business and revenue. At the same time, it is important for the community to build capacity and increasingly become self-sufficient in managing their energy resources.

This tension is often evidenced in how operations and maintenance are handled by an operator and whether there is any community participation. An increasingly self-sufficient community would generate less revenue for an operator, but without any knowledge or involvement in operations and maintenance, the community becomes vulnerable to situations when an operator leaves and the energy system or devices are abandoned.

At the heart of each of these tensions is the nature of the relationship between the Project Developer and End User. Increased engagement is critically important, but it is also very difficult. Even when a technology provider is motivated to engage the End User in the process of planning and eventual operation of energy technology/infrastructure, the difficulty in communicating and exploring the socio-technical complexity of the energy system constitutes a substantial barrier for meaningful engagement. Tools and methods to facilitate this process do exist; oftentimes developed organically by energy access practitioners after many years of experience. Unfortunately, the accumulated knowledge has not been widely shared, and typically remains within individual organizations. Some tools and methods have been formalized within design fields such as user-centered design, participatory design, and the various evolutions of design theory within these (such as interaction design, service design, contextual design). However, although relatively well discussed and debated in academic literature, the knowledge is not adequately disseminated to practitioners. Furthermore, most of these methods have not been rigorously tested and, as far as our group is aware, no metrics have been proposed to compare one community engagement tool or method against another, in the context of energy access.

This brief focuses on the tensions arising from limited flows of knowledge, understanding and empathy between the End User and project developer. The proposed innovation would seek to resolve this tension through enabling clear, bi-directional communication between the End User and project developer, utilizing tools and methods that increase understanding and empathy between the two actors.

3 PROPOSED INNOVATION

3.1 What is the innovation?

A meaningful innovation proposed in this brief consists of two parts:

- 1. A compilation of community engagement tools and methods, suitable for the socio-technical complexity of rural energy systems
- 2. An Outcome Based Evaluation (OBE) framework for evaluating the effectiveness of such methods across a common set of metrics.

The OBE framework would seek to answer the following questions:

Do we have better information? Technology and system design can be greatly improved with more accurate information on factors like the amount and type of energy services demanded by the community; the time variability of demand and ability to pay, and the *e*xpected load growth over time from new productive uses.

Have End Users' understanding of the technology increased? Deeper knowledge on the operation and cost implications of an energy technology or system builds transparency and encourages the End User to follow the "rules of use" in their consumption and payments. It is also important that End Users gain an understanding of the potential of the energy system and how it might be utilized to improve their socio-economic circumstances.

Was the community sufficiently represented? Diversity in representation in the planning process generates more accurate information, promotes fairness and helps to avoid future conflicts between different social groups.

Is there an increased capacity and willingness among End Users to participate in management and/or operation of the energy system? The technical and administrative knowledge of the End Users post-engagement can be measured to assess the level of improvement.

Is there an increase in governance capacity? The ability of End Users to govern the energy system (eg., through a Village Energy Committee that sets policy, manages conflicts, and plans for the future) can greatly increase resiliency to future challenges that inevitably arise.

An effective evaluation framework would not only answer these questions, but would do so in a consistent way such that the outcomes could be reliably compared across different methods, projects and social contexts.

3.2 Why would this be impactful?

Most energy access practitioners who undertake community engagement activities either limit their efforts to conventional community meetings and demand surveys, or if they are interested in deeper engagement, they must develop their own approach through trial and error. There is very little knowledge exchange among practitioners of the experiences on community engagement that have been built over many years. By establishing a knowledge platform, the practical lessons learned in the field by project developers and practitioners could be more easily disseminated. The platform could include a compilation of case studies on "learning by failure", which are often highly insightful, but not frequently shared. Since community engagement is not a linear or step-by-step process, but is instead highly contextual and iterative, case studies from actual practitioners would provide rich and valuable information.

Community engagement is a subtle and long-term process, making it difficult to assess its effectiveness. Another impactful aspect of this project would be to establish common metrics and a rigorous evaluation method to identify the most effective approaches and drive further improvement. This not only enables project developers to choose effective tools and

methods for community engagement, but it's very presence (alongside the compilation of tools and methods) raises awareness of the importance of community engagement and the characteristics of effective tools and methods it should contain. By generating evidence on the impact and benefits of community engagement, project sponsors could be motivated to put a higher priority on meaningful community engagement in project tenders, encouraging them to allocate resources and allow for sufficient time for practitioners to undertake this work.

3.3 Does the innovation involve a major change in technology, economics, society?

No major change is needed in technology, economics or society to implement this innovation. Effective community engagement practices already exist. The challenge among energy access practitioners is that they are not widely shared and there is no body of evidence around their effectiveness.
Other fields are rich with experience in effective techniques. Participatory Rural Appraisal (PRA), for example, is a collection of methods implemented by development practitioners that focuses explicitly on incorporating the knowledge of rural individuals in planning and management of development projects. However, these and other approaches are not widely known to energy access practitioners, which motivates the need for more dissemination, adaptation, and assessment.

3.4 Is this innovation novel?

Is there a reason why current efforts have not produced this solution?
Our project involves the compilation of existing methods on community engagement, PRA, human-centered design, and other inclusive, user-centric techniques relevant for energy system design and planning, along with a new framework for evaluating these approaches in the context of energy access for marginalized populations. The multidisciplinary nature of the methods, the practical lessons from the field, and a practical evaluative methodology will constitute a novel, and we hope useful, contribution towards expanding access to energy.

4 KNOWLEDGE

4.1 How can we know whether this innovation would be effective?

The proposed innovation has two parts: (1) compiling and disseminating knowledge on existing community engagement methods, and (2) developing an Outcome-Based Evaluation (OBE) framework for community engagement in energy access. We consider the effectiveness of each part separately: The effectiveness of knowledge dissemination can measured by tracking the following indicators:

- Publications produced through the project
  - Number of downloads and citations
- Online database created for knowledge exchange
  - Number of viewers and subscribers
  - Volume of information exchange
- Conference/workshop on community engagement methods
  - Number of attendees
  - Post-event survey

For the OBE framework, it should be operational (i.e. straightforward to implement in practice) and consistent across different social contexts. Its effectiveness will be assessed through its application to actual community engagement activities. The proposed project includes application of the framework in at least two separate geographies and

in partnership with at least two different project developers.

4.2 Emerging Research Questions

The line of inquiry proposed in this brief raises two important research questions.

1. How can we evaluate the effectiveness of End User engagement methods, to enable their further development and confident dissemination of what 'works'?
2. What characteristics or modalities of End User engagement tend to be more effective at achieving desired outcomes from energy access (examples of desired outcomes: financially viable energy delivery, uptake of productive use, resilient energy system).

These questions, among others, will be explored through the proposed project.

4.3 What data is important to us and where might it be gathered?

See section 4.1 for an account of what data will be gathered to evaluate the effectiveness of the innovation, and section 5.4 for data that will be collected and analyzed to as part of project implementation.

5 PROJECT

As described in Section 3, we are proposing to create a knowledge sharing platform on community engagement methods for energy access practitioners and to develop and demonstrate an OBE framework to evaluate the effectiveness of different community engagement methods across varying social contexts.

5.1 Project Description and Scope

The project aims to create the tool/method database, develop the OBE framework to assess tool/method

effectiveness, and demonstrate the use of the framework on an End User engagement tool applied in two real-world energy access projects. It is out of the project scope to evaluate all the tools in the database using the OBE framework. Rather, this project will be the catalyst for an evidence-based toolkit of tools and methods for community engagement, available to practitioners to share, test, and improve. The project scope is summarized below.

1. Literature survey and compilation of tools that

aim to engage the End User in solution development; specifically focusing on tools with a potential for adoption to energy access.

2. Development of an OBE framework to assess whether or not these tools are effective in enhancing End User participation (see Section 3.1).

3. Demonstrate and validate the novel OBE framework through its application to two real-world energy access projects in separate geographies. Use the experience of applying the OBE framework to propose further improvements and develop a plan for dissemination to energy access practitioners.

5.2 Key deliverables

1. A database of community engagement tools and methods, suitable for the socio-technical complexity of rural energy systems.

2. An OBE framework for evaluating the effectiveness of the tools and methods across a common set of metrics.

3. Case study results of having applied the OBE framework to a user engagement tool to assess effectiveness.

5.3 Methodologies

The methodologies applied in the project will include:

(1) A literature review and compilation of End User engagement tools and methods, carried out by a multidisciplinary team to ensure tools from all disciplines and perspectives are considered.

(2) Use of Outcome Based Evaluation (OBE) to develop an operational framework for evaluating community engagement tools.

(3) Action Research for demonstrating the framework that will both develop knowledge from application of the framework, as well as address actual energy access challenges faced by at least two communities.

5.4 Data

Exploring the research questions outlined above in Section 4.2 through the proposed project would require access to monitoring and evaluation data on current or previously implemented energy access projects/programs, especially projects for which we could determine the level of community participation and the methods employed. The table below presents a preliminary typology and examples of useful data for this research.

6 RESOURCES

6.1 Project Participants and Roles

This project is multi-sectoral and requires participants from a range of disciplines who are experienced in working with multidisciplinary teams and on action research projects.

PARTNER	ROLES/REQUIREMENTS
Academic partner(s)	• Lead on literature survey • Co-lead on development of OBE framework • Required disciplines: anthropology, human geography, design studies, engineering, entrepreneurship/innovation studies, etc.
Project developer	• Lead on action research implementation, consisting of deployment of OBE framework applied to community engagement tools used in development of an energy access project. • Co-lead on development of OBE framework • Will have upcoming energy access projects to which this research project could be applied

Community	The beneficiaries of the energy access project the action research component is applied to.
Community-based organization (CBO)/ local NGO	- Familiar with the community with a good relationship with them. - Involved in the implementation of the energy access project with the project developer.

6.2 Project Funding

The literature review and case studies collected from the project and the framework for evaluating community engagement tools will be publicly distributed to the energy access community. We expect the funding to be grant-based, originating from foundations or organizations with an interest in knowledge sharing and community participation in the context of energy access.

A wide array of foundations and networks promote knowledge sharing and increased community participation and engagement in energy access. Some examples include:

- People-Centered Accelerator
- Wuppertal Institute (WISIONS)
- Rockefeller Foundation

6.3 Project Locations

The first two stages of the project are desktop studies that do not require a specific geography. The third stage, which involves the application of the OBE framework for an existing project, would need to be undertaken with participation from a project developer, the community benefiting from the project, and a local entity familiar with the community, as explained in the table of project participants. The location would therefore be field-based and would depend on finding the right set of partners to implement the study.

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WHY NOT? INSPIRING GLOBAL CHANGEMAKERS

BY

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1 CHALLENGE

Describe a major systems-level challenge/ tension/ paradox that currently stifles progress on energy access & productive use.

Energy access conversations are often about technology and market economies. However, the subtler aspects of energy usage, described by attendees of the 2019 Innovation Lab as "productive uses of energy", require more discussion. Such is the case for energy practitioners who do not have regular contact with existing and potential end users. As a result, one of the challenges faced by energy access practitioners today surrounds the idea of implementing energy technologies in a minimally disruptive manner with respect to several dimensions of human livelihood including health, education, culture, economics, and fundamental ways of life. Concerns in these social dimensions are often beyond anticipation during the initial design process and pose potential for conflict. Hence, the conflicts within the social dimensions of energy access can then be argued as a limiting factor on overall development in communities receiving these energy technologies.

Looking closer at the social dimensions of energy access, the root causes of arising conflicts are not always unique. In these instances of conflict, it becomes easy to leverage communication silos and attain support for a potential solution when individuals from different backgrounds facing similar challenges are congregated. Additionally, bringing these individuals together also provides a chance for them to recognize that doing something differently to address their unique social and cultural contexts is okay. These exchanges, facilitated through events such as the Innovation Lab, are especially relevant for end-users experiencing the most change during transitions to new energy systems.

In this Innovation Brief, we will detail the current issues regarding 'productive uses of energy' and social dimensions of energy access, and will provide a plan for a solution to begin mitigating these issues.

Who does this challenge affect and how?

In the face of increasingly complicated energy access problems, the successful upscaling of energy access solutions is often challenged by the lack of consensus surrounding productive uses of energy in developing communities. Much work has been done to measure social impacts of energy technologies as part of sustainability assessments and decision-making processes (Carrera & Mack, 2010; Roth, Hirschberg, Bauer, Burgherr, & Dones, 2009; Santoyo-Castelazo & Azapagic, 2014). Social impacts are often considered one of the main pillars of sustainability and are known to exude vast degrees of subjectivity during these assessments. Such impacts often include effects on health and safety, the environment, local industry, education, and land use, along with public perception and acceptance.

Given the diversity of social contexts in which energy systems operate, there is neither a widely accepted social impact theory nor any standardized procedure for deriving appropriate indicators (Maxim, 2014; Roth, Hirschberg, Bauer, Burgherr, & Dones, 2009). Many studies have provided case-specific examples of how to select indicators for measuring the social impact of energy technologies on regional scales. Different stakeholder groups are often engaged with targeted questions and discussion prompts. While these efforts are effective for achieving the objectives set within each study, more effort can be made in facilitating these instances of interdisciplinary learning on a broader scale without over-generalizing the lessons learned from specific projects and contexts. These insights would serve to assist in the development of increasingly holistic operating frameworks used by future energy projects. With this mind, this challenge inherently affects all stakeholders interacting both directly and indirectly with energy systems of interest since their collective inputs have been shown to affect the results of sustainability assessments and decision-making analyses (Carrera & Mack, 2010; Maxim, 2014; Roth, Hirschberg, Bauer, Burgherr, & Dones, 2009).

Are the interests of one group in opposition to another group?

Opposing interests between stakeholder groups can certainly exist in any energy access project. For example, the installation of mini grids for electricity generation in a rural community can positively impact end-users but also negatively affect diesel fuel suppliers given the reduced reliance on private diesel fuel generators caused by improved electricity distribution. Within any context, stakeholder groups have unique values, priorities, and hence different preferences for energy systems of choice. When two or more stakeholders exist with the power to influence the project outcome (in the case of this challenge, development as a result of energy access), social conflicts, as described by Hipel, Kilgour, & Fang (2011), are bound to exist to some extent by definition. While it is favorable to avoid these conflicts in the first place, the study of existing conflicts in the energy access sector can help to inform future decision-making processes, identify key stakeholder groups, and document effective resolutions.

What are the key economic, social, technological, environmental implications?

Economic, social, technological, and environmental consequences are all capable of arising when technological systems do not work harmoniously with social systems. Obtaining social support is a unique and formidable task in energy access projects, where failure could be catastrophic in causing the loss of local support, and subsequently, the project altogether.

Without properly understanding the productive uses of energy provided by implemented technologies, it is challenging to anticipate subsequent changes to the local economy and environment. Impacts on social

welfare also remain unpredictable given no understanding of potential end uses for accessible energy in accordance with local lifestyles. Some questions worth consideration in pursuit of development through energy access technologies:

- Assuming that all basic life functions are supported with electricity (e.g. hot water, light to see at night, cooking power, indoor heating), what uses for surplus energy will a remote village in Nepal prioritize next? How does this differ from the uses set out by a First Nations community in British Columbia?
- Do both regions' decisions result in more youth attaining education opportunities?
- Will local businesses emerge and create a self-sustaining economy?
- Will the local energy demand be expected to grow? If so, at what rate?
- Can the implemented technologies support growing energy demands?
- How many households will be able to put food on their tables every day?
- What conflicts could arise after energy becomes accessible?

Given the interdisciplinary nature of the energy-development nexus, there is a need for dialogues with stakeholders and experts from all its various dimensions during the planning and design of energy projects. Scientists, engineers, economic developers, policymakers, and healthcare providers alike must all be a part of these conversations. We argue that these interactions should be encouraged outside of projects in an accessible manner to further the general understandings of energy access and its social, environmental, and economic implications. By doing so we hope to improve the consensus surrounding what productive uses of energy should entail in different regions.

2 MAPPING THE THEMES

Successes that arise from any meaningful gathering of Changemakers are created by recognizing and making strategic use of newly presented opportunities. When system actors are connected to established networks, technologies gain the potential to be leveraged in ways that would never occur otherwise.

The network of an individual remains relatively constant and self-selected if they are confined to their respective geography and communication silos. Such conditions reduce the chances of learning something new and of encountering "happy accidents", with the possibility of change occurring only when one decides to venture outside of their regular network. In doing so, individuals begin to "know more" by learning more from "knowing more" people, iteratively (Scofield & Hedges, 2011).

Figure 1 presents a hypothetical system of actors interacting with each other for energy access in one community. It is seen that such a system for one community is already complex, but all system actors are "locked-in" on the context and perspectives of the community. Within this system, a consensus may be reached about productive uses of energy and the social aspects of energy access.
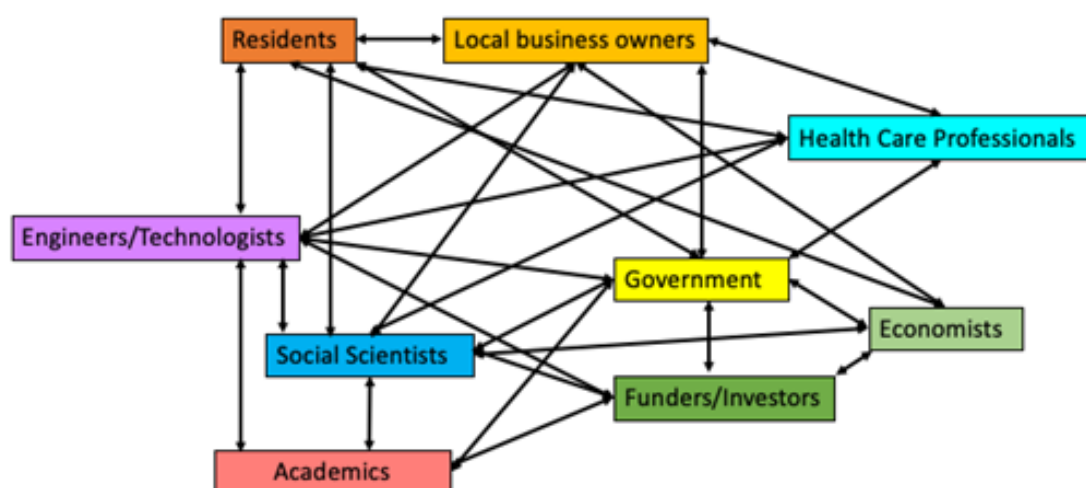

Figure 1: Hypothetical stakeholder interactions concerning energy access in the context of a single community

If the same actors for another community system are placed together with those of the above, interactions between actors from both communities begin to occur as illustrated by Figure 2 in red. When this happens, the previous consensus and established definitions start to change as information and perspectives are exchanged. Expanding this to include more and more communities results in a "system of systems" scenario where global trends can be identified for energy technologies (e.g. the role of mini grids). This would allow for drawing insights such as suitable locations for deployment of select technologies and areas of lacking essential resources.
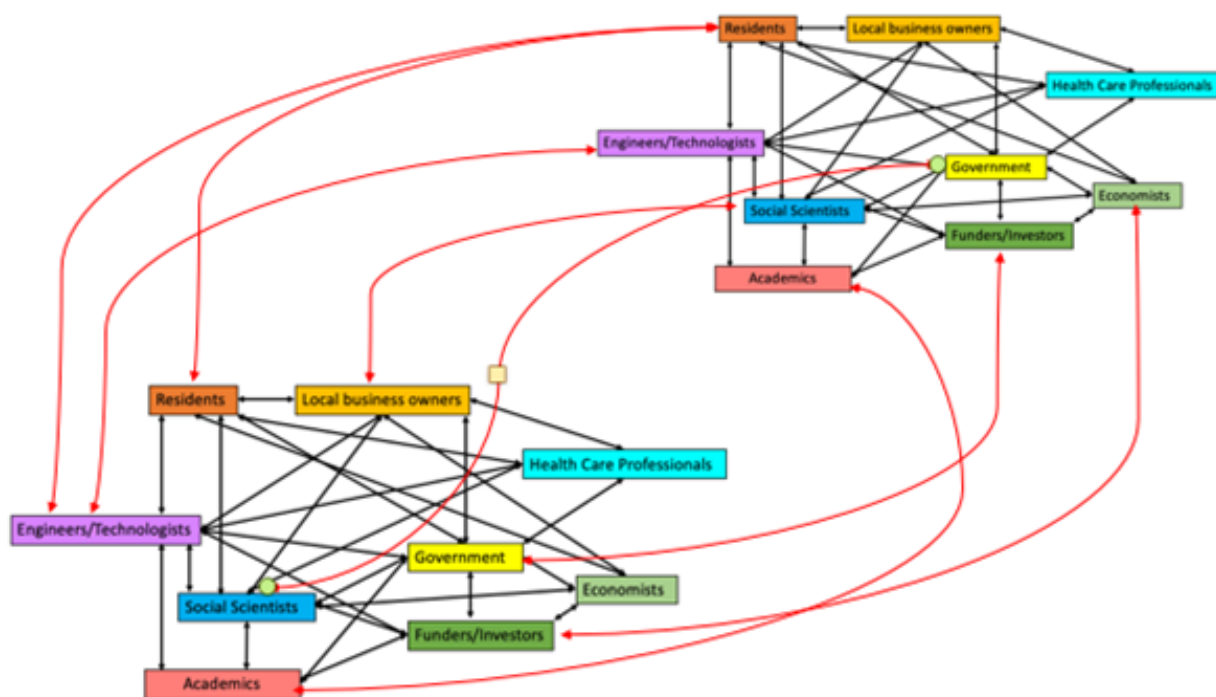
Figure 2. Hypothetical stakeholder interactions concerning energy access across the context of two communities

Regardless of which stakeholder groups and communities are interacting with each other, the interaction (and the various mechanisms through which it is facilitated) itself is the core component of the system that brings all the different ideas together. In our case, the interaction mechanism was storytelling, one of the most powerful tools for building collaboration. As Neimand (2018) writes in the Stanford Social Innovation Review:

"Storytelling is one of the greatest tools we have for engaging communities on complex social and environmental issues, in ways that can drive belief and behavior change. People are far more likely to remember information if it reaches them in the form of a story. Good stories also have an incredible ability to reduce counterarguing on divisive issues. And when people are transported by a great story, they remember the events in the story and feel like the experiences were their own. As a result, the story has the power to influence future beliefs on related issues."

Through stories, system actors can identify with characters possessing similar norms, socio-economic status, social identity, geographic location, life experiences and values. For audiences, being able to identify with a character increases the likelihood of the story being influential and capturing their attention (Neimand, 2018). With this attention comes the motivation to consider ways of "doing the things you currently do better". We experimented with this through video interviews during the working sessions of the Innovation Lab and drew messages that contribute to understanding the holistic system of humanity shared between Changemakers around the world.

The following systems diagram (Figure 3) was started based on content from these interviews. It should be expanded with more recordings and used as a reference for interviewers and producers who wish to create content of their own. An analysis of the diagram can be periodically conducted to identify major themes.
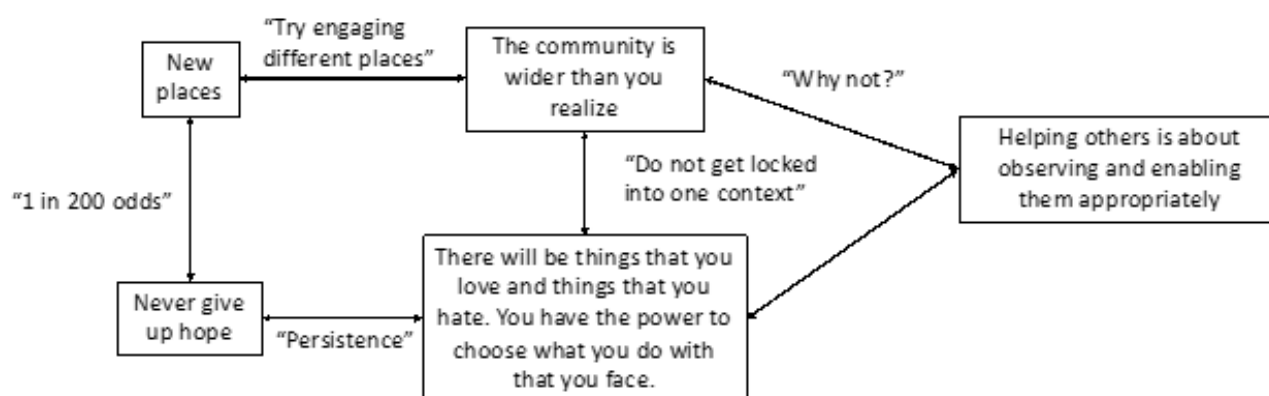
Figure 3. System mapping of lessons learned based on experimental interview content at the Innovation Lab

In viewing the first videos produced, we noticed the following trends:

- Success often stemmed from trying something beyond what is known
- New ideas and perspectives can be found if one searches outside of their network and region
- *T*he search for support can still sometimes be quite challenging despite a large community

As this was a small sample of 7 interviewees, universal trends remained unclear at the time of the Innovation Lab. Commonalities of success or challenges can be clearly identified with more interviews and a meta-analysis of the content. The theme of shared humanity spoke loosely about the productive uses of energy and rather more broadly about creating change for social impact (generally through some means related to energy access).

3 INNOVATION

Describe an ideal innovation or action that would resolve the challenge/tension/ paradox.

International conventions, treaties and global development agendas such as the Paris Agreement and the United Nations' Sustainable Development Goals (enshrined in the 2030 Agenda) have been significant drivers of development in the environmental dimension of energy projects. This has resulted in the wide acceptance, adoption and diffusion of renewable energy technologies to reduce environmental impacts. Similar developments in the economic and institutional dimensions can be observed through subsidies funded by government-industry partnerships and new financial models such as the Pay-As-You-Go model, Carbon Tax, and the Cap and Trade Program.

Despite the major improvement in the technological, economic, environmental and institutional dimensions of energy, significant gaps remain in the

social dimension. As a way to capture the social dynamics of energy access in various contexts, sharing the narratives of Changemakers with different experiences would help to drive social innovation in energy projects. These unique human connections with energy access will provide insights on increasingly holistic approaches that could help to improve the positive impact of energy projects on socio-economic development.

Extending and expanding the dialogue relating to the social value of energy and productive uses of energy can be made possible through the creation and accessible sharing of videos recorded in a story-telling format. In the spirit of innovative thinking, each video captures the personal narrative of an individual and their relation to energy access when given a prompt of "Why Not?".

Videos would begin with a greeting in the first language of the individual, followed by the individual

announcing where they are from to demonstrate universality. The footage continues with a concise narrative by the individual describing a time in which they faced adversity (relating to energy access) and how they responded. Like many of the published studies, this provides a specific context for which energy access is a challenge. The video concludes with the individual sharing lessons they have learned based on their story, offering viewing audiences both a unique perspective on energy access and food for thought when considering the role of energy in their own respective contexts.

These videos would be made widely available to audiences around the world through a web-based medium. Contact information such as email or phone number may accompany videos based on the discretion of the individual featured. The platform would also provide instructions and guidance for inspiring audiences on how to produce these videos and feature their own stories for sharing. Over time, the key messages across videos can be aggregated and analyzed to map global characteristics of the social value of energy and productive uses of electricity. Analyses can also help identify and track instances of social innovation.

Why would such innovation be so impactful?

Based on our experiences at the Innovation Lab in Waterloo, many people do not stop and consider the social side of energy access and productive energy use.

While there is a general "feel good" about the work we are doing, there is also a lack of depth and context. This innovation would help create a mutual understanding of what successful energy access means in different systems for academics, practitioners, government workers, and end-users alike.

Storytelling requires and encourages interviewees to reflect on the work they are involved in and to look forward to seeing how they can continue impacting

the communities they serve.

Through context provided by individual stories, it can unanimously establish that people around the world requiring energy access are simply trying to carry out unique functions with more efficiency and that there are no quick fixes available to tackle every challenge. With the sharing of stories about overcoming challenges and lessons learned from failure, common ideas can be refined and championed to better address future challenges of similar nature while considering the social aspects of energy access and productive uses of energy.

Other related impacts include gathering unity and increasing momentum for ensuring access to affordable, reliable, sustainable and modern energy for all (United Nations Sustainable Development Goal #7), building intuition for selecting social impact indicators and inspiring future generations to work in the energy sector.

Does this innovation in particular involve a major change in technology, economics, society?

This innovation brings about two major changes:

- 1. A shift in the design process of energy access solutions to place more emphasis on fitting adapted technologies appropriately with the context of its end-users. In this manner, final solutions will work to enhance the local culture and way of life rather than disruptively changing it altogether once electricity becomes readily available.
- 2. Through accessible sharing of stories, the second change brings forth an extended knowledge base for Changemakers living in the context of the energy access challenges we face today. This can help bring new insights across contexts into a collaborative network, bridging theory and application through meaningful patterns in user-defined requirements and feedback.

Is this innovation novel? Is there a reason why current efforts have not produced this solution?

Consultation and engagement with target communities and beneficiaries is often standard practice in energy access projects. Using the findings from these interactions to inform the design process is becoming common. However, widespread sharing of the user feedback and lessons learned from

projects does not always happen. This is especially true for single projects implemented by private investors as they may not share reports or project implementation strategies. For projects developed as part of a program, sharing of lessons learned may be limited by the lifespan of the program, funding and other factors. Moreover, such tasks may be considered outside of project scope (if not considered an entirely separate undertaking in itself).

4 KNOWLEDGE

How can we know whether this innovation would be effective?

Effectiveness of this innovation can be observed with different stakeholders at different stages in the energy project:

- Practitioners, Academics and Funders: Greater understanding of user needs and empathy of the challenges faced by all system actors.
    - Effective solutions implemented with end-user inputs and feedback, resulting in less social conflicts.
    - Increased intuition for selecting indicators of social impact and sustainability
    - Increased connections made by viewing videos and understanding similarities with others, leading to collaboration.
    - Establishment of broader networks across geographies tackling the same/similar issues.
- End-users: Access to a platform to share a definitive desired change in their community and its associated benefits.
    - Creation of local role models and influencers for energy access.
    - Lowered barriers to product uptake.
    - More ownership and familiarity with final energy access solutions

Note many of these actions can all happen face to face, but the use of videos on an accessible platform could accelerate the process and cross borders at a faster rate, with the added potential benefit of

broader public interest in the problem and participation during the planning stages of projects.

What research questions are emerging?

Do videos of individuals sharing their stories lead to greater empathy, motivation and action from other individuals in the system, and subsequently inspire more productive uses of energy?
- Ex. What will business owners do when shown videos relating to how energy access can transform their daily operations?

Are there socio-political sensitivities associated with storytelling relating to energy access? Are all communities of focus able to convey the necessary information freely?
- What social hierarchies and political constraints prevent system actors from creating and sharing their stories?

What are key insights are currently unavailable for (or overlooked by) those working in the energy access sector? Where are their sources, and how do we identify them?

Is there already dedicated infrastructure for widespread sharing of energy access contexts and if so, how can an Innovation like this one support and/or leverage the work that has already been done?

What data is important to us and where might it be gathered?
- Personal stories related to social impact and established social sustainability indicators for energy technologies – this can be found with end-users in serviced communities.
- Video platform analytics (number of views, location of views, comments) - being mindful of vanity metrics.

- Number of new videos organically uploaded / shared.
- Connections in the system made from viewing the videos - e.g. individuals collaborating on projects as a result of watching the videos.
- Resultant actions of note by end users who have watched the videos.
- Required accessibility formats with respect to language and visual and aural accommodations.

5 PROJECT

Describe a feasible project that would help make this innovation a reality.

A review of current story sharing practices in the context of energy access should be compiled into a report. The report would be used in proposals for funding with the result being the launch of a measurable platform to share videos across the world. It features the work of individuals to inspire, engage and build even more momentum for change across stakeholder groups involved in the energy-development nexus.

What are the objectives of the project and its key deliverables?

This primary objective of this project is to establish a platform dedicated to sharing individual stories related to energy access around the world by:
- Providing a means for energy users, providers, and managers alike to access and create content that builds the perspectives and contexts unique to energy access challenges around the world.
- Bringing energy access working groups from around the world together into a common network.

Milestones of this project would be indicated by key deliverables, including:
- Submission of a preliminary report on the current state of insight-sharing practices around the world in the context of energy access challenges. The report will aim to:

- inform the design phase on appropriate mediums and create awareness of any existing insight-sharing services
- determine what kinds of information are valuable across working groups
- assess the efficacy of current insight-sharing practices and recommend improvements
- Submission of a proposal (or a presentation) summarizing design aspects of the insight-sharing platform following the design process informed by the submitted report. The final design should:
  - facilitate the delivery of valuable insights/information (as informed by the report) and
  - provide a user-friendly guide (in the form of a manual) that explains our ongoing effort of identifying commonalities of successes and challenges, along with how to create content for sharing.
  - This may result in a series of proposals, as the design process is often iterative.
  - Prototyping and user-testing (with collaborating working groups) of the designed platform may also be intermittent throughout.
- Launch of platform and open access to communities
- This can be staggered in stages by region and/or by scale for enhanced data analytics tracking and assessment of additional requirements

Additional adjustments may be needed for the platform, but the project team should initially prioritize the primary objective based on user

feedback before trying to accommodate secondary or indirect needs outside the project scope (think within contexts but do not lose sight of global vision!)

Possible Methodologies

Information gathering for the preliminary report can be done through surveys and interviews with individuals and organizations working in the energy access sector. These contacts can be identified through WISE and the AE4H project.

The data requirements and other resource needs for prototype testing and providing feedback in different contexts must be defined (e.g. accessibility requirements concerning format and language). This information can be collected through surveys and interviews with select individuals operating in these contexts.

Design and subsequent modifications can be presented remotely via conference call with additional information gathering occurring in parallel. A schedule of deadlines can be set to ensure design milestones are met, and sufficient user testing has been conducted.

Identification of insight commonalities could be automated initially based on the keywords used by shared stories. Research can be done here to discover existing software for this purpose. Some manual work would follow to synthesize the patterns into a system map for energy access challenges and successes for

content creators to see. The system map then serves as a reference in the manual for creators when learning about the content that communities are sharing.

Launch schedules could be delayed according to a region or stakeholder groups in order to assess the effects of specific interactions. Doing so can help draw insights on when and how to best deploy the platform for remaining global communities. Alternatively, the platform could also be made immediately available to a small subset of several stakeholder groups to observe sub-system effects.

What is a reasonable project timeline?

The total lifetime of the project, based on the milestones above would be:

- Submission of a preliminary report on the current state of insight-sharing practices around the world in the context of energy access challenges: 6 months.
- Submission of a proposal (or a presentation) summarizing design aspects of the insight-sharing platform following the design process informed by the preliminary report: 4 months.
- Launch of platform and open access to communities: 6 months.

Additional tasks can be created upon recommendation as each of the abovementioned milestones and deliverables are completed.

6 RESOURCES

Who should be involved in the project and what are their roles?

There would be three key roles in the project: Project Manager, Analytics Manager and Engagement Manager. The Project Manager would oversee the budget, scope, deadlines and overall quality assurance of the experience for users and viewers, as well as manage reporting for funding and grant

applications.

The Analytics Manager would focus on setting targets and recording data and insights (quantitative via the platform and qualitative via participants and users) to refine the platform and leverage key opportunities. They would also map the system and record significant feedback, impacts or changes discovered throughout the project.

The Engagement Manager would be responsible for promoting the platform, creating the manual and building relationships with communities to facilitate the use of the platform.

In terms of actual individuals to undertake the work, we would need resource support to continue this concept. Openings in the project team could also highlight student positions (co-ops) from various fields of study (Communications, Political Science, Engineering, etc.) to incorporate considerations for the social aspects of energy as part of their early career development.

What sources of funding/financing are required and where might we find them?

Research for sources of funding and financing would be incorporated into the first phase of the project, with a decision point built in for progressing with the work. Sources of funding are expected to be quite diverse and outside the "traditional" sources for energy access projects (e.g. media funding, arts funding).

Geographic considerations – where could the project be carried out?

A strength of this project is its ability to be delivered globally at low cost. We would rely on the geographies of the participants at the Innovation Lab to generate more practitioner, academic, and end-user content. Such countries would include Uganda, Tanzania, India, and Nepal.

7 NEXT STEPS

What needs to happen next to get this project started?

The existing videos need to be added to a platform (e.g. YouTube channel) to gauge initial responses to the content and format. AE4H participants and interviewees need to be encouraged to share the existing videos.

AE4H participants should challenge another person they know in the energy access realm to create their own videos.

The video format, "Why not?", needs to be tested with end-users. There is potential for this to be undertaken in India via Pollinate Group.

Who will do what?

We need resource support to continue this work and make it worthwhile per the project plan and outline. We welcome the opportunity to discuss the project potential further based on AE4H's initial review of the approach.

APPENDIX: EXISTING INTERVIEWS

Aaron Leopold	shorturl.at/jvOSY
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