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Delivering on the Promise of Decentralized, Community-Controlled Renewable Energy Access

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COVER PHOTO

SHARIFA RELIES ON A BASIC WOOD FIRE TO COOK HER FAMILY'S FOOD.

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Introduction: Why Renewable Energy Access?

The world is in the grips of a climate crisis driven by greenhouse gas emissions, of which the largest single source is the energy sector. Any successful global effort to mitigate climate change will require a drastic reduction in energy sector emissions, which can be achieved by a shift to renewable energy sources and a reduction in energy consumption. Environmental and other non-governmental organizations (NGOs) and activists have been pushing for such policies for decades. However, while a shift to renewable energy must happen across the board, it is critical that in undertaking such a transformation, global inequities in energy consumption are taken into account. While most people in developed countries – in particular the United States – consume large and arguably excessive amounts of energy on a daily basis,[1] many people in poorer countries have the opposite problem: *underconsumption* of energy. These are people living in energy poverty, without access to sufficient energy for basic needs and services, much less a minimum level of entertainment or luxury that most would consider inherent to a dignified and fulfilling life.

Access to energy is crucial to breaking out of the vicious cycle of poverty. Reliable access to energy can greatly expand opportunities for a girl, a woman, a household, or a community, including through saving time and labor from the sourcing of fuels. Unfortunately, these very same girls, women, households and communities are even now struggling with the impacts of climate change, largely driven by emissions from dirty energy. Compounding this vicious cycle, lack of energy access often undermines communities' resilience to disasters and climate impacts. For example, communities where trees are crucial for ecosystems and livelihoods are also often communities where deforestation is rampant, as people cut down trees for charcoal and energy use.

Renewable energy access comprises not just household access to electricity, but also access to electricity for public services (schools, health facilities etc.), clean cooking environments, clean forms of motorized transport, and so on. In order to maintain a certain level of conciseness, this paper follows on many existing studies in focusing largely on access to electricity; however, in the closing "further research" section we discuss how the model proposed in this paper might be expanded to encompass a more holistic vision of energy access.

1 Of course, energy consumption is deeply unequal even within developed countries, and affordable community energy access programs exist in, for example, the United States as a means of addressing this. See for instance Center for Social Inclusion (2016), *Energy Democracy – Co-op Power: A profile in cooperative ownership*. Retrieved from http://www.centerforsocialinclusion.org/wp-content/uploads/2016/02/Energy-Democracy-Co-op-Power.pdf.

Even when only considering electricity, global energy inequality is incredibly stark. New York State, with a population of less than 20 million, consumes about the same amount of residential electricity as the 800 million people in sub-Saharan Africa (excluding South Africa).[2] Curtailing energy consumption by elites, particularly in the industrialized world, is necessary but politically difficult, to say the least. Increasing access to energy for the poor is equally necessary and, in contrast, is a goal that is widely recognized and supported, at least in theory (though as we will show in this paper, many initiatives that claim expanding energy access as a goal in fact do nothing of the sort). For example, UN Sustainable Development Goal #7 aims for "universal access to modern energy services," and there are many mainstream initiatives such as Sustainable Energy for All (SE4All) that have substantial resourcing and institutional backing.

Simply delivering universal energy access, however, does not guarantee a sustainable or just future. Universal energy access will spearhead a just transition to a sustainable economy only if it meets two conditions: first, that is based on sustainable forms of renewable energy; and second, that it is under the control of the communities living in poverty that are meant to be the beneficiaries. Without the first condition, increased energy consumption will contribute further to the climate crisis that the poorest and most marginalized are already suffering from first and worst. Current scientific models say in the clearest possible terms that the world cannot afford to create new fossil fuel infrastructure if we are to have any hope of limiting global warming to a manageable level. And without the second condition, there is simply no guarantee that communities, especially those living in poverty, will actually receive the benefits of new sources of renewable energy: the energy itself, and also the profits and opportunities that accrue to those that sit at the top of the energy value chain.

Historic experience from across the globe illustrates that communities in rural areas far from large population centers are often the last to gain access to energy infrastructure or are overlooked altogether, because returns on investment for the commercial entities that typically provide such infrastructure are minimal or nonexistent. In areas where commercial developers *do* see potential profits, if local communities are interested in exploiting renewable energy resources themselves, they tend to lose out or face numerous barriers (see the example of the Ixtepec Community Wind Farm below). Community groups are often volunteer-led, move relatively slowly as they develop skills and expertise, find it difficult to raise finance, and may encounter difficulties due to policies that cater more to commercial developers as primary actors. By failing to help deliver universal energy access, energy developments that exclude rural populations exacerbate inequalities within regions or countries, potentially leading to an increase in rural-urban migration in search for better livelihoods.

2 International Energy Agency (2010), *World Energy Outlook 2010*.

This paper makes the case that *decentralized, community controlled renewable energy access* is the solution to energy poverty in the context of climate change and broader social injustice. The current model of energy production, distribution, supply and consumption can be radically transformed by renewable energy, which by its nature is found everywhere. Solar, wind, micro-hydro and other renewable energy forms can be harnessed directly by communities rather than having to be centralized under the control of a few powerful actors. By their very nature, renewables – when combined with investment in off-grid and mini-grid technologies and infrastructures – can democratize energy production in such a way that makes universal energy access an achievable goal in the relatively near future.[3]

The paper is structured into three sections. First, it offers an overview of the importance of decentralized renewable energy access in the context of two overarching problems: energy poverty and climate change. Second, it develops a conceptual model for decentralized renewable energy access in three steps – overarching principles, economic, social, political and technical considerations, and lessons learned from existing examples. Finally, drawing from ActionAid's experience working with communities living in poverty in the Global South, the paper sets forth a proposal for a pilot program that can be implemented with specific communities in order to provide a proof of concept or demonstration that the model is workable on the ground, in addition to being conceptually sound.

Climate change and energy poverty

The world currently faces many challenges of a global scale. In this paper, we address two such challenges that are intimately linked and that have massive implications for the world's poorest and most vulnerable populations: climate change and energy poverty. Climate change, of course, refers to inexorably increasing average global temperatures that are already driving increasingly intense storms, persistent droughts, rising sea levels, pests and diseases, unpredictable and disastrous rainfall and other weather patterns, ocean acidification, crop failures and more. Energy poverty refers to an inability to access reliable electricity and all the necessities and luxuries that are dependent on such access – from lighting and refrigeration to entertainment and access to information – as well as a similar lack of consistent energy for cooking, heating, transport, mechanical power and so on (for reasons of scope, in this paper we focus primarily on electricity access).

3 The target date for achieving universal energy access under the UN/World Bank Sustainable Energy for All initiative is 2030, while some civil society initiatives such as the Global Renewable Energy and Energy Access Transformation aim for 2025. The Global Renewable Energy and Energy Access Transformation (GREEAT) is an initiative of the Centre for Science and Environment (India), What Next Forum, and Friends of the Earth International. For more information, see the GREEAT Programme document available at http://www.cseindia.org/userfiles/GREEAT.pdf.

IN 2010, FLOODING IN PAKISTAN TOOK MORE THAN 1,600 LIVES AND AFFECTED OVER 14 MILLION PEOPLE. CLIMATE CHANGE IS EXACERBATING THE COUNTRY'S HIGH RISK FOR FLOODS.

CREDIT: GIDEON MENDEL/CORBIS/ ACTIONAID

Because anthropogenic (human-induced) climate change is driven by greenhouse gas emissions and the production of energy is the largest single source of said emissions, from a global climate perspective the world faces an energy overconsumption problem. However, from the perspective of the poor who lack access to energy, the problem is actually energy *underconsumption*, both in communities of the global south and the global north. In fact, the real problem is one of energy inequality: wealthy countries and global elites consume vast amounts of energy and thus are responsible for massive levels of greenhouse gas pollution, while the poor consume little or negligible amounts of energy and have a correspondingly tiny emissions footprint. In a particularly perverse example of injustice, many of those same poor are also the most vulnerable to climate impacts, despite having done the least to cause the problem.

Climate change and sustainability

Policy discussions around energy access are, by necessity, deeply tied up with the conversation about the global climate crisis. A massive transformation in global energy systems is needed if the world is to limit global temperature rise to 1.5 or 2 degrees Celsius below pre-industrial levels – the stated goals of the Paris Agreement and an absolute necessity to avoid catastrophic climate impacts, particularly in vulnerable developing countries.

Even at current warming levels around 0.85 degrees Celsius, the world is already seeing substantial and highly damaging climate impacts: typhoons, floods, rising sea levels, droughts, ocean acidification, and more. Poorer countries, and particularly people living in poverty within these countries, are particularly vulnerable to these impacts. Communities and economies that are primarily based on farming and coastal livelihoods have the least capacity to cope – for example, a farming community entirely dependent on rain-fed agriculture (perhaps in part due to a lack of resources or energy to enable irrigation systems) is highly dependent on predictable rainfall patterns, which are already being disrupted by climate change.

Adaptation to these climate impacts, and the financing necessary to enable such adaptation, are a major priority for developing countries. However, there is a point at which impacts become so severe that adaptation is no longer possible – for instance, in the classic example of sea level rise entirely displacing people from small island countries. These types of impacts, which in international climate policy parlance have been deemed "loss and damage," cause irreversible harm to livelihoods, the environment, cultural heritage, local, and national economies, and much more.

Proactive climate adaptation measures and compensation for loss and damage are absolute necessities for developing countries, and have rightfully been major points of contention in international climate negotiations. However, in the absence of aggressive greenhouse gas emissions – driven first and foremost in the energy sector – these measures will only go so far to protect the poorest and most vulnerable. Alongside financing adaptation and dealing with loss and damage, the world must embark on a rapid energy transformation or a huge number of vulnerable people will be forced to cope with increasingly severe climate impacts that they had no part in causing.

The scale of this transformation, and the resources needed to effect it, can hardly be overestimated. A widely cited study in early 2015 showed that in order to have even a 50-50 chance (which would be an unacceptable level of risk in most contexts, and should be for us with regards to climate change as well) to keeping global warming under the weaker goal of 2 degrees Celsius, 80% of currently known coal reserves must be left unburnt.[4] Given the still-dominant role of coal in worldwide power generation and the fact that fossil fuel reserves are listed as assets on the books of the world's major energy corporations, this statistic alone implies that the scale of societal and economic change needed is massive.

That change means a huge shift in financial markets and investments is also needed. The International Energy Agency has estimated that to stay below 2 degrees average global temperature rise, "About 40 trillion additional investment (relative to the USD 318 trillion expected to be invested anyway in the business-as-usual 6C scenario)"

4 McGlade, C. and P. Ekins (2015). "The geographical distribution of fossil fuels unused when limiting global warming to 2 °C." *Nature*, 517: 187-190.

will be needed by 2050.[5] Bloomberg New Energy Finance has estimated that US$880 billion annually in new investments for renewable energy alone will be needed by 2030.[6] While these are enormous numbers, they are tiny fractions of global GDP, as the IEA points out, and are not particularly large relative to the amount of public money already being directed towards subsidizing the use of fossil fuels,[7] the income of the world's richest 50 people,[8] or the $1.676 trillion in global military spending in 2015 alone.[9]

Given economics and path dependencies based on existing investments and infrastructure, there is a certain temptation on the part of governments and corporations to expand energy access by expanding the use of fossil fuels. In many places, coal or, increasingly, natural gas, are the easiest options for energy generation, and thus the most obvious "solution" to energy poverty. As a result, there are many efforts to improve energy access by burning more fossil fuels. These include domestic efforts underway in many developing countries, as well as internationally financed efforts through initiatives like the US Power Africa Initiative or many projects funded by multilateral development banks.

Unfortunately, these efforts are ultimately self-contradictory, as many of the intended beneficiaries are also those who are most vulnerable to the increasing climate impacts that will only be exacerbated by the continued consumption of highly climate-polluting fossil fuels. Furthermore, the traditionally centralized nature of energy production in these models means that the full benefits of increased energy production do not flow to local communities – and in some cases, one of which we explore further later in this paper, even the additional energy capacity itself ends up serving large commercial interests rather than alleviating energy poverty.

Energy and development

While climate change and energy poverty are inextricably tied together, they each present distinct challenges for people living in poverty. Like climate change, energy poverty has implications for virtually all indicators of human development and well-being, and is associated with consistently poorer outcomes in multiple areas. As an illustrative – far from comprehensive – look at the varied impacts of energy poverty, we will briefly address the following five: livelihoods, women's rights, agriculture, public services, and resilience.

5 International Energy Agency (2015). *Energy Technology Perspectives 2015 – Executive Summary*. Retrieved from http://www.iea.org/textbase/npsum/ETP2015SUM.pdf.

6 Bloomberg New Energy Finance (2013). *Global Renewable Energy Market Outlook 2013*. Retrieved from http://about.bnef.com/presentations/global-renewable-energy-market-outlook-2013-fact-pack. All figures US$ unless otherwise stated.

7 On the order of $775 billion to $1 trillion per year, according to analysis by Oil Change International (2012). "No Time to Waste: The Urgent Need for Transparency in Fossil Fuel Subsidies." Retrieved from http://priceofoil.org/content/uploads/2012/05/1TFSFIN.pdf.

8 Friends of the Earth International (2015). *An Energy Revolution is Possible*. Retrieved from http://www.foei.org/wp-content/uploads/2015/11/foe-energy-revolution-full-report-web.pdf.

9 Stockholm International Peace Research Institute (2015). *Trends in Military Expenditure, 2015*. Retrieved from http://books.sipri.org/files/FS/SIPRIFS1604.pdf. In addition, military spending is a massive source of greenhouse gas emissions. "The Iraq war alone was responsible for 141m tonnes of carbon releases in its first four years… On an annual basis, this was more than the emissions from 139 countries in this period, or about the same as putting an extra 25m cars on to US roads for a year." https://www.theguardian.com/environment/2015/dec/14/pentagon-to-lose-emissions-exemption-under-paris-climate-deal.

Livelihoods

Regarding **poverty**, lack of access to modern energy services (defined by the International Energy Agency as "reliable and affordable access to clean cooking facilities, a first connection to electricity, and then an increasing level of electricity consumption over time to reach the regional average"[10]) is a major constraint on opportunities for income-generating activities. Not only is basic electricity necessary for a wide range of such activities, but lack of energy means that considerable amounts of time – particularly for women – is spent gathering biomass for fuel. This is time that could be invested into more productive activities. In addition, the ability to run basic electrical appliances or tools can greatly broaden the scope of potential productive opportunities.

Women's Rights

Women in the global South are disproportionately impacted by energy poverty in many distinct ways, including:[11]

- Women tend to bear most of the burden of collecting biomass for energy. This takes considerable time and effort, reducing their ability to grow food or earn incomes. Indoor air pollution associated with burning biomass causes 3.8 million premature deaths annually, with exposure particularly high among women and children;[12]

- Women's roles in natural resource management also increases the burden they face in relation to resource constraints driven by large-scale commercial energy infrastructure, such as water stress and increased land grabbing, while lack of access to credit and/or power over capital sees them at the end of the value chain of beneficiaries from these projects;

- Women tend to have less reliable access to energy services, or access to finance to pay for such services, compared to men; and

- Women are often excluded from policy discussions about energy, resulting in policies and plans that are insufficiently gender-responsive, and institutions like energy cooperative boards tend to be dominated by men.[13] When women are not part of planning on energy needs, decisions often tend to favor large-scale energy investments to promote commercial and industrial sectors, rather than universal energy access or meeting household energy needs. (This is similar to investment in large-scale agriculture over

10 International Energy Agency (2013), *World Energy Outlook 2013*.

11 United Nations Development Programme (2012). "Policy Brief 3: Gender and energy."

12 World Health Organization (2016). "Fact Sheet: Household air pollution and health." Retrieved from http://www.who.int/mediacentre/factsheets/fs292/en/

13 See for example, forthcoming piece by Lapniewska, Z., "Growth, Energy and Equality. Energy Cooperatives from a Gender Perspective." Glasgow Caledonian University. Unpublished results shared via presentation showing disparity in women's participation and leadership in European energy cooperatives.

WOMEN AND GIRLS GATHER FIREWOOD FOR COOKING FUEL IN THE NDIAËL RESERVE IN SENEGAL.

CREDIT: MAMADOU DIOP/ACTIONAID

subsistence, small-scale farming, which is also very gendered.)[14]

On the other hand, women can benefit from access to energy in very specific ways. Perhaps the most cited example is around the reduction of labor time spent gathering biomass, but increased safety (e.g. lighting for sanitary facilities to help prevent gender-based violence), improved school performance for children (particularly girls), support for a variety of household tasks, and increased opportunity for income-generating activities are all substantial benefits that can be reaped if women, specifically, have access to energy. For instance:

- Country level analysis of the Gender Inequality Index shows that the greater a proportion of a country has access to electricity, the greater the gender equality;[15]
- In Brazil, rural women with access to electricity were 59% more likely to complete primary education;[16]

14 International Union for Conservation of Nature and US Agency for International Development (2014). *Women at the Forefront of the Clean Energy Future*. Retrieved from https://www-cif.climateinvestmentfunds.org/sites/default/files/knowledge-documents/iucn_gender_and_re_-white-paper.pdf

15 As analyzed by O'Dell, K., S. Peters and K. Wharton (2014). *Women, energy and economic empowerment*. Deloitte University Press. "The regression of the Gender Inequality Index against both poverty headcount ratio and electrification rate yields a coefficient of -0.26 for electrification rate, which is statistically significant at the $p < 0.01$ level." Retreived from http://dupress.com/articles/women-empowerment-energy-access/

16 Ibid.

- In Nicaragua, rural energy access increased women's work potential by 23%, while the impacts for men were negligible;[17]

- Women comprise half the buyers of solar lighting in developing countries; and in both developed and developing countries, women make most decisions regarding energy use inside households and the residential sector, constituting around 18% of energy use globally.[18]

Thus, any solution to the problem of energy poverty must take into account the gendered dimensions of the problem.

Agriculture

Those most affected by energy poverty are often smallholder farmers, who stand to benefit greatly from access to energy, though rigorous research on this topic is surprisingly scarce. The kind of energy-intensive industrial agriculture associated with the 1960s "Green Revolution" is deeply unsustainable from a climate and environmental perspective and has also failed to feed the world due to inherent problems with power and distribution. Therefore, the primary focus on energy and agriculture has been on reducing energy usage and associated emissions from industrial agriculture. Another hot-button energy and agriculture topic has been the growth of energy crops (biofuels), which has been an ongoing source of contention given that biofuel monocropping has led to food insecurity, land grabbing, and human rights violations,[19] and has not been demonstrated to actually reduce greenhouse gas emissions.[20]

A literature review conducted by the International Institute for Environment and Development (IIED) highlights four primary areas in which smallholder agriculture could benefit from energy access: land preparation (e.g. tilling, plowing and weeding), irrigation, processing (e.g. drying, milling and pressing grains and other crops) and storage (e.g. refrigeration).[21] However, as noted in the IIED paper, energy needs go far beyond this overly concise list, particularly for any crops that go beyond meeting subsistence needs, and naturally are highly dependent on local context. While more work needs to be done on the impacts of new energy access on smallholder agriculture, particularly for women-led agro-ecological approaches, there is little reason to believe that there would not be substantial benefits.

17 Ibid.

18 International Union for Conservation of Nature and US Agency for International Development (2014). *Women at the Forefront of the Clean Energy Future.* Retrieved from https://www-cif.climateinvestmentfunds.org/sites/default/files/knowledge-documents/iucn_gender_and_re_-white-paper.pdf

19 See e.g. GRAIN (2013), "Land grabbing for biofuels must stop: EU biofuel policies are displacing communities and starving the planet." Retrieved from https://www.grain.org/article/entries/4653-land-grabbing-for-biofuels-must-stop.pdf; also ActionAid Tanzania (2009), "Implication of biofuels production on food security in Tanzania." Retrieved from http://www.actionaid.org/sites/files/actionaid/implications_of_biofuels_in_tanzania.pdf.

20 See e.g. Searchinger, T. et al (2008). "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change." *Science*. Published online 7 February 2008 10.1126/science.1151861

21 Best, S. (2014). "Growing Power: Exploring energy needs in smallholder agriculture." IIED Discussion Paper, April 2014.

A WORKER AT A PLANTATION IN MATO GROSSO, BRAZIL, WHERE SUGARCANE IS GROWN FOR ETHANOL. LAND OWNED BY LOCAL COMMUNITIES IS UNDER THREAT AS GLOBAL DEMAND FOR BIOFUELS INCREASES.

CREDIT: FABIO ERDOS/ ACTIONAID

Public Services

Regarding **education, health and other public services**, access to energy increases the likelihood that such services are available and reliable, and increases the quality of such services as well. For example, electrification of schools and availability of lighting at home can both play a crucial role in improving access to and quality of education. Studies have shown conclusive links between electrification, increased literacy, and improved quality of education.[22] Electrification allows for longer study hours outside of school that may be more compatible with other activities that require children's time at home, as well as access to basic educational technologies and tools including computers, televisions, radios, projectors, and so on. It is important, however, that electrification of community facilities such as schools not happen in isolation – as is often the case – but rather be part of a broader context of community energy access, including for households.

Resilience

Access to energy similarly increases the likelihood of people and communities being able to utilize essential services such as early warning systems and the communications technology needed to take full advantage of them. Benefits to agriculture and livelihood diversification also have positive spillover effects on resilience to climate impacts, including disasters. Furthermore, reducing reliance on gathering biomass can both free up time for other work and help build resilience. If alternative forms of energy were

22 See e.g. Kanagawa, M. and T. Nakata (2008). "Assessment of access to electricity and the socio-economic impacts in rural areas of developing countries," *Energy Policy*, 36: 2016–2029.

available, community members in places such as rural Rwanda (where 94.4% of households use firewood as a primary cooking fuel) would feel less need to cut down trees and forests that serve as wind breaks, protect soil from erosion and landslides, and otherwise provide benefits for the community and its crops.[23]

In sum, both energy poverty and climate change are already having massive effects on poor communities around the world. These effects manifest in countless different ways – with energy poverty and climate change often combining forces to harm livelihoods, women's rights, agriculture, education, health, and more. An urgent global effort to support climate adaptation efforts, combined with a paradigm change in energy systems that ensures access to and control over renewable energy for local communities, is needed to reverse these trends for the world's poorest and most vulnerable.

A model for decentralized renewable energy access

The dual challenges of energy poverty and climate change would seem to be irreconcilable, if it weren't for the promise of decentralized renewable energy. This model of the renewable energy revolution emphasizes energy economies that deliver universal energy access, including for those who need it most, while ensuring that local communities are no longer drained by having to pay for expensive energy imports. This simple idea – the new paradigm to which the world's energy systems must shift – has the potential to address both of these global crises at the same time. But of course, big ideas for solutions to difficult problems are never as easy to implement in reality as they seem in theory. A robust model for decentralized renewable energy access must be sensitive to local context and socially, environmentally, economically and politically feasible. Is such a model possible? If so, what might it look like?

In this paper we approach this question in three steps. First, we identify key principles that a model must follow in order to properly address both energy poverty *and* climate change, in a sustainable, gender-responsive, and inclusive manner. Second, we look at economic and political feasibility considerations. Finally, we look at a set of real-world examples of energy access initiatives, to see what lessons might be learned from existing practice.

Principles for renewable energy access

A core concept of decentralized renewable energy is that local context matters. Local environmental conditions, social structures and power dynamics, supply chains, access to markets and technology, policy frameworks and more are all important determinants of what will work and what will fail. However, this is not to say that a set of overarching principles is completely irrelevant. Indeed, such principles are of

23 National Institute of Statistics of Rwanda (2015). *Rwanda Poverty Profile Report*. Retrieved from http://www.statistics.gov.rw/file/4135/download?token=cylGgLRl.

central importance to ensuring that decentralized renewable energy, regardless of how it is specifically implemented in a particular locale, benefits the right people with a minimum of environmental and climate impact.

We believe there are four principles that must be considered in any implementation of decentralized renewable energy access, and that apply regardless of specific local or national conditions:

1. **Energy sufficiency:** energy access must be defined in such a way that ensures people have access to enough energy for a full and dignified life.

2. **Decentralization and subsidiarity:** ownership, control, and decision-making over the production of energy should be devolved to the most local level possible.

3. **Gender-responsive:** energy access must ensure all people have equal participation in the value-chain of energy planning, design and delivery, taking into account gendered divisions of labor and power resulting in specific needs, assets and abilities of women and men.

4. **Environmental and social sustainability and respect for human rights:** only appropriate technologies that pose minimal risk to the climate, environment and local communities, with the full buy-in of and accountability to those communities, should be considered.

In any specific context there will be many factors that must be considered, but these basic principles should be considered universal.

Energy Sufficiency

Our first principle is that of "energy sufficiency" – which is to say that energy poverty must be addressed by providing universal access to *sufficient* amounts of energy to support dignified and fulfilling lives. This sets the bar somewhat higher than existing institutional definitions of energy access.

The International Energy Agency defines "access to modern electricity" for a rural household of five people as 250 kilowatt-hours per year, or enough to "provide for the use of a floor fan, a mobile telephone and two compact fluorescent light bulbs for about five hours per day." For an urban household the threshold is 500 kWh per year, for which "consumption might also include an efficient refrigerator, a second mobile telephone per household and another appliance, such as a small television or a computer." Using this definition, the IEA determined that 1.2 billion people in the world currently live without access to modern electricity, of which more than 95% live in sub-Saharan Africa and "developing Asia."[24]

While this is may be a useful benchmark for looking at aggregate levels of energy poverty

24 International Energy Agency (2015). *World Energy Outlook 2015*.

HASHA CHARGES HER MOBILE PHONE USING A SOLAR PANEL IN EASTERN KENYA. HER PHONE WILL STAY FULLY CHARGED FOR A WEEK BEFORE SHE NEEDS TO CHARGE IT AGAIN.

CREDIT: PIERS BENATAR/PANOS PICTURES/ACTIONAID

at a global scale, for the actual goal of universal energy access, a rather more ambitious threshold is needed. We cannot consider the problem solved if 1.2 billion people around the world have barely enough access to energy to power a few lightbulbs for a few hours a day. Rather, universal energy access will only be achieved when lack of energy is no longer a barrier to meeting people's needs – when everyone has access to enough energy to power modern appliances, communications devices, and more, consistent with what would be considered a dignified and fulfilling life in societies that have already achieved near-universal energy access. This implies energy on demand to power productive income-generating activities as well as some level of leisure activity, not just subsistence levels of energy consumption.

In other words: any acceptable model of decentralized renewable energy that truly aspires to the goal of providing universal access to energy must be able to deliver sufficient amounts of energy to all women and all households – well beyond powering one lightbulb for a few hours per day. This sets the bar considerably higher than, for

example, Sustainable Development Goal 7, which aims for "universal access to modern energy services" but, in the absence of a definition of such access, likely will be interpreted as using the IEA's definition of a mere 250/500 kWh/year. The Center for Global Development has suggested that a more appropriate threshold would be "average per capita energy consumption of at least 1,500 kWh."[25] The Global Renewable Energy and Energy Access Transformation (GREEAT) framework, a collaboration by a variety of NGOs that heavily influenced the development of the African Renewable Energy Initiative, defines energy access as

> "access to electricity 24/7 for both basic and aspirational needs and for local business and economic development, while stressing sufficiency and efficiency. Access to sufficient energy is a human right and must be affordable for poor people. Ultimately, per capita global energy use needs to converge at a level that avoids overuse and wastefulness while ensuring human well-being."[26]

On the surface, it seems that there is a tension between ensuring universal access to sufficient energy and avoiding the kind of overconsumption of resources that has directly led to climate and other environmental crises. Implicit in this model is the idea that additional energy for poor people's consumption should be renewable, *and* that elites who are the primary drivers of overconsumption moderate their excessive energy use. There is simply no other way of staying within ecological limits and avoiding a planetary catastrophe.

Decentralization and Subsidiarity

The next principle is one that is already explicitly mentioned in our choice of the phrase "decentralized renewable energy access" – that is, the concept of decentralization. Because resources like sunlight and wind are available everywhere, there is no inherent need for the production of renewable energy to be centralized in the same way that fossil fuels are. Decentralization should go beyond production; it is equally important that *ownership and control* over energy be decentralized. This follows from the principle of subsidiarity, that decision-making power should be devolved to the most local level possible, "allowing for sub-regional, national and regional planning and co-ordination."[27] Subsidiarity provides for the best chance that the benefits of energy accrue at the local level, rather than profits flowing to actors outside the community – or even the energy itself being redirected towards corporate projects or centralized developments.

It is possible to imagine a renewable energy revolution in which large-scale centralized fossil fuel power stations are simply replaced by large-scale centralized solar plants, wind

25 Moss, T. (2015). "SDG Seven: Update the 'Modern' in Universal Modern Energy Access." Center for Global Development blog, retrieved from http://www.cgdev.org/blog/sdg-goal-seven-update-modern-universal-modern-energy-access.

26 Centre for Science and Environment et al (2015). "Programme for Global Renewable Energy and Energy Access Transformation (GREEAT)." Retrieved from http://www.cseindia.org/userfiles/GREEAT.pdf.

27 See e.g. Friends of the Earth International (2015). *An Energy Revolution is Possible*. Retrieved from http://www.foei.org/wp-content/uploads/2015/11/foe-energy-revolution-full-report-web.pdf.

farms, and so on. In this scenario, the same kinds of large multinational corporations that dominate the energy industry today would retain their power and control. The same economic structures and incentives that exist today that lead to these companies failing to deliver energy to large segments of the world's poorest and most marginalized, or attempt to price gouge vulnerable communities that *are* grid connected, would persist. As a result, this version of the energy transition does not guarantee that communities and those without access to sufficient and affordable energy – the poor, those living far from urban centers, and so on – will *gain* that access.

Renewable energy by its very nature lends itself to a more radical vision of a new energy paradigm. Energy from the sun, wind and water is present, and can be harnessed, virtually everywhere. Rooftop solar panels, small-scale wind farms, and micro-hydro generators mean that energy can be generated, controlled, used, and potentially sold by communities, cooperatives, or even individual households – ensuring that the multiple benefits of this energy accrue to local people, not big companies. This "energy democracy" revolution is a necessary step that can and must take place as part of a wider renewable energy revolution and a just transition to a circular energy economy and therefore wider sustainable economy transition.

The Center for Social Inclusion, a US-based nonprofit working on energy democracy in the context of communities of color in the United States, defines the concept as follows:

> "Energy democracy means that community residents are innovators, planners, and decision-makers on how to use and create energy that is local and renewable. By making our energy solutions more democratic, we can make places environmentally healthier, reduce mounting energy costs so that families can take better care of their needs, and help stem the tide of climate change."[28]

In the next section of this paper, we will examine several case studies of energy democracy in action, in both the Global North and the Global South.

Gender Responsive

A third principle for renewable energy access is that it must be gender-responsive. The benefits of energy access must not only accrue to communities as a whole; they must accrue to members of that community in an equitable manner. Any implementation of decentralized renewable energy access must proactively account for differential gender impacts, including through gender analysis in order to understand who does which activities when, who has control over and access to resources, the prevailing structures, relationships and attitudes of the community, and how to incorporate that learning into policies and projects. Understanding from gender analysis can support inclusivity of groups often marginalized as well as respect for all human rights.

28 See e.g. http://www.centerforsocialinclusion.org/ideas/energy-democracy/.

As described in the previous section, energy poverty and energy access affect women in very different ways from men. Women must therefore be engaged from the beginning and be empowered to make decisions about how the implementation of energy access policies and projects are conducted in their communities. Many projects have failed for not including communities, and women in particular, as end users, in the design of energy systems. Oftentimes, during the consultation and implementation of policies and projects, the potential disruption of traditional and cultural practices, such as gendered power relations over resources, are not taken into account. It is important to consider that transitioning to renewables can potentially displace an established energy chain in non-renewables, one that may be dominated by women.

For example, in the case of one community, the use of Styrofoam boxes to reduce the use of solid fuels for keeping food warm, was initially resisted by men because it transferred the control over the resource and food processing technology to women.[29] Similarly, while gathering biomass can increase the drudgery of women, and have negative effects on both education and health, these practices often frame women's livelihoods and relationships – for instance, providing valuable time for women to socialize and discuss their challenges in the absence of men. Women, men, and communities must be provided in-depth information on new technological developments, whether centralized or local, so that they can make informed decisions weighing the full range of potential benefits and detriments.

Additionally, a critical part of energy democracy will include ensuring equality in labor and economic opportunities created via a transition to local renewable energy systems. Already in the United States we see that, according to the Solar Foundation, women and racial minorities make up a smaller share of the solar workforce than of the overall national economy.[30] In addition, energy cooperatives have historically been male-led.[31] Part of being gender-responsive in renewable energy access is ensuring that women and men in local communities are given the knowledge and skills needed not just to design and install renewable technologies, but also training on deriving economic benefits from these technologies and education on community energy distribution, micro-grids and setting up local energy cooperatives. Some of this work is already being done, for example, with women's groups in Georgia, through a project with Women in Europe for a Common Future (WECF).[32]

Finally, as mentioned above, a core decision-making role for women may well be essential to achieving true decentralization, as women tend to favor local energy production, prioritizing households and communities over large-scale centralized commercial energy infrastructure projects.

29 International Union for Conservation of Nature and US Agency for International Development (2014). *Women at the Forefront of the Clean Energy Future*. Retrieved from https://www-cif.climateinvestmentfunds.org/sites/default/files/knowledge-documents/iucn_gender_and_re_-white-paper.pdf.

30 The Solar Foundation (2015). *National Solar Job Census, 2015*. Page 18. Retrieved from http://www.thesolarfoundation.org/wp-content/uploads/2016/01/TSF-2015-National-Solar-Jobs-Census.pdf

31 Nippierd, A. (1999). *Gender Issues in Cooperatives*. Retrieved from http://www.aciamericas.coop/IMG/pdf/genderissues.pdf.

32 For more information, see http://www.wecf.eu/english/articles/2016/04/georgiaworkshop2016.php

Attempting to showcase how the principle of gender-responsiveness works in reality, women advocacy groups engaged in international policy spaces on climate change have drawn attention to projects and practices that can be considered "gender-just." The criteria for this includes local initiatives that

- ensure equal access to benefits/equal benefits to women in all areas of the energy value chain;
- are designed to alleviate rather than add to women's workload;
- empower women via enhanced accessibility, livelihood security, food security, health and safety;
- ensure decision-making by local women and men, women's groups, cooperatives and communities; and
- enhances and promotes women's democratic rights and participation in all areas of decision-making.

Some featured projects under the initiative include a women-led clean-cookstove and solar installation project in Tanzania; a women owned and operated energy cooperative in Germany; and a female entrepreneurial "energy shop" initiative in Mozambique – all of which put the empowerment of women and democratic participation and ownership of energy systems at the heart of their programming.[33]

Environmental and Social Sustainability and Human Rights

Environmental and social sustainability and respect for human rights is the fourth principle. In many cases this is directly linked to the above principles. Not all so-called "renewable" energies may necessarily lead to the outcomes we seek. Decentralization and subsidiarity, in which communities are truly the ones with final decision making authority, is generally the best way to ensure that dangerous and unsustainable energy developments are avoided. However, this fourth principle is important enough that it deserves to stand alone.

Many governments, corporations and even NGOs are pushing for "false solutions" to climate change in the energy sector, such as a rapid increase in global biofuel stock that would require massive amounts of land. Many other solutions that might look good from a top-down, technical perspective may also result in the displacement of marginalized communities or other human rights violations – and in fact the history of development and climate finance has a long track record demonstrating the unfortunate truth of this. For example, large-scale hydropower, still considered "renewable" in certain circles, has a long and well-documented history of large-scale displacement of communities as well as environmental damage.

Many governments and other interests are pushing nuclear power as the most

33 Women's Environment and Development Organization and Women in Europe for a Common Future (2015). *Gender Just Solutions*. Retrieved from http://wedo.org/wp-content/uploads/2015/12/WECF-WGCCOP21.07.121.pdf

MUCH OF MATO GROSSO STATE IN BRAZIL IS COVERED IN LARGE SUGARCANE PLANTATIONS. THE RAPID INCREASE IN GLOBAL DEMAND FOR BIOFUELS REQUIRES MASSIVE AMOUNTS OF LAND.

CREDIT: FABIO ERDOS/ ACTIONAID

climate-friendly energy solution, yet nuclear is a dangerous technology whose environmental sustainability is highly doubtful given the amount of waste generated – and is by nature expensive and centralized, and incompatible with a model based on energy democracy. Finally, some are advocating that large-scale biofuel plantations be part of the "renewable" energy mix, yet biofuels are already well-documented for their role in land grabbing and displacement (in addition to being, at best, dubious in terms of climate benefits).[34]

Ensuring that communities are at the center of decision-making processes can help avoid situations in which external forces drive the implementation of a project that may ultimately be harmful rather than beneficial to the community and the environment. However, a great deal of care must also be taken to avoid exacerbating injustice and inequities within the community, especially for those particularly vulnerable like women, people with disabilities and socially excluded groups. Ensuring that all interventions are gender-responsive helps address one dimension of this, by ensuring that women are

34 GRAIN (2013). "Land grabbing for biofuels must stop: EU biofuel policies are displacing communities and starving the planet." Retrieved from https://www.grain.org/article/entries/4653-land-grabbing-for-biofuels-must-stop.pdf. See also Searchinger, T. et al (2008). "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change." *Science*. Published online 7 February 2008 10.1126/science.1151861.

equally able to participate as men. Yet certain community members may be marginalized for any number of reasons, from geographic isolation away from the village core to real or perceived class, caste, race, age, gender identity, sexual orientation, migrant/refugee status, livelihood, disability or literacy level to the vagaries of interpersonal relationship histories.

Care must be taken that efforts to ensure community engagement are inclusive of all community members, not just those who are most powerful or most outspoken. It would be all too easy for new access to energy to accrue primarily to those already relatively privileged within the community – for instance, if the access model is based on individual household ownership rather than community ownership and management, only those already wealthy enough to afford the access will attain it. Similarly, if access is initially based on kiosks or central plug-in points, those living outside the main geographic concentration of the community may be left out – and given their relative isolation, they are already likely to be excluded from other infrastructure improvements as well, such as water infrastructure.[35]

Finally, as alluded to above, the transition to decentralized renewable energy must open up new opportunities for workers and community members whose livelihoods currently depend on the dirty energy value chain. This may not be directly relevant to many of the communities currently experiencing energy poverty, but the concept of a "just transition" to a new sustainable economy is nevertheless an important overarching concern to take into account in all aspects of the renewable energy revolution. Once again, this is linked to the above principles, as decentralization and gender-responsiveness in particular will tend to provide new livelihood opportunities to those who have previously been excluded.

Underpinning all of this, of course, is the simple idea that throughout any implementation of new renewable energy access systems, the human rights of community members must be respected. While this would appear to be noncontroversial, it has been an elusive goal at times when it comes to externally-financed and externally-driven climate and development interventions. It seems logical to think that implementation of new renewable energy systems is least likely to violate the broad spectrum of human rights – civil and political as well as economic, social, and cultural – when that implementation is owned, driven, controlled and overseen by the community itself.

In sum, accountability to communities – in which the community, acting collectively and representing all of its members in an equitable and transparent manner, has the final say over how a system is implemented and controls the outputs and benefits of that system – is the foundational element that ensures the principles outlined above will be fulfilled. Without community control, the likelihood of human rights violations, the community simply being left behind instead of receiving profits or benefits from new renewable energy capacity, and project failure are all much higher. Engaging

35 One of this paper's authors (Schiffer) observed this exact phenomenon in a community in The Gambia.

ACTIONAID ACTIVISTS CALL ON RICH COUNTRIES TO PAY THEIR CLIMATE DEBT AT THE 2009 UN CLIMATE CHANGE CONFERENCE IN COPENHAGEN.

CREDIT: PETER BISCHOFF/MS ACTIONAID DENMARK

communities in a meaningful, systematic and inclusive fashion should be considered a bare minimum before any renewable energy access implementation is begun.

Economic, political and technical feasibility of electricity access systems

In addition to social feasibility, which is at the core of the principles outlined above, any implementation of decentralized renewable energy that meets the above principles must also be economically, politically and technically feasible to be successful. Feasibility in this sense, of course, is not set in stone – what might not be economically feasible without any external inputs could become not only feasible, but even highly competitive, especially with a source of international finance (for instance from the Green Climate Fund, African Renewable Energy Initiative, or similar) to cover upfront capital costs or support policies such as payment guarantee schemes.

Cost considerations

The first feasibility consideration to address, of course, is around economics. For decentralized renewable energy to become a long-term, sustainable solution, it must be

cost-effective, so that a constant source of external finance is not needed, and ideally so that monetary benefits are accruing to local owners and producers. A requirement for some initial external finance – even for a relatively long period spanning multiple decades – is not necessarily a problem and is certainly to be expected in many contexts, not least of which the principles of "climate justice" which state that wealthy countries with high levels of historical greenhouse gas pollution have an obligation to pay to fix the problem they have created in poorer countries.[36] Even so, there must be some vision for long-term economic sustainability.

Fortunately, due to many external factors, and as has been well-documented elsewhere, the price of renewable energy is decreasing quickly, including relative to non-renewable energy sources. As renewable energy technology becomes more widespread, in many countries renewable energy options are cost-competitive with fossil fuels over the long run.[37] Because renewable energy requires no fuel inputs, most of the expense is upfront in the form of capital. This necessitates a certain policy environment and a certain kind of financing, but with the right pieces in place, cost effectiveness is far from an insurmountable obstacle.

International financing mechanisms can be an essential element of ensuring economic viability – and indeed their role is particularly important in the context of international equity in climate action. That is, it is inherently unfair to expect poor countries – much less poor communities – to bear the cost of climate action when climate change is a problem that rich countries and rich elites have been primarily responsible for creating. This basic concept of "climate justice" implies that rich industrialized countries must pay for at least part of the cost of climate action in poorer countries, including (but not limited to) the transition to renewable energy economies.

This concept is widely accepted and institutionalized in the UN Framework Convention on Climate Change and its various associated bodies. The Green Climate Fund (GCF), for instance, is a multilateral fund set up specifically to support climate-related action (for both mitigation and adaptation) in developing countries that would not be viable in the absence of GCF financing. Regarding renewable energy access, the GCF result areas include "low-emission energy access" and "small-, medium- and large-scale low-emission power generation," so decentralized renewable energy is clearly well within its mandate. The GCF could provide grant finance to institutions in developing countries to incentivize the development of decentralized renewable energy, including off-grid and mini-grid solutions. This does not have to be limited to project finance but could also include policy-based approaches such as support for feed-in tariff schemes or other payment guarantee mechanisms. Indeed, the GCF's

36 For the quantitative implications of climate justice principles in terms of national obligations for emissions reductions and the provision of climate finance, see for example ActionAid et al (2015). *Fair Shares: A Civil Society Equity Review of INDCs*. Retrieved from http://civilsocietyreview.org/wp-content/uploads/2015/11/CSO_FullReport.pdf.

37 See for example Multilateral Investment Fund et al (2015). *ClimateScope 2015: The Clean Energy Country Competitiveness Index*. Retrieved from http://global-climatescope.org/en/download/.

mandate to finance transformational activities, as well as its desire to take a programmatic approach rather than a project-by-project approach, seems to point it in this direction.

Similarly, there are regional activities like the African Renewable Energy Initiative (AREI) that have a specific mandate to promote and provide financing for renewable energy access and development. The AREI in particular is an interesting example because many of the principles outlined in this paper are baked into its conceptual framework – including the importance of community participation and of decentralized, off-grid and mini-grid developments.

The AREI framework document states that the goal of the initiative is to achieve at least 10 gigawatts of new renewable energy generation in Africa by 2020, and 300 gigawatts by 2030. One of the core stated purposes of this additional renewable energy capacity is "to help achieve sustainable development, enhanced wellbeing, and sound economic development by ensuring universal access to sufficient amounts of clean, appropriate and affordable energy."[38] Furthermore, in this framework document the AREI adopts decentralization as a core principle necessary to the achievement of its ambitious goals:

> "The AREI envisions smart, distributed energy systems that can handle a mix of renewable energy generation. With a highly diversified ownership base compared to that of conventional, centralized energy systems, a vast number of households, communities, cooperatives, small and medium-sized enterprises, as well as larger companies, become both producers and consumers of electricity. This will enable Africa to leapfrog to the energy systems of the future."[39]

The AREI also recognizes that only with sufficient financing will any of this be possible, and calls for its programming to be supported by international climate finance in line with the commitments and principles of the UNFCCC. The African Development Bank has been selected as the AREI's trustee, and substantial pledges of financing from developed countries have already been made. However, as with any international financing mechanism, it remains to be seen how money is spent and counted and how decision-making, prioritization and country and community involvement will play out in practice. As the AREI is just about to become operational, how this plays out, and whether the initiative will deliver on its huge potential to embark the continent on a different, people-centered trajectory, will be determined by the interplay of many actors, not least civil society.

A different model has emerged in Scotland, for example, where the Scottish Government provides specific support for "community and locally" owned energy through a number of financing tools. Most notably, the Community and Renewable Energy Scheme

38 African Renewable Energy Initiative (2015). *AREI: A framework for transforming Africa towards a renewable energy powered future with access for all.* Retrieved from http://www.arei.org/wp-content/uploads/2016/04/AREI-Framework_ENG-1.pdf.

39 Ibid.

(CARES) allows communities to access start-up grants for feasibility work as well as favorable loans to take projects forward. Importantly, CARES does not just provide financing but also has regionally based advisors who help groups deliver projects – highlighting the frequent need for local capacity-building in order for implementation to succeed. Several other countries are looking into adopting a similar model, such as Malawi, which receives relevant development assistance from Scotland.

The Local Energy Challenge Fund is another financing tool made available by the Scottish Government. Its primary function is to help deliver innovative demonstrator projects that support circular energy economies by linking generation and supply, for example through innovation in the areas of storage or distribution. Projects receive separate funding for feasibility and project delivery. In developing countries, a similar mechanism could for example help provide innovation in areas that require new solutions such as off-grid developments.[40]

There are also emerging regional financing models driven by citizens. REScoop, the European federation of groups and cooperatives of citizens for renewable energy and energy efficiency, is developing a European-wide revolving fund. The idea emerged out of the understanding that some cooperatives have managed to raise more money than they have energy projects to invest in, while other groups have projects they wish to develop but lack the finance to do so. A revolving fund can match cooperative funding with projects on a European-wide scale.[41] Similarly, Citizen Energy, a European crowdfunding platform, grew out of the need to match citizen investors with projects across the region.[42]

Energy groups supporting one another is partly a result of the cooperative principle that promotes "cooperation between cooperatives," as well as the fact that projects often struggle to secure finance through conventional means including bank loans.

Policy frameworks

Economics are not the entirety of the feasibility picture, and do not exist in a vacuum. Policy frameworks will set important parameters defining the economics of renewable energy deployment. There are any number of policy tools available to governments to bring down the cost of renewables, encourage community-led initiatives for new renewable energy capacity, reform the grid in order to accommodate more decentralized forms of power generation, and otherwise meet the goals of a decentralized renewable energy access model.

First and foremost, governments must be allowed to use the full range of appropriate policy tools. The trend of international trade and investment agreements curtailing

40 More information can be found on the Local Energy Scotland website, the consortium that currently manages CARE, at http://www.localenergyscotland.org. Information about Challenge Funds can also be found on the Local Energy Scotland website.

41 For more information, see https://rescoop.eu/revolving-fund.

42 For more information, see https://citizenergy.eu.

A PROTESTOR DEMONSTRATES AGAINST THE PROPOSED KEYSTONE PIPELINE XL IN NEW YORK.

CREDIT: FLICKR/ MICHAEL FLESHMAN/ CREATIVE COMMONS

national policy options because they (for example) privilege domestic investors, manufacturers or service providers over foreign ones poses a serious threat to equitable global climate action in line with principles of sustainable development. In January 2016, TransCanada Corporation sued the United States government, under the investor-state dispute settlement (ISDS) clause of the North American Free Trade Agreement (NAFTA), for the government's rejection of the Keystone XL pipeline.[43] Under NAFTA, if TransCanada's challenge is upheld, the United States could be forced to overturn its rejection of the pipeline or face actual economic penalties.

Similarly, the World Trade Organization's dispute settlement mechanism, which allows for governments (but not private corporations) to challenge other governments' policies as discriminatory, poses a danger to the policy space needed for countries to tackle climate and development challenges. The United States recently won a WTO case against India claiming that Indian domestic content requirements for solar technology discriminate against US corporations.[44] Of course, this is precisely the point of such requirements, which are meant to build domestic capacity and drive a domestic transformation. Rather than insidious machinations to undermine foreign companies, such policies are important tools that governments have to incentivize certain kinds of economic activities – like those that will be needed to drive a revolution towards decentralized renewable energy access.

43 See e.g. Tucker, T. (2016). "TransCanada is suing the U.S. over Obama's rejection of the Keystone XL pipeline. The U.S. might lose." Washington Post, January 8.

44 See e.g. Office of the US Trade Representative (2016). "United States Prevails in WTO Dispute Challenging India's Discrimination Against U.S. Solar Exports." Press release retrieved from https://ustr.gov/about-us/policy-offices/press-office/press-releases/2016/february/united-states-prevails-wto-dispute.

Trade agreements, investment agreements, and so on must not be allowed to challenge valid policies that many countries will need to support their domestic economies to transition to renewable energy. Even in the absence of actual disputes, the precedents that have already been set mean that there may be a real chilling effect on proactive policymaking to support domestic renewable energy efforts, something that communities and the world cannot afford given the urgency of the fight against climate change and the fact that only strong public policy can ensure that the needs of the poorest and most vulnerable are addressed in the course of that fight.

For example, many countries are experimenting with different implementations of payment guarantee policies, such as feed-in tariffs, to bring down the cost of renewables deployment. This approach addresses the fact that renewable energy investments have a high upfront cost, such that the financial risk and barrier to entry for potential investors can be prohibitive – even though the lifetime cost may be lower than non-renewables. The policy can be designed in many ways, but fundamentally provides "a public guarantee to purchase electricity from new (renewable) energy projects at pre-announced prices,"[45] which ensures a specific amount of revenue to the producer/investor even if consumers are unable to pay at a level that would make the investment viable. This reduces investment risk while also serving to speed up reductions in the unit cost of renewable electricity and stimulating the development of the domestic renewable energy sector.

These policies are generally meant to support energy systems that feed into a national grid; however, they can easily be adapted to municipal grids, mini-grids and off-grid solutions. Payment guarantees are a proven mechanism in developed countries and many developing countries are experimenting with them as well, though in many cases will need international climate finance in order to make them financially viable.[46] Some two-thirds of global wind installations, and almost 90 percent of solar PV installed capacity, has received support from payment guarantee type policies.[47]

Many other policy tools exist beyond payment guarantees, of course, and beyond simply the issue of financing or incentivizing investments. Many national and subnational governments, for example, are using renewable portfolio standards to mandate that a specified percentage of energy production come from renewable sources. Other policies around priority grid access, community title or access to land, shared ownership mechanisms, procurement laws and domestic content requirements, environmental and social safeguard policies, implementation of Free, Prior and Informed Consent, and so on will all be relevant in shaping how renewable energy investments are made in a given context. It is beyond the scope of this paper

45 Banuri, T. and N. Hällström (2012). "A global programme to tackle energy access and climate change," *What Next Volume III: Climate, Development and Equity*. Dag Hammarskjöld Foundation, Uppsala, Sweden.

46 See e.g. World Future Council et al (2013). *Powering Africa Through Feed-in Tariffs*. Retrieved from https://www.boell.de/sites/default/files/2013-03-powering-africa_through-feed-in-tariffs.pdf.

47 Hallstrom, N. (2014). Global renewable energy support programme: *Globally funded payment guarantees/feed-in tariffs for electricity access through renewable sources*. Retrieved from: http://www.whatnext.org/resources/Publications/Energy/White-Back-Page.pdf p.12

to examine all of these relevant policies in detail, but in any particular country, before implementation of new renewable energy access, the context analysis must include broader policy matters to ensure the best chance of sustained success.

Technical considerations

In addition to economic and policy considerations, the paradigm shift from a centrally managed, grid-based power system to a decentralized and democratized energy structure is rife with technical issues that must be addressed. It is beyond the scope of this paper to examine these technical considerations in detail; however, a brief overview can help inform what questions may need to be asked in a given locality or context to determine what kind of renewable energy access deployment is possible on what time frame.

It cannot be overstated how significant a change it is to transition an energy system from centralized to decentralized. Rather than a single point of high-voltage generation from which electricity flows through a unidirectional distribution network to end users, a decentralized grid system implies a much more complex network in which electricity generation (on all different voltage levels), storage and load (consumption) may all occur at the same point in the system at any given time. This requires a multidirectional transmission system and a more sophisticated energy planning and operational management system. These technical challenges have been solved in various contexts, including for example in Germany.

While the development of island grid, mini-grid and off-grid systems – which are essential to achieving universal energy access, given the difficulties in extending the grid to remote areas where energy poverty is often most acute – sidesteps some of these issues, they present their own technical challenges that also must be addressed. Energy storage, for instance, is an issue of particular concern for off-grid systems, where load cannot be transferred among multiple end-users. Ensuring equitable access to energy is also both a social and technical concern with off-grid systems, including kiosk models in which there are specific places where community members can access shared energy for charging mobile phones or utilizing other plug-in services.

In summary, none of the challenges outlined here are insurmountable, but all must be considered and carefully accounted for in order to give the best change of sustained success of any renewable energy access initiative. All of these challenges are highly dependent on specific local and national contexts, indicating that a one-size-fits-all approach will not be sufficient, and further point towards a decentralized approach that places agency in the hands of community members who are most familiar with their own contexts.

Existing models for increasing energy access

The principles behind the model for decentralized renewable energy access presented in this paper are not particularly new. There are examples of this type of work that already exist, in both the Global North (where energy access is already virtually universal, and the

transition from centralized fossil fuel-based energy to decentralized renewable energy is the fundamental challenge) and the Global South (where energy access is itself a challenge, and leapfrogging fossil fuels straight to renewables is a real possibility – and indeed a necessity given the climate crisis and the cost of fossil fuel dependence).

It is instructive, however, to begin with examples that illustrate the failings of the predominant model and discourse of development and new energy deployment. We first examine the Power Africa Initiative, a US-government driven effort to promote energy development in sub-Saharan Africa that can very well be seen as the antithesis to the model presented in this paper, if it is not substantially modified and improved in the coming years. Following this are two brief examinations of wind projects that failed to deliver for communities, La Mata/La Ventosa and Tierras Morenas. We then turn to three more positive examples, one from the Global North – community energy developments in Scotland – and two from the South – CRELUZ in Brazil and the Ixtepec Community Wind Farm in Mexico. These are examples from which one can draw positive, hopeful real-world lessons.

Taken all together, these negative and positive examples reinforce the importance of the principles and considerations laid out above, and should inform any possible future implementation of decentralized, community controlled renewable energy access.

Power Africa Initiative

Power Africa is an Obama Administration initiative to support the development of new energy access in Ethiopia, Ghana, Kenya, Liberia, Nigeria, and Tanzania. Launched in 2013 primarily through U.S. development institutions and export credit agencies, but also with the participation of the World Bank, African Development Bank, and Africa Finance Corporation, the Power Africa Initiative incentivizes primarily U.S.-based private sector companies to invest in energy development in the six target countries. Yet there is no mandate that the new energy deployments be entirely or even primarily from clean, renewable sources.

On its immediate face, the initiative therefore violates two of the core principles of the model described in this paper: community ownership and environmental sustainability. Financing and decisions are made by outside entities, rather than countries or communities, and ultimately the policies associated with Power Africa are meant to benefit foreign private sector investors, not communities living in energy poverty. The fact that most Power Africa projects seem to exploit natural gas – a fossil fuel – means that it is utterly incompatible with the kind of energy transformation needed to keep the climate crisis in check, not to mention the already inadequate climate action commitments that the U.S. and other countries have made in the Paris Agreement.

Power Africa does include a “Beyond the Grid” sub-initiative encouraging small-scale, off-grid energy solutions that might actually reach new end users. Beyond the Grid is certainly more promising than the rest of the broader Power Africa Initiative; however,

it is relatively tiny (comprising only about 5% of financial commitments made under Power Africa[48]) and its focus is still on supporting U.S. companies to make investments rather than directly supporting the communities that are the supposed beneficiaries.[49] While in principle there is nothing wrong with incentivizing companies in rich countries to make better investments, great care must be taken to ensure that in doing so domestic economies in developing countries are not being hamstrung.

Outside the small Beyond the Grid sub-initiative, one concrete example is illustrative: the Azura-Edo Independent Power Project. Launched with fanfare at the US-Africa Summit in Washington D.C. in 2014, Azura-Edo is a 459 megawatt natural gas plant in the Edo state in southern Nigeria. Through Power Africa, the US Overseas Private Investment Corporation (OPIC) approved up to $50 million in financing for American Capital Energy & Infrastructure (ACEI), which would be managing the project.[50] Yet despite the fact that the majority of Nigerians are not grid-connected, according to the project's own Environmental Impact Assessment,[51] the Azura-Edo power plant only connects to the existing grid, rather than extending the grid or providing any new energy access.

Furthermore, a visit to local communities by Environmental Rights Action/Friends of the Earth Nigeria revealed a high level of confusion among community members about the impacts of the project, indicating a deeply flawed and inadequate consultation process. "The project from the communities' perspective has been shrouded in secrecy," and communities have been offered resettlement compensation but this had been largely unpaid at the time of the visit.[52] On the basis of their findings, Environmental Rights Action, in conjunction with several U.S. NGOs, wrote to OPIC in 2014 demanding that it reject financing the Azura-Edo project.[53]

This concrete example of a Power Africa Initiative project violates the same principles that the initiative violates on a general level. Local communities that currently lack energy access are not benefitting directly from the new energy generation that the project will create, nor do they have any ownership or control over the project or its implementation. The project is a centralized fossil fuel based power plant that will lock in new polluting infrastructure and create new greenhouse gas emissions for years to come, further exacerbating the climate crisis and thus failing the test of climate sustainability.

48 Power Africa (2015). *Annual Report 2015*. Retrieved from https://www.usaid.gov/sites/default/files/documents/1860/PA_2015_Report_V16_TAGGING_508.pdf.

49 For more information on this sub-initiative, see for example US Agency for International Development (2015). "Powering Africa, Beyond the Grid." Factsheet retrieved from https://www.usaid.gov/sites/default/files/documents/1860/USAID_BTG_1Pager_V4.pdf.

50 Overseas Private Investment Corporation (2014). "American Capital Energy & Infrastructure's Azura-Edo Power Project Receives $50 Million Financing Commitment From OPIC." Press release retrieved from https://www.opic.gov/press-releases/2014/american-capital-energy-infrastructures-azura-edo-power-project-receives-50-million-financing-commitment-opi

51 Environmental Resources Management (2013). *Azura-Edo Independent Power Project Environmental Impact Assessment, Vol. I: Final EIA Report*. Page 2-1. Retrieved from http://www.ifc.org/wps/wcm/connect/7a493f8040f94ecea4e0ef25d54dfab3/ESIA+Report+Volume+1.pdf?MOD=AJPERES.

52 Environmental Rights Action/Friends of the Earth Nigeria (2014). *Field Report #352, Azura-Edo IPP*. Retrieved from http://www.ips-dc.org/wp-content/uploads/2014/05/ERA_FieldReport_HostCommunities_Azura-EdoProject.pdf

53 Pacific Environment, Environmental Rights Action, Friends of the Earth US, Oil Change International (2014). Letter to Elizabeth Littlefield and Mary Boomgard, U.S. Overseas Private Investment Corporation. April 22. Retrieved from http://www.ips-dc.org/wp-content/uploads/2014/05/NGO_Input_OPIC_Azura-Edo_EIA.pdf

WIND FARMS LIKE THIS ONE PLAY AN IMPORTANT ROLE IN LOCAL COMMUNITY ENERGY PROJECTS.

CREDIT: FLICKR/ MATHIAS APPEL/ CREATIVE COMMONS

The core failing of the Power Africa Initiative is that it is something being imposed from the top down, with the interests of U.S. businesses, rather than local communities or the climate, at heart. No initiative that is structured in this manner is likely to be successful or sustainable in the long run. Without much deeper engagement at the community level, without ensuring that local people reap the benefits of new developments, and without ensuring that both the climate and the local environment are well protected, resistance is likely to develop that will tarnish the reputation of the project, the associated companies, agencies, and funders, and greatly increase the risk of failure. A radically different model is needed to ensure the long-term success of renewable energy deployment, particularly in the Global South where power differentials between investors and local communities are massive.

La Mata/La Ventosa Wind Farm

The La Mata/La Ventosa wind farm in Mexico is another example of an energy development that failed to respect community rights and failed to deliver benefits for local people. This project, a 67.5 megawatt/year wind farm owned by EDF, the major French energy company, is situated on 361 hectares of communal lands of the villages of La Mata and La Ventosa, EDF provided $11.5 million in equity financing, and the project received over $140 million in concessional financing from a variety of development climate finance institutions, including the Clean Technology Fund (CTF,

one of the World Bank's Climate Investment Funds), the International Finance Corporation (IFC, the World Bank's private sector arm), the Inter-American Development Bank (IDB), and the US Export-Import Bank.[54]

In an exposé of the project, the World Development Movement reported that "there is no record of official consultation meetings taking place before the start of construction… All three official 'consultations' took place after construction work on the project had already begun." Community members spoke out to say that the consultations that did take place were inadequate, and that communities were given no real voice or power over whether or how the project would be implemented. To add insult to injury, the energy generated by the new wind turbines was to be sold at a discounted rate to four local Walmart retail stores – instead of going to the communities themselves.[55]

Tierras Morenas Wind Farm

The 32-turbine Tierras Morenas wind farm near Arenal Volcano in the Guanacaste province of Costa Rica, a partnership project between a Bermudan electric company and wind companies from the US and Costa Rica that began in 1999, is another illustration of how a visionary approach to strategic consultation processes for both communities and facilitators is critical. A community engagement process for Tierras Morenas began five years prior to project inception to ensure the relocation of the communities near the wind farm. Over twenty years later, the wind farms continue to generate benefits outside the community, but responses from community leaders indicate a lack of long-term benefits for the community itself. Additional insights from the women in the community demonstrate the need to secure community benefits that are beyond immediate needs (water wells and schools), in exchange for the land and resources that are often lost for future generations. Additionally, the community did not have the capacity to represent their needs during the process as the facilitators were engineers without training in community consultations.[56]

Community Power Scotland

Thankfully, radically different models, and examples of these models in action, do exist, in both the Global North and South. Community Power is a consortium of a dozen organizations that links together communities and cooperatives across Europe that "own or are actively involved in running an energy resource."[57] Friends of the Earth Scotland is an active member of the Community Power coalition and has been a leader in building community-owned energy solutions in Scotland to help the country meet its national

54 For more information on La Mata/La Ventosa project, see World Development Movement (2011). *Power to the People? How World Bank financed wind farms fail communities in Mexico*; and also Dunlap, A. (2016). "'The town is surrounded': From climate concerns to life under wind turbines in La Ventosa, Mexico." Colloquium paper for the International Institute of Social Studies.

55 Ibid.

56 Giddy, I. (n.d.) "The Largest Wind Farm in Latin America." Retrieved from http://pages.stern.nyu.edu/~igiddy/cases/tierras-morenas.htm as summarized in International Union for Conservation of Nature and US Agency for International Development (2014). *Women at the Forefront of the Clean Energy Future*. Retrieved from https://www-cif.climateinvestmentfunds.org/sites/default/files/knowledge-documents/iucn_gender_and_re_-white-paper.pdf.

57 Community Power website, retrieved from http://www.communitypower.eu/en/about-us.html

A SMALL ELECTRIC HYDRO DAM ON THE ISLE OF EIGG, SCOTLAND.

CREDIT: FLICKR/ ISLEOFEIGG/CREATIVE COMMONS

greenhouse gas reduction targets by 2020 and 2050, and its goal of complete decarbonization of the power sector by 2030.

Examples of what communities are doing to generate, own and control their own renewable energy resources throughout the Community Power consortium are by necessity quite diverse, given the wide variety of local and national contexts. Even within Scotland, different communities have taken a range of approaches using a range of technologies. The following three examples are illustrative of creative and inclusive solutions to locally specific challenges.

As alluded to earlier, the Scottish Government has set a clear direction to move towards 100% renewable electricity. The support of and benefits to communities are seen as vital in achieving this transition. The Scottish community energy sector has evolved to meet the diverse needs of Scottish communities and ranges "from remote island grids to urban solar co-operatives."[58] The following examples illustrate the range of projects in terms of technology, financing, ownership structure and geographic context:

Today the **Isle of Eigg,** located in the Scottish Inner Hebrides and with a population of less than 100 people, is a well-known example for innovation in the community energy sector. Until 2008, locals were largely dependent on costly fossil fuels shipped in from the mainland to run diesel generators that produced limited electricity. A grid connection to the mainland was not an option, but through a combination of EU

58 Friends of the Earth Scotland (2015). *Community Power Scotland: from remote island grids to urban solar co-operatives.* Retrieved from http://www.communitypower.scot/wp/wp-content/uploads/2015/02/CommunityPowerScotlandOct2014Web.pdf.

funding, overdrafts and contributions by residents, the islanders managed to finance an off-grid system instead. Apparently a world's first, the mini-grid is powered by a mix of solar, wind and small hydro. A battery bank helps smooth out supply and there is a diesel generator back-up, but approximately 90% of electricity of the electricity supply – now available 24 hours a day, 7 days a week – comes from renewables.

To avoid having to pay for a system that could deal with spikes in energy consumption (high peak loads), the islanders decided to put a cap on how much a household (5kW) or business (10kW) can consume at any one time, providing an example of how energy sufficiency can look in practice. If a household or business goes over the allocated threshold it is kicked off the system and has to be re-connected manually by the Eigg Electric maintenance team. Islanders can manage their consumption with a small electronic display. These displays were especially useful in the early days – but for many, knowing how many appliances they can switch on simultaneously has long since become second nature.

The system is operated by Eigg Electric, a subsidiary of Eigg Heritage Trust, which was set up "to provide and create opportunity for economic development, housing and infrastructure, whilst conserving our natural and cultural heritage to ensure that development takes place in a sustainable way."[59] The system has reduced energy costs for consumers and generated the equivalent of one full-time job, employed by Eigg Electric.

The **Edinburgh Community Solar Co-operative (ECSC)** will soon (by September 2016) own solar photovoltaic installations with a combined generating capacity of 1.5MW across the city of Edinburgh, making it the UK's largest urban community solar project. Solar cells are installed on 25 public buildings such as schools and leisure centers, which are owned by Edinburgh City Council. The scheme provides an important opportunity for people in an urban area, who traditionally lack access to land and other spaces, to take an active role in and benefit from the renewable energy transition.

The project raised money through a so-called share offer,[60] which allowed citizens to invest in the scheme and so become members of the co-operative as well as take part in decision making processes on a one-member-one-vote basis.[61] A total of 541 members raised £1.4 million (US $1.8 million) for the project, which will be fully operational in September 2016.

ECSC promotes self-consumption and ensures that host buildings receive a better deal on their electricity cost than they would with a conventional supplier. Excess electricity generated is sold onto the grid for which the co-operative also receives feed-in tariff payments. Members are entitled to an annual return on their investment, which is expected to average at 5% per annum. Members could also benefit from 30% tax relief aimed to encourage early investors.[62]

59 See http://www.isleofeigg.net/eigg_heritage_trust.html.

60 Note, shares in a co-operative a different to shares on the stock exchange that fluctuate in value and can easily be traded.

61 This applies regardless of the amount of money an individual has invested.

62 Tax relief to benefit community energy projects known as Enterprise Investment Scheme were abolished in a series of attacks on the renewable energy sector by the UK government.

However, one criticism of cooperatives that raise capital through share offers is that they exclude those who cannot afford to invest. ECSC is set up legally as a "Community Benefit Society" or "Bencom," which requires a share of the financial profits to stay local. As such, the project is expected to generate over a million pounds for a "community benefit fund" over the lifespan of the project in addition to interest payments for members. For the first five years, money from the fund will be made available for the schools and other buildings that are part of the scheme. After that, it will be allocated for a common fund that aims to make finance available for energy efficiency measures that help alleviate fuel poverty in the city. The project thereby will attempt to ensure more equitable local distribution of benefits.

Finally, **Earlsburn Wind Farm**,[63] located near the town of Fintry, is known for pioneering what is known as "shared ownership" in Scotland. In 2003 Fintry residents started to explore options for local renewable energy installations. The idea for "virtual ownership"[64] of a wind turbine emerged following a community council meeting in which a commercial developer announced their intention of building Earlsburn Wind Farm nearby.

Initially, the developer wanted to erect fourteen 2.5MW turbines. However, local residents made a compelling case for an additional "community wind turbine" leading to a total of 15 turbines with a combined generating capacity of 37.5MW. The community owns one 15th of the overall wind farm and profits generated or the equivalent of one virtual turbine. As Gordan Cowtan of the Fintry Development Trust (FDT) explains, "We can point to one of the turbines on the hills and say that one is there because of the efforts we put in... at the same time we are not completely dependent on that turbine for the income generated."[65]

Local residents set up Fintry Renewable Energy Enterprise Limited (FREE) to be able to enter a joint venture agreement with Falck, the first partnership of its kind in the UK. For the purpose of deciding what to do with the income generated the community also established Fintry Development Trust a membership organization with charitable status, which is governed by a board of local residents. FREE is a trading subsidiary of FDT, which means the latter can legally control how profits should be spent.

FDT secured Scottish Government grant funding to commission a feasibility study that illustrated the financial viability for the initiative. After having explored different financing options, the community decided to take Falck Renewables up on their unique offer to provide up front capital for the 15th turbine. Over the first 15 years of

63 See Friends of the Earth Scotland (2015). *Community Power Scotland: from remote island grids to urban solar co-operatives*. Retrieved from http://www.communitypower.scot/wp/wp-content/uploads/2015/02/CommunityPowerScotlandOct2014Web.pdf.

64 The terms "virtual ownership" or "virtual turbine" describe the fact that a community have bought into a larger commercial project but do not own a specific turbine in that project.

65 Fintry Development Trust (2011). *Winds of change* [Online video], 19 September. Retrieved from https://www.youtube.com/watch?v=ls_1p8ad2mc.

the project, the FREE pays back the loan while generating and annual income of £30,000-50,000 (about US $39,000-65,000) to the local community. Once the loan payments have been made, income is expected to rise to £400,000 (about US $515,000). This is significantly more income than Fintry is able to attract from the wind farm compared with £35,000 (about US $45,000) of annual community benefit payments that is shared between three other communities nearby.

An initial project funded through the income generated by the turbine was used to survey household electricity consumption and offer free roof and cavity wall insulations to local households. The result was an estimated £90,000 (about US $115,000) reduction of household energy bills across Fintry, a community with 338 homes. Every local home is offered a £500 grant to install carbon reduction measure such as double-glazing, insulation or wood burning stoves. Double that is available to households living in fuel poverty (where a household spends more than 10% of income on fuel).

A more recent initiative provides grants to students in further education to help them manage costs related to reducing their impact on the environment. The money may be spent on goods or services such as the purchase of a bicycle, second hand books or public transport passes. As such, the majority of income from the turbine goes straight back to the community via grants though larger local initiatives may also receive funds from other.

CRELUZ

Cooperativa de Energia e Desenvolvimento Rural do Médio Uruguai Ltda (CRELUZ) is a Brazilian energy cooperative that started off by bulk-buying electricity from the national supplier to supply to its members and extending grid to previously neglected households.[66] In 1999, the cooperative started to develop environmentally sensitive mini-hydro generation plants to provide more reliable sources of energy. CRELUZ supplies electricity to 20,000 families benefitting approximately 80,000 people, a quarter of which is met by local mini-hydro generation. According to CRELUZ's president Elmar Battisti, "The consumers are members of the cooperative. Some regions were abandoned, they did not have electricity or light so CRELUZ was born out of the needs of the small farmers, small business and small industries." [67]

By linking generation, distribution and supply, the cooperative has also been able to create a "social program" to subsidize low-income customers, including infrastructure to connect them to the grid. Approximately 600 families do not pay for electricity consumed and only pay a token fee.[68] CRELUZ is just one of many community energy initiatives from around the world that demonstrates how energy democracy is delivering access to affordable renewables.

66 Ashden Awards (n.d.). *CRELUZ, Brazil: Micro-hydro makes the grid reliable* [Online]. London: Ashden. Retrieved from https://www.ashden.org/winners/CRELUZ10.

67 Ashden Awards (2010). *CRELUZ, Brazil: hydro-power for community – Ashden Award winner* [Online video], 7 July. Retrieved from: https://www.ashden.org/winners/CRELUZ10.

68 Ibid.

THE IXTEPEC COMMUNITY WIND FARM IN OAXACA, MEXICO.

CREDIT: FLICKR/ OAXACAN WIND MONSTERS/CREATIVE COMMONS

Ixtepec Community Wind Farm

A particularly illustrative final example is the development of wind power in the isthmus region of Oaxaca, Mexico, which has extremely strong and steady wind resources that could be harnessed for energy.[69] Thanks to interest from both external foreign actors and the Mexican national government, the development of wind farms in Oaxaca has been highly investor-focused, without much regard for the needs of communities in the region. Wind power companies obtained land rights over tens of thousands of hectares by forcing communities to sign long-term leases – with the assistance of Mexican government pressure on those community members who resisted signing.[70]

One community, Ixtepec, was not approached to sign away its land rights. In 2008,

69 National Renewable Energy Laboratory (2003). *Wind Energy Atlas of Oaxaca*. Retrieved from http://www.nrel.gov/wind/pdfs/34519.pdf.

70 See Oceransky, S. (2008). "Wind Conflicts in the Isthmus of Tehuantepec," *The Commoner*, 13: 203-222; and Pasqualetti, M. J. (2011). "Social Barriers to Renewable Energy Landscapes." *Geographical Review*, 101: 201–223.

the community decided to avoid leasing land to external companies and instead attempt to implement a community-based wind project. The community chose to work with Yansa, a nonprofit social enterprise whose objective is to support community leadership of renewable energy projects in the Global South. Together, Ixtepec and Yansa planned a community wind farm that would generated 102 megawatts of power.

Over the course of several years, Ixtepec and Yansa conducted an assessment of community priorities, established a trust to manage potential proceeds and use them for social development including for agriculture investments and pension funds, and began outreach to potential financiers. All these activities were conducted through community consultations, including the establishment of specific forums for women and youth, and with local assemblies having final decision-making power.

By 2012, the final step before project implementation was to obtain a long-term Power Purchase Agreement (PPA); unfortunately, the Mexican national utility erected huge barriers to the community and Yansa, by placing conditions that meant only large energy corporations would be able to bid in a competitive public tender for the PPA. Several attempts by the community and Yansa to navigate these requests and negotiate conditions that would be more appropriate and reasonable for communities as opposed to large corporations were rebuffed. The community filed lawsuits in October 2012 against these discriminatory barriers; these are still ongoing but "are close to a resolution."[71]

While the Ixtepec/Yansa story is currently inconclusive, the contrast between the process driven by outside investors and the national government for most of the wind power projects in Oaxaca on the one hand, and the community driven process for Ixtepec on the other, is highly instructive. It illustrates both the benefits of true community ownership and the political barriers that may often be erected to discourage such ownership in favor of more traditional top-down models that favor already wealthy and powerful corporations and those in government who support their interests.

Community participation in decentralized RE access: a power pilot proposal

The above sections have spelled out the basic parameters for a model of decentralized renewable energy access that would put ownership, control, and above all the benefits of energy into the hands of communities rather than corporations and executives. Of course, models last until the exact moment they encounter reality - at which point myriad unforeseen complexities enter into play and tend to render the best-laid plans (and the best intentions) moot. While we cannot pretend to anticipate all the issues that might arise in all the places that decentralized renewable energy access will be attempted, we can learn some lessons and begin to ask some basic questions.

One of the most important lessons learned from the principles and examples described

71 Oceransky, S. (2016). Currently unpublished paper for AREI Technical Secretariat.

WOMEN IN WEST BENGAL, INDIA, MEET TO TALK ABOUT THE ISSUES THEY FACE. ACTIONAID FACILITATES LOCAL FORUMS CALLED "REFLECT CIRCLES" WHERE PEOPLE DISCUSS THE NEEDS OF THEIR COMMUNITY.

CREDIT: NICOLA BAILEY/ACTIONAID

in this paper thus far is that genuine community ownership – in the broadest sense of the word – must be considered a prerequisite for any implementation of new decentralized renewable energy access. Each of the core principles of decentralization/subsidiarity, gender responsiveness, and environmental and social sustainability are only achievable with the full consent, buy-in, and active participation of the communities that are meant to benefit from new energy access. Even energy sufficiency, the roots of which might seem to be more external to communities, is more likely to be achieved if communities' voices are heard in broader local and national decision-making processes.

The primary question that must be answered, then, is: what processes are needed to ensure that implementation of decentralized renewable energy access is genuinely community owned? In this section we explore some ideas for what a pilot adapting ActionAid's existing models for community empowerment to the specific needs of a decentralized renewable energy access program, might look like, potentially using one or two ActionAid communities (Local Rights Programs, or LRPs) as initial sites of implementation and learning.

ActionAid's Reflection-Action Methodology

ActionAid has several decades of experience working with communities in ways that ensure that agency and power lie firmly with the communities and not the external

actor (NGO, in this case). We have developed a number of methodologies that have been largely unified under our current Reflection-Action methodology.[72] The Reflection-Action framework emphasizes several core principles that center on recognizing local experience and expertise, ensuring all community members – especially women – are able to participate, treating people as active agents of change rather than passive recipients of benefits, and recognizing that effecting change must include confronting and challenging power at the local, national, regional and international levels. With regards to climate change, ActionAid has many years of experience using these methodologies to work with communities on climate adaptation challenges – including climate-resilient sustainable agriculture, alternative livelihoods, disaster risk reduction, community emergency response, advocacy with local government for better resilience policies and budgets, and more.

ActionAid's community engagement process often begins with a participatory analysis of the challenge to be addressed. In the case of climate adaptation and resilience work, this takes the form of a Participatory Vulnerability Assessment (PVA); in the case of community-controlled energy access, the tools and questions will differ but the overall methodology can remain largely the same. The process enables the most marginalized members of communities, organized in Reflection-Action circles, to self-analyze their assets, resources, capacities, challenges and vulnerabilities, laying the groundwork for them to develop their plans to address the identified challenges. Women are prioritized for participation in Reflection-Action circles, and specifically supported with training on women's empowerment and understanding their rights. These ongoing circles can become a space in which the women may also build their capacity in literacy and numeracy in the dominant language, or in other relevant communication skills. Reflection-Action circles use a number of tools for community members to use to analyze the context of the challenge to be addressed, develop a strategy, act on that strategy, and reflect on the entire cycle through participatory monitoring and evaluation.

The community may go on to form different committees or groups to work on different issues, such as farming or disaster response. Gender balance is strongly encouraged, particularly in leadership positions. The communities are also supported to create separate women's groups so that they can talk more freely, identify capacities and challenges that often go unnoticed by men, and put ideas together to bring them more clearly to the wider community.

Community-level change alone does not guarantee the sustainability of that change if the broader environment is hostile. Engagement with the government, particularly local government but also national government, is thus an inherent complement to the ActionAid model of community engagement – with community circles linked for example at district level and even across districts, building their analysis and capacity at each stage. Through this process the circles identify areas where they can engage with different levels of local

72 For a concise summary of the Reflection-Action approach, see ActionAid (2012). *People's Action in Practice: ActionAid's Human Rights Based Approach 2.0*. Retrieved from http://www.actionaidusa.org/sites/files/actionaid/1._peoples_action_in_practice_final_20_07_2012.pdf. For a more in-depth overview, see Archer, D. and S. Cottingham (2012). *Reflect Mother Manual*. Retrieved from http://www.reflect-action.org/sites/default/files/u5/Reflect%20Mother%20Manual%20-%202012.pdf.

government to demand support, better service provision, or changes in policy and practice – and can track their engagement and learning over time.

The natural scalability of this process – in terms of linking together Reflection-Action circles at a local, district and national level, and in terms of elevating community concerns and solutions to the policy level – is particularly important for the implementation of decentralized renewable energy access. In many cases, individual communities may be able to implement off-grid renewable energy solutions that meet the majority of their energy needs. However, in most cases it is likely that deep changes will be necessary outside the community as well in order for energy needs to be fully and sustainably met – including policy changes, technical capacity for domestic service providers, external financing, and possibly eventual grid interlinkage.

For financing in particular, many entities – universities, philanthropies, pension funds, etc. – are or will be seeking opportunities to invest in renewable energy alternatives, after divesting from fossil fuels. Linkages beyond the community level will be necessary in order to attract such entities, which require relatively large, bankable projects. Indeed, the very nature of decentralized, community controlled renewable energy access might seem to run counter to the needs of such large-scale outside investors.

However, through principles such as Enhanced Direct Access, international financing institutions like the GCF or the UN's Adaptation Fund are beginning to understand how to channel money to effective initiatives while allowing local actors to retain decision-making power over how the money is spent. Through a small grants facility and other modalities, the Adaptation Fund has successfully supported locally driven adaptation projects for example in South Africa,[73] while the GCF has launched an Enhanced Direct Access Pilot Programme that aims to do something similar at a larger scale, for either mitigation or adaptation activities.[74] Thus, there is some limited precedent for large outside institutions to effectively invest in locally driven, locally owned initiatives. Nevertheless, some demonstrated capability of such local initiatives to scale out, be replicated, or effect broader policy change will likely make them much more attractive to potential external financers.

The Reflection-Action Cycle and Decentralized Community Controlled RE Access

At the community level, the Reflection-Action process can be understood as a participatory cycle with three discrete steps: context analysis & problem identification, planning & action, and reflection & evaluation. This section examines each of these steps and considers the additional factors that would need to be considered to use

73 See for instance Germanwatch (2014). *Learning from Direct Access Modalities in Africa.* Retrieved from http://www.southsouthnorth.org/wp-content/uploads/Learning-from-Direct-Access-Modalities-in-Africa.pdf.

74 Green Climate Fund (2016). "Request for Proposals: Enhancing Direct Access." Retrieved from http://www.greenclimate.fund/documents/20182/318991/2016_EDA_RFP.pdf/406a5b0b-c4f9-4784-813a-ef90a966f3c6.

Reflection-Action for a community-level implementation of decentralized renewable energy access. (The majority of the process will likely adapt fairly cleanly to this purpose, with most of the modifications frontloaded into the first step.) The following section returns to the question of how to scale out from the community level through knowledge-sharing, collective advocacy and more.

Understanding the Context: Questions for Participatory Analysis of Energy Needs and Existing Community Assets

At the core of the initial step of the Reflection-Action cycle, understanding the context, are a series of questions framed around seven primary lenses: rights, power, women's rights, relevant actors & institutions, vulnerability, communications and risks & feasibility. A first step towards adopting Reflection-Action for the context of decentralized renewable energy access, then, is identification of a set of key questions that are likely to be needed to assess assets and challenges with regards to implementation of new energy access. In order to take advantage of existing experience and the proven success of the Reflection-Action process, these new questions should ideally fit under the seven existing lenses. What follows is an attempt to put forth a set of such questions, though it must be stressed that these are far from comprehensive and indeed will need to be supplemented or even replaced through the experience of actual implementation, or at the very least adapted to the particular context of any pilots.

- **Rights:** What existing rights are being guaranteed thanks to existing access to energy?
- **Rights:** What rights are being violated due to a lack of access to energy, or inequitable distribution of access to energy within the community? What rights are being, or might be, violated due to possible new energy infrastructure?
- **Power:** What level of control – ability to access or make decisions – do people living in poverty, women, and marginalized people have over existing energy resources? Who does have power over energy resources at this time and do they use that power responsibly?
- **Actors/Institutions:** What institutions are duty bearers in the provision of energy services for the community, and how can they be influenced?
- **Actors/Institutions:** What are the existing actors in the national energy system, and how well do they serve the community, if at all?
- **Actors/Institutions:** In order for energy access to be implemented, what new actors would need to exist, and what would they provide that is missing – in terms of technical expertise, political power, etc?
- **Women's Rights:** Do women have equal access to and control over existing energy services and resources in the community?

- **Women's Rights:** How might new access to energy benefit women in the community specifically? How might it exclude them from benefitting?

- **Vulnerability:** In what ways does the current level of access to energy exacerbate existing vulnerabilities to shocks, including disasters and climate-related shocks?

- **Communications:** Is the use of modern forms of communication limited by current levels of energy access?

- **Risks:** What are the risks to existing social relations within the community of introducing greatly increased energy access, particularly if the new energy resources are community controlled or community owned?

- **Risks:** Are there existing community members or small entrepreneurs who would lose out when new energy access is implemented?

- **Risks:** What is the risk that new energy access might be implemented in the community but ultimately fail due to lack of appropriate policies, institutions, and resources external to the community and outside its immediate control?

- **Risks/Feasibility:** What renewable energy resources exist in the community that could most fruitfully be harnessed – sun, wind, water, etc? Are there any possible negative side effects (social or environmental) of harnessing those resources?

- **Feasibility:** What is the existing capacity of the community in terms of its ability to organize collectively, to form committees or cooperatives, and so on? What is the existing capacity of the community in terms of local entrepreneurship or micro- and social enterprises?

- **Feasibility:** Is the community currently grid-connected? Given the overall context analysis, would an off-grid solution make sense as an initial starting point, or would grid-connected access be the better option?

- **Feasibility:** To what extent does the technical capacity and resources for implementing decentralized community controlled renewable energy access exist domestically, or to what extent is there the potential to build this capacity domestically in the short term?

From all the above analysis, the community will identify its assets and capacities and key problems with regards to energy access. This analysis feeds logically into the next step of the cycle – identifying possible solutions, deciding which solutions are most appropriate, and planning and implementing those chosen solutions. The bulk of the modifications to the Reflection-Action process that need to be made to adapt the framework to questions of renewable energy access are in this initial step; the planning and action and M&E steps likely can be adapted with few major changes.

Planning and Action

While the basic process of this step of the cycle may not differ much from existing implementation of the Reflection-Action cycle, because of the technical nature of renewable energy it is likely that an increased number of partnerships with outside actors will be needed through and beyond the planning and action phase. It would be a rare community that possesses all of the capacities and resources necessary to implement even a fully offgrid renewable energy access solution, particularly if they are working with an NGO such as ActionAid which also does not possess much of the relevant technical expertise. Of course, the necessary partners would be identified in the first step of the cycle above. The key focus in this stage is that the steering of the process remains with the community – who can draw on expertise and advice from multiple sources as and when they need it – and who can be informed about a range of possible options relating to technologies, ownership models, size of operations and so on. Continuing sensitivity to, and analysis of power dynamics within, the process is important so that external actors to do not dominate the agenda. There is then a phase of reflection and learning after each action or intervention, to be able to plan and organize more effectively in future.

Reflection and Evaluation

Participatory monitoring and evaluation (M&E) is the third step in the cycle, and again may not need major tweaking to be applicable to the renewable energy access context. The Reflection-Action framework provides for a number of tools that can be used to facilitate a participatory M&E process, but the core idea is that all stakeholders should be involved including Reflection-Action circle participants and facilitators, community members outside the circle, relevant external agencies or institutions, and so on. Participants are encouraged to identify the set of indicators on which the evaluation will be based, and are actively part of data collection and analysis. In participatory M&E, evaluation is not an extractive activity done for the benefit of external donors; instead, it is directly linked to empowerment of community members and is part of an ongoing process of learning, rather than being an afterthought. Because community members themselves are involved in the generation, analysis and use of information, this often leads to deeper community learning and knowledge that can also be used for better mobilization and advocacy in the future.

Linking Reflection-Action Circles: Impact Beyond the Community Level

While Reflection-Action circles are made up of a subset of the community, the analysis is shared with a broader set of stakeholders and the planning and implementation typically involves the entire community. Furthermore, issues generated by the process will ideally feed into mobilization, campaigning and policy demands, as communities push government entities to live up to their responsibilities for delivering public services or otherwise upholding the human rights of community members. In many cases Reflection-Action circles from multiple communities have come together to influence

district-level governments around policies that have a direct impact on their lives. Budget accountability is a particularly common advocacy strategy, in which community members analyze government budgets, hold officials accountable to budget allocations where there are shortfalls, take legal action where needed, and advocate for more equitable budgeting, for example for increased funding for health care or education, or increased investments in smallholder agriculture or renewable energy access programs.

Beyond the district level, Reflection-Action circles can catalyze community mobilization around national campaigns, often linking up with local or national social movements or NGOs. Because the process is grounded in local knowledge and documentation of local experiences, there is a natural evidence base for policy advocacy that is often invaluable in national campaigning (and also can provide extremely useful material for international advocacy). In this way, these participatory processes can feed directly into impacts well beyond the community level, and indeed this is a core part of the methodology.

A Pilot Program

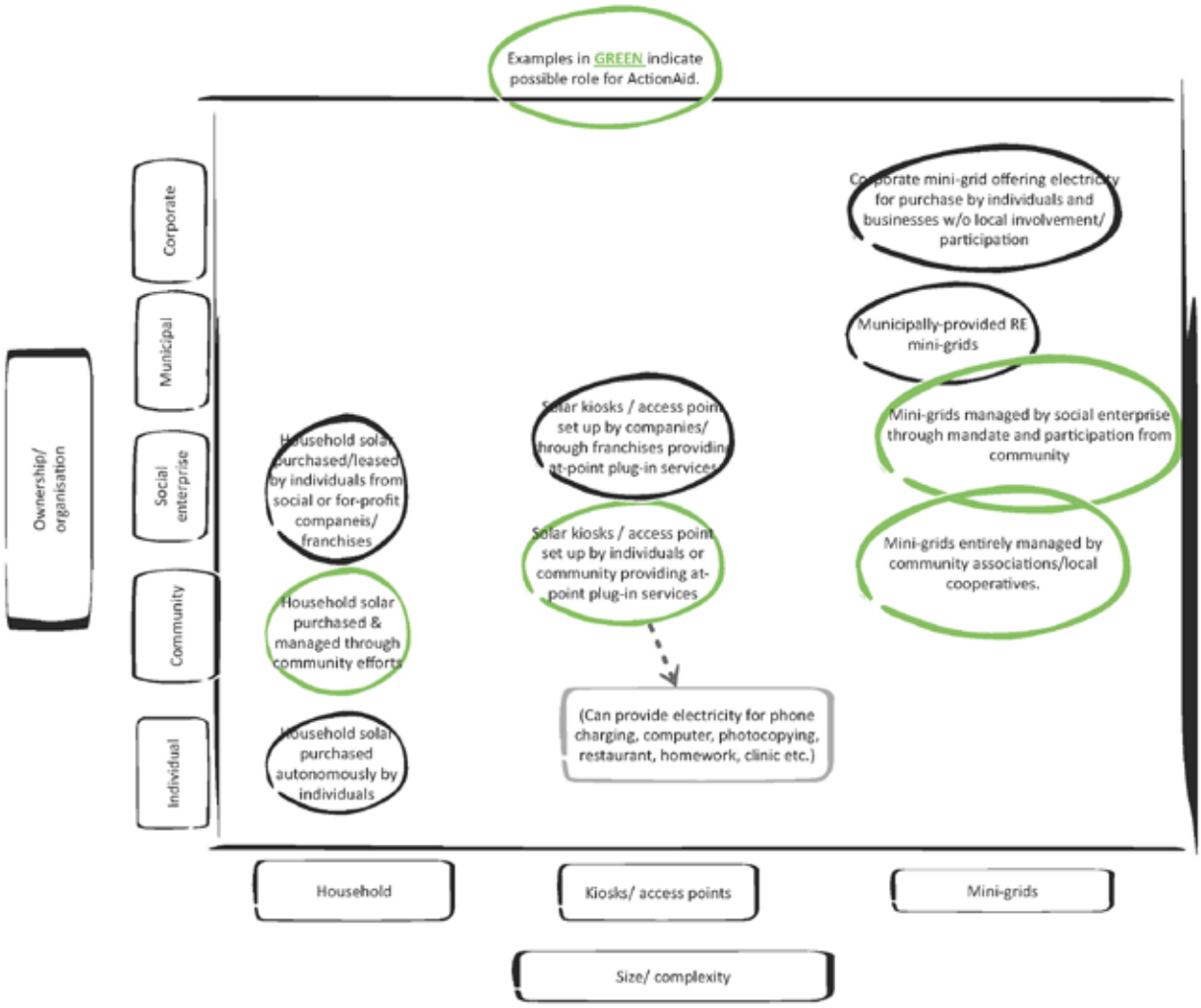
There are countless ways that communities can implement renewable energy access in terms of ownership models and technology options, and the Reflection-Action model will be particularly useful for a specific set of these. For simplicity's sake, one might consider a grid of renewable energy access modalities, with one axis representing different ownership structures (from individual ownership to community cooperatives to social enterprises to municipal public utilities) and the other axis representing variances in size and complexity of implementation (from isolated offgrid household access to community kiosks/access points to mini-grids to full grid connectivity). This grid analysis can be done separately from an analysis of what specific renewable energy technology – solar PV, small-scale wind, micro-hydro, etc. – is most appropriate to a given community.

A pilot program for decentralized renewable energy access based on this paper and the strengths of a participatory model like Reflection-Action might naturally focus on the community level on one axis, with applicability across the full range of size and complexity. Individual ownership is not necessarily a problem, but can lead to exacerbated inequalities within a community as described earlier in this paper. Collective community control may be a preferable option for that reason, and fits better into the Reflection-Action process. The advantages and disadvantages of each option will have been analyzed in an informed way by local people themselves in any case.

The framework could be adapted to work with local entrepreneurs and social enterprises as well (and Reflection-Action circles could link together to influence municipal utilities), but again, truly inclusive and transparent community-level processes are the focus of the framework. With regards to size and complexity, this is likely to be a question of local capacity – how well organized is the community, how strong are its leaders, how accessible are service providers that have the relevant technical expertise,

how linked up is the community to a larger electrical grid? The key with Reflection-Action is that the community themselves make an informed judgment on what will work best for them in respect of ownership model and size and other features.

An oversimplified but illustrative grid is contained in the figure below:



These are merely illustrative examples for a community in which solar is the preferred technology option and connecting to a larger grid is not currently an option – this diagram should not be taken as comprehensive in any way, and it could easily be made technology-agnostic. For the purposes of a pilot program, decisions about the scope and type of activities that are appropriate for the pilot to present to communities as options for their consideration would be made in advance of approaching specific communities. Once these decisions have been made, it would be relatively easy to find communities that have already identified energy access or energy poverty as a relevant issue. A four-step process might then ensue:

1. Initial implementation of Reflection-Action methodology, or similar participatory process, to enable community members to analyze energy needs, existing community assets, and resources required.

2. Reflection-Action circles to deepen analysis, develop technical literacy, etc. so community members feel confident to lead activities, and design appropriate renewable energy initiatives.

3. Setting up relevant community structures (committees, cooperatives, etc.) to implement and manage renewable energy activities, including learning through participatory M&E processes about what works and what doesn't.

4. Engaging with duty bearers, such as local government line ministries and related entities, to demand support or policy changes, as appropriate, to enable, support and sustain the activities being implemented; and also with other communities and Reflection-Action circles to share learning and experience.

As with much of this sort of work, this will be a long-term affair that can only be effective through deep engagement with the community to ensure their full ownership and buy-in. Many communities will not have the necessary capacities or structures in place to effectively work through all four of these steps on an issue that may be new to them and is rife with technological and economic jargon. Others, however, will – and a pilot program should identify these communities and empower them to demonstrate that this model is feasible and implementable. At this early stage, the demonstration effect alone will be powerful.

Further research

This paper represents an initial, and largely theoretical, attempt to think through a community-based approach to decentralized renewable energy access. Obviously, a great deal of further research is needed – though much of this can take place through the implementation of a pilot program as described in the above section. Through such a pilot, a great deal of refinement will naturally happen – regarding the questions that need to be asked, the capacities that need to be in place both in the community and in the broader domestic context, and the processes that need to be implemented in order to ensure all the principles outlined earlier in the paper are adhered to.

Further conceptual work is also needed. As noted, this paper focuses largely on electricity systems, yet energy access is much broader than this single issue. Future research can focus on decentralized renewable energy access with regards to transport, cooking environments, and so on. More research can also be done on how energy access can best be used to create direct benefits in specific sectors such as agro-ecological approaches to smallholder agriculture.

The paper highlights a number of examples of interesting and relevant work happening around the world. A large number of governments, intergovernmental organizations, and NGOs are working renewable energy access, some of them with a community-based approach in mind (at least in theory). While drawing lessons learned from these experiences is obviously valuable and a core thrust of this paper,

closer collaboration may in some cases be highly desirable to avoid duplication or, worse, contradiction of effort.

Finally, some clear thinking about the role of external actors in pushing for decentralized renewable energy access is also needed. If renewable energy access is to be truly community-driven and community-controlled, the role of (for example) an international NGO in facilitating implementation must be carefully considered. A great deal of the history of NGO intervention is one of unwitting privatization: in which an external actor takes upon itself the responsibility of providing basic services, perpetuating a situation in which the government is failing to meet its obligation as duty bearer and fostering dependence of communities on outside actors who are accountable to entirely external forces and may disappear with little or no warning.

This challenge applies to any NGO intervention that purports to be community-driven, of course, but a future iteration of this study might develop a framework to clarify the specific roles of external agents relative to the full range of stakeholders – including community members, community groups and local NGOs, technical service providers, local entrepreneurs, local government entities, and so on – given the particularities of renewable energy access implementation.

Conclusions

A successful pilot program for decentralized, community-controlled renewable energy access would have positive impacts well beyond the individual communities participating in the pilot. The renewable energy revolution is underway and will only accelerate in the coming years. The world needs proven examples that a decentralized and community-controlled version of this revolution is not only feasible, but *necessary* to reach the goal of universal energy access while simultaneously addressing the global climate crisis.

Absent these examples, the existing power structures will remain dominant. The world may indeed transition from fossil fuels and dirty energy to renewable energy, but if this is a mere technology swap without a corresponding change in structures of production and ownership, the same inequities in distribution and benefits will be perpetuated. A centralized model of energy in which large, powerful multinational corporations are largely in control will simply never be able to deliver sufficient energy access for all people around the world. As Sergio Oceransky has written,

> "A series of high-profile successful community projects may lead long-term investors to realize that the role currently played by project developers and private energy corporations can be played more efficiently by communities with strong governance structures and access to adequate support and capacity-building. Furthermore, on the basis of a positive track record, investors may quickly conclude that community agency and social development goal significantly reduce in the risk profile of projects. Hence, as well as its potential to curb unequal land deals, community utility-scale renewable power could expose private energy corporations as expensive and unnecessary intermediaries, whose main impact is to increase risk and costs. Such a realization will not take place overnight, and will require a solid track record of successful community projects. But once it happens, it may lead to a paradigm change in the sector."[75]

To achieve this paradigm change and make the renewable energy revolution work for everyone, all the key players – governments, NGOs, private companies, investors, and communities themselves – must believe in the importance and potential of decentralized community-controlled renewable energy access. For this to happen, early successes will be immeasurably helpful. Those early successes must not only deliver results, they must also demonstrate good process. Proven community engagement methodologies like Reflection-Action can help deliver on both counts.

75 Oceransky, S. (2016). "Fostering Low-Cost Investment and Enhancing Development Impacts through Community Leadership in the Energy Transition." Forthcoming paper for AREI Technical Secretariat.

BEATRICE, WHO LIVES IN A RURAL COMMUNITY IN RWANDA, COLLECTS FIREWOOD FOR COOKING FUEL.

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