POWERING PROGRESS 2

Realizing the Potential of Renewable Energy in Somaliland, Puntland, and South Central Somalia

A research report by: David A. Poplack & Kelsey Coolidge

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INTRODUCTION

The Need for Multi-Stakeholder Collaboration

Building upon last year's successful Somali Investment Forum held in Nairobi, Shuraako, a project of the One Earth Future Foundation (OEF) held the Somali Renewable Energy Forum (SREF) 2016 in February in Hargeisa, Somaliland. Based on Shuraako's deep investment in the Somali economy and OEF's robust experience sponsoring multi-stakeholder collaboration, this year's SREF focused on convening key stakeholders in the regional economy in order to share lessons learned and encourage the development of a common vision of the renewable energy sector in South Central Somalia, Somaliland, and Puntland[a] and to catalyze growth and investment in that sector.

Electrical engineering class at Gollis University.

Multi-stakeholder collaboration requires convening diverse stakeholders who have differing interests and perspectives on a decision or set of issues in order to find creative, inclusive solutions to problems of collective action. According to practitioners, multi-stakeholder collaboration promotes information-sharing and the identification of creative solutions, and often produces better decisions than adversarial processes.[1] Additionally, the sense of shared ownership among participants created by multi-stakeholder collaboration increases the likelihood of effective implementation.

The Somali renewable energy market is composed of a diverse array of stakeholders who have interests that converge, overlap, and often diverge widely. The work of these actors has largely been uncoordinated and done in relative isolation from one another and global markets, although signs of progress in cooperation are beginning to take shape. Independent power producers (IPPs) in the private sector and foreign aid donors regularly install electricity generation capacity in similar locations but are unable to connect to a common grid, resulting in inefficiencies. Cutting-edge technologies sold abroad are unavailable to Somali firms due to high costs, unreliable infrastructure, and a lack of technical expertise. Finally, the aid community generously sponsors renewable energy development for individual clinics, schools, or cold-storage projects but often fails to connect these projects to each other or to utilize the private sector, wasting key opportunities to scale and integrate their successes with the broader economy.

Each of these disconnections prevents linkages that might help develop the overall economy, make renewable energy scalable to the national level, and allow Somalis to "leapfrog" to an information economy. Some of this inefficiency can be linked to lingering distrust and competition among actors but some is also the result of systematic failures in both governance and processes of foreign aid dispersal. Institution building has been hindered by unclear constitutional processes and suspicions among foreign backers, the government, and other interests. A long history of foreign intervention and aid that prioritizes donor objectives and sentiments over those of Somalis has nurtured a culture of dependence and unhealthy competition.[2] Importantly, the ways in which donors fund aid projects tend to prevent collaboration, hinder learning, and limit effective strategic planning.[3]

Part of the problem is that the Somali region is still relatively underdeveloped and has yet to build a clear and effective enabling regulatory environment that can set the stage for coordinated investment and development. However, in lieu of such systems emerging in the short term, more could be done now to create a favorable climate for investment and development. During Somalia's decades-long civil war and periods of statelessness, the business sector, often tied to a tight-knit diaspora on multiple continents, built a stable and prosperous market for many goods and

a Shuraako and the One Earth Future Foundation take no position on the division of Somali territories, nor do they advocate for any outcome in the definitions of territorial boundaries or citizenship. Our choice of wording in this document reflects an attempt to give equal voice to all people of the region. To the extent possible, regions will be referred to individually, to include "South Central Somalia," "Somaliland," and "Puntland" as well as all individual regions. Where we must be more inclusive, this report will refer to "the Somali region" as a whole or "Somali regions" to refer to the separate regions. This should not be construed to include any part of other countries in the region. Many international organizations do not collect or analyze data that reflect the multifarious Somali political designations or preferences of Somalis and thus data will first refer to the above designations and secondarily to the unit of analysis included in the cited works, which might include the term "Somalia" etc. to refer to the entire region, as for example, when referring to population statistics provided by the United Nations. The images used in this document will similarly avoid contested designations of territory.

services including energy, export commodities such as livestock and agricultural products, mobile technology, and, recently, renewable energy technology and services. But more needs to be done. In keeping with the spirit of resilience and innovation among Somali entrepreneurs, multi-stakeholder coordination could help fill some of the key market and regulatory gaps through (1) the sharing of lessons learned and other non-proprietary information; (2) greater coordination of markets including improved integration, where appropriate, across sectors and between private and donor-funded projects to create energy solutions for more Somalis; (3) joint purchasing of imports for better rates; (4) collective drafting of regulatory frameworks for consideration by the government; and (5) where appropriate, coordination of infrastructure investments that benefit multiple stakeholders.

In pursuit of these objectives, the purpose of this report is to provide a common operating picture based on diverse information collected from renewable energy experts, development actors, donors, and Somali businesspeople in the traditional and emerging renewable energy market. This report updates but draws heavily on the previous Powering Progress report, written by Dr. Jami Nelson-Nunez. The first section distills some key problems in the Somali energy market, including issues of access, affordability, and reliability as well as an in-depth exploration of the economic and social costs associated with these issues including constraints on the economy, environmental damage, and ineffective service provision. The second section explores the benefits to the economy, society, and individual families from increased electrification, the potential of renewable energy sources to contribute to Somali development, as well as some exciting technological innovations powering the renewable energy revolution. The third section of the report outlines some key trends in the Somali region's energy sector and profiles the eighteen firms contacted for this study including their accomplishments and plans for the future, as well as their perceptions of the business and regulatory environment that inform their decisions. This section ends with a survey of five major donor-funded programs that include renewable energy and an analysis of their likely impact in the Somali region. The fourth section ends with an in-depth appraisal of the investment climate and facilities available to Somali firms in the energy sector. The final conclusions and recommendations section explores some of the key avenues to increasing the share of renewable energy in use in the Somali region and improving coordination among all stakeholders.

This report helped inform the SREF 2016 and provided a platform for more educated discussions among and between relevant stakeholders. We expect that effective

Attendees of the Somali Renewable Energy Forum 2016.

coordination and increased cooperation will pay dividends from increased market value of individual firms to greater affordability of and access to energy for Somalis throughout the country. To facilitate multi-stakeholder collaboration, the SREF 2016 included as many relevant voices as possible, promoted the development of a more cohesive vision for the future of the Somali energy sector, explored advances in technology and technical skills, strengthened investment opportunities, and identified best practices in the renewable energy sector previously unavailable in any other venue.

Methods

From December 2015 to January 2016 OEF/Shuraako researchers conducted interviews with seventeen private sector firms throughout South Central Somalia, Somaliland, and Puntland, collecting data on the capacities, business models, and challenges facing Somali IPPs and retailers. Of these, fourteen were IPPs, several of which had installed or were planning to incorporate renewable energy into their operations. All told, these IPPs provide electricity to at least 116,933 connections,[b] over 43% of the region's low estimates of 270,000 users.[4] On the higher end of the range,[c] the OEF/Shuraako survey contacted firms possibly representing 287,725 connections, more than 100% of the African Development Bank (AfDB) estimates or, conversely, 42% of the estimated 679,073 connections based on UN population and electrification figures available.[d] An additional cohort of five donor and NGO/implementing partners working in the Somali energy sector, including with renewable energy, were surveyed.

b The OEF/Shuraako survey failed to collect all relevant data from all respondents. As a result, some of the largest IPPs were left out of this and other calculations, including for Mogadishu, the region's largest market.

c If we estimate that BECO in Mogadishu is at least 80% of the market there, as referenced in recent interviews, out of a total urban population of 1,280,939 (UNFPA, p. 31), with an average household size of six, BECO's market share would be about 170,792 connections. If we add this to the OEF-confirmed number of 116,933, we arrive at at least 287,725 connections.

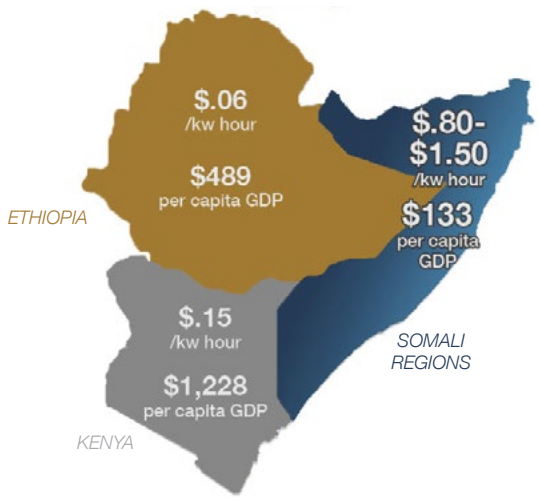
d See section below for details on this figure of 679,073 connections in the region.

The firms' representatives were purposely sampled by OEF and contacted by email, telephone, and in person by Somali research staff.[e] The survey was conducted in two parts, one "for attribution" that detailed each firm's business operations and a second "not-for-attribution" (anonymous) survey that yielded mostly numeric data on perceptions of the energy market and business environment in the Somali region. This is the second iteration of the Powering Progress report, first published in January 2015, but it is the first to include this representative survey. A second iteration of the survey will attempt to gather more qualitative data as well as confirm and expand the sample to more regions of the country and contribute to Powering Progress III, to be released in winter 2016–2017.

THE PROBLEM:
Counting the Costs of the Somali Region's Energy Deficit

Throughout the last several decades of conflict in the Somali region, efforts by local communities, the Somali diaspora, a vibrant local private sector, and key donors have kept the country afloat and planted the seeds of a resilient and stable economy. An impediment to further progress, however, is the amount of affordable energy needed to power sustained growth. While these actors have kept the lights on at night in many places, detailed below, little more has been possible. With the region's grid infrastructure decimated by decades of conflict and isolation, the generation, transmission, and storage of electricity are among the least efficient and costliest in the world.

Per Capita GDP and Average Electricity Tariffs



e All respondents consented in written or verbal form to be interviewed and have their "for attribution" responses made public.

Limited Access and the Rural-Urban Divide

The Somali region suffers from three major problems related to broad-based electrification that are only now beginning to be addressed: lack of access, high costs, and low reliability. Only a fraction of households and businesses in the country have access to electricity, and that access varies widely by region and by settlement pattern. Although reliable statistical information about energy in the Somali region is generally unavailable and extremely unreliable,[f] the World Bank estimates that 32.7% of Somalis have access to electricity, which is up from 29.1% just last year.[5] With the United Nations Population Fund (UNFPA) 2014 population report citing a total of 2,076,677 households, the figure for electricity access should be about 679,073 connections for the whole region.[6] However, other estimations do not give as rosy a picture. The 2014 African Energy Outlook estimates that less than a quarter of the population has access to electricity.[7] Even worse, a recent energy needs assessment by the AfDB based on firm-level reportage of electricity statistics provides a grand total figure of 270,000 connections (households and businesses) in the Somali region with access to electricity.[8] If the overall population is 12.3 million,[9] this leaves only 13% of Somalis with access to electricity. Therefore, the range of possible connections is between 13% and 32.7% access to electricity based on current best estimates.

These estimates also obscure a significant rural-urban divide. Electrification in rural areas is nearly nonexistent, though some off-grid renewable energy solutions will be discussed below. In urban areas, electrification varies significantly by region. Recent optimistic estimates for Mogadishu and Hargeisa are 60% and 68% of the population, respectively, while smaller cities, like Merka, have only 23% connected to electrical services.[g] Estimates of access to electricity are probably overstated in areas with higher numbers of internally displaced people who are harder to track. Indeed, according to the authors of a recent study billed as the "first population study" of Mogadishu in twenty-five years, the city's electrification rate is only 46%.[10]

f Data of most kinds are scarce for the Somali regions, where even reliable GDP estimates have been difficult to ascertain. This report includes statistics obtained with as much diligence as possible given the lack of data about the country; however, all statistics cited should be used cautiously.

g The Somaliland Energy Policy (2010) lists the urban average in the region at 68%. In the World Bank paper "Addressing the Electricity Access Gap" coverage for sub-Saharan Africa was estimated at 57.5% on average in urban areas while rural electrification stood at only 11.9% in 2008. Also see "Somalia 2012 on the REEEP Policy Database at http://www.reegle.info/policy-and-regulatory-overviews/SO (accessed December 3, 2015).

The High Price of Electricity Tariffs

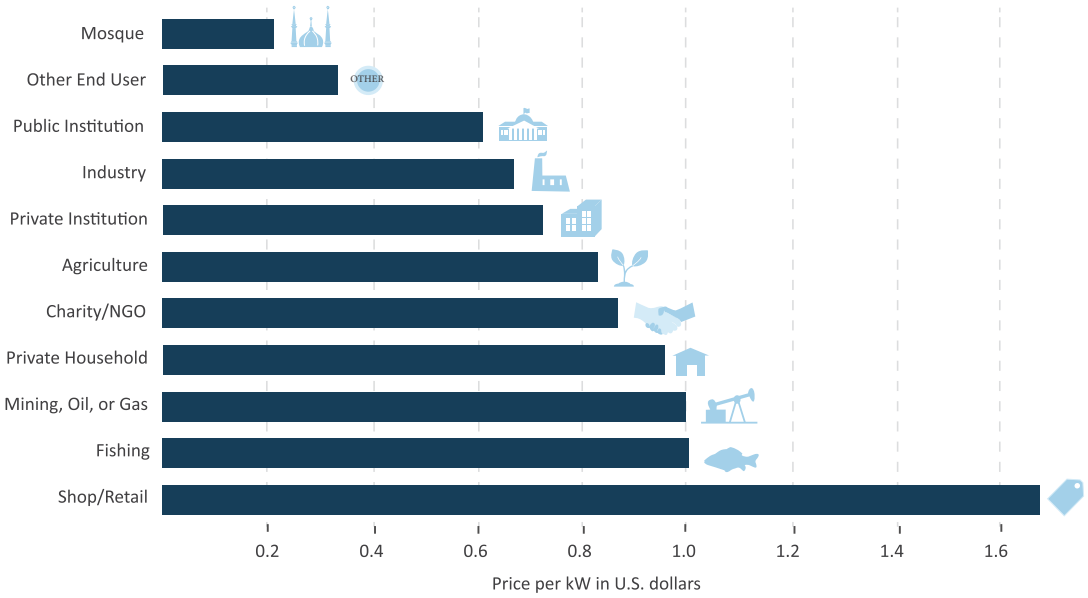
IWhile the extent of urban electrification is actually higher than comparable cities in sub-Saharan Africa, particularly in Mogadishu and Hargeisa, the rates paid by businesses and households are among the most expensive in the world, with "tariffs" varying from $0.80 to $1.50 per kilowatt hour.[11] Comparatively, neighboring Kenya and Ethiopia are far less expensive, enjoying average rates of $0.15 and $0.06 per kWh, respectively.[12] Not only are Somalis paying substantially higher tariffs for electricity, but they are also earning substantially less. The Somali region's estimated GDP per capita in 2013 was $133, a fraction of that in Ethiopia ($489) and Kenya ($1,228).[13]

Wide variation in electricity tariffs within the Somali region is explained by geography, infrastructure, and differential pricing by energy providers. Consumers in locations far from urban centers typically pay the most in energy costs.[14] Within cities, tariffs vary between providers and most use tiered rates among their own customers. For example, according to the majority of respondents in OEF's recent survey of energy providers,[h] larger customers pay less (according to an economy of scale) as do public and some private institutions like government offices, charities, and hospitals, while mosques often pay nothing. While this tiered system amounts to a subsidy provided by private households, such arrangements also help fund public goods. Although unorthodox by developed-world standards, in environments lacking legitimate tax-and-spend capacities, such subsidies in fact constitute a kind of public utility tax and likely contribute to state-building.

Inefficiencies in Traditional Power Generation

As high as these rates seem, they are not unreasonable given the costs for electricity producers in a postwar environment and in fact only earn IPPs modest profits.[i] A lack of scaled, interconnected, or high enough capacity grids resulting in major transmission losses, as well as the fluctuating cost of diesel, contributes to the high cost of producing what little electricity comes to market in the Somali region. IPPs rely almost solely on imported diesel fuel, which contributes to unpredictable electricity prices and local air pollution. According to the GIZ International Fuel Prices Database, the compound annual growth rate of diesel costs in the Somali region from 2002 to 2008 was 24%, rising from $0.29 per liter to $1.15 over that short time period. The Somaliland government estimates that more than 100,000 liters of diesel fuel is burned daily in Somaliland. The cost of fuel is estimated to eat up 60–65% of IPPs' revenues. The price chart on the following page shows

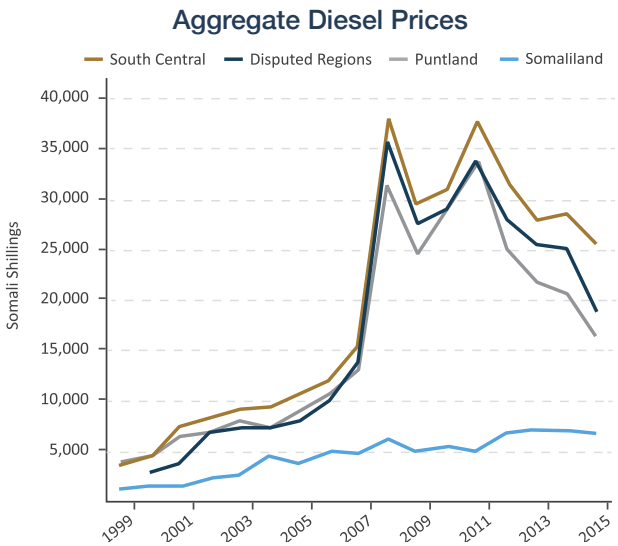
Per Capita GDP and Average Electricity Tariffs



h Ten out of the thirteen IPPs interviewed chose to disclose information about their customers including type, number by type, rates paid by each type, and amount of energy used by each type. Not all IPPs gave complete information.

i See The Landscape of Electricity Provision section below for details on aggregated company profits and losses.

aggregate[j] regional diesel prices broken out by territory.[15] This graph clearly shows the price advantage that the western-most regions of Somaliland enjoy. However, these regions are also the leaders in renewable energy adoption, likely the result of a combination of access to technology and capital and the still-high price of diesel. The rising price of diesel has made it increasingly difficult for IPPs to operate at a profit, a struggle that is exacerbated by theft through illegal connections that are hard to identify given the state of infrastructure. The burden of high prices, felt by both consumers and providers, exacerbates the public perception of profiteering in the context of a massively inefficient delivery system.



Source: FSNAU

Most diesel generators in use are refurbished and purchased from Dubai. One of the few studies surveying the electricity sector in Somaliland found that only 13% of the generators were purchased as brand new and thus the majority in use are inefficient.[16] Moreover, the quality of the distribution systems is low. Most cities have neglected grids that run on medium- and low-tension power lines (see below for details).[17] These systems lead to much higher losses of power than in the developed world. In Somaliland, for example, power losses are, on average, 25% with some IPPs losing more than 40%.[18] The AfDB states that throughout the Somali region, grid losses as high as 50% are the norm.[19] The map below depicts a sample of regional electrical transmission losses, including local Somali electrical grids and her neighbors. A loss of 40% of power from inefficiency is nearly four times higher than the average rate of loss across African countries and twice the average rate of loss among fragile and conflict-affected countries around the world.[20] When generators break down, IPPs are faced with the cost of sending the equipment back to Dubai to be repaired or, in some circumstances, paying the costs of a visit from a technician from Dubai.[21]

The inefficiencies stem not only from aging equipment and poor infrastructure but also from the lack of monitoring equipment and expertise. Operators need more technical know-how to be able to understand load estimations and how to optimize systems. Many IPPS are not sure of how much electricity they are generating because their systems do not have motor controllers.[22] Metering electricity usage is impossible for most IPPs so instead they charge for the number of light bulbs or other appliances in use. Vendors in Hargeisa pay around $10 each month to light a 100-watt light bulb.[23] This provides little incentive for end-users to buy more energy-efficient products, contributing to overall inefficiency and driving up electricity costs.[24]

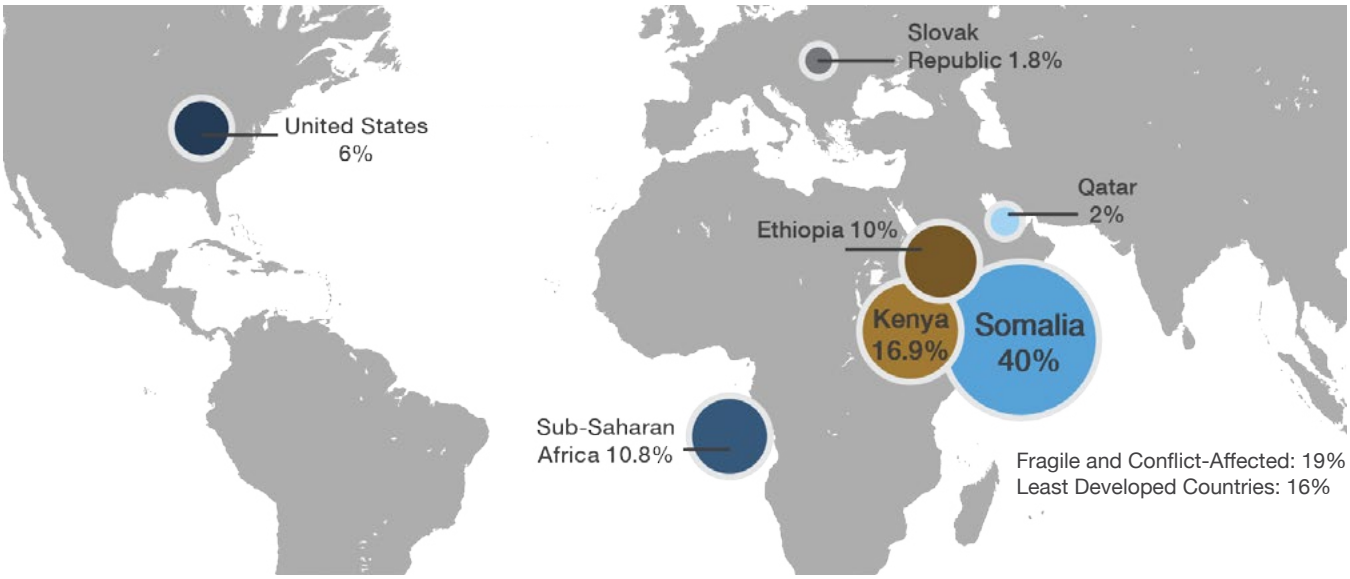
Unreliable Infrastructure

One final but no less important problem with the Somali region's electrical supply is its extreme unreliability. The conflict in South Central Somalia and Puntland has taken a particular toll on electrical infrastructure in urban areas.[25] Looting and shelling during the civil war destroyed the government-owned power plants and unified grids that lit urban areas. Somali infrastructure is hardly alone. According to a World Bank–sponsored study, "power is Africa's largest infrastructure challenge by far."[26] Shortages and outages plague the Somali region's frail networks due to limitations in existing infrastructure. Transmission and distribution networks are mostly improvised at the local level, strung without regulation, and often by technicians without professional training. The power lines are mostly low-tension, with average voltages of 400V–220V, but at times as low as 220V–150V, force that does not carry far from its source. Considering the distances often covered by makeshift power lines, such low voltages are commonly experienced as failing appliances and flickering lights.

The lack of interconnection between generators also contributes to high prices, inefficiency, and low reliability. In cities with multiple IPPs, electricity is supplied on numerous, haphazardly strung networks, referred to as a "radial" system.[27] This drives up costs because providers are unable to achieve efficiencies of scale and because individual systems are unable to offset each other or work together during peak demand. Connecting existing generators requires significant investment in infrastructure and research, such as a synchronization facility for each

j Data were gathered from the Food Security and Nutrition Analysis Unit's (FSNAU) Integrated Database System (IDS). Regional averages were derived from mean annual diesel prices for every region in Somalia from 1999 to 2015. Some values were missing.

Electric Power Transmission and Distribution of Losses



generator, and system stability studies.[28] While expensive, these steps more importantly require cooperation among IPPs that is only beginning to take shape in the largest cities where consortia of IPPs are consolidating the grid.[k] The SREF 2016 is a step toward such integration and seeks to facilitate ongoing dialogue among diverse stakeholders to achieve this objective.

Limited Consumption

The problems of limited access, high cost, and unreliability explain why the local consumption of electricity, while rising, is among the lowest in the world. Net consumption of electricity in 2012 was 288.3 million kilowatt hours (kWh), placing Somalis in the bottom quintile in the world.[29] Consumption per capita paints an even direr picture. Somalis' 28.7 kWh use per capita is a mere 1% of the world average (2,798 kWh), half that of Ethiopians' usage (57 kWh), and only 19% of Kenyans' usage (153 kWh).[30] To put this further in perspective compared to American consumption, the average Somaliland electricity user, already a privileged minority, uses only 3–7% of the energy of an average U.S. consumer, while Somali per capita consumption as a whole may be only 0.2% of that of the average American user.[31]

Unsustainable: Evaluating the Somali Region's Biggest Energy Source

Without affordable or reliable access to electricity, Somalis continue to rely on biomass for basic needs. Biomass accounts for 96% of energy sources in the country including organic fuels like wood, charcoal, and animal waste.[32] Charcoal remains the primary fuel as electricity or alternative fuels remain uncompetitive in cost and accessibility, leading to compounding environmental, economic, and public health problems.[33] An estimated 2 million bags of charcoal are consumed throughout the Somali region each year, contributing to the devastation of local forests.[34] Overexploitation from domestic charcoal use and illegal exports, including those that fund armed groups like Al Shabaab, has reduced forest cover in the Somali region from an estimated 60% in 1985 to 10% in 2001, a stunning reduction that continues at an increasing rate.[35] At the same time, costs for charcoal have more than quadrupled since 2007, cutting into the incomes of Somalis, sometimes eating up more than half of households' monthly income.[36] Moreover, the use of charcoal poses significant health risks for families including pulmonary diseases like child pneumonia and lung cancer.[37] The World Health Organization estimates that indoor pollution–related deaths throughout the Somali regions exceed 11,000 per year.[38]

Constraints on the Economy

While the energy deficit in the Somali region is undoubtedly a major human development problem, the evidence below suggests that it is also the biggest constraint on economic growth, surpassing violence, corruption, and a lack of land or capital. The penalty of electrical outages and unreliable service on productivity in the developing world more broadly leads to substantial aggregate effects on economies.[39] In

k See below in Landscape section for details.

Burao after dark.

Africa, the unreliable electrical supply can cost an average of 1 to 2% of GDP per year as businesses are forced to shut down operations when the power goes out.[40] Fragile and low-income countries like the Democratic Republic of Congo and Malawi (and presumably the Somali region) lose up to 4.5% of GDP per year through underpricing, unaccounted losses, and collection inefficiencies in the energy sector.[41]

These challenges have forced businesses to cut back on local production and some have even relocated to neighboring countries like Ethiopia, where large-scale hydroelectric and other efficiencies lower production costs.[l] When businesses close or relocate, short-term economic losses are not the only problem; such failures also scare investors.[m] This is especially so in fragile and conflict-affected states. For example, in Uganda, electricity access was seen as the greatest impediment to investment in the early years of recovery from conflict.[42] This experience is echoed in the World Bank Enterprise Surveys, which find that electricity is identified by businesses within fragile and conflict-affected states as the primary obstacle they face. Electricity even surpassed concerns with political stability and corruption.[43] In Somaliland, electricity was considered the third greatest obstacle to doing business by 500 firms (46%), only behind land and finance and worse than thirteen other obstacles including transportation and crime.[n]

The energy deficit in the Somali region weighs heavily on the economy, the environment, and the provision of basic services, which further erodes public confidence in government, stability, and the international community. But could an opposite dynamic take hold? We believe that affordable, accessible, and reliable electricity, much of which can come from hybrid generation using renewable sources, has the potential to transform the Somali region and help build much needed legitimacy, stability, and economic growth. While substantial investment in powering the Somali region will take time and coordination, and will strain existing capabilities, the resources for such a revolution—the capital, leadership, and market experience—already exist to some extent and are growing rapidly. But several questions need to be addressed: Can generation be scaled to levels that will power industry? How can Somali entrepreneurs connect with foreign and diaspora investors to capitalize on their initiative? Will biomass fuels be replaced or continue to supply the majority of Somalis' energy needs? And how can the private sector, donors, and civil society better integrate renewable energy into the traditional electricity mix? The next section will examine the potential for the energy sector to improve health, education, livelihoods, and security; detail how investment in this growing sector is proceeding; and explore how new developments in renewable energy technology and ways of doing business are catalyzing growth and investment.

THE PROMISE:
Realizing the Potential of Renewable Energy

Developing the Somali region's electricity sector has the potential to change the course of its development for the better. Expanding energy access in the country has the potential to increase= the productivity and competitiveness of Somali businesses, contribute to alleviating poverty (both of which could lead to increased investment), likely improve health and education outcomes, and bolster security. Investing in electricity can help grow new and existing businesses and can have a strong economic multiplier effect. This is due in part to disruptive new technologies and ways of funding development, but it has as much to do with the ingenuity and perseverance of the Somali private sector. This section briefly catalogues some of the key benefits that increased electrification will have on Somali society and the economy; maps the sources of renewable energy and the investment landscape; and considers the technology, both administrative and technical, that could

l The survival of businesses is a major concern. Somaliland's National Industry Association found that thirty-nine of the fifty-four small and medium enterprises registered with the government failed. See the Somaliland Investment Guide, also cited by Schwartz (2014). However, among small and medium energy-related firms that OEF/Shuraako surveyed, half of them were established over five years ago, with some reorganizing, renaming, or becoming operational within the past five years. The oldest two are twenty-five and fifteen years old.

m For details on investment in the Somali energy sector, see below.

n Forty-six percent of respondents felt that electricity was a "moderate" to "very severe" obstacle to doing business. From Business in Somaliland: What Can the Data Tell Us? (Broomfield, CO: One Earth Future Foundation, 2012). N = 500 conducted in Somaliland depicting firm-level behavior and perceptions.

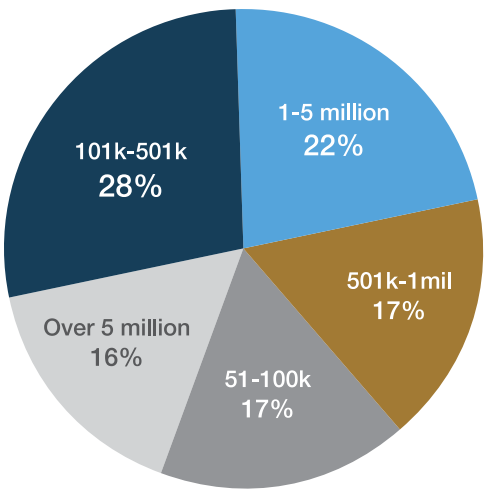
be used to exploit those resources in order to achieve these developmental milestones.

The Potential

Growing the Economy, Reducing Poverty

The Somali region is not the first case of developmental lag owing in part to an energy deficit. Nor is it consigned to perpetual underdevelopment. In multiple studies from throughout the global south, electricity access has demonstrably increased agricultural and manufacturing productivity and can yield opportunities for new business creation as well.[44] In South Africa, new access to electricity led to the creation of micro, small, and medium enterprises.[45] While large-scale, donor-funded infrastructure projects typical of some post-conflict reconstruction environments are unlikely in the short term, this might in fact spare the Somali region the massive future costs, foreign debt, and negative externalities often associated with these projects, especially those that are implemented too early or without consultation with a range of stakeholders. Instead, the Somali region will likely continue to develop at its own pace, and with smart investments in the energy sector, it can emerge as a leader in bottom-up development.[o]

Earnings Ranges for Somali Energy Firms
N = 18



Somalis have a strong track record of entrepreneurship and business-led development that rivals the centrally planned efforts of her neighbors. The telecommunications sector, for example, was built rapidly over the past few years and has become the leader in the region. While only 18% of the population were mobile subscribers in 2011, current telecommunications penetration rates are between 51% and 58%, with reportedly better and cheaper service than is found in the region's more stable neighbors.[46] South Central Somalia connected to its first fiber optic broadband Internet in 2013–2014.[47] Profits are also promising. Of the eighteen sampled energy firms in the OEF/Shuraako study, seven earned between $1 million and $5 million per year with three earning over $5 million per year. The majority of firms (ten) earned over $500,000 and none brought in less than $50,000 per annum, a healthy return in a country deemed one of the world's poorest. The vast majority of these firms (fifteen out of eighteen) incorporated or began operating since 2007, signifying rapid growth in a market that is in no danger of saturation. Nonetheless, some have been operating continuously since 1991, a fact that will not be lost on investors looking for longevity.[p] These findings signal a healthy appetite for risk and growth among businesses in a country long used to taking care of itself.

But it is not only business that will benefit from growing access to sustainable electricity. Improving access and affordability will help the country address poverty by increasing household incomes. Access to lighting alone would extend the work day, increasing household productivity and encouraging the establishment of homebased businesses. A 2002 World Bank study in the Philippines calculated that electricity access increased monthly household income by $81–$150.[48] Similarly, a 2009 study in Bangladesh found that electricity access caused a 12.2% increase in household income.[49] In 2005, the UNDP found that rural electrification in Mali led to a $0.32 increase in daily income and raised the annual average income of women by $68.[50] The improvement in household income in turn affects poverty, as has been shown in Tanzania where electricity access reduced household poverty between 4 and 13%.[51]

Supporting Effective Service Provision, Boosting Legitimacy

The successful provision of basic services such as education, health care, water, and sanitation underpin the development of the Somali economy and perhaps even the fragile legitimacy of the federal government.[q] In turn,

o A significant aspect of this decentralized and informal style of doing business is the self-governing principle adhered to among businesses and other groups. OEF considers this a form of governance and is working to support efforts at state formation that rely on citizen, business, and civil society efforts. See OEF's research director Conor Seyle making the case for Somali self-governing achievements here: Conor Seyle, "Making Somalia Work: Governance Without Government," Foreign Affairs (December 10, 2015), https://www.foreignaffairs.com/articles/2015-12-10/making-somalia-work.

p See footnote h for details.

q The notion that effective service delivery will help boost the federal government's legitimacy is not without problems. According to one study, the legitimacy a government derives from providing services is "non-linear" and is "affected by shifting expectations of what the state should provide, subjective assessments of impartiality and

many of these services are made possible through the reliable and affordable supply of electricity. Electricity can improve education outcomes by extending the number of hours students have to study and providing access to the Internet. In Nepal, the extension of electricity services to communities improved literacy rates by 11%.[52]

Customers at a stall powered by a diesel generator.

Investments in electricity will also improve public health. Hospitals and health clinics need electricity for lighting, vaccine refrigeration, surgeries, and pumping water. Positive health outcomes, particularly for women and children, contribute to a healthy society and economy by reducing drag on families and communities from disease, allow for better family planning, and boost the productivity of the nation. Many vaccines, like the one for polio, require refrigeration and the lack of electricity access in clinics makes national vaccination efforts more difficult. Currently, only half of the few clinics that are capable of conducting surgeries have access to electricity.[53] Those that do have electricity struggle with unreliability including blackouts in the middle of surgeries. Even those hospitals that have electricity are paying high premiums that cut into their ability to serve the public. For example, prior to the installation of solar photovoltaic (PV) panels at the hospital in Burao, the hospital paid $6,000 per month for electricity according to the UNDP.[54]

Electricity is also critical for security services, most directly by lighting streets at night but also for powering police stations and checkpoints, charging cell phones for contacting emergency services, keeping computerized records, and lighting detention facilities. In Senegal, street lighting brought communities to life after dark, making streets safer for citizens for more hours of the day.[55] Many Somali cities, including Mogadishu, Beledweyne, Bal'ad, Jowhar, Kismayo, and Galkayo have newly installed solar street lighting due to support from the Nordic International Support (NIS) Foundation.[56] News coverage of newly installed street lights showed crowds of people on the streets at night where few had felt safe to go.[57]

Sources of Energy

Whether traditional fuels such as diesel or kerosene, large-scale hydroelectric, or renewable sources like solar and wind, the ability of Somalis to access energy is growing constantly. Enabled by innovations in technology and new avenues for financing its acquisition, and emboldened by the cost and volatility of global fuel prices, new approaches to accessing energy are growing. The following section analyzes the potential for new energy sources to invigorate the energy sector in the Somali region and suggests ways forward for the near and long terms.

Diesel and Heavy Fuel Oil

As mentioned above, most IPPs operate older and refurbished diesel generators, which are fairly inefficient and can be difficult to repair. However, some IPPs are investing in modifying existing systems to make them more efficient, replacing old generators with newer ones, or modifying existing generators to enable them to use cheaper fuels. Such renewal and renovation are already helping to address the inefficiencies of IPPs in Somaliland.[58] In the south, the country's largest energy producer, Banadir Electric Company (BECO), which supplies most of Mogadishu, is reportedly switching to heavy fuel oil (HFO), a cheaper though potentially dirtier and less efficient oil used as a maritime bunker fuel. Such a move is intended to bring down the costs of generation in order to pass those savings on to consumers, according to BECO's general manager, Abdullahi Hussein Kahie.[59] Such innovations among IPPs are important because carbon-based fuels are likely to remain the dominant energy source in the Somali region for the foreseeable future.

distributive justice, the relational aspects of provision, how easy it is to attribute (credit or blame) performance to the state, and the technical and political characteristics of the service." This may be especially so in South Central Somalia where the writ of the government often does not extend outside the capitol and is seen as particularly corrupt, and where the private sector has taken the lead to produce many of those services. However, if services remain absent, any government will have difficulty enjoying much legitimacy in communities blighted with poor education, lighting, water, sanitation, health care, or, especially, security. See Claire Mcloughlin, "When Does Service Delivery Improve the Legitimacy of a Fragile or Conflict-Affected State?," Governance: An International Journal of Policy, Administration, and Institutions 28, no. 3 (July 2015), 341–356.

Large-Scale Hydroelectric Power and Regional Integration

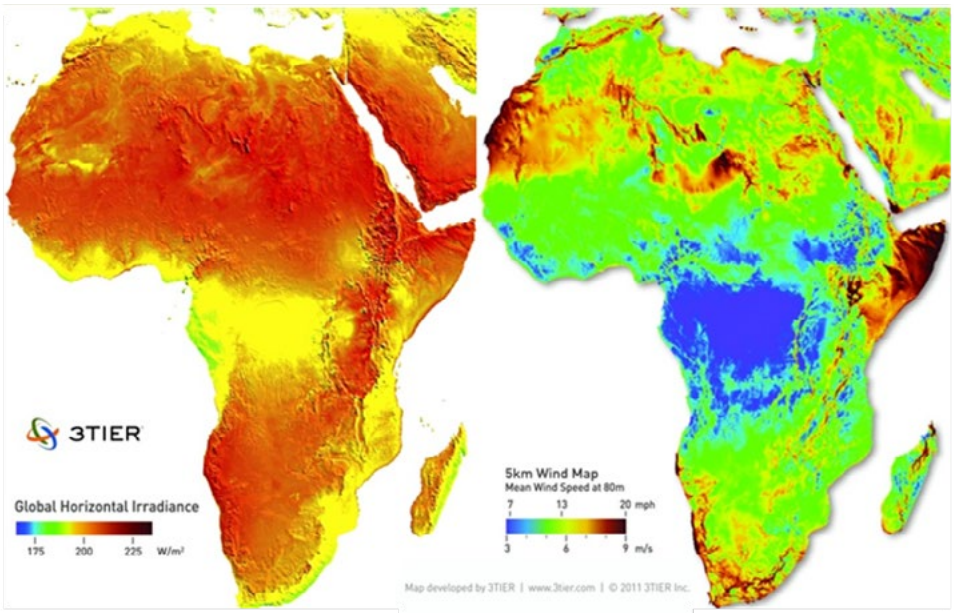
There is an ongoing effort to create regional, cross-border power-sharing networks throughout Africa, though it is not clear to what extent these may help the Somali region. Less than a year ago, the World Bank pledged $200 million to create a regional transmission network, connecting the West African nations of The Gambia, Guinea, Guinea-Bissau, and Senegal in a common energy market.[60] The Eastern Africa Power Pool (EAPP), a similar project for Eastern Africa, was launched in 2005 but does not presently include Somalia or any Somali regions. One opportunity for the Somali region, and much of the driving force behind the EAPP, is connecting to Ethiopia's mostly hydroelectric power grid, which would dramatically reduce energy tariffs and provide a level of reliability unfathomable at present. Ethiopia is one of the region's energy powerhouses and already exports energy to Kenya, Sudan, and Djibouti. Somaliland appeared to be on track to benefit from Ethiopia's more than 2 gigawatts of generation capacity—Somaliland and Ethiopian officials discussed energy sharing and penned trade agreements in 2014—but little progress seems to have been made. The problem of course is that the members of the Somali region lack unified national grid systems, finance facilities, or even central regulatory bodies with which to do business. Should Somalia or Somaliland ever become a viable member of the EAPP, they might be eligible to participate in the Africa Clean Energy Corridor, an initiative in both the EAPP and the Southern African Power Pool (SAPP), to promote "the accelerated deployment of renewable energy" in the member states.[61] This effort, spearheaded by the International Renewable Energy Agency (IRENA), provides support for member countries to plan and implement grid integration that favors renewable sources and creates enabling conditions for renewable energy investments.

Wind

The Somali region is particularly well endowed in wind and solar energy resources. According to an analysis by the African Development Bank Group, the Somali region has the highest potential of any African area for onshore wind power.[62] A recent World Bank document asserts that the potential for onshore and offshore wind power throughout the Somali regions, along with tidal and wave power on the Somaliland coast, could generate more power in the long term than the hydropower potential of Ethiopia.[63]

Although wind speeds vary seasonally in the Somali region, according to a study of NASA data, wind speeds are sufficiently strong throughout the year to support wind-generated energy.[64] A commonly cited statistic is that half of the country has wind speeds greater than 6 meters per second, which are excellent for electric energy production.[r] But these statistics might even be in the low

Global Mean Solar Irradiance and Wind Speed



r In an effort to generate reliable data confirming these findings, four wind-monitoring stations have been built in Somaliland with support from USAID's Partnership for Economic Growth.

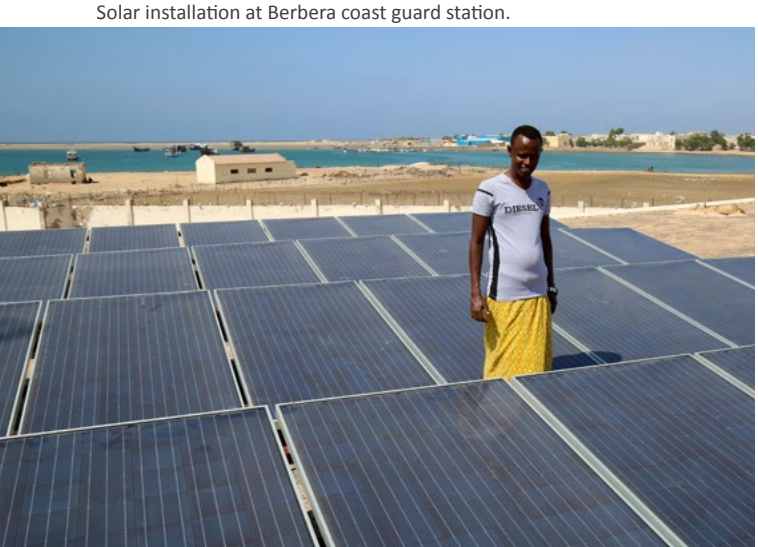
end of the range. Although concentrations differ by region with Somaliland on the low end for wind, the embedded map shows mean wind speeds in excess of 9 m/s at 80 meters elevation (the height of a typical 1.5 MW turbine is 100 meters). The coastal region receives the lion's share of wind energy, with potentials between 30 and 45 GWh/km^2 throughout most of coastal South Central Somalia and into the interior by some estimates. This represents as much wind energy in four square kilometers as the entire Somali region currently produces with diesel and hybrid generation.[s] At these scales, wind energy appears to be a resource that could help meet a significant portion of the Somali region's energy needs. However, scaling wind power to this level would require onerous infusions of generation, storage, management, and distribution technology, a highly skilled workforce, and infrastructure and equipment to install and maintain these systems. These issues will be explored in greater detail below.

Solar

Solar energy is similarly abundant in the Somali region and is an increasingly popular option for rural communities, individual businesses, and facilities as the capital and technical skill required to exploit this resource are much lower than for wind. Unlike wind, which is stronger along the central coast, the most solar irradiation accrues to the north in Puntland and Somaliland. Referring again to the map above, horizontal solar energy is at least 200 W/m^2 over most of the Somali region, equaling roughly 200 kW/km^2. The Somali region gets on average 2,900 to 3,100 hours of sunlight per year.[65] It has one of the highest daily averages of total solar radiation in the world.[66] According to one local measure, the yearly average solar radiation for Hargeisa is 6.4 kWh/m^2/day.[67] Furthermore, the average yearly temperature in the country is 27°C, a reasonable temperature to permit a satisfactory operation life of solar PV systems.[68]

s Based on data from the European Commission's African Renewable Energy Technology Platform (AFRETEP), http://capacity4dev.ec.europa.eu/afretep/minisite/maps-and-data-sources. Calculations based on an average six-hour day of electrification in a 365-day year.

Solar installation at Berbera coast guard station.



Competitiveness of Renewable Energy

Not only are wind and solar both plentiful in the Somali region but they are becoming increasingly financially attractive as well, both in competition with other sources like diesel and also in their own right due to technological advances. Renewable energy costs have come down a great deal in the last few years due to a number of factors.[69] Improvements in efficiency and the falling cost of finance have brought prices down for solar photovoltaic (PV) modules by more than half between 2008 and 2011.[70] Moreover, projections of future prices are optimistic given the pace of technological advancements. For some microgrid options,[t] the "levelized" cost of solar PV reached equilibrium with that of diesel power in 2011, possibly indicating a major milestone.[u] Global prices for wind turbines have also declined since a peak in 2008.[71] The costs of importing renewable technology into the Somali region have followed the global trend and are falling, according to local sources.[72]

Few studies comparing the costs of diesel and renewable energy sources in the Somali region exist. One helpful exception is a study by Abdilahi et al. using HOMER software[v] to model a comparison between diesel-based and hybrid systems in Hargeisa. In their simulations, they find that diesel-based power systems are 1.5 times more expensive than hybrid systems that supplement diesel with wind and solar.

t Microgrids are systems that include energy generation, transmission, and distribution to multiple users. They can vary in their characteristics, sometimes connecting into larger grids and other times operating like isolated islands, as they do for most Somali IPPs. Microgrids can be used in a variety of contexts, such as systems that are used as backup generators when electricity provision is unreliable, to rural villages like mini-utilities. For a good explanation of microgrids, see the following blog by Marilyn Walker at HOMER Energy: http://microgridnews.com/microgrid-categories-quality-standards-training-capacity-building.

u The levelized cost of electricity is a measure used to compare different generating technologies factoring in the per-kilowatt hour cost of capital costs, fuel, operations and maintenance costs, financing costs, and an assumed utilization rate. To arrive at specific comparisons of the levelized costs of diesel versus other renewable energy options, a number of factors need to be considered, such as the need for battery storage, the cost of connections to grids, local costs of materials, and other inputs. The Renewable Energies for Remote Areas and Islands (REMOTE) report from 2012 includes a helpful discussion on this topic.

v HOMER stands for Hybrid Optimization of Multiple Energy Resources and is a computer model that intends to "greatly [simplify] the task of designing hybrid renewable microgrids." See more here: http://www.homerenergy.com/software.html.

The initial capital costs for diesel generators continue to be lower than wind- or solar-powered systems in the Somali region, but considering a longer-term investment horizon makes renewable energy options more competitive. The Somaliland government contends that the difference in net revenues between diesel and wind systems favors diesel from installation through the second year of operation. However, by the third year, investment favors wind by an increasing magnitude over the previous year.[73]

These comparisons make a strong case for wind and solar energy and most experts suggest that the best use of renewables is in combination with diesel or other carbon-based fuel sources (e.g., hybrid systems). In hybrid systems, diesel can offset fluctuations in power supply from renewable sources while wind and solar can significantly reduce exposure to fuel-price instability, thereby increasing energy security.[74] The following section explores some of the available options for renewable energy integration due to recent technological advances.

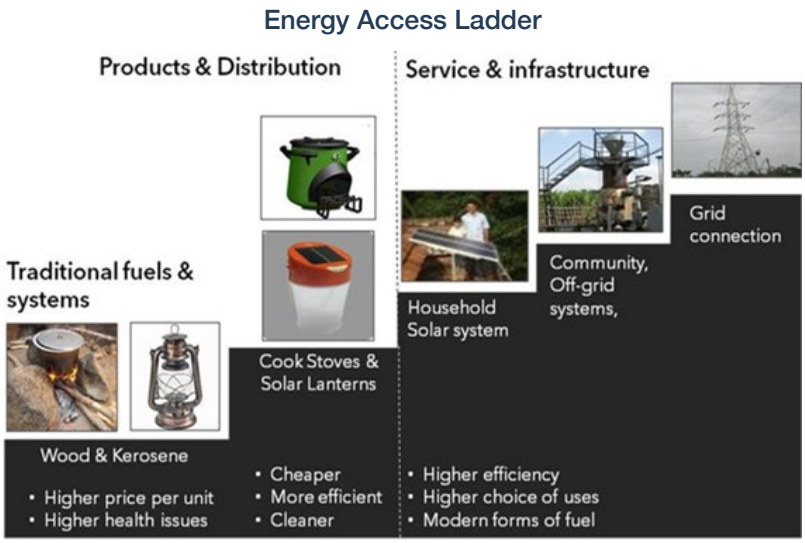


Image from the Acumen Fund.

Incorporating Renewable Energy Technology

Interest in renewable energy is growing everywhere but nowhere as quickly as in the developing world. The introduction of new technology is allowing once isolated communities to improve their quality of life in the absence of reliable national energy systems. Increasingly, communities are investing in off-grid renewable energy products from solar water pumps, stoves, street lights, and mobile phone chargers, to wind- and solar-powered facility systems and microgrids that can power municipal buildings, schools, airports, and hospitals. Renewable energy sources are increasingly being added to the combination used by IPPs, offsetting the drawbacks of diesel-based systems and lowering costs. This adds to their description by some as "disruptive technologies" that have the power to fundamentally change the energy balance in the coming decades. Some have even suggested that countries like the Somali region could advance beyond the industrialized world as early adopters of renewable technology. Echoing others, French President Francois Holland recently said[w] that countries in the developing world could "leapfrog" the West, skipping past an oil-dependent industrial economy straight to a clean energy economy.[75] For those who are not included in this modernization due to geographic and socio-economic disparities, appropriate technologies are already proliferating in the Somali region that allow poorer Somalis to move up the "energy access ladder" from bio-fuels to grid-connectivity (see figure).[76] This section will deal with both the physical technology that makes renewable energy accessible to more people and the administrative and funding innovations that could catalyze growth in the sector.

Off-Grid

There are several ways to address the energy deficit in the Somali region. The use of cleaner, more efficient cook stoves, for example, can help decrease charcoal use. Solar street lights, lanterns, and phone chargers for household use can mean increased security, working and studying hours in the day, and lower electricity bills. Solar stoves can decrease reliance on burning dirty biomass in the home, preventing respiratory diseases. For institutions, individual solar PV systems with inverters lower costs over the long term and provide reliable sources of power to augment their current supplies. However, for the 2.8 million rural and 3.2 million nomadic Somalis (23 and 26%, respectively) living disconnected from basic technology, the possibility of off-grid renewable energy is revolutionary. These communities are aided the most by these products, if financed and delivered in a sustainable way, which help reduce their isolation, giving greater access to health care, education, commerce, and the political process.

w Holland's remarks were delivered at the June 2015 annual meeting of the Organization for Economic Cooperation and Development (OECD) in Paris.

Solargen trade show booth at the Somali Renewable Energy Forum 2016.

There is great potential for these products given the lack of electricity in rural and peri-urban areas and the high cost of electricity in urban areas. There are more suppliers and innovators in the solar product market than ever before, and many of them are taking a social-responsibility approach. Examples are Divi Power, which has developed a pay-to-own system for small solar-powered products, and Nokero, a Denver, Colorado–based company that is producing high quality solar devices for households and businesses, such as solar lanterns and lighting for fishermen. These so-called Solar Pico PV systems, usually under 10 watts/12 volts, and under $100, are a budding alternative to big PV systems. Their simplicity allows non-expert users to benefit without outside consultants or maintenance. Small-scale wind-powered water pumps are already providing potable water for human and animal consumption as well as the game-changing introduction of irrigation.[77] Many of these product types are sold and installed by a number of Somali retail firms contacted for this study including Enersom, Golis, Kaafi, SECCCO, and Solargen.

Finally, in an exciting project that contains aspects of all these innovations, the BOSS project, or Business Opportunities for Solar Systems, aims to provide rural entrepreneurs in the developing world with affordable and complete start-up kits for a range of micro- and small-business ideas. These "plug and play" business ideas include the typical lighting and phone charging capabilities but also solar and wind grain mills, water pumps, entertainment stations, refrigerators for kiosks, and even mobile coolers for drink carts and the transportation of fish and vegetables.[78] Phaesun, the German firm that developed the BOSS project, has operations in fifty-five countries and retails in the Somali region through the Kaafi Horn Renewable Energy Company, one of the OEF/Shuraako respondents.

Hybrid and Microgrid Systems, and the Future of Renewable Energy Tech

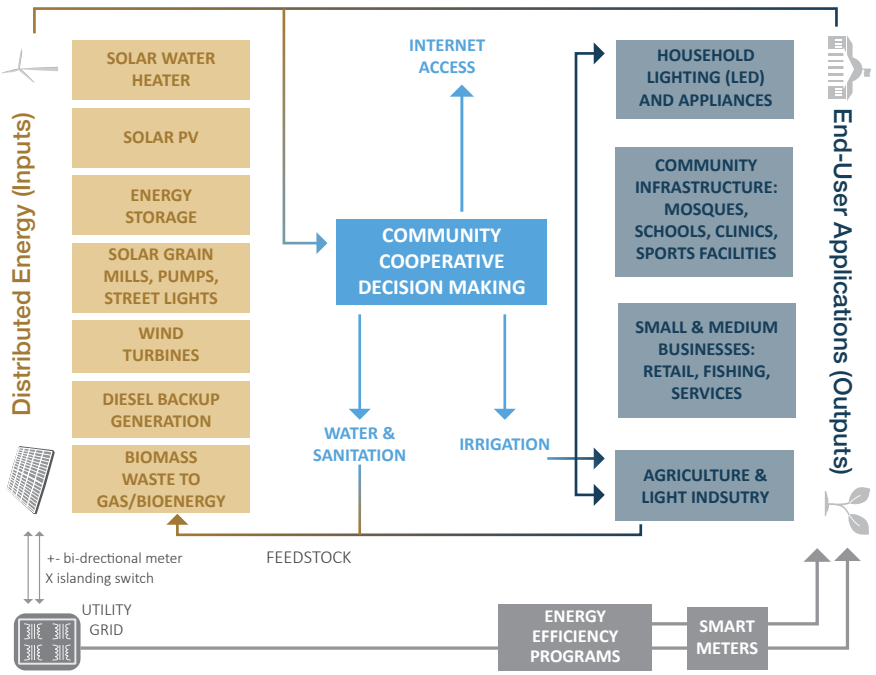
For IPPs already using diesel gensets, the gradual incorporation of renewables technology into their operations is likely the best approach for them and their customers. Hybridization promises lower costs in the long term and improved reliability in the near term by allowing IPPs to hold diesel in reserve to meet increased demand. Hybrid systems are on the rise globally and are already being used or planned by many of the OEF/Shuraako survey respondents. For example, Beder in Erigavo utilizes up to 30% wind in two locations, and LESCO in Lasanod has 12% renewable energy output at their largest generation site. An additional nine firms contacted for this study, nearly every IPP, have plans to incorporate renewables into a hybrid system. Five of these are specific plans or are already under way with deadlines in 2016 or 2017.[x]

In addition to the incremental and widespread change promised by simple hybridization of IPPs' diesel-based operations, the inception of microgrids (and smart microgrids) is one of the most important areas of renewable technology innovation. Microgrids are not very different from the way some IPPs function already, with several generation sites, company-owned distribution networks, a limited number of customers who are not connected to a macrogrid, and even some energy storage capacity. Microgrids on the other hand would ideally have several energy sources, including wind and solar, with diesel as a reserve energy source for use during peak demand. Additionally, installing a "smart" component would optimize even weak inputs by dynamically regulating the flow of electricity based on a whole-system approach. In a smart hybrid microgrid, solar PV and wind turbines would provide the base load of energy for the system, which would go through a series of connected inverters, smart-meters/switches and circuit-breakers, and then be distributed to storage (generally battery arrays), and end-users. Diesel generators would be used as backup at night, during times of peak demand, or when the sun isn't shining and the wind isn't blowing for significant periods of time. By making the system "distributed," individual households or institutions could contribute to the overall baseload with solar PV or wind turbine units. The smart-meter/switch component utilizes information technology to determine the best possible mix of supply and demand and apportion energy based on that automated analysis.

The following figure below depicts a comprehensive smart distributed hybrid microgrid plan for rural communities adapted from a concept by Ravi Vora at NREL. It shows the variety of inputs that might provide energy in this distributed system, feedback loops built into the system from a community decision-making body, and the diverse applications (outputs) that are supported by the system, including small businesses, agriculture, community

x See The Landscape of Electricity Provision in Somalia section below for details.

Smart Hybrid Conceptual Model



infrastructure, and of course individual households. This system is noteworthy because of its holistic approach, not only to energy generation, distribution, and consumption, but also its facilitation of community control over its resources, its responsiveness to local culture and needs, and for the sense of ownership it can create at the local level for all aspects of community development.

Globally, microgrids are among the most dynamic and fastest growing areas of renewable energy research and investment, which is projected to grow substantially by 2030.[79] Meanwhile, the components of microgrids are also developing quickly. Solar PV cells made of semiconductor materials like perskovite have shown confirmed efficiency improvements of 20%.[80] Another critical innovation for renewable energy is the improvement of energy storage. While Tesla Powerwall batteries are in the news, costs remain prohibitive ($3,500 for 10 kWh) for a market like the Somali region. However, according to a new study by the consulting firm AECOM, prices for lithium-ion and flow-batteries (a type of rechargeable fuel cell), are expected to drop by 60% and 40% respectively, by 2020, bringing the cost down to $200 and $350 per kWh.[81] Microgrids can work in a variety of contexts and represent a viable bottom-up approach, building a foundation that is compatible with long-term investments in energy-efficient communities and even national-scale grid networks.

Financing Renewable Energy for Consumers and Small Business

An important step toward increasing access to these products is to develop finance options that reduce the initial capital costs of investment for Somali entrepreneurs and consumers. For suppliers and partners outside of the Somali region, this could be done by supporting credit facilities through local financial institutions or directly to retailers. There are some innovative approaches for small solar lights and appliances, such as DiviLight, that enable pay-as-you-go plans. The development of pay-as-you-go models may allow electricity to better mimic telecommunications, a sector that rebounds quickly in post-conflict areas precisely because of the low upfront costs and flexibility of variable payments.[82] Another exciting example is the recently announced partnership between MicroDahab, a micro-finance subsidiary of Dahabshiil, the Dubai-based, Somali-owned money transfer giant, and SolarGen to provide an *ijarah thumma Iqtina* (lease to purchase) facility for solar water pumps in the Somali region. According to a public-relations release, the "average Somali farming village spends $80,000 USD in fuel costs to power generators for water every year [while] solar powered water pumps [save about] $60,000."[83] For Somali entrepreneurs, offering credit to customers is the best way to enable their participation in the renewable energy economy and this appears to be a widespread "best practice" already. Twelve of the

seventeen respondents (over 70%) of the OEF/Shuraako survey indicated that they already offer their customers credit. Financing household and commercial products has the dual benefit of supporting both Somali renewable energy companies and poor households. The impact of this model is exemplified by Golis Energy in Hargeisa, whose sales increased by 40% in the first few months they began offering a credit system for clients.[84] They also reached more female clients. Golis now has over 2,100 customers.

Similar to household and commercial products, financial instruments can help IPPs and communities invest in renewable energy for microgrids.[85] Such financing can be both lucrative for investors and helpful in building momentum for the use of renewable energy by distributing the initial capital costs over a several-year period. In terms of future scalability, building microgrids now will not detract from investments in unified grids in the future because they can be connected to central macrogrids when they come online. As a result, mixing renewable energy sources into microgrids can address immediate needs and provide a foundation for future systems.

THE PRESENT: The Landscape of Electricity Provision Today

Three key trends have emerged in the Somali region's energy landscape that will greatly determine the shape of the economies of the Somali territory: the emergence of a strong, independent private sector; the rapid and ongoing consolidation of IPPs; and the work of donors and experts to address the energy deficit by integrating renewables into broad-based economic development plans. The following section is divided in four parts: part one looks at the overall strength of the private sector in the Somali region and in particular the cohort of eighteen firms contacted for this study; part two outlines the key trends in the energy market in the Somali region overall and the renewables sector in particular; part three delivers a firm-level analysis of the companies that are powering the Somali economy including their perceptions of their sector and investments in renewable energy; and part four examines the donor sector for their perspectives on the future of development and the role of renewable energy in those long-term plans.

Rural electrification at the household level in Sheikh, Somaliland.

Overall Picture of the Somali Energy Sector

The Somali region is rich with opportunities in electricity provision and renewable energy. Although the OEF/Shuraako survey was unable to contact every IPP and renewable energy provider, the companies involved form the majority of large energy producers and retailers in the territory.[y] As noted above, collectively, our respondents account for between 116,933 and 287,725 electrical connections, which is between 42% and 43% of the Somali region's estimated 270,000–679,073 users. They have a minimum standing generation capacity of between 42.6 MW and 67.6 MW, which is between half and 81% of the estimated 83.4 MW for the Somali regions.[86] They jointly employ over 2,000 permanent staff and almost as many contractors in over two dozen cities throughout the Somali region. Together, they earn a minimum range of $23–$41 million per year, though this figure is likely much higher if BECO, the largest energy provider in the Somali region, and other IPPs are included, likely rising into the range of $50–$60 million per year.[z]

The picture painted by these statistics is of a strong, diverse, and growing private energy sector that is "robust to circumstances."[87] These actors hold numerous advantages over larger, centrally planned power providers that make them adaptable to different contexts, including times of conflict. They are resilient because they are local, enabling them to fluidly navigate local dynamics and risks. They can also mobilize quickly, drawing on private funding such as diaspora support.[88] Conversely, larger utilities are vulnerable during times of conflict. These systems are usually public and suffer from the diversion of public funds to military spending, and large power plants and unified

y The most notable exceptions (that we are aware of) were General Electric (GE) in Somaliland and Nugaal Energy Company (NEC) in Garowe, Puntland.

z A range is given here because the survey, due to potential sensitivities around earnings and costs, gave ranges for both: over $5 million per year, $1–5 million, $501,000–1 million, $101,000–500,000, $51,000–100,000, and below $50,000 per year.

grids are easy targets for conflict actors. Small, private energy providers like these have thrived in Lebanon, Cambodia, and Sri Lanka where the supply of electricity is decentralized, using relatively small generators.[89] However, these firms are already building economies of scale in the Somali region, preparing the way for larger-scale industrial development. This is being manifested at the moment through the consolidation of IPPs in larger markets.

Grid and Firm Consolidation

Development in the Somali region has been predominantly achieved through private investment and entrepreneurism. This is due primarily to necessities brought by conflict and periods of international and regional isolation. Unlike some fragile and conflict-affected states, donor activity has been relatively limited, largely leaving Somali communities and the private sector to fend for themselves. During the Somali civil war and various transitional periods, small IPPs stepped in to address the dearth of electricity by creating small, independent power generation companies. Many of these firms entered the sector because they needed electricity to run their own businesses, such as telecom companies.[90] Once generators were installed, they began to provide electricity to surrounding households. Telesom Electric, for instance, was incorporated in 2014 but its parent Telesom Company has been providing electricity along with telecommunications services since 1999.

The Somali energy market has entered an important phase in which the consolidation of IPPs is clearing the field of some actors and creating large enough conglomerates that they could rightly be called utilities. This phenomenon could make distribution more efficient and achieve better economies of scale but it also raises the specter of monopolization of market space by one or two large firms in each market, which could have the opposite effect on efficiency and drive up costs. There are four major consolidated IPPs of which we are aware. The grid in Hargeisa is now largely controlled by two consolidated energy entities: GE and Alel Power Company. Burao's IPPs recently merged into HECO Electric Supply Company. In Mogadishu, BECO is a corporation formed in 2014 out of an astounding seventy different IPPs. They are reportedly now the largest electric utility in the Somali region, serving some 80% of Mogadishu with a 25 MW diesel generator and plans to expand its generation capacity by an additional 25 MW.[91]

The consolidation of IPPs could pave the way for more economies of scale and "should be encouraged," according to the AfDB, "if access to sustainable power in cities is

A Beder Electric Co. technician stands between a diesel generator and a generator run by a wind turbine in Ainabo.

to move beyond the current 'lifeline' (unreliable, weak, poorly managed, technically deficient) kind of electricity supply."[92] The risk of consolidation, however, is downward pressure on competition as control of electricity provision is concentrated in a few powerful players. There is already concern for some that IPPs might begin to behave as cartels, stifling the development of new energy projects and stalling the implementation of policies.[93] While consolidation is naturally occurring, the uncertainty about market share in the future shapes investment decisions today. For example, a 2011 report on energy needs, issued by the EU, suggests that private operators should be forced to form a privately managed company based on shareholding.[94] Smaller companies may find the uncertainty around such possibilities a deterrent to investing in renewable energy options to supplement their diesel-based systems.

Two other interrelated developments that would have a multiplier effect on the economy are increased interoperability and cooperation between IPPs and, should this become feasible, the introduction of high-tension power lines in interconnected grids. In most Somali cities, multiple distribution lines for different providers hang haphazardly from electrical poles, increasing inefficiencies and dangers from electrocution.[95] Most IPPs who responded to the OEF/Shuraako survey in fact own their own electric distribution infrastructure, including Alel, ALOOG, BECO, Beder, Dayax (that maintains 6 km of 11 kV and 50 km of low voltage lines), EEPCO, Golden, NEPCO, HECO, LESCO, SECCCO (also with 11 kV lines), and Telesom.[aa] Many have expressed interest in increasing cooperation and some have even begun installing higher tension power lines that can reach more customers with more power and at further distances from the generation point. BECO, for example,

aa While the majority of IPPs distribute power on privately owned lines, there are exceptions. Baidoa Electric distributes on power lines that are 40% public and 60% privately owned and in Berbera, Tayo Energy entered into a public-private partnership (PPP) agreement with the government to run the electric company and grid.

has recently installed new transformers and upgraded their regulators to manage tension in their distribution network. While the urban grids in the Somali region are not currently sophisticated enough to allow the synchronization of multiple microgrid systems, there is some movement toward conducting grid consolidation feasibility studies in some cities. The Danish development agency DANIDA met with IPPs in Borama to work on a master plan to fix the grids there and in other Somaliland cities.[96] However, until either increased regulation or greater cooperation among IPPs occurs, such projects will face difficulty.

Adoption and Proliferation of Renewable Energy

As mentioned above, of the eighteen firms contacted in the survey, six were explicitly renewable energy focused, mostly retailers/distributors of renewable products and/or engineering, procurement, and construction companies. The renewable products offered by these firms include off-grid solar for rural communities, solar and wind home systems, grid-tied windmills, solar street lights, water pumps and lighting, and solar Pico systems. There was also one entirely solar IPP (SECCCO, based in Garowe, Puntland) who serves over 20,000 customers and utilizes 600 batteries to store energy on their 1 MW system. Additionally, there was one consulting firm, Haidaman Engineering works (HEC), based in Nairobi and Hargeisa, whose clients presently include a large wind-powered installation.

As mentioned above, hybrid systems are already being used by several IPPs, including Beder, based in Erigavo, who uses wind in two locations (30% in Ainabo and 24% in Oog) to generate over 300 kW in conjunction with diesel generators. Similarly, LESCO in Lasanod employs 12% renewable energy output at their largest generation site. BECO too already employs 2.5 MW solar generation at one site, which it plans to upgrade by another 2.5 MW in the near future. Further, BECO says it wants to install another 5 MW of solar in a separate site. Such upgrades, in conjunction with the economies of scale enabled by their industrial-sized diesel generation capacity, have allowed BECO to reduce prices for the public. As this report goes to print, BECO is set to announce new residential tariff rates as low as $0.40/kWh with a target of $0.25 within two years. Needless to say, if this promise materializes, it would make BECO the most affordable IPP in the Somali region. Successful projects like these demonstrate the potential of renewable energy to transform diesel-dependent businesses into more efficient, less costly, and more sustainable hybrid systems.

Retrofitting a well with solar power.

As mentioned above, nearly every IPP intends to incorporate renewables into hybrid systems in the future. Five of these included specific plans or ongoing hybridization efforts with deadlines in 2016 or 2017. For instance, Aloog Electricity, based in Borama, plans to install two 450 kW wind turbines and 300 kWs of solar by June 2016. Similarly, HECO in Burao is installing 450 kW of wind and 1 MW of solar into a hybrid system with diesel gensets. Finally, Telesom, the electric subsidiary of the telecom firm, plans to install 1 MW of solar in the next two years. Renewable energy can play a critical role in manufacturing, agriculture, and the fishing industry through increased refrigeration and lighting capacity. If these firms' plans are realized, economic growth in multiple sectors will be enhanced.

Challenges to Expansion

	CHALLENGE	MEAN SCORE
1	Lack of technical expertise in the workforce	1.4
2	Cost of capital goods and services including equipment parts, land, products (including imported goods)	1.47
3	Poor infrastructure (roads, telecommunications, etc.)	1.56
4	Lack of equipment such as cranes, wire spoilers, trucks, etc.	1.6
5	Lack of government assistance or expertise	1.8
6	Lack of access to capital or finance	1.81
7	Competition from other businesses	2
8	Corruption	2.4
9	Politics	2.47
10	Insecurity or instability in my region	2.5

While the findings of the surveys featured in this report on specific subjects such as governance, finance, and work force are covered in other sections, a critical area of inquiry are the challenges to expansion of existing businesses. Respondents were asked in two different ways about these problems: the first was to identify all the problems they faced, and the second was to rank them in terms of the most-to-least important. In the first question, the most salient responses included (1) the lack of capital and a trained workforce, followed by (2) the cost and scarcity of supplies and poor infrastructure. Not many firms considered political instability or violence, competition from other vendors, or instability in the market or regulatory environments to be prohibitively challenging. An anonymous ranking of these key challenges largely replicated these perceptions but with some notable exceptions (see table below). The poorly trained workforce again came in at number one; it is resoundingly the biggest concern of our respondents (1). This was followed by the cost of capital goods (2), poor infrastructure (3), a lack of heavy equipment such as cranes and trucks (4), the lack of government assistance or expertise (5), the lack of access to capital or finance (6), and competition from other businesses (7). These results are interesting in part because, when forced to make a decision on which problems are most important, access to finance fell closer to the bottom, even behind the lack of heavy equipment. This suggests that more detailed surveys of firm-level behavior, needs, and opinions are required in order to determine appropriate levels and targets of potential investment. Another interesting finding of note to scholars and policy makers is the relative insignificance of political and security challenges in determining the business plans of companies. This suggests that, as mentioned above, the resilience of Somali entrepreneurs is stable and growing, undeterred by challenges that would inhibit growth elsewhere. It also suggests that conditions in the Somali region are improving at the moment and are not seen as an important enough risk to prevent future investments.

Company Profiles

The following tables represent the profiles of our sample of the energy market in the Somali region.

	LOCATION(S)	BUSINESS TYPE AND EMPLOYEES	GENER-ATION CAPACITY	ANNUAL OUTPUT (2015)	NO. OF CUSTOMERS	RENEWABLE ENERGY TECHNOLOGY
Alamis Electric Co (ALEL Co.), est. 2013	Hargeisa and Gabiliay, Somaliland	Sole owner with over 300 employees	3.850MW	17,520,000 kWh	32,429	Diesel
Aloog Electricity Co, est. 2004	Borama, Somaliland	Partnership, Corporation with 93 employees	2.4MW	2,650,800 kWh	6,750	Diesel but with plans to install two 450kW wind turbines and 300kW solar by June 2016
Baidoa Electric Co, est. 2012	Baidoa, Bay Region, South Central (SC)	Partnership with 102 employees	3.05MW	1,045,000 kWh	5,175	Diesel but plans to expand to RE and other locations
Banaadir Electric Co (BECO), est. 2014	Mogadishu, Banaadir and Lower Shabelle Regions, SC	Cooperative with 1,074 employees	14MW*	N/A	N/A	Diesel but with plans to install 10MW of solar
Beder Electrcity Co, est. 1991	Erigavo, Sanaag Region, Somaliland/ Puntland	Sole Owner with 70 employees	1.316MW	N/A	4,000	Diesel and wind (up to 30% in two locations)
Dayax Electric Power Co (DEPCO), est. 2015	Cabudwaaq, Galgaduud Region, SC	Cooperative with 50 employees	2MW	N/A	20,000	Diesel but with a vision of moving to solar

	LOCATION(S)	BUSINESS TYPE AND EMPLOYEES	GENERATION CAPACITY	ANNUAL OUTPUT (2015)	NO. OF CUSTOMERS	RENEWABLE ENERGY TECHNOLOGY
Enersom Ltd., est. 2014	Hargeisa, Somaliland	Partnership with 5 permanent employees	N/A	N/A	N/A	Distributes off-grid solar products to rural communities in Somaliland
Golden Power Co, est. 2010	Bosaso, Bari Region, Puntland State	Corporation with 10 employees	.06MW**	20,888 kWh**	350	Diesel but with a vision of moving to renewables
Golis Energy Co, est. 2007	Hargeisa, Somaliland	Corporation with 19 employees	500kW (OEF estimates 658kW)	180,000 kWh	2102	Install solar and wind units in homes, communities, and facilities; building a renewable energy service center
Haidaman Engineering Works Ltd, est. 2007	Nairobi and Hargeisa	Partnership with 2 employees	N/A	N/A	N/A	Currently consult for company with three grid-tied windmills at an airport generating 40kW
Horn Electricity Co (HECO), est. 2014	Burao, Somaliland	Partnership with 150 employees	6MW	7,500 kWh	22200	Diesel but installing 1MW solar and 450 kW wind hybrid with gensets in Burao
Kaafi Horn Renewable Energy Co, est. 2012	Hargeisa and Borama, Somaliland	Partnership with 7 employees	15.665 kW	N/A	11305	100% solar; implementing partner for the Business Opportunities for Solar Systems (BOSS) project
Leading Energy Solutions Co (LESCO), est.	Lascanod City, Sool Region	Corporation with 55 employees	2.44MW	273.75 MW	~10,000	Hybrid diesel/renewable energy system (12% RE on largest system) with battery storage
National Electric Power Co (NEPCO), est. 2009	Gaalkacyo, Galdogob, and Burtinle, Mudug region	Corporation	3MW	5,103,000 kWh	14,730	Diesel but with a vision of moving to renewable energy
Solar Energy Consulting & Construction Co (SECCCO), est. 2011	Garowe, Puntland but operates in Bosaso, Hargiesa, Mogadishu	Sole owner with 10 employees	1MW	N/A	~20,050	100% solar with 600 batteries (1200Ah 2v), also install solar street lighting, water pumps, & lighting for homes & businesses
Solargen Technologies (SGT), est. 2012	Kenya & Somalia (Mogadishu, Kismayo, Hargeisa, Dolo, Baidoa, Dusmareeb, Beledweyne)	Corporation with 30 employees	N/A	N/A	N/A	EPC firm (engineering, procurement, and construction) that distributes solar pumps, street lights, & off-grid solar power, and solar Pico systems
Telesom Electric Co, est. 2014	Hargeisa, Somaliland	Corporation with 47 employees	3MW	4,000,000 kWh	N/A	100% diesel at present but with plans to install 1mw of solar between 2016 and 2018

Donor-Led Initiatives in the Somali Region

This section will introduce some of the largest donor-led initiatives currently operating in the Somali region. Information and data collection for this section took place from December 2015 to January 2016 via desk research and telephone interviews conducted with key practitioners among donor agencies and implementing partners including the U.S. Agency for International Development (USAID), Adventist Development and Relief Agency (ADRA), Development Alternatives International (DAI), the UK Department for International Development (DFID), and the Swedish International Development Cooperation Agency (SIDA). The donor-led initiatives reviewed below are not an exhaustive list but represent a sample of development projects in the Somali region. They include projects focused exclusively on renewable energy and those that plan to incorporate renewable energy.

Several existing donor-led initiatives that involved some element of renewable energy ended in 2015 and were replaced by larger programs that include (but are not exclusively focused on) renewable energy. These new programs, which are expected to funnel approximately $137 million into the Somali region, try to integrate renewable energy solutions into larger development goals such as small business promotion. Although exact numbers of direct beneficiaries are still unknown, it is projected that, collectively, over 14,000 jobs will be created. Program outputs range from small-scale solar lighting to large-scale infrastructure and development projects. These projects will extend throughout the Somali region.

Although electricity access was incorporated in past development projects, particularly to enable off-grid electricity at clinics and schools, the international development community's focus on renewable energy is relatively new according to Per Karlsson, at the Swedish Embassy in Nairobi.[ab] "It's quite striking how the issue of energy has come up. When I first started in 2013, it came up once in a while. In the last year, it's really front and center. It's identified as a key constraint for industry growth, social-economic development, and infrastructure development."[97] As outlined above, access to reliable and affordable electricity underpins success of nearly all other areas of economic development, a principle embraced by this new wave of development aid. Stephen Gudz at USAID Somalia notes, "Renewable energy is an important economic sector and an enabling condition to provide an environment whereby business can operate."[98]

PROJECT	DONOR & FUNDERS	BUDGET (USD) (BASED ON EXCHANGE RATE AS OF 1/21/2016)	TIME PERIOD	LOCATION	BENEFICIARIES
ESRES—Energy Security and Resource Efficiency in Somaliland	DFID/Mott MacDonald (contractor)	$29,368,000	2014–2018	Somaliland	Undetermined, "Due to lack of data, at present it is difficult to determine the number of people with access to clean energy[ac]
GEEL—Growth, Enterprise, Employment, and Livelihoods	USAID/Engility	$74,000,000	2015–2020	Somaliland, Puntland, South Central	Goal to create 5,000 new jobs
PIMS—Promoting Inclusive Markets in Somalia	DAI/DFID	$15,956,000	2015–2018	Somaliland, Puntland, South Central	9,000 long-term jobs
SET—Somali Energy Transformation	ADRA/DFID	$3,250,000	2015–2018	Somaliland, Puntland, South Central	~3,900 house-holds/~238,000 direct beneficiaries
Somalia Power Sector Development Support	World Bank/Multi Partner Fund	$18,000,000	2015–2018	Mogadishu, Hargeisa, Garowe	Government ministries, identified private sector actors

ab Mr. Karlsson is a senior program manager of the Somalia Section in the Embassy of Sweden, Nairobi, Kenya.

ac "Energy Security and Resource Efficiency in Somaliland (ESRES) Annual Review 2015" (DFID, June 2015).

The Somali Private Sector

All development actors interviewed for this section remarked at how successfully the private sector rebuilt markets during and after the civil war and provided basic services like electricity. "It's really the private sector that has moved Somalia forward especially through exporting livestock and importing grain to create jobs and support food security," according to Gerry McCarthy, director of DAI's PIMS program.[99] However, to the international development community, the advent of IPPs was considered both a blessing and a curse. The Energy Security and Resource Efficiency in Somaliland (ESRES) 2015 Annual Report warns that "the absence of effective legislation or the capacity to enforce it" risks creating monopolies, which presents a challenge to ensuring "affordable electricity to low income households."[100] In response, the ESRES program engages with local IPPs in order to mitigate the effects of this risk. Like ESRES, many programs work directly with IPPs and other private sector actors to support their goals but also to advocate for the public interest in planning efforts.

Engagement with the private sector in the context of donor-led initiatives takes various forms. For instance, ADRA applies a public-private partnership (PPP) approach to their projects focused on providing rural households with off-grid solar power systems. Specifically, they aim to replace existing diesel-run systems with solar energy options. ADRA has worked in the Somali renewable energy sector since 2002 and Energy Program Manager Samuel Muthamia has observed, "When we started implementing programs in Somalia, there was no private sector doing work in renewable energy. Today, so many businesses are dealing with solar energy."[101]

Some programs identified specific industries for which renewable energy technology may be particularly useful. Fisheries and dairy production were referenced often as areas where solar-powered refrigeration and ice generation would be impactful. Gerry McCarthy explained, "A major problem in the dairy sector is high loss of fresh milk value due to spoilage—up to 30% of fresh milk supplied to urban centers in Somaliland is soured within two hours of reaching market, half of this beyond economic recovery."[102] A similar problem exists for the Somali region's emerging fisheries and agricultural sector. The DAI PIMS (Promoting Inclusive Markets in Somalia) and USAID GEEL (Growth, Enterprise, Employment, and Livelihoods) programs both identified these industries as potential recipients of solar-powered refrigeration, although such plans depend on the stewardship of beneficiary communities rather than outside planners.

Hargeisa Egal International Airport: Update

In the 2015 Powering Progress report, the Egal airport in Hargeisa was featured as an example of how the lack of technical capacity can undermine the success of development projects. Lawrence Mott, a principal consultant with SgurrEnergy, a renewable energy consultancy based in Glasgow, Scotland, and recently contracted to work on the project, explained the project's history and how the technical crisis developed.

The Egal International Airport was built in the 1950s and its electrical system has had only minimal upgrades since then. Additional appliances, including twenty-three air-conditioning units, were added to the existing system, which contributed to an unbalanced electrical load. USAID supported a project aimed at alleviating the huge costs and inefficiency associated with the airport's electrical system and demonstrating the potential of wind energy in the Somali region. DAI implemented the project and Golis was hired as the local contractor. A PPP was developed to give ownership to the government and management to the newly renamed General Electric (GE), formerly known as Kaah Utility Company. The project intended for the wind turbines to operate as a direct power source to the airport alone, or to be off-grid compatible. However, the equipment purchased was grid-connected technology, which made it "more susceptible to grid conditions," according to Mr. Mott. As a result, the turbines, while operating according to standards, have struggled within the already poorly functioning electrical system at the airport. This was the status of the project as of early 2015 when SgurrEnergy and Golis agreed on an upgrade design and implementation plan along with support from the Airport Administration and GE.

The wind turbine project at Egal International Airport.

As of last year, the wind turbines built at the Egal airport were detached and nonfunctional. Since then, however, significant progress has been made on the airport's wind farm. Before the turbines could be attached to the grid, the existing system needed to be repaired. SgurrEnergy and Golis rewired the existing electrical system (with new panels, cables, wiring, etc.) and then connected the wind turbines to the grid just last year. According to Mr. Mott and Golis, the wind turbines were functioning at the time of publication of this report. Additional goals for this project include setting up an agreement between involved government and private sector actors for long-term operations and maintenance (O&M).

Development Perspectives on High Energy Tariffs

A consistent observation among development practitioners is that the high cost of energy in the Somali region limits the development community as well as the private sector. According to DFID, "Access to energy (including through high cost . . .) is a fundamental constraint to other DFID Somalia interventions in economic development, health, education, livelihoods, peace building, and security." Within major international development plans, the cost of energy is highlighted as a significant risk factor for development projects. It is no surprise, therefore, that development actors have sought to build the nascent renewable energy market. Samuel Muthamia explains the potential for solar energy given long days with ample sunshine: "There are many renewable technologies but solar is key. The solar market is vibrant. As you know, Somalia has a very warm climate. The sun shines from around 5am to late in the evening. The market is very big."

The development agencies contacted for this study approach the issue of energy in different ways. The World Bank's Somalia Power Sector Development program, for instance, aims to "contribute towards developing the fundamental building blocks for the establishment of modern energy sector in Somalia," by developing a master development plan for three major cities in the Somali region, preparing for the introduction of "Lighting Africa" and finalizing renewable energy resource mapping.[103] Other programs have considerably smaller scopes. As was previously mentioned, ADRA's programming aims to electrify rural households with solar technology. While newly started programs like USAID's GEEL approach energy with the understanding that "the cost of power is critical to competiveness," they are also remaining flexible so that communities themselves will identify the best way to approach the energy deficit. According to USAID, "at these early stages [of the GEEL project] we are trying to understand the way we can fill the gap."[104]

All those interviewed reported that while lowering energy costs was crucial, this would depend on the confluence of multiple factors, including agreement over the use of oil and gas reserves, how the private sector is able to respond to energy demand, and the advent of a regulatory framework. Some noted that different Somali regions would likely experience change in the energy sector at different paces. Often, there are more optimistic projections for Somaliland and Puntland, while more cautioned projections for South Central.

Other Renewable Energy Projects

In addition to the programs included in the table above, there have been a number of other, smaller-scale renewable energy projects. They were excluded from the table because budgetary and beneficiary information attached to the smaller-scale projects was not available. This includes USAID's TIS/TIS+ program and the work of the Nordic International Support Foundation (NIS). Both programs have operated throughout the Somali region installing solar street lights in partnership with local communities, government, and private sector actors. According to the USAID TIS/TIS+ program, they have installed 1,114 street lights with an additional 100 scheduled.[105]

NIS has been involved in a number of small-scale renewable energy projects, including the electrification of hospitals and government offices, the solar street lighting project,

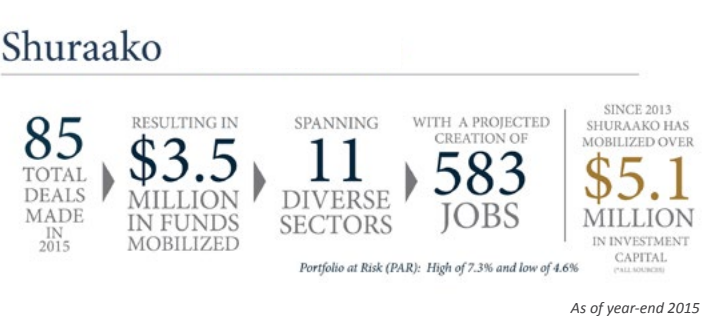
A solar installation at Burao Hospital.

and other infrastructure projects. As mentioned above, between 2011 and 2015, NIS was involved in the installation of 842 solar street lights throughout the Somali regions. There have also been a number of other renewable energy projects funded by the UK Stabilization Fund, the Somalia Stability Fund, and the Norwegian MFA.[106]

STIMULATING INVESTMENT AND GROWTH

While the work of donors to support and integrate renewable energy solutions into their long-term development plans has evolved considerably in just the past few years, the work of investment facilitation is, in many ways, already achieving those goals. The work of Shuraako in particular has been path-breaking, not only for the material investments in renewable energy it has made, but also for the convening role it has assumed in bringing together diverse stakeholders to make the connections needed to achieve broad-based development of this sector. In terms of direct investments, Shuraako has, to date, concluded seven deals worth $1.1 million that include renewable energy technology. They range across numerous sectors including hybrid grid generation, agriculture, fishing, and renewable energy product retail. These transactions will collectively create eighty-four skilled jobs. But these firms and workers are not the only beneficiaries. An even wider swath of stakeholders has been affected by Shuraako's ability to convene around key issues. At the first Somali Investment Forum held in Nairobi in March 2015, Shuraako held a plenary session on renewable energy that brought in technical experts and energy retailers representing each region (Somaliland, Puntland, and South Central) and that resulted in an outpouring of support for a more concentrated event on the subject. In response, Shuraako and its esteemed contributors will convene over 200 stakeholders in the renewable energy sector in Hargeisa, Somaliland, in February 2016, to discuss paths toward a more sustainable energy future for all Somalis.[107]

This section will outline the burgeoning demand for investments in the Somali energy sector while outlining the growing promise of investment facilities to date and their impact on Somali businesses. It is intended to help catalyze interest among potential investors from within and outside of the region, including the growing instance of impact investors and among the Diaspora community. Data for this section were collected from two OEF/Shuraako surveys and represent new voices that have not yet been heard on the need for, and growing supply of, investments from within the global Somali community.



As of year-end 2015

The Need for FDI

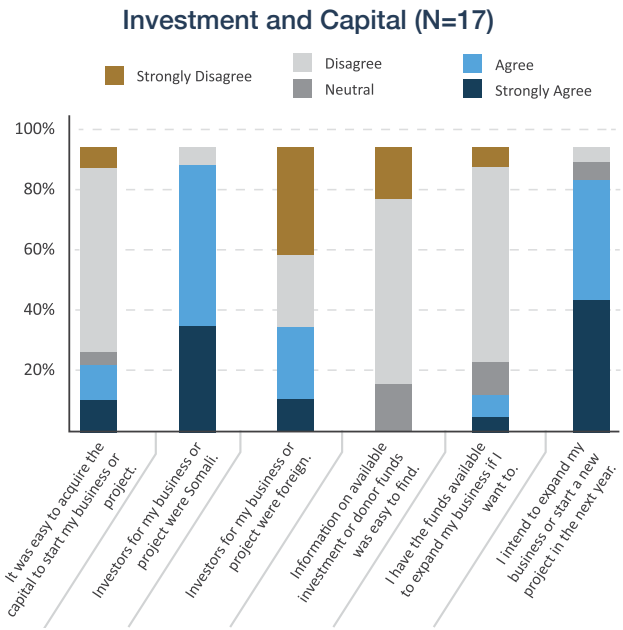
Fighting poverty, consolidating the state, and providing services are critically needed tasks of development and state-building that electricity provision can specifically facilitate. But real progress will only be achieved with broad growth in the economy. Economic growth requires capital and, while research reveals that Somalis provide the vast majority of investment capital, more is needed; foreign direct investment (FDI) is needed. In an analysis of foreign investment in fragile and conflict-affected states, Whyte and Griffin (2014) argue that "the most cost-effective way to generate new flows of [FDI] may be to encourage established investors to expand, deepen, or diversify their operations." However, a recent evaluation of the USAID Partnership for Economic Growth program assesses that investment in manufacturing for the Somali region will be held up for several years due to the cost of electricity and suggests that USAID focus on other sectors instead. But just as the Somali region risks losing such investors if the costs of electricity are not brought under control, it is also possible to jump-start economic growth through investments in electricity production.

Although Somali investments in electricity are strong and growing, Somali power producers are likewise discouraged by the lack of foreign investment in their sector. According to the OEF/Shuraako survey, Somali firms in the energy sector claim that investment finance is among their top concerns. Out of the seventeen firms who answered this portion of the survey, eleven (65%) said that the lack of capital was among the most significant challenges to scaling or expanding their business, a concern only equaled by the lack of skilled workers.[ad] Similarly, twelve of the seventeen (71%) found it difficult to acquire the capital to start their business and fourteen of the seventeen (82%) found it difficult or very difficult to find information on finance availability. See chart above.

Somali businesspeople are, however, not waiting around for FDI to trickle into the country and are accessing the

ad OEF Power Providers' Survey, N = 17, December 2015–January 2016.

capital they need to grow with the help of other Somalis. Of the seventeen energy firms who answered these questions, only six said that their investors were foreign while fifteen (88%) said that their investors were Somali. In another recent OEF/Shuraako study, the Somalia Diaspora Investment Survey, about one-third of the 923 respondents reportedly invested in the Somali economy.[ae] Of these, an impressive 68% found their investments over the past year profitable or anticipated a profit. Diaspora investors saw the value of building the energy sector and 17% of those respondents who elected to describe their investments had invested in the energy sector.[af] According to focus groups, the average investment among diaspora groups was between $5,000 and $50,000, although investments as high as $100,000 were not uncommon.[ag]



Considerable potential for investment exists not only among foreign sponsors, the Somali business community, and diaspora, but also for "impact investors." Impact investments seek to improve the Somali region's economic development and political stability in addition to returning a profit. A recent report by The Global Impact Investing Network (GIIN) estimates that approximately $500 million in "impact capital" could become available to the Somali region. Although FDI inflows in 2013 were only $107 million and not growing, roughly the same annual amount over the past four years, the GIIN predicts that FDI will grow in the coming years.[108] The report finds that Somali entrepreneurs can aid in priming the pump: "a growing pipeline of viable businesses, especially in Puntland and Somaliland, could increase the attractiveness of Somali businesses to impact investors and stimulate impact capital flows into the country."[109]

Investment in Renewable Energy

Growth in renewable energy has been slower than renewable enthusiasts would have predicted twenty years ago. Carbon-based energy has a foothold in markets around the world and has historically offered quicker returns on investments. Moreover, diesel is more widely available, easier to use, requires much lower capital costs and less technical knowledge, and is scalable in a flexible manner well-suited to the current, largely unregulated Somali energy market. Across the world, and especially in Africa, however, there is a change afoot. According to the Renewable Energy Policy Network for the 21st Century, investments in renewable energy in 2012 and 2013 were greater than the previous eight years combined for Africa and the Middle East.[110] Renewables are a particularly lucrative option for the Somali region given the abundance of renewable resources, the increasing affordability of renewable products, and the fact that a market for renewable energy has already been established in the region.[111]

Infrastructure

While the majority of Somali investments in electricity production, including renewable energy, fall far below the threshold of large infrastructure, scaling up energy production and unifying regional grids is an important objective. Although the Somali region is emerging from conflict and has done much to consolidate peace, risks will continue to deter investment in large infrastructure. Investment in infrastructure is particularly challenging for fragile and conflict-affected states.[112] Moreover, it is a major problem for energy firms trying to provide a service: infrastructure was ranked the second most important challenge to Somali energy businesses in the OEF/Shuraako survey, behind trained labor.

Efforts have been made at trying to bridge the infrastructure investment gap in fragile and conflict-affected states. For larger projects, infrastructure guarantees may represent

ae OEF/Shuraako, Somali Diaspora Investment Survey, N = 923. Online, purposive and snowball sampling, open on Survey Monkey from July 21 to August 12, 2015.

af Q42, 26 of 147 responses.

ag Focus groups were recruited to obtain qualitative data. Eleven focus groups were conducted in eight cities around the world: Denver (USA), Djibouti City (Djibouti), Hargeisa x 2 (Somalia/Somaliland), London x 2 (UK), Minneapolis x 2 (USA), Nairobi (Kenya), San Diego (USA), and Stockholm (Sweden). They were held in late 2015.

one of the few mechanisms to usher in investment into the Somali region. While such guarantees have been rare in fragile and conflict-affected contexts in the past, they represent an important mechanism for the Somali region to overcome the hurdles to infrastructure financing. Some possible sources of such programs are Guarantco, a donor group that has created a guarantee facility for infrastructure support at local levels, and the World Bank's Multilateral Investment Guarantee Agency (MIGA), which has provided investment guarantees to conflict-affected areas, particularly targeting small investments under $5 million.[113] However, neither Somalia nor any Somali region is presently a member of MIGA.

For energy projects of all magnitudes, there may be more funding sources available in the near future in the Somali region as international organizations prioritize renewable energy across the world and as more organizations find tractable ways to engage in the Somali region. For example, the AfDB has become more interested in renewables. It administers the Sustainable Energy Fund for Africa (SEFA), representing a potential source of financial support. It has funded projects including a $480,000-backed clean energy business plan competition in the Ivory Coast and $950,000 to develop a solar power plant in western Burkina Faso.[114] As part of SEFA, the AfDB recently created the African Renewable Energy Fund (AREF) that aims to invest $200 million to support IPPs' investments in grid-connected renewable energy.[115] Finally, the AfDB conducted the aforementioned Energy Sector Needs Assessment in order to "identify critical areas of short-term assistance to maintain, rehabilitate and/or develop basic energy infrastructure." From this evidence-based approach, the AfDB has formulated an action plan for the Somali region that aims to invest $803 million between 2016 and 2025. The Energy Sector Action/Investment Programme allocates $58 million for "training, technical assistance, and capacity building"; $10 million to "the creation of the Somali Electrification Institute and its operations over 5–6 years"; an enormous $580 million for the "expansion of [the] electricity supply" to cities throughout the region; $95 million to combat the overuse of biomass fuels; and $60 million to promote "off-grid energy services/products to rural/nomadic communities." Taken together, this program, despite its claims to modesty, will likely have a major impact on the landscape of energy in the Somali region in the next decade.

The World Bank has also become more committed to renewable energy. It initiated a Renewable Energy Mapping Program, backed with an $11.6 million initial budget, which seeks to provide localized data on renewable energy resources so that governments understand how to best allocate resources in the development of renewable energy. The World Bank also allocated $3.6 billion for renewable energy investment throughout the world in 2012, which was 44% of its energy financing and a 430% increase from the 2007 amount. Similarly, the IFC is a funding source that is highly committed to renewable energy. In their fiscal year ending in June 2014, renewable energy projects accounted for more than 70% of their energy investments. The IFC has thirty-four wind investments around the globe amounting to 2,500 MW and thirty-five solar investments totaling 650 MW with more than four times as many investments in large hydro, thermal, geothermal, transmission, and distribution projects. With the increased focus of international financial institutions on renewable energy, businesses in the So energy sector have the potential to tap into an ever growing pool of capital intended for diversifying energy sources in fragile economies.

CREATING AN ENABLING ENVIRONMENT: Governance and Training

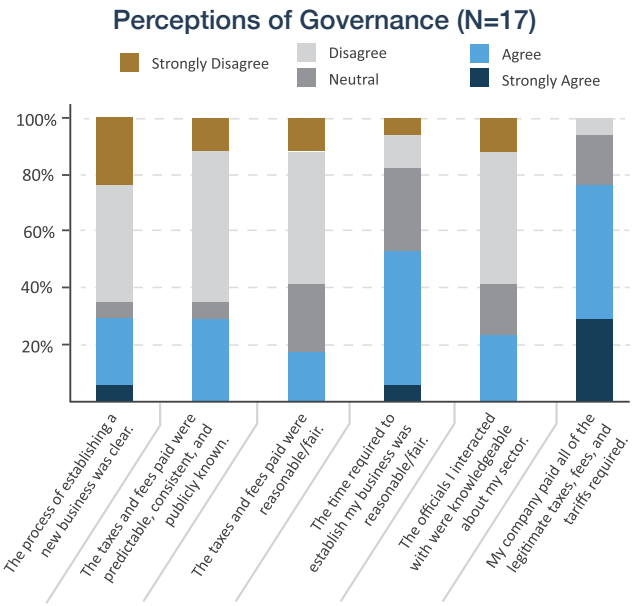
While outside observers might expect instability and violence to inhibit economic growth and figure significantly in the calculations of firms, according to the vast majority of survey respondents, these were virtually non-issues. (See graph below.) Besides the availability of finance, two pressing problems for the electricity sector and investment in renewable energy cited by respondents were the lack of skilled workers and absence of effective governance around energy. The path to effective energy sector development outlined in numerous studies and by our respondents will require steps taken cooperatively by private and public

sector actors to build an *enabling environment for increased investment*. Specifically, these steps include the training of cadres of skilled engineers, technicians, and planners in the interrelated electricity, utility infrastructure, and renewable energy technology sectors; the establishment of reliable training programs and the normalization of curricula and standards; in governance, the clarification of rules, particularly on fees and the process for establishing new businesses; greater government engagement on regulations governing electricity transmission and safety; and inclusive planning for future developments, particularly in grid infrastructure and utility consolidation.

Governance

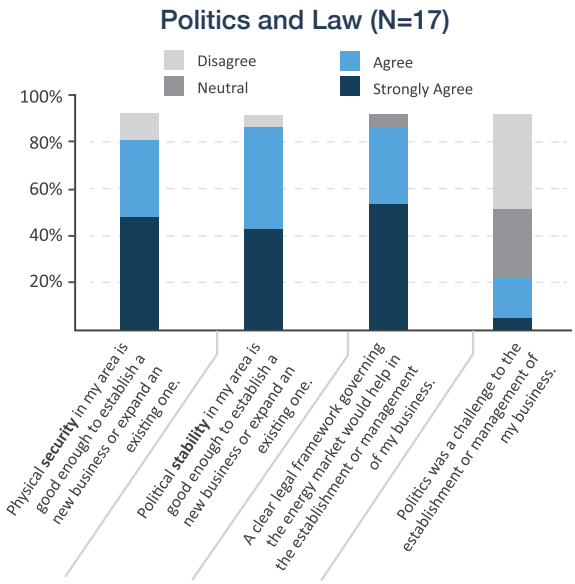
While governance concerns did not top the list of challenges for the firms surveyed for this report, it has been a consistent problem outlined in nearly every study on the subject. The companies included in this survey were divided over the role of government and whether or not the laws and regulations were clear enough as well as whether they considered government to be a "reliable partner." However, firms' views converged around other issues. For instance, the firms mostly believed that the timeframe needed to establish a new business was fair. This positive opinion was counterbalanced by the views that government officials were not knowledgeable about their sector; that the process of establishing a new business was not clear; and that the taxes and fees paid were not consistent, predictable, and reasonable/fair. On these views, the majority of respondents (between ten and eleven out of seventeen) voice negative opinions. Nevertheless, the majority (76%) reported that their company paid all legitimate taxes and fees demanded of them. (See chart on governance.) A significant focus of energy industry development should include establishing policies and laws that can govern these sectors. This point was echoed strongly by all donor/development-sector respondents interviewed. According to one longtime administrator working with renewables, "a program like this cannot be implemented without policies in place. These systems need to have standards."

Developing strong institutional frameworks will likely be an arduous but necessary process for the Somali region. Nevertheless, Somali governments have already begun to focus attention on the development of the renewable energy sector and electricity utilities in general. The Somali Federal Government's 2014–2015 Economic Recovery Plan included provisions for renewable energy promotion. In Puntland, the government listed renewable energy as one of four key priorities for the economy in its 2014–2016 plan. The Puntland government also targets a 20% increase in the use of solar and wind energy over five years. But the Somaliland government has arguably developed the furthest, with some help from international organizations. It produced an energy policy in 2010 and has completed a policy dialogue series bringing together stakeholders to outline goals and shared concerns in the establishment of an energy law.[ah]



The product of this effort in Somaliland is a bill that has been stalled for over a year but, as this report goes to print, the Electrical Energy Act has been redrafted by the Ministry of Energy and Minerals with assistance from DAI (USAID) and ESRES (DFID). While the creation of the 2010 Somaliland Energy Policy and the energy dialogues have been significant steps forward, progress on the Electrical Energy Act will signal to investors the substantial development that has taken place in the sector just in the last few years. It is critical for the various Somali governments to prioritize the establishment of laws and regulations to continue to encourage investment and preserve momentum. According to the majority of OEF/Shuraako respondents (over 80%), having a clear legal framework would directly benefit their businesses.

ah Somaliland's energy policy is based on extensive research conducted by ADRA through the Somalia Energy and Livelihoods Project supported by the European Commission. Following the project, USAID, collaborating with local partners at DAI, facilitated a series of policy dialogues, convening government, IPPs, and other stakeholders in the energy sector to develop an energy law and electricity regulations through deliberative processes. This process helped bring together diverse perspectives and enhance communication about needs and future possibilities between IPPs and the government. This experience can serve as a model for Puntland and South Central Somalia.



Laws and regulations can help clarify relations and the rules for conducting business, while simultaneously reducing investment risk for local investors. At a higher level of analysis, respondents noted that it is also necessary to establish government ministries of energy that could oversee these frameworks. "The creation of a government energy ministry is a challenge in Somalia. You have amazing people but just not enough people in the ministries." Both a framework and a government ministry dedicated to energy policy are necessary components to move the governments of the Somali region into a more mature phase of development.

In some cases, non-state and quasi-governmental bodies can help fill the governance gap. Renewable energy organizations in Somaliland have initiated a renewable energy association, the Somaliland Renewable Energy Power Association, which aims to call attention to the renewable energy sector and further professionalize the sector. Such associations can elevate the voice of renewable energy companies and enhance cooperation among them, which will in turn help reinforce these companies' sustainability and success.

The steps to transition from the existing systems to a long-term vision of efficiency and abundant electricity for the country are unclear, but efforts at establishing a solid regulatory base appear to be gaining traction. Overarching strategies on how governments and electricity providers will cooperate and coordinate to deliver master-planned systems would help clarify horizons for investment, reduce risk, and increase interest in investing in the sector.

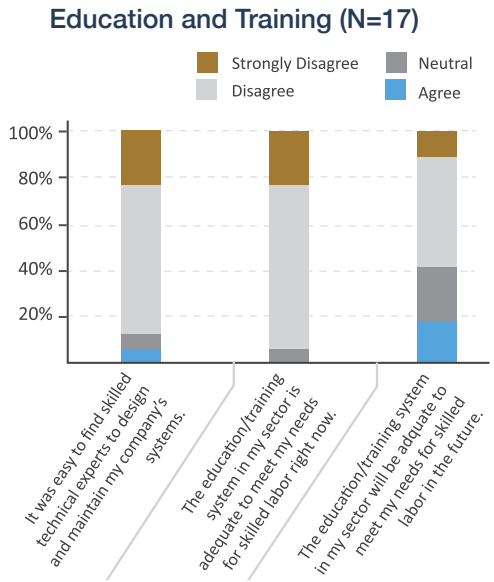
Building Technical Capacity

Despite the growth of renewable energy expertise from projects executed in the last several years, the need for technical capabilities in the Somali region remains the number one limit to growth, according to OEF/Shuraako respondents. The call for training in renewable energy continues to surface in most assessments and reports about the Somali regions. The stakeholders interviewed for the first Powering Progress report expressed their concern about the limited number of experts available to design renewable energy systems and assess the feasibility of projects. One owner of a renewable energy company pointed out there are few professionals in the country in any sector, and those who remained are mostly older people who were working in the sector before the Somali central government collapsed in 1990. As noted above, OEF/Shuraako survey respondents cited the lack of trained professionals in the traditional and renewable energy sectors as their number one concern and the primary reason they might not be able to scale or expand operations. Sixteen of the seventeen respondents on the anonymous portion of the survey (94%) felt that the education systems available for training technicians and engineers were insufficient to meet their needs right now. A slightly smaller group (59%) was pessimistic even about the future, believing that the education system would similarly fail to meet their needs in the coming years.

An electrical engineering student at Gollis University

Additionally, building technical capacity is necessary for bringing renewable energy to scale. According to Max Arte, a renewable energy specialist who has worked on several projects in Somaliland and other developing contexts, when projects move to larger scales, they require greater

competency and more complexity in design, ordering parts, construction, and management. Constraints from the lack of technical capacity have also led to delays establishing renewable energy systems. In 2014, Aloog Energy procured wind turbines from Germany but due to issues with some of the parts on the products, they needed more advanced technical support. The German company charges daily rates unaffordable by most Somali businesses to send technical experts so the project was stalled as of 2015 pending a solution. In lieu of locally trained personnel, expertise for these projects most often comes from outside the country, including from Kenya and Uganda, and even from Somali Americans based in the United States. Efforts to create a training center have been made but have yet to materialize. In 2012, the Somaliland Business Fund and the World Bank tried to create a renewable energy center for training and certification for wind and solar systems. The project to this point has faced problems, including difficulty in attracting technical leaders.



Not only would an expansion of technical capacity ensure greater success in projects, it could also address other problems throughout the country, such as unemployment. Projects commissioned by international organizations, such as the installation of street lights, have provided opportunities to hire and quickly train new young professionals. Recent Shuraako investments have created eighty-four new jobs that include some element of renewable energy. Another example was the installation of 185 street lights in Galkayo city by SECCCO, which was contracted by the Nordic International Support Foundation to hire and train young people, expanding the expertise of two newer professionals on staff. While these employment gains may not appear significant, they are an indication of the much larger employment potential of a scaled-up renewable energy sector as a whole.

An alternative to creating a training center would be to offer on-the-job training opportunities with existing renewable energy organizations. This approach incorporates hands-on experience and relevant training and ensures that graduates are eligible for a specific job in which they can apply the skills they learn immediately because the curriculum will match the exact needs of existing businesses and projects. Planning and facilitation of such training opportunities would be more easily completed with donor and NGO assistance.

THE WAY FORWARD: Conclusions and Recommendations

The durability and strength of the Somali region's recovery from decades of conflict and underdevelopment depend on the degree to which foundational elements of the economy and state can support economic expansion, investment, and the provision of basic services. Electricity is one such foundational element. With affordable access to electricity, businesses can expand productivity and compete with imports as well as enter regional and global markets. Without affordable access to electricity, businesses will continue to be forced to curtail activities and investors will continue to see risk where they could see opportunity. Affordable, accessible, and reliable electricity is also a basic service that profoundly affects the well-being, productivity, education, and health of families and communities. Investments in the electricity sector can pay social, economic, and perhaps even political dividends to groups and governments willing to put in the effort.

The private sector has already gone far toward improving the lives of ordinary Somalis as well as acting as an economic multiplier by providing businesses, government, and civil society organizations with the energy needed to serve the public. Additional investments in renewable energy can help address many problems in the Somali region, especially high energy tariffs, low reliability, and lack of access, particularly for rural and nomadic communities. Renewable energy is already a budding market in the region due to plentiful endowments of wind and solar resources and the increasing affordability of renewable energy products. To harness these potentials, several key issues outlined in this report should begin or continue to be addressed. These are improved training and education

opportunities, more effective technology transfer, improvements to infrastructure, improved governance of energy markets, better cooperation and integration among stakeholders, starting small with rural and off-grid development of renewables, and information collection and feasibility studies.

Improved Training and Education Opportunities

Building technical capacity was identified in OEF/Shuraako research as the preeminent challenge facing the entire electricity sector in general and the renewable energy sector in particular. As mentioned above, while this gap is well known among experts and practitioners in the field, few actionable plans have been implemented to address the problem. Some notable studies, however, have recommended improving technical skills for the African energy sector in general and for Somalis in particular. The AfDB Energy Sector Needs Assessment also identifies the lack of qualified personnel as an important issue, particularly in government, and makes several proposals in its Energy Sector Action/Investment Programme (2016–2025). These include $6 million to train technical capacities for a rural off-grid electrification project, $58 million to train and build capacity among government officials who deal with energy; and $10 million for the establishment of a Somali Electrification Institute that would evaluate and license energy projects and manage donor funding for the "construction, repair, and expansion of distribution grids."

To address this gap, Shuraako conducted a region-wide survey of skilled workforce needs in the renewable energy sector and identified the specific skillsets in highest demand, data that can be used to formulate action plans. According to the Somali Skilled Workforce Survey Report, highest demand was for "design skills (such as technical plans, blueprints, and drawings), management skills, construction and installation skills, engineering abilities, as well as technical expertise in specific renewable energy technologies," especially advanced "technical areas" such as "engineering and technology, solar planning and installation, and wind turbine maintenance and installation skills." A striking 92% of the fourteen firms surveyed complain that insufficient training opportunities exist in the Somali region to meet their needs, echoing the present study's findings outlined above. In a ranking of the most pressing needs among training programs, respondents to the Skilled Workforce Survey most strongly recommend improving "linkages between Somali and international technical programs" and "establishing third-party accreditation mechanisms." Also important are the implementation of "more rigorous standards to ensure high quality programming, increasing investments into training programs, and increasing the number of training programs." To meet these pressing needs, Shuraako recommends a comprehensive approach to training, specifically to

- *Establish training programs that focus on building technical capacities in renewable energy technologies, engineering, project design and management, installation, and maintenance.*
- *Collaborate with renewable energy sector employers to identify skill gaps in the existing labor force.*
- *Implement focused on-the-job training programs for current employees to develop RE-related technical capacities. According to the survey, "93% of respondents (even those hired from technical programs and universities) train new hires on-the-job in order to develop the necessary skills," making this an important recommendation.*
- *Establish or support sustainable energy business associations as bodies for stakeholder coordination.*
- *Build networks with technical training programs and universities in other countries to support the incorporation of internationally recognized curricula into training programs.*
- *Implement internationally recognized certification of these programs to meet quality standards.*
- *Encourage skills transfer by bringing international experts to the Somali region to train RE tech students.*

A renewable energy instructor at Gollis University.

- *Engage technically skilled diaspora linked to sustainable energy to bridge the skills gap in the region.*
- *Similarly, implement structured internship and apprenticeship programs for companies in cooperation with universities and TVET centers.*
- *Create partnerships and exchanges with renewable energy companies abroad to support exchange of knowledge and best practices.*
- *Promote employment opportunities within the sector and its benefits.*

More Effective Technology Transfer

According to our contributor Ravi Vora, an advisor for international programs at the National Renewable Energy Laboratory (NREL) in Colorado, USA, a strategic approach to renewable energy adoption must focus on the people involved rather than just the tools and devices employed. New technologies require a long-term outlook that accounts for the O&M requirements of renewable systems over their life cycles. A strategic approach should maximize the available local supply chain and local labor. A comprehensive technology transfer program is needed that both effectively deploys existing technology and also helps adapt these technologies to local conditions to meet local needs. This, in turn, will catalyze local innovation and entrepreneurship for long-term development and adoption. All of these approaches are predicated on the training of local stakeholders, the establishment of training facilities, and the convening of stakeholders from within and outside of the Somali region to enable long-term investments in the sector.

Improvements to Infrastructure

The Somali energy sector faces numerous technical challenges including poor transmission and distribution systems; the inability to monitor energy generation and usage; and the social, financial, and infrastructural obstacles to synchronizing generators and grids. The renewable energy sector in particular faces challenges in importing large machinery such as wind turbines as well as the lack of capital goods such as cranes needed to emplace these products. As noted above, the lack of crucial infrastructure, including roads, bridges, and telecommunications, are keenly felt by Somali entrepreneurs who must instead rely on ingenuity, or pay high costs and even postpone planned investments. Addressing the infrastructure gap in the

Burao's newest and largest solar installation, owned and operated by HECO.

Somali region could be a way to catalyze investments in the energy sector. Indeed, many see large-scale infrastructure development as the first crucial step toward economic modernization and to this end multiple post-conflict environments receive hundreds of millions of dollars in foreign aid. However, investing in infrastructure is a concern in post-conflict areas where they can exacerbate conflict with injections of resources that raise tensions among groups. Due to low absorptive capacities in the economy, the lack of institutional support mechanisms, the scarcity of trained personnel, and insufficient budgets to sustain such investments—not to mention usually catastrophic levels of corruption—these large infrastructure projects often end up doing more harm than good.

While large infrastructure projects may appear to be the fastest way to achieve change, the largest among them are generally unfeasible in the Somali region at the moment. Firms and governments should instead focus on laying the foundations for broad-based development that reaches the most people and eventually these projects will become necessary and achievable. By identifying and incrementally addressing underlying issues such as governance, developing a skilled workforce, and increasing cooperation among stakeholders—in other words, by starting small—the stakeholders can lay the foundation for larger infrastructural investments in the future.

Improved Governance of Energy Markets

The issue around which broad-based collaboration is most urgently needed—and most readily attainable—is the establishment of strategies, laws, and regulatory capacity in the governments of the region. The void in energy laws and regulation will continue to stymy progress in the energy sector until this basic issue is addressed. Without clear policies and regulations, international investors may perceive the region too risky for significant ventures. To this end, we recommend the following: (1) The creation of transparent guidelines to help navigate investment mechanisms including PPPs. Processes to ensure competitive bidding and transparent decision making at the community, municipal, regional, and national levels are essential. Demonstrated success in creating such processes

will encourage investment in the future. (2) Systematic data collection and the conduct of feasibility studies can help address the ongoing shortage of actionable information needed for investment and planning. Laying out plans for revamping the dilapidated distribution grids with associated costs can illuminate the steps needed to prepare for more efficient arrangements in the future. Policy and regulation are the pivotal pieces that will enable investments in large-scale infrastructure and the broader energy economy because they send signals to investors about the readiness of the country for large investments. Legitimate regulatory bodies and reliable law enforcement reduce the perception of risk for investors and create security for markets overall. Large projects are less likely to be demand-driven or initiated by local companies who, in any case, likely lack the necessary capital to invest. As such, these projects require a clear policy framework and require broad-based and high-level partnerships to ensure long-term viability.

Better Cooperation and Integration among Stakeholders

A key objective of this report and the SREF is the promotion of cooperation among private sector actors and their counterparts in government and abroad. We hope that the SREF 2016 provides an appropriate venue for growing cooperation on issues of mutual concern. In particular, Somali firms, experts, community leaders, and government will benefit from increased exposure to one another. Outcomes of this type of exposure would most productively be (1) the establishment of a shared vision of the electricity sector in general and the renewable energy sector in particular; (2) the creation of standards by which firms of all sizes can develop in a safe, lucrative, and competitive manner; and (3) the outlining of priority needs for investment, legal clarification, and continued cooperation. Similarly, Somali stakeholders and foreign donors, experts, and especially investors, will benefit greatly from increased familiarity with each other's priority needs and concerns, allowing eventually for collaborative initiatives that benefit more people. Shuraako has a particular interest in facilitating investments in renewable energy that it believes will have a multiplier effect on the economy, spurring investments in human capital as well as governance, infrastructure, and industry. We hope that the stakeholders involved in this process will accept the challenge of creating a shared space for collaboration on key issues and move the whole Somali region toward greater peace and prosperity.

Networking at the Somali Renewable Energy Forum 2016.

Starting Small

This report identified important opportunities for investors and entrepreneurs in the energy sector. The opportunities include investing in smaller-scale projects that are more resilient and feasible given the country's weak infrastructure (such as cranes and roads), financing options, lack of strong institutional frameworks, and limited technical capacity. Smaller-scale projects could focus on investing in smaller cities that have little to no access to electricity and collaborating with IPPs to increase the mix of renewable energy in existing systems. There is clearly demand from households and businesses to invest in renewable options but the upfront capital costs continue to constrain development of this market. A viable option to support renewable energy development would therefore be to invest in mechanisms to allow customers to pay as they go or pay in installments. Other options include a focus on rural and non-grid tied-and microgrid solutions to community energy resource development. Solar Pico systems, as well as small-business solutions like solar- and wind-powered grain mills, refrigeration, and water pumps, would increase the productivity of communities and households, ensuring greater resiliency as well. Many of these small-scale investments made over time will increase the market for both Somali businesses and communities, increasing the market for larger investments. Starting small is a feasible way of growing the interest, technical capacities, and capital needed for larger investments in renewable energy.

Information Collection and Feasibility Studies

Finally, a major gap continues to be the lack of reliable data on the supply, demand, existing capacities, and future plans of Somali businesses, communities, and governments. Obtaining accurate data for this report was difficult even from private sector actors about their own firms. Data collection, management, and dissemination should be a key focus of all parties involved in the energy sector. Without reliable data, policy makers, investors, and others must rely on incomplete information to make critical decisions about where to focus their attention and monies. All stakeholders should work collaboratively to collect data, beginning with their own entities, and make these available to their partners as well as to launch or support feasibility studies, needs and project assessments, and market studies about the specific needs and capabilities of firms, communities, municipalities, and regions. It is obvious that interest exists among all parties to propose solutions to the region's energy deficit but these proposals must be grounded in evidence. Support is needed in identifying the specific steps for IPPs to begin incorporating renewable energy sources and for communities to receive assistance in installing off-grid options. These studies and assessments should provide additional opportunities for training and developing Somali technical capacity for renewable energy. Only with good data and cooperation can the technical challenges to increasing energy access be overcome.

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