

#### ABSTRACT

Somaliland is a breakaway nation in a dangerous part of the world. They have struggled to gain recognition and legitimacy in the eyes of the international community and, as a result, have faced many more challenges in their own development as a country. Electricity is essential for growth, reducing poverty, etc., and Somaliland is struggling to upgrade their power sector. Energy prices are high and there is no regulatory body to oversee the operations and organization of the power sector. There is widespread use of charcoal, with enormous environmental and social consequences. There is no financial system to create capital for large-scale investments and no regulation to protect any investors that may be willing to take a chance. There is not a plan for how and in what order to overcome these challenges, and attempts to create financial and energy regulations have been stalled in parliament. But, surmounting these challenges and reforming their power sector can have huge rewards for their GDP and social development. The challenges are overwhelming and it is unclear in what order to address them, which ministry should focus on which issue, and what the time-frame should be for implementation. This is made worse by the fact that there is a dearth of technical expertise regarding renewable energy in Somaliland and the advantages it provides. The key question of this paper is: Will prioritizing and addressing the challenges of power sector reform set Somaliland on a course to realize its GDP growth potential and social developments goals?

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### Somaliland Timeline of Events<sup>1</sup>

- 1895 Abdullah Hassan, the “Mad Mullah” of Somaliland, returned from a pilgrimage to Mecca with inspiration to defy the British in emulation of the Mahdi in Sudan.
- 1909 Abdullah Hassan, the “Mad Mullah” of Somaliland, waged jihad against local tribesmen who had accepted British rule. He slaughtered a third of the territory’s inhabitants.
- 1960 Jun 26, British Somaliland became independent and five days later was united with Italian Somaliland as the Somali Republic.
- 1960 Jun 27, British Somaliland became part of Somalia.
- 1967 Jul, Mohamed Ibrahim Egal (d.2002) served as the prime minister until 1969.
- 1969 Oct 21, In Somalia Marxist dictator Maj. Gen. Mohamed Siad Barre (1919-1995) staged a coup and threw PM Mohamed Ibrahim Egal in jail, where he spent 12 years.
- 1981 Northern Somali rebelled against dictator Mohammed Siad Barre. A national civil war followed. During the civil was an estimated 40,000 people were killed and about 400,000 refugees fled to Ethiopia.
- 1988 Hargeysa, the capital, was shelled for 2 months. Some 2,000 people were later believed killed and buried in mass graves.
- 1989-1991 A civil war was fought with the regime of Somali Pres. Mohamed Siad Barre.
- 1991 Jan, Dictator Siad Barre was ousted. Power fractured into some 27 warring sides and Ali Mahdi Mohamed declared himself president.
- 1991 The northeast corner of the country declared itself the independent Republic of Somaliland under former Pres. Mohamed Ibrahim Egal.
- 1993 May, Clan leaders chose Mohamed Ibrahim Egal as President.
- 1996 Apr, Pres. Mohhamed Ibrahim Egal is the leader of the Pennsylvania size region of Somalia. The five year old state flag, army, police and currency but does not have international recognition.
- 1997 Jan 25, It was reported that many wells and bore holes had dried up and that cattle and goats were dying in large numbers.
- 1997 Feb 24, Mohammed Ibrahim Egal was re-elected by clan leaders as president.
- 1997 Dec, In Hargeysa a mass grave with some 200 bodies was excavated
- 1997 Clan warfare ended.
- 1998 Feb 6, Saudi Arabia imposed a ban on livestock imported from Somaliland, allegedly due to the threat of Rift Valley Fever.
- 1998 Apr, Authorities in Hargeysa established a war crimes committee to investigate the Barre-era human rights violations.
- 2001 May 31, The people of Somaliland voted 97.1% in a referendum for independence. The referendum was opposed by the government of Somalia and did not lead to any state recognizing the independence of Somaliland.
- 2002 May 3, Pres. Mohammed Ibrahim Egal (73) died. VP Dahir Riyale Kahin became acting president.

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<sup>1</sup> Timelines of history, *Timeline Somaliland*.

- 2003 Apr 14, In Somaliland elections incumbent Dahir Riyaleh Kahin was re-elected president of the breakaway republic by 80 votes. The opposition candidate said he would not accept the results.
- 2003 Oct 21, Two British teachers working for an aid agency in Somaliland were found dead after being shot at their apartment at the school.
- 2005 Sep 23, Police in the breakaway republic of Somaliland raided houses in the capital, Hargeisa, where al-Qaida militants were believed holed up and captured four suspects after a shootout. A fifth suspect was arrested 20 miles away. Pres. Dahir Riyale Kahin said the men were mostly locals trained at a camp outside Mogadishu, Somalia.
- 2005 Sep 29, Residents of the breakaway Somaliland voted in the 1st multiparty parliamentary elections since the region separated from Somalia more than a decade ago.
- 2005 Somaliland's population was about 2.5 million at this time.
- 2007 Jul, The Sanaag region of Somaliland, a former sultanate, declared independence and renamed itself Makhir with Badhan as its capital.
- 2007 Oct 1, Fighting broke out between Somaliland and Puntland in the disputed Sool region and at least 10 people were killed in a battle for control of Las Anod.
- 2007 Oct 15, Fresh fighting in northern Somalia left several combatants dead in an escalating boundary dispute between the breakaway regions of Somaliland and Puntland.
- 2008 Oct 29, In northern Somalia 5 suicide car bombs attacks killed 28 people in Hargeisa, the capital of Somaliland, and in Bosasso, Puntland. Somali authorities arrested Cleric Sheik Mohamed Ismail in connection with the attacks. One of the suicide bombers was an American of Somali origin.
- 2010 Jun 26, Voters in Somaliland queued for hours and thronged polling stations for the second presidential election held in the self-declared republic. Early indications showed Pres. Kahin losing to Ahmed Silanyo.
- 2010 Sep 14, Authorities in the self-declared republic of Somaliland said their troops have surrounded up to 300 Ethiopian rebels who entered the territory illegally.
- 2010 The population of Somaliland was about 2.5 million.
- 2011 Jan 13, A Somaliland judge sentenced a German man to four years in jail for making pornographic films and pictures in Somalia. Gunter Pischhof Albert (72) was ordered jailed and fined him \$10,000. A woman (23) was also sentenced to one year in jail and fined \$880.
- 2012 Jun 28, In Dubai Somali President Sharif Sheikh Ahmed and his counterpart Ahmed Mohamed Silanyo of Somaliland agreed to boost cooperation between their different factions. The two men signed the "Dubai Charter" in the presence of the leaders of Puntland and Galmudug, two self-proclaimed autonomous regions in Somalia.
- 2012 Oct 23, Somali journalist Ahmed Farah Sakin, a reporter for the Somali television station Universal, was shot to death in the town of Lasanod in the breakaway region of Somaliland. This brought the number of journalists killed in Somalia this year to 16.

## 1 Introduction

Somaliland citizens pay some of the highest electricity rates in the world. The power sector is characterized by private utility companies that use imported diesel to generate electricity and the government has no oversight on energy regulation and no plan for increasing the capacities of state and private utility companies to lower unit costs of electricity. There are a large number of steps that need to be taken over the short, medium, and long term in order to achieve lower unit costs and power sector reform should be considered a necessity for achieving Somaliland's economic and social development goals. A mass transition to electricity, if costs can be lowered, could be a critical step in generating higher GDP for Somaliland and reducing poverty.

Somalia is well known around the world for violent conflict and failed governance. Terrorist organizations like al-Shabaab and piracy groups dominate the headlines and public opinion is mostly negative. Situated in the Horn of Africa, Somalia is bordered to the northwest by Djibouti, to the west by Ethiopia, to the south by Kenya, and by the Gulf of Aden and the Indian Ocean.

Within this troubled environment, Somaliland is a bright spot in an otherwise bleak reality. Somaliland is a stable autonomous state within northern Somalia, bordered by Puntland, a second autonomous region, to the east (see Maps 1 and 2). Somaliland had been a British protectorate since 1884 (see Map 3) and, only days after gaining independence in 1960, merged with the recently independent state of Somalia, which had been under Italian colonial rule. In 1988, when a Civil War broke out between government forces in Mogadishu and Somaliland separatist rebels. It wasn't until after the collapse of the Somali government and the Siad Barre regime that Somaliland officially declared independence on May 18, 1991.<sup>2</sup>

Since that time, Somaliland has established a currency, set up a functioning government, held free elections, and had a peaceful transition of power.<sup>3</sup> Despite this, it remains unrecognized as a legally independent state by any country or international

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<sup>2</sup> Lacey, "The Signs Say Somaliland, but the World Says Somalia."

<sup>3</sup> The Economist, "Can't Get No Recognition."

organization. Some sources maintain that Somalia wants to keep the Somaliland government close, rather than concede their independence, hoping that the stability and success will have ripple effects in greater Somalia.<sup>4</sup> From the perspective of the international community, Somaliland's claim for independence is strengthened by the adherence to colonial borders that the community supports (See Map 3)<sup>5</sup>; yet, many western nations maintain that legal recognition of an African state should come from within Africa.<sup>6</sup> The African Union seems unwilling to acknowledge independence because of the precedent it would set for other separatist bids, exacerbated by the current crisis in South Sudan.<sup>7</sup>

This lack of international recognition has not slowed Somaliland's spirit and drive to succeed, but it has hindered their access to private investment. The government of Somaliland seems to be hoping that a solution will fall into their lap, having issued large oil exploration contracts to Genel Energy, an Anglo-Turkish firm. Their hope may be that discovering oil will generate a windfall of revenue to fund the revitalization of their energy sector. They also have an "offer worth 'hundreds of millions [of dollars]' [that] has been tabled by 'one of the world's best port operators' to develop the harbour at Berbera."<sup>8</sup> Despite this opportunity, any regulation or development of the energy industry is non-existent—especially in the power sector. Even if there is a huge windfall from oil discovery or development of their port, it will be useless without an effective financial and regulatory system in place to properly allocate resources and protect investors. The current situation will not suffice.

Electricity is wired through the city through wires that have been cut, split, and reconnected multiple times. There have been more than twenty utilities in Somaliland at a single time, many of whom have overlapping service zones. In certain cases, there are four utilities with electric wires running over the same streets and into different homes and businesses, and consumers often pay ten times what consumers in the United States pay.<sup>9</sup>

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<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Carr, "Somaliland: The Opportunity for Renewable Energy."

A visitor to Somaliland will find themselves on Jigjiga-Yar Road, which stretches from the main highway in Hargeisa all the way to the outskirts of the city. It winds past Gollis University, past the bustling marketplace and open storefronts, past the new mall and government buildings, with dark blue windows reflecting the afternoon sun. It runs all the way to the Man Soor Hotel, an elegant open-air hotel filled with international businessmen, government officials, and entrepreneurs. The walk is warm and the air is dusty, but there is an excitement that can be felt walking through the city. Beyond this bustling energy of development and progress, there is another kind of energy one can't help but notice—a constant dull roar a few yards from the main road and in the middle of a cluster of houses—that of a diesel generator.

These kinds of generation facilities can be found all over the city, with a wall of concrete and a tin roof generally being the only thing to hold back the clamor of the engine from the neighboring homes. The generation costs and consumer costs are high because the generators are powered by imported diesel fuel and kept running twenty-four hours a day, seven days a week. There is currently a complete lack of any regulatory body, very high generation costs, poor transmission capacity, high costs for consumers, and very little investment in the industry, despite huge opportunity for development. As the roar of the generator intensifies, it becomes clear that Somaliland's power sector is in desperate need of reform.

This was the environment I found myself in when I walked off of my Ethiopian Airlines flight and looked out on the tarmac of the recently constructed Hargeisa airport. I worked in conjunction with Qorax Energy and Abaarso Tech University representatives to conduct interviews of eighty families in Hargeisa, Berbera, Wajaale, and Gabiley between June and August 2014. I wanted to understand how people were using electricity, what their service was like, and find a way to channel their experience into actionable recommendations for the government. I also interviewed government officials regarding their perspectives of the power sector. The main objective was to understand what major barriers are limiting the development of the power sector and creating such high costs for electricity. Preliminary conclusions of the data collected were presented at an event organized by Abaarso Tech University in June 2014. Ultimately, I wanted to know why some of the poorest people in the world were paying so much money for



electricity and receiving so little in return. There is a very strong correlation between electricity consumption, economic performance, and poverty reduction, and, as a result, many developing countries have incorporated power sector reform into their short-term and long-term development goals.<sup>10</sup> I believe that by focusing on reforming the power sector, Somaliland can achieve a number of goals and take one step further towards recognition as an independent state.

In order to focus the priorities, I organized the Somaliland government's challenges from their development action plan into a framework that can be found in Figure 1. It uses a categorization method to order the challenges into related and prioritized pillars. By recognizing that the challenges are factors of a larger problem, it becomes clear that the first priority should be to develop a financial system and pass legislation that would create an energy commission to oversee transition of the sector. Once established, the commission can oversee goals for growth in generation, transmission, and distribution in accordance with the "Textbook Model" of power sector reform. All of these together, if done properly, can mitigate the environmental and social ills that Somaliland currently faces.

For my research, I conducted interviews in Somali, Arabic, and English using a prepared survey of questions. The interview responses were recorded and later digitized into a spreadsheet; typically, they lasted between 25 and 40 minutes. Interviews of government officials were less structured and often lasted for roughly 60 minutes. The organization of this document was inspired by Paul Maidowski's Master's thesis at The Fletcher School, which discussed power sector reform in Mongolia by proposing a phased approach for achieving goals for generation, transmission, and distribution.<sup>11</sup> Throughout the paper, I use the term "utilities" generally to refer to any power producer in Somaliland. Most of the independent producers are in the process of merging into larger entities, which makes references to the specific roles of each utility difficult to define.

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<sup>10</sup> Ministry of Infrastructure, "National Energy Policy and National Energy Strategy 2008 - 2012."

<sup>11</sup> Maidowski, "How To Create Efficient, Reliable And Clean Electricity Markets: A Regulation Design For Mongolia And Northeast Asia."

There is very little data available regarding Somaliland's power sector. All relevant data was found in the Somaliland government's Development Plan,<sup>12</sup> the Private Sector Investment Guide,<sup>13</sup> a 2011 Private Sector Assessment produced by USAID and DAI,<sup>14</sup> and limited data from the World Bank.<sup>15</sup>

Regarding the structure of this document, I first lay out the story and my reasons for becoming interested in this topic, then I discuss my methodology and the literature review involved in the process. I look at Somaliland's current situation, which is characterized by a vertically-integrated natural monopoly of private utility firms. The largest and most immediate area of concern for Somaliland is the elimination of "mandatory minimum payments," which disproportionately affect the poorest community members. Next, I take a closer look at Somaliland's power sector, and its impact on society, using the Millennium Development Goals as a lens for understanding these impacts. Following that, I begin to look at the traditional understanding of power sector reform, why it is important, and some of its limitations. Specifically, I look at the barriers to renewable energy investment in developing countries, and the impact that power sector reform can have on those investment barriers.

In order to understand goals for power sector reform in the context of Somaliland, I review three case studies for countries that have undergone power sector reform. Using their experience as a guide, I can make better predictions about the impacts of power sector reform in Somaliland. Finally, I make recommendations for reform in Somaliland. The goal and challenge for Somaliland will be finding an adequate and gradual balance to diversify their energy portfolio, while also investing in upgrades for their current system and incentivizing innovation in renewable energy sources. In many countries that have undergone dramatic shifts in their energy policy, they establish goals in five-year increments, as well as 20 to 25 year increments.

In the absence of investment, regulation, and any real promising discovery of oil, the government should seek to reform their energy sector as a way to lower the cost of electricity and grow GDP while reducing poverty. The priority should be to increase

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<sup>12</sup> Ministry of National Planning and Development, "National Development Plan, 2012 - 2016."

<sup>13</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

<sup>14</sup> DAI, *Somaliland Private Sector Development Assessment*.

<sup>15</sup> The World Bank, *New World Bank GDP and Poverty Estimates for Somaliland*.

generation in the short, medium, and long term. Transmission and distribution should not be prioritized in the short term. There will need to be a government body overseeing the reform and ensuring that utilities meet their upgrade quotas. Since there is currently no such oversight body and there are no banks to create access to capital, all of this will be contingent on the passage of two laws currently being debated: the energy act and the commercial banking act.

In reviewing Somaliland's current situation, power sector reform, and specific cases, I hope to answer the following question: Should Somaliland reform their energy sector as a way to alleviate poverty, attract investment, and further their case for recognition? If so, how can they achieve this?

## 2 Somaliland's Power Sector: Find The Gap

The Somaliland Energy Policy Document was completed in November 2010.<sup>16</sup> The document called for development of an energy regulation as soon as possible, but as of early 2015, no regulatory or enforcement framework has been developed or implemented.<sup>17</sup> Somaliland's power sector is characterized by vertically integrated private utilities that are currently unregulated and, up to this point, have operated independently of each other.

Despite the existence of these power utilities, 85 percent of energy demand is still met by biomass instead of electricity<sup>18</sup>—mostly as a result of prohibitively high costs of electricity (roughly US\$1 per kilowatt-hour).<sup>19</sup> Biomass is fuel that is taken from biological materials like trees or dung. While many homes in major cities, like Hargeisa and Berbera, are supplied with electricity, many of them still use biomass for cooking and, to a lesser degree, heating. The most common form of biomass is charcoal, which is produced by cutting down trees and burning them in a controlled environment. In recent years, there have not been sufficient amounts of dead, dry trees to cut down; as a result, sixty-five percent of the charcoal brought to Hargeisa and Berbera is produced from cutting down live trees.<sup>20</sup> This means that the soil is being deprived of nutrients and losing its ability to retain moisture to foster new growth, resulting in fewer and fewer trees. This is being made worse by the increasingly dry climate and the unpredictable rainfall patterns, which make it difficult for trees to regrow quickly.<sup>21</sup> As trees in the northern areas of Somaliland are disappearing, much of the charcoal production has been shifted to Ethiopia, which raises transportation costs. The average family uses four sacks of charcoal per month, which, in 2011 and 2012, cost an average of \$5 to \$5.50 each. However, based on recent studies, the average cost has risen to roughly \$10 for each sack of charcoal, raising the total to \$40 for the average family per month.

The electric utilities' high costs have exacerbated an environmental problem, rather than alleviating it. It is understood that power sector reform can be a powerful tool for

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<sup>16</sup> Ministry of Mining, Energy and Water Resources, *Somaliland Energy Policy*.

<sup>17</sup> DAI, *Somaliland Private Sector Development Assessment*.

<sup>18</sup> Ibid.

<sup>19</sup> Carr, "Somaliland: The Opportunity for Renewable Energy."

<sup>20</sup> Dahir, "Increasing Charcoal Production Worries Somaliland Officials."

<sup>21</sup> IRIN News, "Somalia: Somaliland Needs Own Plan For Climate Change."

poverty alleviation but the government has struggled to prioritize one action over another, resulting in inaction.<sup>22</sup> The government has listed out nine major challenges, which can be found in Figure 1. If they divide these challenges into three categories of a larger issue, they can more easily prioritize their actions. By focusing on these three categories, rather than all of the issues at once, Somaliland's government can more effectively allocate resources to overcome challenges for reforming their energy sector.

The following sections will outline the basic structure of Somaliland's existing power sector in order to best understand how to effectively focus energy on the areas that are most in need of short term action and those that can wait until the medium and long term. By finding the gaps that currently exist in the sector, the Somaliland government can effectively plan reforms that align with what the current organization is lacking, what investors need to gain confidence, and what society at large needs to happen.

## 2.1 Current Organization Of The Power Sector

Somaliland's energy sector is a natural monopoly that uses a Ramsey pricing model (See Figure 2). The goal of that model is to provide the most economically efficient method of delivery, where the price markup is the inverse of the price elasticity of demand.<sup>23</sup> In this model, the price-inelastic consumer will pay more per unit than the price-elastic generators and industrial consumers, which is often interpreted as price discrimination.<sup>24</sup>

Currently, Somaliland has approximately 70 Megawatts of installed capacity, which is controlled by a variety of utilities. There is one state-operated enterprise (SOE) called the Somaliland Energy Agency, which operates one of the utilities in the capital city of Hargeisa.

### 2.1.1 Demand

No data has been collected regarding the load demand curve, which is used to plan investments and monitor efficiency for utilities. A load demand curve is essentially monitoring of how much electricity is being demanded at any given time. Power

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<sup>22</sup> USAID/EGAT Office of Infrastructure & Engineering, Energy Team, "Electricity Sector Reform."

<sup>23</sup> Harvard University, *The Ramsey Pricing Rule For Monopolies*.

<sup>24</sup> Ibid.

producers use this data to ensure that they produce enough electricity to meet demand; otherwise they risk causing a blackout.<sup>25</sup> According to the Somaliland Ministry of Planning, “energy utilization in Somaliland is extremely low by world standards. It is currently estimated at 200 to 280 kilo joules per capita per year and is mainly dominated by biomass-based fuels.”<sup>26</sup>

### 2.1.2 Generation

A major reason for the high costs is that all of the fuel used to produce electricity is imported from the Port of Berbera, which is an ancient city on the Gulf of Aden.<sup>27 28 29</sup> Utilities purchase fuel from the port for roughly \$170 to \$200 per barrel, depending on their location and transportation costs.<sup>30</sup> Oil is considered the most convenient means for generation because it is easy to transport and store, but is one of the least efficient. This fuel is then stored in makeshift containers on site.<sup>31</sup> One business owner I interviewed was an icemaker. He paid for an enormous cooling unit to create ice all day for fishermen who needed to store their catch when they pulled into shore. The cost of electricity forces him to raise his prices to a level that makes him nearly uncompetitive.<sup>32</sup>

Many of the generators that are being used to generate electricity were purchased second hand from, mostly, Middle Eastern countries that have already upgraded their own system of generation. They range in age from five to twenty years old—some even older—and many of them have had their make and model scratched off. According to a 2011 report, “Because most Somaliland electricity traders are not necessarily engineers,

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<sup>25</sup> Shen, “Power and Energy Primer: Part 3 - Load Curves and Generation.”

<sup>26</sup> Ministry of National Planning and Development, “National Development Plan, 2012 - 2016.” page 138

<sup>27</sup> Dumper and Stanley, *Cities of the Middle East and North Africa*.

<sup>28</sup> Berbera has been mentioned in literature as early as the first century C.E. in *The Periplus of the Erythraean Sea: Travel and Trade in the Indian Ocean by a Merchant of the First Century*. In the book, the city is believed to be the city of Manao: “After Avalites there is another market-town, better than this, called Malao, distant a sail of about eight hundred stadia. The anchorage is an open roadstead, sheltered by a spit running out from the east. Here the natives are more peaceable. There are imported into this place the things already mentioned, and many tunics, cloaks from Arsinoe, dressed and dyed; drinking-cups, sheets of soft copper in small quantity, iron, and gold and silver coin, not much. There are exported from these places myrrh, a little frankincense, (that known as far-side), the harder cinnamon, duaca, Indian copal and macir, which are imported into Arabia; and slaves, but rarely.”

<sup>29</sup> Wilfred H. Schoff, *The Periplus Of The Erythraean Sea: Travel And Trade In The Indian Ocean By A Merchant Of The First Century*.

<sup>30</sup> Based on field interviews

<sup>31</sup> Electropaedia, “Electricity Generation From Fossil Fuels.”

<sup>32</sup> Schwartz, “Energy And Entrepreneurship In Somaliland.”

the Middle Eastern companies usually have a technical advantage vis-a-vis Somaliland traders and buyers and are able to sell them obsolete machinery."<sup>33</sup> The utilities have no means of measuring the operating efficiency of their generators or measuring the amount of electricity being generated on a daily basis. For example, the lone utility in Berbera has four generators, all of them fairly new and powering the entire city (See Figure 3). There is no way to test their efficiency or monitor how many kilowatts are being produced and sent onto the grid. Many business owners and consumers have confessed that if electricity prices get any higher, they will have to close their business or cut their power altogether.

### 2.1.3 Transmission

Electric infrastructure in Somaliland has been developed by the utility working in an area (See Figure 3). Many of the grids have not been connected—a trend that has emerged very recently—and the systems remain bundled.<sup>34</sup> Utilities have been limited by the high fixed costs of building new infrastructure in this area. The government has estimated that loss is roughly 30%, but because monitoring has been lacking, it could be much higher.<sup>35</sup>

### 2.1.4 Distribution

Distribution in Somaliland is poor. The distribution network is patchy and is often broken. All costs for repairs are placed on the consumer. Many of these inadequacies are related to the poor transmission system. Indeed, the only real difference between transmission and distribution is that transmission lines usually carry a much higher voltage than distribution lines, which connect a home or business to the transmission line.

### 2.1.5 Renewable Energy Potential

The Somaliland government has identified opportunity for the following alternative energy generation methods: wind, solar, tidal, hydro, and geothermal.<sup>36</sup> This

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<sup>33</sup> DAI, *Somaliland Private Sector Development Assessment*.

<sup>34</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

<sup>35</sup> Ministry of National Planning and Development, "National Development Plan, 2012 - 2016."

<sup>36</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

document will focus only on wind and solar, those being the two most readily deployable technologies.

### **Wind Energy**

There is consistent wind across the country year round. On the coasts, wind speeds exceed 7 – 9 meters per second. 50 percent of the country has wind speeds that exceed 6 meters per second, which could be able to generate electricity on a large scale.<sup>37</sup> And larger areas have wind speeds of more than 5 meters per second, which is suitable for water pumping and rural electricity generation.<sup>38</sup>

The Somaliland government recently launched a wind energy pilot project at two sites.<sup>39</sup> They installed five 20-kilowatt wind turbines at Egal Airport in Hargeisa, and three more turbines will soon be completed just outside of the coastal city of Berbera. Additionally, the government has installed four wind data monitoring stations in Hargeisa, Borama, Berbera, and Burao, which can be monitored online (See Figure 5).<sup>40</sup>

Wind represents a significant means for achieving short-term reductions in the electricity rates. In 2008, the British Wind Energy Association and the World Bank estimated the average cost of onshore wind farm output to be U.S.\$0.089 per kWh (U.S. \$89.10 per megawatt hour).<sup>41</sup> According to Owuor, “this figure was deemed comparable to the cost of new generating capacity for the higher-startup-cost options of coal and natural gas, which the Somaliland five-year development plan and the CIA World Factbook state exist but which remain unexploited.”<sup>42</sup> See Figures 5, 6, and 7.

### **Solar Energy**

Somaliland receives 3,000 hours of sunshine every year. According to NASA’s data on surface meteorology and solar energy,<sup>43</sup> Somaliland is an excellent resource for large-scale solar deployment. The below chart illustrates the amount of solar radiation shown as kWh/m<sup>2</sup>/day, which has been averaged over a twenty-two year timeframe.

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<sup>37</sup> Ibid.

<sup>38</sup> Ibid.

<sup>39</sup> DAI, “USAID Project Supports Construction of Major Wind Farm in Somaliland.”

<sup>40</sup> DAI, “Somaliland Wind Speed Database.”

<sup>41</sup> Owuor, *Wind Energy*.

<sup>42</sup> Ibid.

<sup>43</sup> Atmospheric Science Data Center, *NASA Surface Meteorology and Solar Energy*.



**Table 1: Average solar irradiation by month**

Lat 9.562												
Lon 44.07	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
22-year Average	5.37	6.03	6.39	6.22	6.38	6.34	6.26	6.33	6.29	5.82	5.59	5.16

Source: NASA Atmospheric Science Data Center<sup>44</sup>

Averaged over the entire country, this translates to roughly 5.8 to 6.0 kilowatt-hours per squared-meter per day (kWh/m<sup>2</sup>/day). The potential for large-scale solar deployment is quite high. Currently, the major initiative is being undertaken by local businessmen who travel to China or elsewhere to purchase solar panels in bulk and sell them in local electronics stores in major cities in Somaliland. Many consumers reported having purchased solar panels and installing them before realizing that they were faulty or did not generate to the advertised capacity. Large scale deployment of solar panels by utilities is much more difficult, especially when considering the degree of investment that would be required, in addition to the social, technical, and political barriers that would need to be overcome.

## 2.2 Barriers To Investment

Developing countries like Somaliland are subject to incredible investment risk, especially for renewable energy.<sup>45</sup> The following section will review the technical, environmental, economic, and political barriers for renewable energy in developing countries.

**Technical:** Markets function best when everyone has low-cost access to information and skills. However, many developing countries suffer from a lack of technical or commercial skills and information.<sup>46</sup> Project managers lack sufficient technical, financial, and business skills. Likewise, consumers, managers, engineers, architects, lenders, or planners lack information about renewable energy technology characteristics, economic and financial costs and benefits, geographical resources, operating experience,

<sup>44</sup> Ibid.

<sup>45</sup> IRENA, *Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries*.

<sup>46</sup> Beck and Martinot, "Renewable Energy Policies and Barriers."

maintenance requirements, sources of finance, and installation services.<sup>47</sup> All of these barriers lead to increased uncertainty and blocked decisions.

In Somaliland, there is a lack of public knowledge regarding the use, advantages, and limitations of renewable energy.<sup>48</sup> The Ministry of Trade and Investment has identified the development of technical skills and resources for renewable energy power production as one of their major priorities for utilizing future investment.<sup>49</sup>

**Environmental:** There are a number of environmental impacts that result in large costs to society, but are rarely accounted for when calculating the bottom line for making energy related decisions. These impacts include human health (i.e., loss of work days, health care costs), infrastructure decay (i.e., acid rain), decline in forests and fisheries, and possibly ultimate costs associated with climate change.<sup>50</sup> The costs of environmental externalities are difficult to assess and often vary widely. Over the long term, many renewable energy projects cost less than conventional energy projects. Somaliland's heavy reliance on coal has placed a heavy burden on their already diminished forests.

**Economic:** As discussed above, there are frequent failures of energy pricing to account for externalities, or for environmental, or social cost of production.<sup>51</sup> Commercial investors are reluctant to invest because of limited understanding of renewable energy technology, the “unique” costs, and the high up-front liquidity costs required by renewable energy projects.<sup>52</sup> The initial costs for renewable energy is a higher cost-per-unit than conventional energy technologies, but their long-term costs are often much smaller.<sup>53</sup> Somaliland has an abundance of renewable energy resources (see Map 4, Figure 5, and Table 1), which make the long-term investments a necessity for achieving the social goals addressed previously.

**Banks:** Somaliland has been in the process of creating, but has not yet completed, a financial sector featuring commercial banks. Up to this point, their investment has been limited because of the reliance on Islamic banking and money transfer lenders instead of traditional investment channels. Creating access to debt for end-users will allow the cost

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<sup>47</sup> Ibid.

<sup>48</sup> Ministry of National Planning and Development, “National Development Plan, 2012 - 2016.”

<sup>49</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

<sup>50</sup> Beck and Martinot, “Renewable Energy Policies and Barriers.”

<sup>51</sup> IRENA, *Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries*.

<sup>52</sup> Ibid.

<sup>53</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

of renewable energy to be spread over time, and allow local suppliers to purchase components locally and abroad.<sup>54</sup> Likewise, establishing a commercial banking presence will allow for better allocation of risk through project finance structures.

The major challenge for the wind model is that the upfront costs are much higher than those for diesel generation—some estimates show that 75% of the total cost is the upfront investment. Despite their maintenance costs being much lower than diesel generators, many local utilities have avoided these kinds of investments. However, since electricity prices are already at \$1 per kilowatt-hour, and susceptible to the volatility of oil prices, these investments should be seen as a way to secure long-term profitability, while avoiding unexpected future costs related to rising oil prices.

**Private sector involvement:** The private sector in Somaliland lacks funds, resources, and information for renewable energy investment from industrialized countries.<sup>55</sup> The government has developed a financial model for comparing the diesel and wind investments over time, which is available from the Somaliland Investment website.<sup>56</sup> Wind energy's upfront cost is much higher than diesel generators, but the absence of fuel costs mean that the investment is recovered after three years, and opens the door to cheaper electricity while still maintaining profitability.

**Political:** In many developing countries, the power utilities have a monopoly on generation and distribution. In this situation, there is often no legal frameworks present, which limit their ability to invest in renewable energy technologies. If they do make investments, they often use power purchase agreements on an ad hoc basis, which makes it hard for projects planners to plan and finance with consistent rules.<sup>57</sup>

**Mandatory minimum payments:** A considerable amount of the potential for renewable energy investment is small-scale systems for homeowners to offset their total consumption or cancel their utility connection and replace with an off-grid system. These systems are impeded by the presence of mandatory minimum payments, which disproportionately affect the poor. These payments are established by utilities and require

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<sup>54</sup> Ibid.

<sup>55</sup> Ibid.

<sup>56</sup> The Ministry of Trade and Investment and The Government of Somaliland, "Somaliland Windpower vs Diesel Financial Scenarios."

<sup>57</sup> IRENA, *Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries*.

consumers to pay a fixed minimum amount every month, regardless of their consumption levels. These rates vary between utilities, but are often somewhere between US\$8 and US\$12. Small-scale solar systems will benefit the poor most of all, but limit the ability of customers to collect a return on investment unless they commit to an off-grid system. The following is an example from my own interviews:

*I interviewed one individual who was paying an average of \$20 per month for electricity (consuming roughly 20 kilowatt-hours per month). Fed up with the high rates for his low use (lighting his home and charging his family's phones), he saved money and bought a 10-watt solar panel for US\$100 to power four lights in his home. As a result, his consumption dropped from 20 kilowatt-hours to just 7 kilowatt-hours. However, because of the mandatory minimum payments required by his utility provider, his [monthly] bill only dropped to US\$15. While his consumption dropped by 65%, his payments only dropped by 25%. This requirement makes his payback period on this investment roughly twenty months, rather than just under eight months if there was no mandatory minimum electrical payment.<sup>58</sup>*

In cities with high rates of poverty and unemployment, the minimum requirements have caused many families to cut their power altogether. Instead, they are reverting back to kerosene lanterns and battery-powered flashlights. Effectively, some areas are being forced backwards by this billing structure.

**Social and Cultural Constraints:** While conducting interviews, many individuals expressed suspicion of renewable energy sources, specifically solar. Many of them cited the upfront cost as a major barrier for their adoption of the technology. Generally, the initial cost of US\$100 is too much for many Somalis, who have limited experience with the technology and are unconvinced of its use as a substitute for grid-connected energy sources. The presence of loans will allow the costs to be spread over time, and greatly improve the attractiveness of small-scale, residential systems.

### **Impact of Power Sector Reform on Investment Barriers**

There is an incredible lack of investment in the energy sector, which is the culmination of many different factors. However, the major barrier to investment is the lack of a commercial banking system in Somaliland. Even when discussing issues other

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<sup>58</sup> English, "Facing An Electric Paradox."

than banking, they are usually the kinds of issues that can only be resolved through the large investments made possible through a commercial banking system. The energy sector is no different. Many of Somaliland's opportunities are hampered by the lack of access to investment capital.

Regulatory reforms directly impact the profitability of energy projects.<sup>59</sup> Investors can mitigate some, but not all risks associated with these kinds of projects. They are limited regarding legal risks (corruption, access to courts), regulatory risks (administrative, grid access, preferential dispatch, PPAs), and political risks (country and sovereign risks).<sup>60</sup> By limiting some of these risks, regulators and politicians can reduce costs of renewable energy investment.

The World Bank conducted a study in 2012 to assess how easy or difficult it was to conduct business in different parts of the world.<sup>61</sup> The capital city of Hargeisa was one of the 184 economies analyzed for the report, ranking 174th out of 184th. The largest challenges faced were “starting a business,” “getting credit,” “protecting investors,” and “resolving insolvency,” where they ranked 175<sup>th</sup>, 184<sup>th</sup>, 181<sup>st</sup>, and 183<sup>rd</sup>, respectively (See Figure 9). These issues are tied to the current lack of access to finance in Somaliland and reflected an “incomplete regulatory framework.”<sup>62</sup>

Instead of commercial banks, there are money transfer agents that fill a small gap and allow Somali diaspora to send money to family and friends still living in Somaliland. Dahabshiil and Salaam Financial Services both use Islamic-style banking, or “Sharia compliant finance.” One of the characteristics of Islamic banking is that interest rates are considered Haraam, or sinful, and are not allowed.<sup>63</sup> <sup>64</sup> There are ways around this, and one individual I interviewed said that it came down to “semantics.” His reasoning was that interest for the project can be calculated at the time of purchase and added onto the up-front cost. The notion behind eliminating interest is that “the lender is assured a return without doing any work or sharing any risk, while the borrower, in spite of doing so

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<sup>59</sup> Maidowski, “How To Create Efficient, Reliable And Clean Electricity Markets: A Regulation Design For Mongolia And Northeast Asia.”

<sup>60</sup> Ibid.

<sup>61</sup> The World Bank, International Finance Corporation, *Doing Business In Hargeisa 2012*.

<sup>62</sup> Ibid.

<sup>63</sup> Ross, *Working With Islamic Finance*.

<sup>64</sup> Serafeim, Henderson, and Gombos, *Omar Selim: Building a Values-Based Asset Management Firm (A)*.

much of the hard work, is not assured of any return at all.”<sup>65</sup> However, the largest hurdle is that the existing lenders are primarily transfer agents, and are unable to issue debt to facilitate large-scale investments.

In my interviews with business owners, they claimed that they would be unable to take out loans of any amount from either lender, and the burden of securing capital would fall squarely on the business owner’s shoulders. When reviewing the attractiveness of certain investments, businesses to be much more selective because of the risks involved in Somaliland. Certainly, Somaliland entrepreneurs have been able to work around this challenge, but it proves far more difficult when reviewing the challenges facing the energy sector, which requires much larger up front investments, especially when considering renewable energy technologies.

### 2.3 Social Consequences of Inaction

There are a number of social consequences that arise without a well-regulated and efficient power sector that can be alleviated through power sector reform. A large reason why poverty remains so high in Somaliland is due to the underdevelopment of the sector. This can be seen by reviewing Somaliland’s progress in meeting the UN’s Millennium Development Goals (MDGs). The eight MDGs were established in 2000 and agreed to by all UN member states, having committed to achieving them by 2015.<sup>66</sup> A successful energy policy should recognize that the MDGs can be an efficient means of measuring the impact of reforms.<sup>67</sup> The MDGs are relevant because, while energy is not explicitly mentioned in any of these goals, they underlie the achievement of each of them. According to a 2005 report from the UN Millennium Project, “Even though no MDG refers to energy explicitly, improved energy services—including modern cooking fuels, improved cookstoves, increased sustainable biomass production, and expanded access to electricity and mechanical power—are necessary for meeting all the Goals.”<sup>68</sup>

According to the same report, access to electricity enhances education and healthcare services, where a lack of energy can inhibit sterilization of medical equipment,

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<sup>65</sup> Islamic Debt Solutions, “Islam Prohibits Interest.”

<sup>66</sup> United Nations, “UN Millenium Development Goals.”

<sup>67</sup> EUEI PDF, UNDP, GTZ, *Strategy on Scaling Up Access to Modern Energy Services in Order to Achieve the Millenium Development Goals*.

<sup>68</sup> Modi et al., *Energy and the Millennium Development Goals*.

water purification, sanitation, and refrigeration of medicine. Electricity can power machines for income-generating opportunities like pumping water, food processing, clothing production, and manufacturing. Additionally, more rural areas without electricity and energy services are unlikely to attract more-educated workers, which further limits local opportunities.

It was difficult to find data specific to Somaliland regarding these issues and the MDGs, but there is a list of projects being undertaken by the Somaliland Development Fund, which provides preliminary data regarding their progress.<sup>69</sup> Information related to Somalia and the MDGs is incomplete and difficult to collect in the field for many reasons.<sup>70</sup>

**Poverty and hunger:** Electricity and fuels are essential for creating jobs, industry, transportation, commerce, small enterprises, and agriculture—they are also necessary for cooking and preparing food.<sup>71</sup> The poverty rate in urban areas of Somaliland is estimated at 29%, which is similar to Ethiopia (26%) but rural poverty is higher at 38%.<sup>72</sup> Urban households are better off but inequality is very high.<sup>73</sup> In rural villages the inequality is readily apparent. Many villagers rely on the assistance received from groups like the Norwegian Refugee Council, who have been active in encouraging energy generated through photovoltaic solar panels.<sup>74</sup> Many homes have gotten rid of their electricity altogether because the costs are so high.

**Universal primary education:** Electricity is necessary for attracting teachers to rural areas. In many of the areas where there is no access to electricity, children, especially girls, are kept out of schools to collect firewood and water for their families.<sup>75</sup> In Somaliland, roughly 50% of children age 6 to 13 attend primary school, which is in stark contrast to Ethiopia (87%).<sup>76</sup>

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<sup>69</sup> Somaliland Development Fund, *Projects*.

<sup>70</sup> Transitional Federal Government, *Millennium Development Goals Progress Report Somalia*.

<sup>71</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>72</sup> The World Bank, *New World Bank GDP and Poverty Estimates for Somaliland*.

<sup>73</sup> *Ibid.*

<sup>74</sup> Norwegian Refugee Council, “NRC’s Country Programme in Somalia.”

<sup>75</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>76</sup> The World Bank, *New World Bank GDP and Poverty Estimates for Somaliland*.

**Gender equality:** Women spend a significant portion of their days collecting water and firewood for cooking—something that disproportionately affects women in areas with little or no access to electricity.<sup>77</sup>

As it stands now, in many areas of the world, poor women on average have a more difficult time than men do.<sup>78</sup> According to the Food and Agriculture Organization of the United Nations and the United Nations Development Program, the time and energy used to collect wood and water limits their ability to engage in more productive income-generating activities, which makes them more likely to become trapped in poverty. Targeted investments in energy-related projects in areas like Somaliland can help to prevent diseases resulting from breathing in toxic fumes and can generate income for families spending less on expensive fuels.

It is important to note that there is a difference between large-scale and small-scale energy investments and their impacts on gender.<sup>79</sup> Many energy investments for development purposes have favored large-scale, capital intensive investments that develop formal sectors of the economy like cash crops and mechanical production. This is generally a male-dominated arena, which does not have as large of an impact on women. Women are generally impacted more by investments in small-scale activities where women use their own power. These activities include food processing, water procurement, transportation of water and fuel. These areas are generally not included in energy planning and women tend to be excluded from any possible benefits. Investments in more efficient cookstoves that produce less smoke, use less fuel, and last much longer than traditional stoves.

**Child mortality:** Child mortality and disease are made worse by a lack of clean water, and respiratory diseases result from indoor air pollution when using traditional fuels and stoves to cook.<sup>80</sup> Babies in Somaliland are more likely to die before their first birthday than in Ethiopia or Djibouti.<sup>81</sup>

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<sup>77</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>78</sup> Helen Clark, “Sustainable Energy.”

<sup>79</sup> Elizabeth Cecelski, *Enabling Equitable Access To Rural Electrification: Current Thinking And Major Activities In Energy, Poverty and Gender*.

<sup>80</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>81</sup> The World Bank, *New World Bank GDP and Poverty Estimates for Somaliland*.



**Maternal health:** Lack of electricity in health clinics, where nighttime deliveries can be limited by a lack of light, and increased pressure on women for collecting firewood and water contribute to poor maternal health conditions.<sup>82</sup> Somaliland's urban areas compare well to neighboring countries but in rural areas, most births take place at home without skilled attendants. Mothers are more likely to die in childbirth and babies are more likely to die before their first birthday than in Ethiopia or Djibouti.<sup>83</sup>

**HIV/AIDS:** Electricity allows for the spread of important public health information regarding deadly diseases. Likewise, health care facilities require electricity to deliver services.<sup>84</sup> In 2003, a number of articles indicated that the prevalence of HIV/AIDS in Somaliland was only 1 percent.<sup>85</sup> However, those numbers are rather suspect because there is so little data being collected, especially considering the high rates of infection in neighboring countries like Ethiopia and Djibouti.<sup>86</sup> The government has not taken a strong enough stance on HIV/AIDS education or anti-retroviral distribution.<sup>87</sup> Power sector reform could allow for the development of more rural health centers and better public awareness campaigns.

**Environmental sustainability:** Cleaner energy can address indoor air pollution, land degradation, acid rain, and global warming.<sup>88</sup> In many areas without electricity and areas where high electricity rates can be prohibitive, most of the cooking is done with charcoal on traditional cook stoves. In my own research, nearly 90% of interviewees reported cooking with charcoal on cheap, inefficient stoves. That number would be higher, but a considerable number of respondents from poorer communities explained that charcoal was too expensive, and that they scour the surrounding areas for firewood. These stoves cost around \$3, last a maximum of three months, and have considerable negative impacts on health and well-being.<sup>89</sup>

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<sup>82</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>83</sup> The World Bank, *New World Bank GDP and Poverty Estimates for Somaliland*.

<sup>84</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>85</sup> Y. Garow MD MPH, "HIV/AIDS in Somaliland Too Good To Be True."

<sup>86</sup> Ibid.

<sup>87</sup> IRIN News, "Somaliland Rolls Out ARV Treatment, But HIV/AIDS Education Lagging."

<sup>88</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>89</sup> Omar and Sugulle, *Impact of Charcoal Production on Environment and the Socio-Economy of Pastoral Communities of Somaliland*.

Traditional methods of charcoal conversion can take eight to ten tons of wood to make one ton of charcoal.<sup>90</sup> Estimates say that four trees are cut down to produce one sack of charcoal. According to the Ministry of Environment and Rural Developments, there are eight to ten trucks<sup>91</sup> carrying up to 1,600 sacks of charcoal into the major city of Hargeisa every day. According to a USAID study, the percent of biomass being used as a primary fuel is declining, but the price continues to rise.<sup>92</sup> One solution is to use more efficient stoves that use less charcoal. Still, the challenge will be to limit the use of charcoal without crippling those individuals who depend on that industry for survival. This could be solved with career training programs in other sectors like manufacturing that are made possible through more efficient delivery of electricity.

In the past, farmers and pastoralists could make assessments of the ideal times to mate their livestock based on the mating habits of local gazelles, but land degradation has led to destruction of their grazing territory and their classification as a “vulnerable” species,<sup>93</sup> rendering the traditional pastoralist methods useless.<sup>94 95 96</sup>

**Global partnership for development:** The World Summit for Sustainable Development has called for partnerships between public, private, civil society, and development

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<sup>90</sup> Daisy Ouya, “Unpacking The Evidence On Firewood And Charcoal In Africa.”

<sup>91</sup> Dahir, “Increasing Charcoal Production Worries Somaliland Officials.”

<sup>92</sup> DAI, *Somaliland Private Sector Development Assessment*.

<sup>93</sup> The Red List, *Nanger Soemmerringii*.

<sup>94</sup> A Somali poem describes the process used by these farmers and pastoralists: *When the male ‘Cawl’ wishes to mate with his females, // He first makes astronomical calculations, // He knows their menstrual periods and the techniques of mating, // The day he wishes to cause propagation and off springs, // He, placing first his front knees on to the female’s back, // Judges whether the young will be born in sun or green from the signs in the heavens, // His decision whether to continue mating or to descend is in accordance with his celestial inductions.*

<sup>95</sup> Ingrid Hartmann and Ahmed J. Sugulle, *The Impact of Climate Change on Pastoral Societies of Somaliland*.

<sup>96</sup> It has been shown that some gazelles can delay the birth date of their young if the conditions are not right, and will wait until a rainy season to deliver calves. Herders would monitor the mating habits of local gazelles, which were believed to be able to predict the next rainy season using the stars. This has been a useful strategy for avoiding negative impacts of an increasingly unpredictable rainy season. However, due to rangeland degradation, deforestation, and hunting, the gazelle (*nanger soemmerringii*) is currently rated as “vulnerable” by the International Union for Conservation of Nature and Natural Resources, and is no longer considered an efficient indicator of proper mating dates. This has been exacerbated by rising temperatures and increasingly unpredictable starts to the rainy season each year. The decline of this species is one result of a much larger and multifaceted problem facing Somaliland and many other countries in the Horn of Africa and sub-Saharan Africa: trees are being cut down in great numbers in pastoral regions and being used to produce charcoal for cooking in rural and urban areas.

agencies to work together to address the issues discussed above.<sup>97</sup> All of these issues together present an opportunity for Somaliland to take major steps to improving social well-being and increase their international cooperation and legitimacy. Power sector reform is a critical step in this process and can make significant impacts on Somaliland's social and economic development.

## 2.4 Preliminary Conclusions

The above analysis highlights the gaps that currently exist in the Somaliland power sector by identifying how the sector is currently configured, what investors need to reform it, and why society at large needs that to happen. Consumers and producers are in a similar situation regarding electricity at the moment. The utilities can't raise prices without further prohibiting access to electricity. They also can't make investments in infrastructure to drive down prices and increase access unless they find additional capital. The creation of a long-term energy policy will create more confidence for investors, who will have a greater incentive to make longer commitments and more long-term investments, which greatly improves the chances for renewable energy investments and more efficient power generation overall.

As noted earlier, there have been upwards of twenty electric utilities in Somaliland at once.<sup>98</sup> They are vertically-integrated monopolies, but have recently begun to organize large mergers, where a single utility absorbs a competing utility's customers, grid, and employees. The utilities vary from city to city, and in more populous areas like Hargeisa, there are multiple utilities governing the same neighborhoods; in other areas, there may be only a single utility available. Regardless of whether or not there are competing utilities, residents pay an average of \$1.00 per kilowatt-hour, which is one of the highest rates in the world.<sup>99</sup> This becomes even more troubling when one considers that GDP in 2012 was \$1.4 billion, which translates to roughly \$347 per capita, the fourth lowest in the world according to the World Bank.<sup>100</sup> Figure 11 illustrates how

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<sup>97</sup> Modi et al., *Energy and the Millennium Development Goals*.

<sup>98</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

<sup>99</sup> U.S. Energy Information Administration, "Electricity Prices for Households for Selected Countries."

<sup>100</sup> The World Bank, *New World Bank GDP and Poverty Estimates for Somaliland*.

prohibitively expensive this is by comparing the average costs of electricity and per capita GDP across multiple countries.<sup>101</sup>

The immediate needs are for the elimination of the mandatory minimum payments to minimize strain on the poor, the passage of the commercial banking law, and the passage of the electric energy act. Elimination of the mandatory minimum will be necessary—either through a gradual phase-out to minimize losses to the utilities, or immediately, with government funding provided to minimize the same losses.

Politicians and policymakers will need to establish strict guidelines regarding mandatory minimum payments. Up to this point, politicians have been reluctant to take action on two of the most critical components for their economic development: financial sector reforms and electric energy policies. The absence of an effective policy environment discourages the use of alternate energy systems.<sup>102</sup> Many of these issues are linked, and contributing to larger and more long-term problems that could dramatically impact economic productivity and social structures. With electricity becoming more readily available, many families and small businesses are finding it to be a more viable solution. The time to act is now.

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<sup>101</sup> *Based on information from Statista and World Bank*

<sup>102</sup> Ministry of National Planning and Development, “National Development Plan, 2012 - 2016.”

## Power Sector Reform: Close The Gap

Having identified the gaps that exist in Somaliland's power sector, the next step is to figure out how to close those gaps. Power sector reform is the process of restructuring public utilities, corporatization and commercialization of utility operations establishing legal and regulatory frameworks, setting level playing fields for operators in the power sector, privatization of public utility assets, and private sector investment in green-field power projects.<sup>103</sup> The following section introduces the basic structure and strategy for power sector reform. It reviews the four organizational structures for the power sector and the “textbook model” for power sector reform before reviewing case studies of successful power sector reform in South Sudan, Rwanda, and Ethiopia.

### 2.5 Diversification of Energy Sources

One of the goals of power sector reform is to diversify an energy portfolio. By relying on mainly imported diesel for energy generation instead of a balanced generation of multiple sources, including renewables, Somaliland has made itself economically vulnerable. Importing diesel for power generation makes Somaliland incredibly susceptible to price shocks for oil. According to Robert Bacon, the change in oil prices has an associated change in GDP of low-income countries.<sup>104</sup>

### 2.6 Organization Of The Power Sector

In order to propose a successful policy for electricity regulation, it is critical to assess the current state of the energy sector, identifying areas of success, and areas for improvement. There are four organizational forms of the electricity sector and most countries generally fit into one of these categories: natural monopoly, single buyer, wholesale market, and retail market (See Figure 13). As was mentioned earlier, Somaliland can be classified as a natural monopoly.

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<sup>103</sup> Teferra, “Power Sector Reforms in Ethiopia: Options for Promoting Local Investments in Rural Electrification.”

<sup>104</sup> Bacon, *The Impact of Higher Oil Prices in Low Income Countries and the Poor: Impacts and Policies*.

## 2.7 The “Textbook Model”

The “Textbook Model” for power sector reform is widely accepted as a successful guide for electricity market restructuring.<sup>105</sup> The more a country digresses from the model, the more likely they are to have problems.<sup>106</sup> The following is the process for instituting the “textbook model” for power sector reform.<sup>107</sup>

**Privatization:** Privatization of state-owned electricity monopolies to create hard budget constraints and high-powered incentives for performance improvements and to make it more difficult for the state to use these enterprises to pursue costly political agendas.<sup>108</sup>

**Vertical separation of competitive and regulated services:** Vertical separation of potentially competitive segments (e.g. generation, marketing and retail supply) from segments that will continue to be regulated (distribution, transmission, system operations) either structurally (through divestiture) or functionally (with internal “Chinese” walls or “ring fencing” separating affiliates within the same corporation). These changes are thought to be necessary to guard against cross-subsidization of competitive businesses from regulated businesses and discriminatory policies affecting access to distribution and transmission networks upon which all competitive suppliers depend.<sup>109</sup>

**Horizontal restructuring:** Horizontal restructuring of the generation segment, to create an adequate number of competing generators to mitigate market power and to ensure that wholesale markets are reasonably competitive.<sup>110</sup>

**Independent Transmission System Operator (TSO):** Horizontal integration of transmission facilities and network operations to encompass the geographic expanse of “natural” wholesale markets and the designation of a single independent system operator to manage the operation of the network, to schedule generation to meet demand and to maintain the physical parameters of the network (frequency, voltage, stability), and to guide investments in transmission infrastructure to meet reliability and economic standards.<sup>111</sup>

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<sup>105</sup> Kessides, “The Impacts of Electricity Sector Reforms in Developing Countries.”

<sup>106</sup> Ibid.

<sup>107</sup> Paul L. Joskow, *Lessons Learned From Electricity Market Liberalization*.

<sup>108</sup> Ibid.

<sup>109</sup> Ibid.

<sup>110</sup> Ibid.

<sup>111</sup> Ibid.

**Voluntary wholesale markets for electricity and ancillary services:** The creation of voluntary public wholesale spot energy and operating reserve market institutions to support requirements for real time balancing of supply and demand for electric energy, to allocate scarce network transmission capacity, to respond quickly and effectively to unplanned outages of transmission or generating facilities consistent with the need to maintain network voltage, frequency and stability parameters within narrow limits, and to facilitate economical trading opportunities among suppliers and between buyers and sellers.<sup>112</sup>

**Demand Side Management:** The development of active “demand-side” institutions that allow consumers to react to variations in wholesale market prices and fully integrate demand side responses to energy prices and reliability criteria into wholesale and retail markets.<sup>113</sup>

**Transmission Regulation:** The application of regulatory rules and supporting network institutions to promote efficient access to the transmission network by wholesale buyers and sellers in order to facilitate efficient competitive production and exchange. This includes mechanisms efficiently to allocate scarce transmission capacity among competing network users, and to provide for efficient siting and interconnection of new generating facilities.<sup>114</sup>

**Unbundling of Retail Tariffs:** The unbundling of retail tariffs to separate prices for retail power supplies and associated customer services to be supplied competitively from the regulated “delivery” charges for using distribution and transmission networks that would continue (primarily) to be provided by regulated monopolies.<sup>115</sup>

**Independent Regulator:** The creation of independent regulatory agencies with good information about the costs, service quality and comparative performance of the firms supplying regulated network services, the authority to enforce regulatory requirements, and an expert staff to use this information and authority to regulate effectively the prices charged by distribution and transmission companies and the terms and conditions of

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<sup>112</sup> Ibid.

<sup>113</sup> Ibid.

<sup>114</sup> Ibid.

<sup>115</sup> Ibid.

access to these networks by wholesale and retail suppliers of power, are also an important but underappreciated component of successful reforms.<sup>116</sup>

**Transition Mechanism:** Transition mechanisms must be put in place to move from the old system to the new system. These mechanisms should be compatible with the development of well functioning competitive markets.<sup>117</sup>

Each step in the process of the textbook model is critical for reforming the power sector. The degree to which a country conforms to the textbook model can be a good indicator for how successful reform will be, but the order and rate at which they implement the changes can vary depending on the country. In Somaliland's case, it makes sense to review cases of other countries that have undergone reform in their power sectors and see how well they fared.

## 2.8 Cases Studies

In order to understand the proper approach and strategy for power sector reform in Somaliland, it is critical to study the experiences of other sub-Saharan African countries that have undergone such changes. The following case studies for Rwanda, South Sudan, and Ethiopia will examine the role that power sector reform has played and the different approaches each country has taken.

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<sup>116</sup> Ibid.

<sup>117</sup> Ibid.



### 2.8.1 Rwanda: Financing Renewable Energy

#### Key takeaways:

- Providing—and encouraging—off-grid solar development in rural areas can limit pressure on the utilities and government to extend transmission lines into rural areas.
- Increased demand-side efficiency by consumers can reduce the amount of electricity needed, and often the amount of fuel needed, which can drive down the cost of electricity.
- Power Purchase Agreements can provide attractive loan structures for governments to make long-term investments in energy generation.

Between the years 2002 and 2005, Rwanda carried out a Poverty Reduction Strategy Program, which demonstrated that high economic growth rates were critical for poverty reduction.<sup>118</sup> The Rwandan economy had been growing between 5.5% and 7% annually during this time. However, it was noted that shortages of energy and high prices threatened to limit economic growth, the success of the program in the short-term, and in meeting the goals of the Vision 2020 plan.<sup>119</sup> Having recognized this reality, the power sector became a cornerstone of their Economic Development and Poverty Reduction Strategy (EDPRS) program, which was introduced as a means to improve standard of living of Rwandans through high economic growth.

Rwandans pay roughly US\$0.38 per kWh, which is lower than in Somaliland (US\$1.00), but still very high when compared with many other countries.<sup>120</sup> They have tried to reduce the cost per unit by making large supply-side investments, but just as important are the short-term actions to increase demand-side efficiency.

#### **Demand Side Management:**

In order to achieve their development goals, Rwanda prioritized raising the level of electricity access and the efficient use of electric energy.<sup>121</sup> The following areas were emphasized:

<sup>118</sup> Ministry of Infrastructure, “National Energy Policy and National Energy Strategy 2008 - 2012.” Page 2

<sup>119</sup> Ibid. Page 2

<sup>120</sup> Long, “Rwanda Solar Grid Capitalizes on Limited Sunshine.”

<sup>121</sup> Ministry of Infrastructure, “National Energy Policy and National Energy Strategy 2008 - 2012.” Page 3

1. Efficient charcoal and wood production: The production of eucalyptus wood in woodlots produces 6.8 cubic meters of wood per year per hectare. This could be increased to 20 cubic meters by using improved forest management techniques.<sup>122</sup>
2. More efficient conversion of wood to charcoal: It was noted that it is possible to improve charcoal yield by 30-40% by using improved kilns.<sup>123</sup>
3. Improved cook-stoves: In 2008, more than 50% of Rwandan households owned improved cook-stoves that reduce fuel and charcoal use, as well as respiratory diseases associated with traditional cooking methods. By 2012, their goal was to reach 100% coverage.<sup>124</sup>

These are all relatively simple solutions on the demand side that can help improve efficiency and minimize strain on consumers. Many small businesses have begun selling small home solar systems, which are installed on the roof. This is mostly for Rwandans in rural areas who do not have access to grid electricity, and where expansion of the grid would be too expensive for the government or utilities. Generally, these solar systems are paid off over three years with monthly payments of US\$10.<sup>125</sup>

#### **Supply Side:**

Rwanda generates roughly half of its electricity from diesel, which can be incredibly inefficient and increase the per-unit cost of electricity.<sup>126</sup> This prompted them to invest more heavily in renewable energy sources.

#### **Solar:**

In order to drive down the per-unit cost of electricity, Rwanda has committed to larger-scale solar construction to reduce the cost of generation. They introduced a plan to install 3,000 solar photovoltaics (1 MW each) between 2008 and 2012. The following chart breaks down the rate at which they plan to introduce the panels:

**Table 2: Yearly Breakdown Of Solar Introduction Plan In Rwanda**

<b>Year</b>	<b>Addition (MW)</b>	<b>Total (MW)</b>
2009	500	500

<sup>122</sup> Ibid.

<sup>123</sup> Ibid.

<sup>124</sup> Ibid.

<sup>125</sup> Long, "Rwanda Solar Grid Capitalizes on Limited Sunshine."

<sup>126</sup> Ibid.

2010	1000	1500
2011	1000	2500
2012	500	3000

*Source: Rwanda Ministry of Infrastructure*<sup>127</sup>

**Aghozo Park:** In 2014, Rwanda installed the largest solar plant in East Africa on a 21-hectare field. The field has a peak generation of 8.5 megawatts, which is close to 7 percent of capacity on the national grid. It was purchased using a power purchase agreement to pay for the electricity over 25 years. The exact price that the Rwandan government will pay for the electricity is confidential, but it is estimated between 20 and 25 cents per kilowatt (twice as expensive as most hydropower projects).<sup>128</sup>

The Rwandan government has noted that it doesn't want more than 10% of their total energy coming from solar because it can fluctuate day to day. However, the adoption of solar was preferable to hydropower as a renewable energy source. Solar can be installed much faster than hydroelectric facilities—a hydroelectric plant would have taken as much as two years to construct, whereas the solar field was operational roughly six months after construction began. The Aghozo Park has more than 28,000 solar panels and was built at a cost of \$23.7 million.<sup>129</sup>

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<sup>127</sup> Ministry of Infrastructure, "National Energy Policy and National Energy Strategy 2008 - 2012."

<sup>128</sup> Long, "Rwanda Solar Grid Capitalizes on Limited Sunshine."

<sup>129</sup> Ibid.

## 2.8.2 South Sudan: Regulatory and Legal Frameworks for Success

### Key takeaways:

- Establishment of regulatory and legal framework
- Reducing barriers to investment
- Charcoal and fuel wood consumption should be included as an explicit step for power sector reform.
- Expansion of generation capacity should be incorporated into short, medium, and long-term plans.

The first goal of the recently created South Sudan government was to create a foundation for business and investment.<sup>130</sup> South Sudan is wealthy with natural resources. According to the International Monetary Fund, oil revenues represented 98% of total revenue for the country in 2008.<sup>131</sup> South Sudan depends more on oil revenues than any other country in the world.<sup>132</sup> Despite this, only 1 percent of South Sudan's population has access to electricity, cost of generation is incredibly high, distribution is very inefficient, and more than half of the electricity that is supplied and billed is uncollectible.<sup>133</sup> Roughly one-third of South Sudan's citizens have no lighting source and half rely on biomass as their primary energy source.<sup>134</sup>

South Sudan has prioritized the development of modern energy services and the creation of regulatory and legal frameworks for increasing energy access in smaller towns and trading centers.<sup>135</sup>

### 2.8.2.1 Investment

One of their first initiatives has been to reduce the barriers to investment. The World Bank coordinated with the South Sudanese government to enact the first phase of the Investment Climate program, which started in 2007 and was focused on investment laws; laws for business to enter, operate, and exit, a business strategy; and a taxation law.

<sup>130</sup> Shankleman, *Oil and State Building in South Sudan: New Country, Old Industry*.

<sup>131</sup> REEEP Policy Database, *South Sudan Energy Overview*.

<sup>132</sup> Shankleman, *Oil and State Building in South Sudan: New Country, Old Industry*.

<sup>133</sup> World Bank Investment Climate, *South Sudan Takes On Business Friendly Reforms In Strategic Sectors*.

<sup>134</sup> Ibid.

<sup>135</sup> African Development Bank Group, "South Sudan: An Infrastructure Action Plan."

The 2009 Investment Promotion Act listed the electric industry as one of their major priorities, and the other priority areas required increased access to electricity for their operations.<sup>136</sup> By June 2012 they had enacted sixteen laws, adopted five regulations, streamlined over fifty procedures, registered 17,000 businesses (from a base of 135), and attracted more than \$200 million in private investment into South Sudan.<sup>137</sup>

The energy policy document attempts to create fewer, but larger power plants. As early as 2011, there was a total installed electricity capacity of twenty-five megawatts. The document is limited in that it does not account for the consumption of charcoal and fuel wood, and instead relegates the issue to the Ministry of Agriculture and Forestry.<sup>138</sup> There is no policy governing the consumption of charcoal and fuel wood, but one is badly needed. Biomass still represents the main fuel source for most South Sudanese and 99 percent of the population uses biomass for cooking and 50 percent use it for lighting—only 4 percent of the population uses electricity.<sup>139</sup>

### **Short Term (2012 – 2015)**

In the short term, the South Sudanese government prioritized the expansion of generation capacity. The existing generation facilities would be rehabilitated, new diesel power plants (336 MW) will be installed in thirteen towns, and a large (40 MW) power plant will be constructed to supply the Juba Regional Grid. In addition, they planned for the expansion of the transmission grid, installation of two regional grids, and strengthening of the distribution network.<sup>140</sup>

### **Medium- and Long-Term (2016 – 2020)**

In the medium and long-term, the South Sudanese government plans to expand the generation capacity again with the installation of additional 115 MW diesel units in the Juba and Malakal grids, as well as expansion of the transmission network. They expect that the interconnection with the neighboring countries will increase with the

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<sup>136</sup> Southern Sudan Legislative Assembly, “The Investment Promotion Act.”

<sup>137</sup> World Bank Investment Climate, *South Sudan Takes On Business Friendly Reforms In Strategic Sectors*.

<sup>138</sup> Government of the Republic of South Sudan, Ministry of Environment, and United Nations Development Programme, *Environmental Impacts, Risks, and Opportunities Assessment: Natural Resources Management and Climate Change in South Sudan*.

<sup>139</sup> African Development Bank Group, “South Sudan: An Infrastructure Action Plan.”

<sup>140</sup> Ibid.

Ethiopia-South Sudan and Uganda-South Sudan Interconnectors set to be commissioned by the end of 2019 and 2020.<sup>141</sup> Between 2010 and 2030, the government of South Sudan expects electricity demand to increase from roughly 300 MW to nearly 1500 MW.<sup>142</sup>

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<sup>141</sup> Ibid.

<sup>142</sup> The Minister of Transport, The Minister of Electricity and Dams, and The Minister of Housing and Physical Development, “Opportunities for Investors in Infrastructure.”

### 2.8.3 Ethiopia: Economic Growth and Power Sector Reform

#### Key takeaways:

- Creation of regulatory agency is critical to maintaining consistency and developing the trust of investors.
- It is possible to have a vertically integrated state-owned company that is efficient enough to secure investment from the international community.
- Long-term and consistent political commitment is necessary for development of the sector.
- Commitments to reengineering, cost reductions and dismissal of those opposed to the new strategy facilitate consistency and trust from investors.

The Ethiopian government plans to become a middle-income country by the year 2025, establishing their plans for achieving this goal in the Growth and Transformation Plan (GTP).<sup>143</sup> This will be a major challenge for Ethiopia, especially given that traditional energy sources make up 94% of Ethiopia’s energy consumption and modern sources (petroleum and electricity) make up only 6%.<sup>144</sup> They have since completed large-scale hydropower projects that have greatly improved their energy consumption—having already known that the hydroelectric potential was very high (45,000 MW).<sup>145</sup>

The first step taken was a study by Ethiopia Electric Light and Power Authority (EELPA) in 1997.<sup>146</sup> The study concluded that the public utility in the future should be created “within a sound and decentralized framework with Government providing the overarching regulatory oversight.”<sup>147</sup> The goal of the reforms was to restructure state monopolies into competitive entities via vertical and horizontal unbundling and a significant contribution from the private sector.<sup>148</sup> The study also noted that the Ethiopian power sector had problems with an unreliable power supply, low capacity utilization and availability factors, deficient maintenance, poor procurement for spare parts, high transmission and distribution losses, and that the financial performance of EELPA was unsatisfactory.<sup>149</sup>

<sup>143</sup> Canadian Trade Commissioner Service, *Power Sector Market Report - Ethiopia*.

<sup>144</sup> REEEP Policy Database, *Ethiopia Policy and Regulatory Overviews*.

<sup>145</sup> Pauly et al., *Power Sector Reform in Africa*.

<sup>146</sup> Teferra, “Power Sector Reforms in Ethiopia: Options for Promoting Local Investments in Rural Electrification.”

<sup>147</sup> Ibid.

<sup>148</sup> Electrical and Compute Engineering Ideas, “Power Sector Reform in Ethiopia.”

<sup>149</sup> Ibid.

The government divided the outlook for the power sector into short-, medium-, and long-term plans of five, ten, and twenty-five years.<sup>150</sup> Commercialization was emphasized because it improves cost effectiveness and profitability, while decentralization strengthens regional offices and improves decision-making and implementation of regional staff without having to rely on the national office.<sup>151</sup>

### **Short Term Actions**

**Creation of regulatory agency:** The Ethiopian Electric Agency (EEA) was created in 1997 and given the power to “issue licenses, set tariff and supervise the generation, transmission, distribution, sales, import and export of electricity. The Agency also issues regulations and directives necessary to carry out duties, certificates of professional competence for electric contractors.”<sup>152</sup> The government’s intention was to “create an institution which is entrusted with policy formulation, priority setting, and coordination of all energy sector development activities in order to coordinate and ensure consistency in energy resource development, and to avoid resource waster and duplication of efforts.”<sup>153</sup>

**Rural electrification:** A separate agency, known as The Rural Electrification Agency (REA) was created to prioritize the development of a rural electrification plan. They are in charge of preparing plans, providing information on potential sites, reviewing proposals for investments, and providing technical assistance to investors.<sup>154</sup> A Rural Electrification Fund was also created to help facilitate rural electrification through “smart subsidies.”<sup>155</sup>

### **Investment**

The Ethiopian government and planners knew that for large-scale projects like hydropower plants, external funding would be contingent on lender confidence.<sup>156</sup> In

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<sup>150</sup> Canadian Trade Commissioner Service, *Power Sector Market Report - Ethiopia*.

<sup>151</sup> Teferra, “Power Sector Reforms in Ethiopia: Options for Promoting Local Investments in Rural Electrification.”

<sup>152</sup> Electrical and Compute Engineering Ideas, “Power Sector Reform in Ethiopia.”

<sup>153</sup> Federal Democratic Republic of Ethiopia, “The National Energy Policy.”

<sup>154</sup> Electrical and Compute Engineering Ideas, “Power Sector Reform in Ethiopia.”

<sup>155</sup> Ibid.

<sup>156</sup> Pauly et al., *Power Sector Reform in Africa*.



order to achieve this, the electricity company became an independent legal entity with its own Board of Directors.<sup>157</sup> This helped to improve the project management capacity of project leaders, who are now largely independent. Above all, professionalism, transparency of the planning process, better pricing policies, and increasing operating performance facilitated profitability of the company, which made it more attractive to investors.<sup>158</sup>

### **Developing investor confidence**

The electricity company was instituted as an independent legal entity and the government improved the rules of governance. A Board of Directors was created. It can be assumed that given the government's involvement in the electric power sector it will choose the members of the Board of Directors based solely on their abilities. The company uses the "total quality management" method.<sup>159</sup> EEPCo is now characterized by strong commitment from the government, always prioritizing energy investment, and a commitment to reduce costs while maintaining partnerships with local companies.<sup>160</sup>

Overall, they have been remarkably successful. Since implementing these changes, the Ethiopian government has reduced the time needed for new units added from 8/9 years to 4/5 years and has secured financing for 3000 MW of expansion of generational capacity.<sup>161</sup> Financing conditions vary but the cost is expected to be roughly US\$0.04 per kWh.<sup>162</sup>

### **Long-term actions**

By the year 2037, Ethiopia plans to have an installed generation capacity of 37,000 MWs and to be a major exporter of electricity. This will require major investments from the private sector.<sup>163</sup> EEPCo remains vertically integrated, but it is likely that EEPCo will unbundle generation, transmission, and distribution in the future as a way to further

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<sup>157</sup> Ibid.

<sup>158</sup> Ibid.

<sup>159</sup> Ibid.

<sup>160</sup> Ibid.

<sup>161</sup> Ibid.

<sup>162</sup> Ibid.

<sup>163</sup> USAID, "What Power Africa Means for Ethiopia."

improve their efficiency.<sup>164</sup> An overhaul of the legal and regulatory framework for energy efficiency will also be necessary, as losses of roughly 30% have greatly limited profitability.<sup>165</sup> Finally, introducing pricing adjustments can facilitate faster returns on investment.<sup>166 167</sup>

## 2.9 Preliminary Conclusions

The “textbook model” for power sector reform provides a guideline for countries to follow when reforming their power sector. These reforms need to take into account the individual characteristics of the country. Small developing countries may be limited in regards to some of the larger investments. One absolutely critical factor is the long-term political commitment and the ability to adjust the policies if problems should arise.

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<sup>164</sup> Ibid.

<sup>165</sup> Ibid.

<sup>166</sup> Ibid.

<sup>167</sup> Pauly et al., *Power Sector Reform in Africa*.

### 3 Proposal for Power Sector Reform in Somaliland

The strong correlation between electricity consumption, economic performance, and poverty reduction<sup>168</sup> has led to many developing countries incorporating power sector reform into their short-term and long-term development goals. By reforming their power sector, Somaliland can greatly increase their economic productivity and lift significant portions of their population out of poverty. The following sections propose a strategy for reforming the power sector in Somaliland and should be employed for the specific purpose of driving down the per-unit cost of electricity. Effective planning will be the key to reducing per-unit costs; the per-unit price should cover the costs of supply, including new generation and network investments but profit margin should be held below an established ceiling.<sup>169</sup> The Somaliland government's actions for power sector reform can be designated into three phases: short-term/immediate (1 – 5 years), medium term (5 – 15 years), and long-term (15 – 25 years).

The short and medium terms should be characterized by increasing generation capacity and enhanced transmission capabilities as well as diversification of their energy supply. Renewable energy can be the answer to short term concerns regarding diversification and rural electrification. As investors gain confidence, renewable energy could become a viable option for larger investments in the sector. The long-term plan should focus on unbundling of the generation, transmission, and distribution. Successful implementation of these reforms will be contingent upon strong political commitment from the Somaliland government; the Ministry of Planning will need to work closely with the Ministry of Energy and the Energy Commission to establish a long-term plan for the energy sector (25 years).

Many other countries have undergone power sector reform and have followed a steady and strategic approach to upgrading their generation, distribution, and transmission systems. In the case of Somaliland, before any of this can happen, the legal and regulatory systems will need to be put into place.

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<sup>168</sup> Ministry of Infrastructure, “National Energy Policy and National Energy Strategy 2008 - 2012.”

<sup>169</sup> Hertzmark, “Electricity at the Right Price.”

### 3.1 Establishing Legal and Regulatory Frameworks

Similar to South Sudan, the short-term plan of the Somaliland government should emphasize regulatory and legal frameworks. The first stages of that plan involve passage of laws and can be achieved relatively easily with political buy-in. In many of the interviews that I have conducted, there have been varying degrees of optimism regarding how soon this could be passed. Some have predicted that the Commercial Banking Act and the Electric Energy Act could be passed within a month, and others still claim that they will not pass before at least another year. Both were expected to pass some time in 2013 or earlier. Some have claimed that local transfer agents are lobbying against the Commercial Banking Act to prevent increased competition, desiring to remain the sole source of “finance” in the country. In order to have any impact, the energy and commercial banking acts must be passed as soon as possible.

#### **Electric Energy Act**

The goal of the act itself is to promote consumer-oriented electricity services, attract investment, encourage best practices, and incorporate environmental concerns into short-, medium-, and long-term planning.<sup>170</sup> If passed, this act will enable the Somaliland government to initiate reform through the creation of the energy commission,<sup>171</sup> which will oversee and enforce regulation of utilities as well as designing and implementing the long-term strategy of the sector. Drafts of the act are currently being debated in the Somaliland Parliament and it has been under review since 2012.<sup>172</sup>

#### **Passage of Commercial Banking Law**

Currently, the only access to finance is through money transfer lenders, who move money from the Somali diaspora in the United States and Europe into Somaliland. The passage of a commercial banking law would allow banks to enter and issue loans, as well as providing a necessary framework for project finance. These measures will help to develop investor confidence in the sector. In February, a number of company accounts transferring money between Somalia and the U.S. were closed, a possible added impetus

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<sup>170</sup> Ministry of Mining, Energy and Water Resources, *Electrical Energy Act 2012 (Draft)*.

<sup>171</sup> Ibid.

<sup>172</sup> Republic of Somaliland, “Republic of Somaliland, House of Representatives.”

for passing the commercial banking act sooner rather than later.<sup>173</sup> As was seen in the case of South Sudan, creating a sound regulatory framework around finance builds investor confidence.

The Commercial Banking Act will relieve some of the larger limitations around the finance industry and attract banks to the area, creating much-needed access to capital and investment.<sup>174</sup> In the case of Rwanda, the government was able to secure a large-scale Power Purchase Agreement to finance the construction of a solar field. The Somaliland government has an opportunity to partner with local utilities for a large-scale generation project that could be paid off over 20 to 30 years, with ownership transferring to the utilities as shareholders once the government has recovered their investment.

### 3.2 Restructuring Organization of Power Sector

#### **Energy Commission:**

The creation of an Energy Commission will be necessary for establishing long-term goals for the energy sector. The Energy Commission's primary responsibility is to oversee the energy industry, including the power sector, in Somaliland—similar to the case of Ethiopia, where a semi-autonomous regulatory body was created to oversee and regulate the sector.<sup>175</sup> They will be charged with price setting, establishing development goals, and overseeing and regulating private utilities to ensure that they are maximizing efficiency to reduce consumer costs. Establishing a transition mechanism will be critical for a smooth transfer from one organizational structure to another.

Once the legal and regulatory frameworks are in place, the Energy Commission will be charged with establishing and enforcing those frameworks for the power sector. This will help attract larger investments and, similar to Ethiopia, professionalism and knowledge of officials will be critical to minimizing investor concerns.<sup>176</sup> The immediate priority of the Energy Commission should be the elimination of mandatory minimum payments for energy consumers. The policy disproportionately affects the poorest members of the community and discourages innovation in small-scale

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<sup>173</sup> Hatcher, "Ending Somali-US Money Transfers Will Be Devastating, Merchants Bank Warned."

<sup>174</sup> Mark Anderson, "Somaliland Passes Central Banking Law, Eyes Foreign Banks."

<sup>175</sup> DAI, "Somaliland Poised to Pass First-Ever Energy Law in 2013."

<sup>176</sup> Pauly et al., *Power Sector Reform in Africa*.

energy interventions like solar. It will be slightly more difficult to eliminate or minimize mandatory minimum payments and begin unbundling the vertically-integrated power sector. However, it should be planned immediately or by the end of the short-term phase to begin the unbundling process.

Monitoring the efficiency of utility production will be useful for establishing fair electricity rates for consumers. Maintaining a strong role regarding price setting and monitoring of efficiency for utility companies will be particularly important early on regarding energy efficiency, which should become an immediate priority. Once enough data has been collected to compile a load demand curve, the utilities and the energy commission can regulate and monitor the rates of production and limit waste.

The Energy Regulatory Commission, in conjunction with the Ministry of Energy and the Ministry of Planning, also needs to begin collecting and consolidating data related to energy generation and demand. This will allow them to create a sector-wide load demand curve for electricity generation. By collecting data and understanding the load demand curve, they can properly assess the necessary additions to generation capacity. Increasing efficiency of the utilities is a simple way to improve generation capacity and reduce costs. Demand-side management is not immediately relevant because so many consumers already monitor and limit their energy consumption due to prohibitively high costs.

### 3.2.1 Generation

**Short Term (1 – 5 years):** The Somaliland government should begin plans for an expansion of their own generation facility. The U.S. Energy Policy Act of 2005 defines economic dispatch as the operation of generation facilities to produce energy at the lowest cost to reliably serve consumers, recognizing any operational limits of generation and transmission facilities.<sup>177</sup> The Electric Energy Commission will oversee regulation governing retail energy producers.<sup>178</sup> Despite the energy utilization being so low, many of the individuals that I interviewed had extra appliances that they do not use because of high costs. If unit cost could be decreased, it stands to reason that many of these

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<sup>177</sup> 109th Congress, *Energy Policy Act of 2005*.

<sup>178</sup> Ministry of Trade and Investment, *Somaliland Investment Guide*.

appliances would be more likely used, which means utilities will have to more closely monitor the load demand curve to maintain service without risking blackouts.

**Medium Term (5 – 15 years):** The main strategy for the Somaliland government should be to continue improving generation capacity and efficiency. The Energy Commission at this point should be familiar with the demand growth in order to accurately project how much generation capacity should be added within the time frame.

**Long Term (15 – 25 years):** Utilities will be able to increase generation capacity to meet growing demand. They should focus on increasing the share of renewables from 10% to 20%. A wholesale market could be developed over the long term but is likely not immediately viable and remains to be seen if a wholesale market will be the best solution.

### 3.2.2 Transmission

**Short Term (1 – 5 years):** The ultimate goal should be for transmission lines to be coordinated and managed by a single firm, regulated by the Energy Commission. The majority of this action should be taken over the middle and long term.

**Medium Term (5 – 15 years):** Management of electricity transmission should be completely transferred to an independent operator by the end of the medium term. A possible solution to this is to create long-term transmission rights in the medium term. The intention should be for the utilities to co-finance transmission lines.

**Long Term (15 – 25 years):** The long-term transmission plans should focus on rural electrification. Focusing on renewable energy opportunities for rural areas in the short- and medium-terms will lend flexibility to the long-term approach. One critical distinction will be how the agencies and utilities collect data and monitor the impact on the poor. Generally, electricity acts have not addressed rural electrification, utilities make no effort to track electrification of poor areas, reforms have sometimes had negative impacts on the poor, rural electrification has remained unconnected to overall performance of the electricity industry, and rural electrification targets remain low.<sup>179</sup> According to Karekezi and Kimani, “current rural electrification targets are very low and would, within the next

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<sup>179</sup> Karekezi and Kimani, “Have Power Sector Reforms Increased Access to Electricity Among The Poor in East Africa?”

decade, leave well over 80% of the rural population with no electrification even if the set targets are realized.”<sup>180</sup>

These recommendations attempt to resolve some of these issues, but it is likely that adjustments will have to be made in light of the insights from data collected after implementation of any policies and after initial impacts have been evaluated.

### 3.2.3 Distribution

**Short Term (1 – 5 years):** Distribution should be managed by each respective utility, and the Energy Commission should implement standards of operation for utilities. Major action should be delayed until the medium and long term.

**Medium Term (5 – 15 years):** The ultimate goal should be to unbundle transmission from distribution. However, this will be challenging in the short and, likely, medium term for Somaliland. Without an effective transmission system, it will be challenging to properly allocate responsibility for distribution.

**Long Term (15 – 25 years):** The electric regulatory commission should plan to unbundle distribution from generation in conjunction with the utilities at a set time horizon—likely in the long-term. Smart meters could be employed in the long term. In multiple discussions that I had with industry experts, they noted that the government had likely been in contact with Chinese smart meter manufacturers. However, considering the limited need for demand side management in the short- and medium-term, resources should instead be channeled towards improving the efficiency and base load capacities of generation and transmission facilities.

## 3.3 Incorporating Renewables

A short- to medium- term goal should set renewable energy sources at roughly 10 percent. The energy commission should encourage the expansion of solar into rural areas in order to eliminate the need for grid expansion, while still providing electricity to rural populations. In the event that Somaliland does not create a separate authority to promote rural electrification, renewable energy could provide an interim solution and also mitigate any cultural aversion to the unknown technologies.

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<sup>180</sup> Ibid.



They should begin to make preliminary plans for larger renewable energy projects, but likely these will have to be delayed until a commercial banking system has been approved and established in order to minimize the risk to investors. Granting priority dispatch to select energy technologies like renewables will incentivize investment in larger projects. The following recommendations will allow the Somaliland government to begin developing investor confidence, increasing efficiency, reducing per-unit costs of electricity, and incorporating renewable energy technologies. A public awareness campaign can be used to create awareness of energy issues and technologies. This will help to minimize cultural aversion to renewable energy technologies because very few people have seen it in action.

There are regulatory policies that are used around the world to help support renewable energy electricity generation. These include feed-in tariffs, net metering/billing, and renewable portfolio standards or quotas.<sup>181</sup> According to the Worldwatch Institute, there are 99 feed-in tariffs around the world at the national or provincial level, noting that they are becoming cities are more active in introducing feed-in tariffs.<sup>182</sup> According to Ashine, “In less than a decade, sub-Saharan Africa expanded from no renewable energy support policies to policies on the books in 25 countries, accounting for one fifth of all nations enacting these policies worldwide.”<sup>183</sup>

### **Solar Energy**

**Short term (1 – 5 years):** There are two options available in the near-term: on-grid solar and off-grid solar. On-grid solar would mean that the utilities would install solar panels for large-scale electricity generation to be distributed on an existing electric grid. These projects require large initial investments, which Somaliland utilities have been unable or unwilling to make. Off-grid solar would mean a that a homeowner installs solar panels capable of providing all of the needed electricity for their home, and does not require an electric utility to provide electricity. This would mean that they would withdraw from the electrical grid entirely. There are gray areas in both of these scenarios and they generally depend on a number of different variables in any given home, city, or country.

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<sup>181</sup> Worldwatch Institute, *Policy Support for Renewable Energy Continues to Grow and Evolve*.

<sup>182</sup> Ibid.

<sup>183</sup> Ibid.

**Medium Term (5 – 15 years):** Depending on what financing is available, a pilot project for a solar farm could be installed in a smaller city, before moving ahead with a large-scale solar farm. In the medium term, the renewable energy will likely not exceed 20% of generation. As in the case of Rwanda, 10% could be a goal by the end of the short term. If successful, the medium term could be devoted to much more ambitious share of generation capacity.

**Long Term (15 – 25 years):** Many areas around the world have successfully introduced mainstream solar through programs like Net Energy Metering, where homeowners install solar on their roofs and offset their electric bills by putting as much energy onto the grid than they are using, even though they have become somewhat controversial recently.<sup>184</sup> However, Somaliland’s electrical grid is not capable of supporting the additional load and monitoring that would be required for such a program—at least for the time being. If they can upgrade the grid in the short and medium terms, net energy metering could be a viable solution in the long term to manage growing demand in urban areas.

### **Wind Energy**

**Short Term (1 – 5 years):** The recent installation a five-turbine 100-kilowatt pilot wind farm at the Hargeisa airport is a successful example of the existing capacity to install renewable energy sources. It is hoped that this will bring in additional international investment in the sector.<sup>185</sup>

**Medium Term (5 – 15 years):** Pilot wind farm projects in Hargeisa and Berbera are already operational. Once sufficient data has been collected regarding the energy demand around Somaliland, the goal for the short-term should be to have 10% of the country’s total energy generated to be from renewable resources. If this is the case, the medium term and long term could be characterized by a much more ambitious push for these technologies. This would follow the example of Rwanda, and would allow for more ambitious expansion of renewable energy generation in the long-term.

**Long-term (15 – 25 years):** The long-term potential for wind energy will depend heavily on the results of the short and medium terms. However, if successful, wind could feasibly

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<sup>184</sup> Trabish, “A Rising Tension: ‘Value-of-Solar’ Tariff Versus Net Metering.”

<sup>185</sup> DAI, “USAID Project Supports Construction of Major Wind Farm in Somaliland.”

be rolled out on a much grander scale in the long term and possibly represent a significant shift away from fossil fuels if the base load can be met regularly.

### 3.4 Coordination

There has been discussion of possible coordination of the Ethiopian and Somaliland government regarding electric energy importing and export. Essentially, the Ethiopian and Somaliland governments could come to an agreement regarding the importing of hydropower-generated electricity from Ethiopia across the border in Wajaale. Wajaale is a city that rests on the border between Somaliland and Ethiopia. This has been pointed out as a way to strengthen ties between the two countries and provide much-needed affordable electricity to the area.<sup>186</sup>

Partnering with Ethiopia to deliver electricity is a highly likely and beneficial scenario. Whether this will be completed in the short- or medium-term is debatable, due primarily to bureaucratic and financial uncertainty. International participation and coordination with Ethiopia could be enhanced through contracts with the Port of Berbera. The port could become a boon for investment if land-locked Ethiopia were able to take advantage of a more well-functioning port.<sup>187</sup> This could be used to broker a deal with Ethiopia for a long-term electricity supply. Possible sources of finance include the World Bank and International Monetary Fund, the USA and EU, and Ethiopia.<sup>188</sup> This cooperation has been discussed since 2012, but by early 2015, the grids remain unconnected.<sup>189</sup>

### 3.5 Conclusion

This paper develops a proposal for how Somaliland's electric power sector can become more efficient, while generating greater economic sustainability and alleviating strain on the poor. The paper will be useful as a guide for policymakers in Somaliland, but the major challenge will still lie in the ability to commit to and enforce any regulations that are enacted. Ideally, areas of this framework could be applied in a number of sub-Saharan African countries. However, few countries have the same level of

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<sup>186</sup> Abdullahi, "Ethiopian Electricity Export to Somaliland: Dream or Reality?"

<sup>187</sup> The Economist, "Can't Get No Recognition."

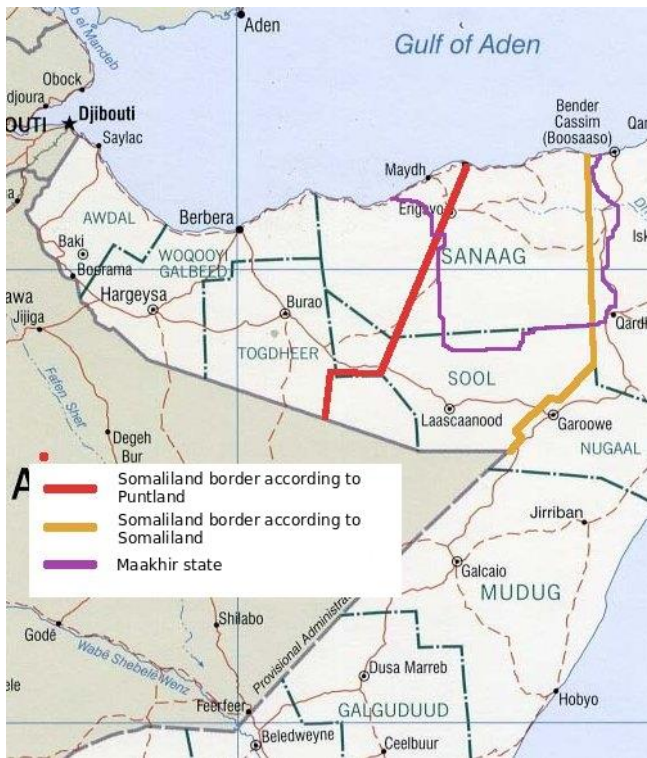
<sup>188</sup> Abdullahi, "Ethiopian Electricity Export to Somaliland: Dream or Reality?"

<sup>189</sup> Ashine, "Ethiopia in Deal to Export Electricity to Somaliland."

electric sector underdevelopment as Somaliland. As such, the proposals in this framework will not be broadly applicable. If Somaliland can find sufficient investment to reform their power sector and channel their focus towards renewable energy technologies, the results could be dramatic.

## 4 Appendix

### Map 1: Somaliland Border Disputes



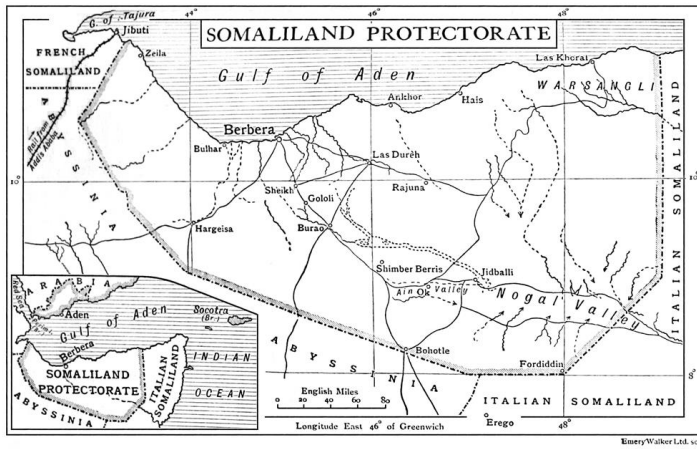
### Map 2: Somaliland current borders



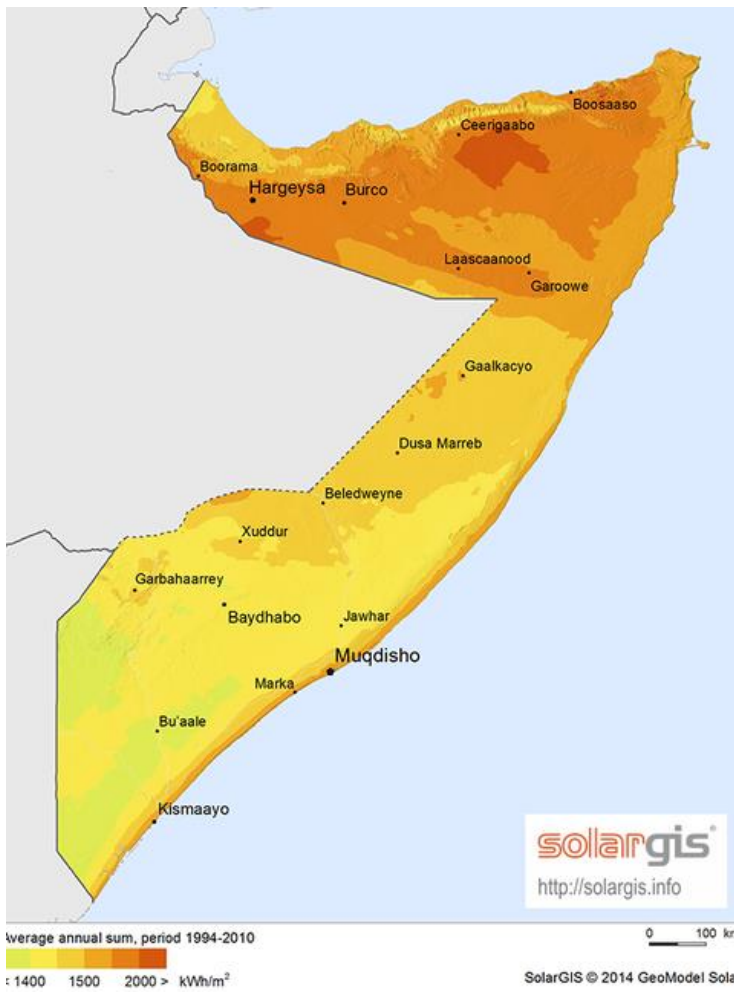
Source: *Somaliland.org*<sup>190</sup>

<sup>190</sup> Somaliland.org, “Ciidamo Kasoo Goostay Puntland Oo Soo Gaadhay Laascaanood.”

Map 3: Somaliland as a British Protectorate



Map 4: Solar Irradiation in Somaliland



Source: SolarGIS

Figure 1: Framework for categorizing Somaliland's energy challenges

1. Lack of capacity and strategy in generating alternative sources of energy for overcoming the environmentally devastating effect of the widespread use of charcoal in the country
2. Dysfunctional or old and tired power plants
3. Poor power distribution network
4. Lack of financial resources for maintenance and expansion
5. Too much reliance on imported sources of energy
6. Inefficiency and industrial fragmentation
7. Rising energy costs
8. Inaccessibility by the poor
9. Inadequate legal and regulatory framework

Source: Somaliland Ministry of National Planning and Development

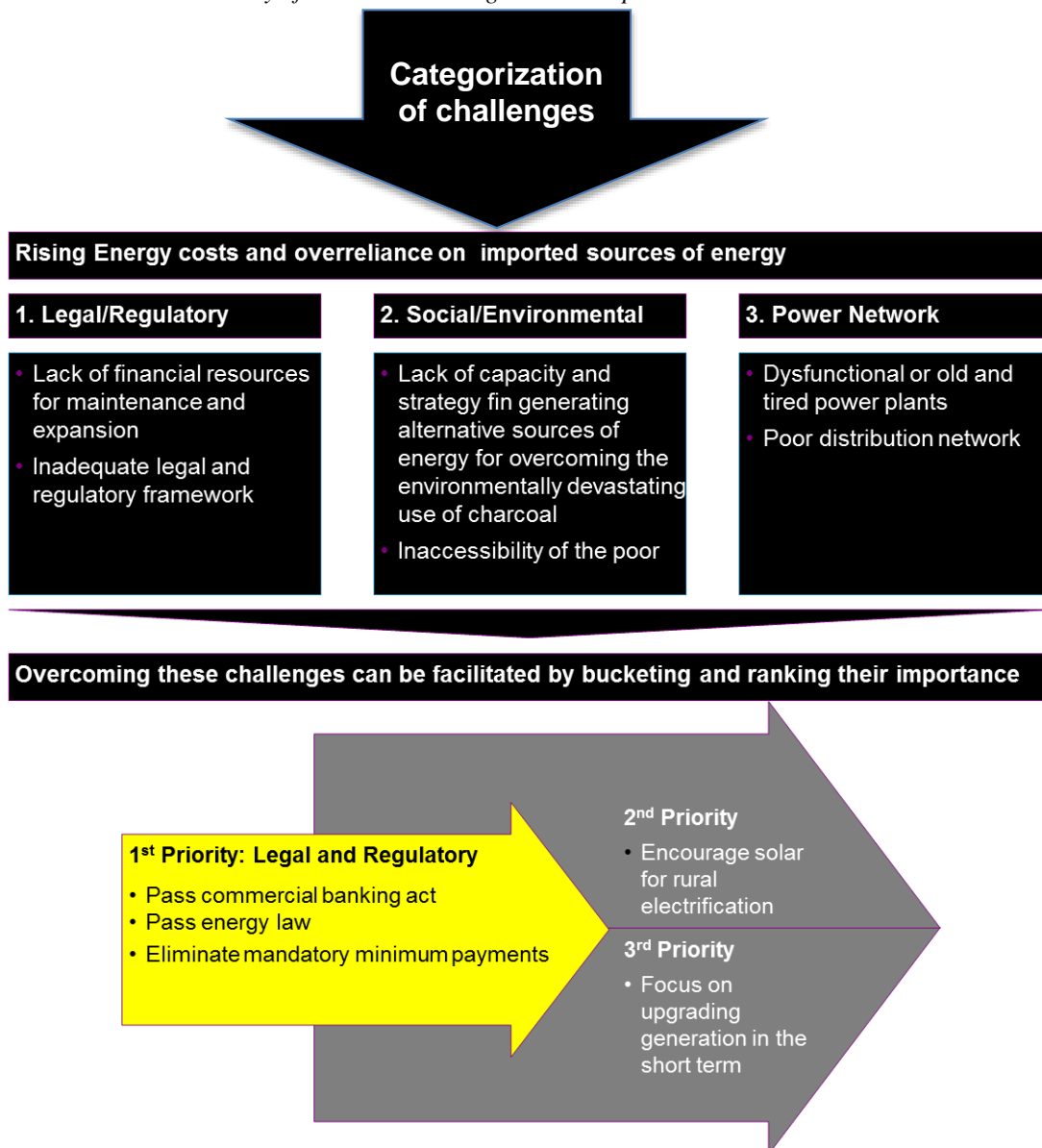


Figure 2: Current structure of Somaliland power sector

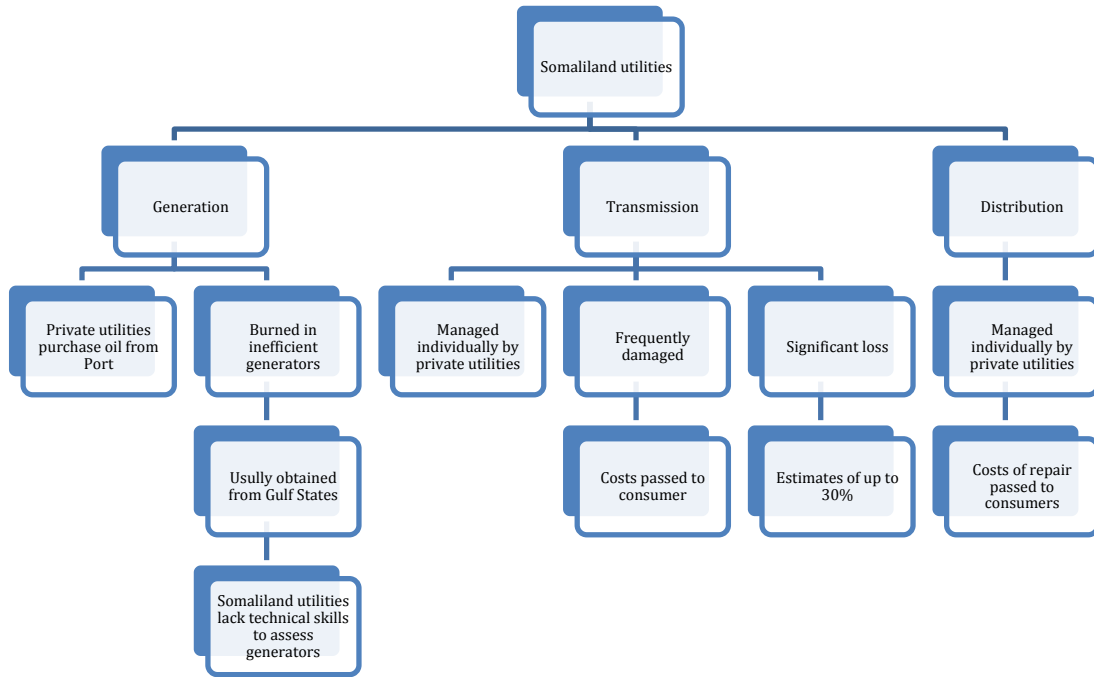


Figure 3: Diesel generator from Berbera power station





Figure 4: Transmission lines in Hargeisa



Figure 5: Monitoring of wind speed at five sites

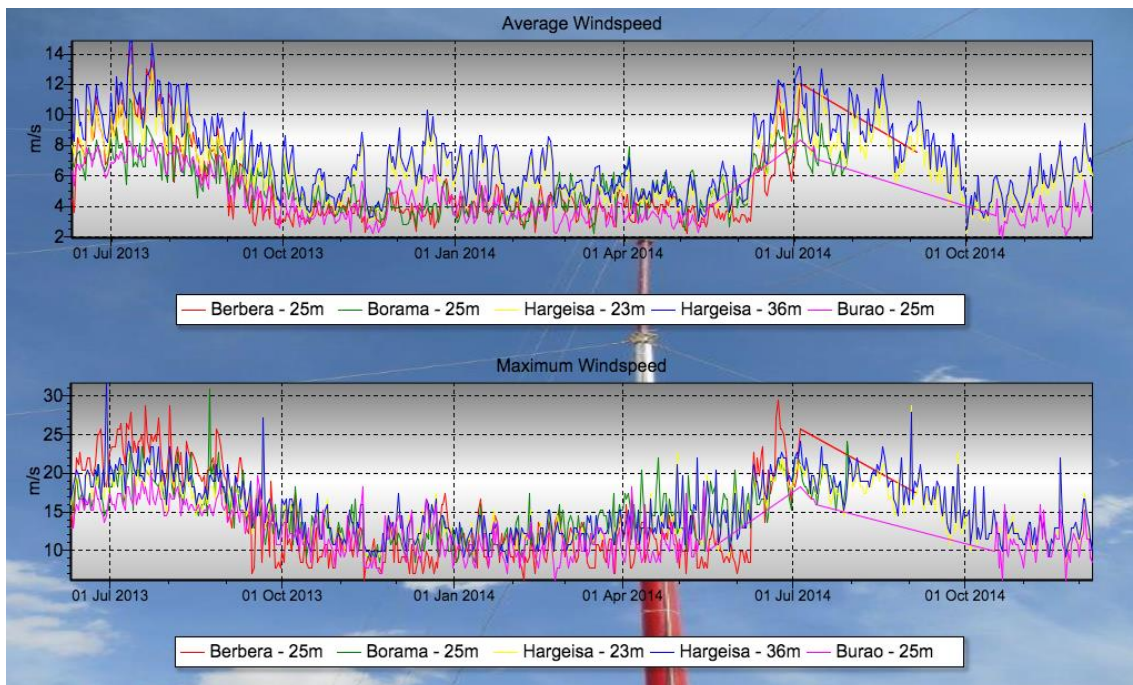


Figure 6: Cost of wind v diesel energy generation (\$USD millions)

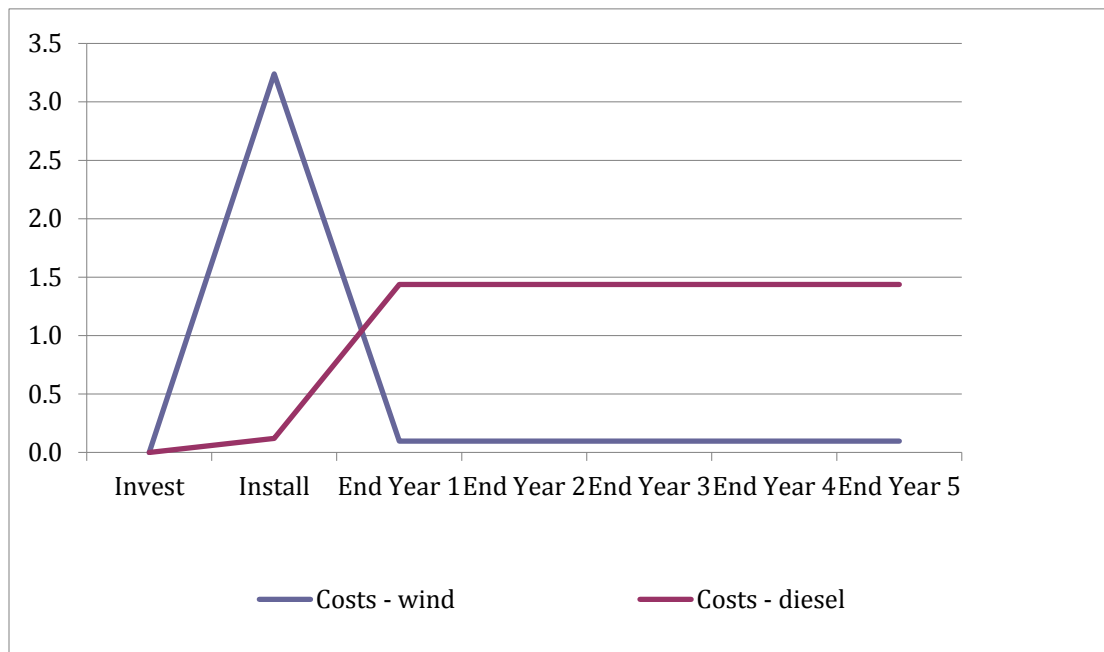


Figure 7: Equivalent figures per-kilowatt for other fuel options

The equivalent figures per kilowatt-hour for the other options are:

- Supercritical Coal - \$0.106
- Biogas – \$0.086
- Solar Thermal - \$0.127
- Geothermal - \$0.102
- Biomass – \$0.165

Source: Owuor, *Wind Energy*<sup>191</sup>

<sup>191</sup> Owuor, *Wind Energy*.

Figure 8: Renewable energy investment barriers

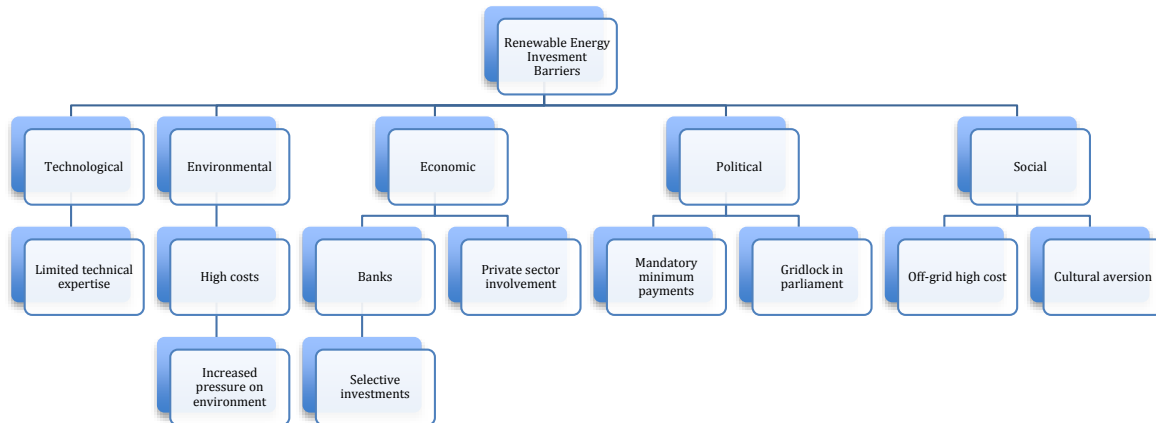
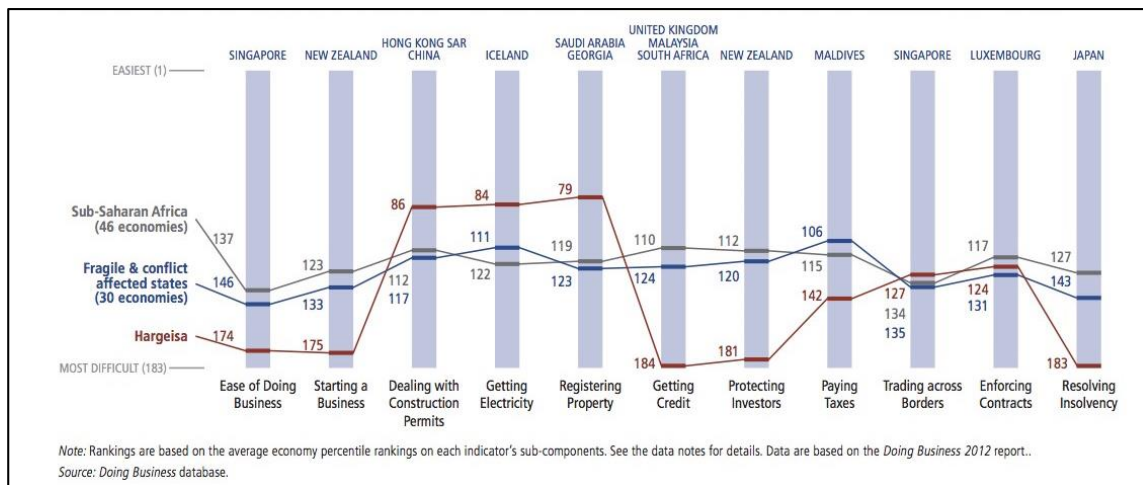


Figure 9: Hargeisa's performance in the "Doing Business" indicators compared with sub-Saharan African economies and fragile conflict-affected states



Source: *World Bank*<sup>192</sup>

<sup>192</sup> The World Bank, International Finance Corporation, *Doing Business In Hargeisa 2012*.

Figure 10: Energy and the Millennium Development Goals

Poverty and Hunger	<ul style="list-style-type: none"> <li>Electricity and fuels are essential for creating jobs, industry, transportation, small enterprises, and agriculture--they are also necessary for cooking and preparing food.</li> </ul>
Universal Primary Education	<ul style="list-style-type: none"> <li>Electricity is essential for attracting teachers to rural areas.</li> </ul>
Gender Equality	<ul style="list-style-type: none"> <li>Women spend a large part of their days collecting water and firewood for cooking--something that disproportionately affect women in areas with no electricity.</li> </ul>
Reduce Child Mortality	<ul style="list-style-type: none"> <li>Child mortality and disease are made worse by a lack of clean water, and respiratory diseases result from indoor air pollution when using traditional fuels to cook.</li> </ul>
Maternal Health	<ul style="list-style-type: none"> <li>Lack of electricity in health clinics can be limit nighttime deliveries, and put more pressure on women for collecting firewood and water.</li> </ul>
HIV/AIDS	<ul style="list-style-type: none"> <li>Electricity allows for the spread of important public health information regarding deadly diseases.</li> </ul>
Environmental Sustainability	<ul style="list-style-type: none"> <li>Cleaner energy can address indoor air pollution, land degradation, acid rain, and global warming.</li> </ul>
Global Partnership for Development	<ul style="list-style-type: none"> <li>The World Summit for Sustainable Development has called for partnerships between public, private, civil society, and development agencies to work together to address the issues discussed above.</li> </ul>

Figure 11: Country comparisons for average cost of electricity

Country	Average Cost of Electricity	Per Capita GDP
Somaliland	\$1.0000	\$347.00
Italy	\$0.2056	\$33,816.00
Germany	\$0.1880	\$42,597.00
Spain	\$0.1410	\$28,274.00
UK	\$0.1361	\$38,920.00
Australia	\$0.1338	\$67,442.00
Portugal	\$0.1330	\$20,175.00
Slovakia	\$0.1217	\$16,893.00
Czech Republic	\$0.1179	\$18,690.00
Belgium	\$0.1177	\$43,399.00
Austria	\$0.1063	\$46,792.00
Netherlands	\$0.1059	\$45,960.00
France	\$0.0995	\$39,746.00

U.S.	\$0.0933	\$51,749.00
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Figure 12: Percentage change in GDP by a US\$10 a barrel rise in oil prices

Per capita income (1999 - 2001 US\$)	Net Oil Import/Export as % of GDP	% Change in GDP
<b>Net oil importers</b>		
Very low income <300 [18]	-4.52	-1.47
Low income >300 & <900 [22]	-3.75	-0.76
Middle income >900 & <9000 [36]	-2.72	-0.56
High income >9000 [21]	-1.49	-0.44
<b>Net oil exporters</b>		
Low income >300 & <900 [10]	21.88	5.21
Middle income >900 & <9000 [17]	22.96	4.16
High income >9000 [7]	19.93	1.5
<b>*Base Oil Price of US\$23.55</b>		

Source: Bacon, "The Impact of Higher Oil Prices in Low Income Countries and the Poor"<sup>193</sup>

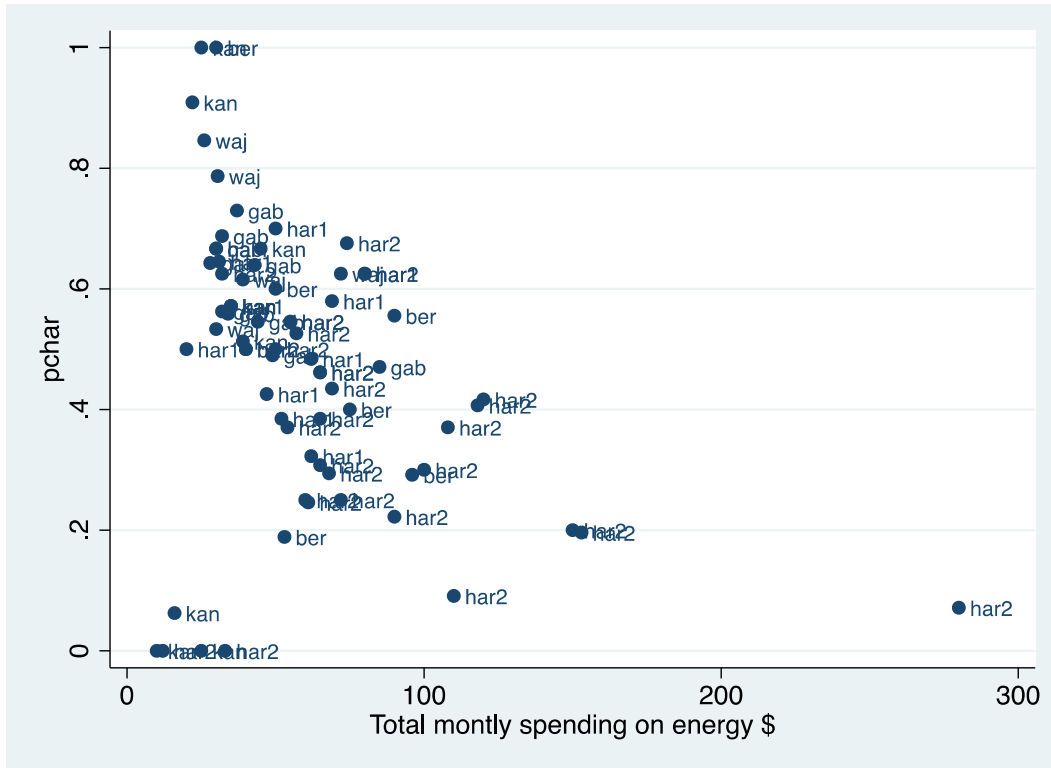
Figure 13: The four organizational forms of the energy sector

<b>Model 1: Natural Monopoly</b>	<ul style="list-style-type: none"> <li>In a natural monopoly, the utilities are vertically integrated and all generation, transmission, and distribution are not subject to competition. No one is able to decide who will be his or her supplier.</li> </ul>
<b>Model 2: Single Buyer</b>	<ul style="list-style-type: none"> <li>A single buyer will choose from various generators IPPs. Access to transmission is not permitted for sales to final customers. A single buyer has a monopoly over the transmission networks and sales to the end user.</li> </ul>
<b>Model 3: Wholesale Competition</b>	<ul style="list-style-type: none"> <li>The distribution companies buy directly from the generator (IPPs). Distribution companies have a monopoly over the final customers. There is open access to transmission wires and generators compete to supply power. A power pool is established to facilitate.</li> </ul>
<b>Model 4: Retail Competition</b>	<ul style="list-style-type: none"> <li>All customers have a choice of their supplier, there is open access to transmission and distribution wires, and distribution is distinguished from retail activity. The retail industry is competitive.</li> </ul>

Source: Eberhard, *Electricity Market Structures and Investment Challenges in Africa*<sup>194</sup>

<sup>193</sup> Bacon, *The Impact of Higher Oil Prices in Low Income Countries and the Poor: Impacts and Policies*.

Figure 14: Scatter plot of monthly spending on total energy and monthly spending on charcoal



<sup>194</sup> Eberhard, *Electricity Market Structures and Investment Challenges in African (& Many Other Emerging Countries)*.

Figure 15: Scatter plot of monthly spending on energy and monthly spending on charcoal after dropping outlier variable

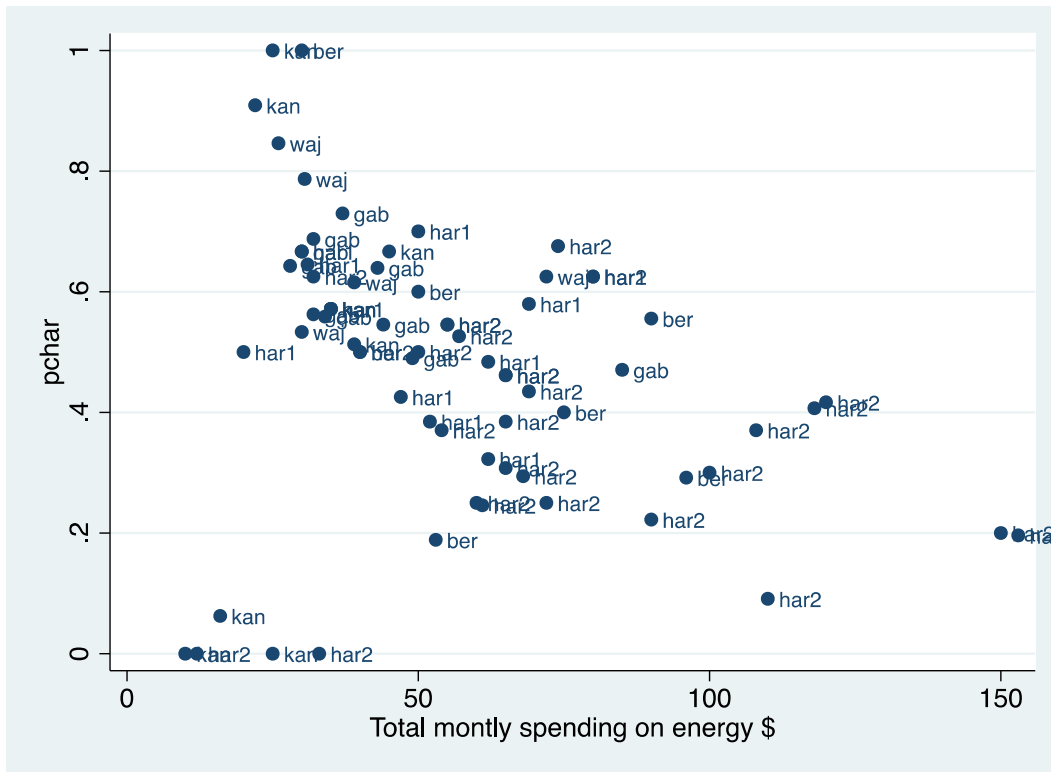


Figure 16: Percentage of electricity consumed relative to total energy consumed

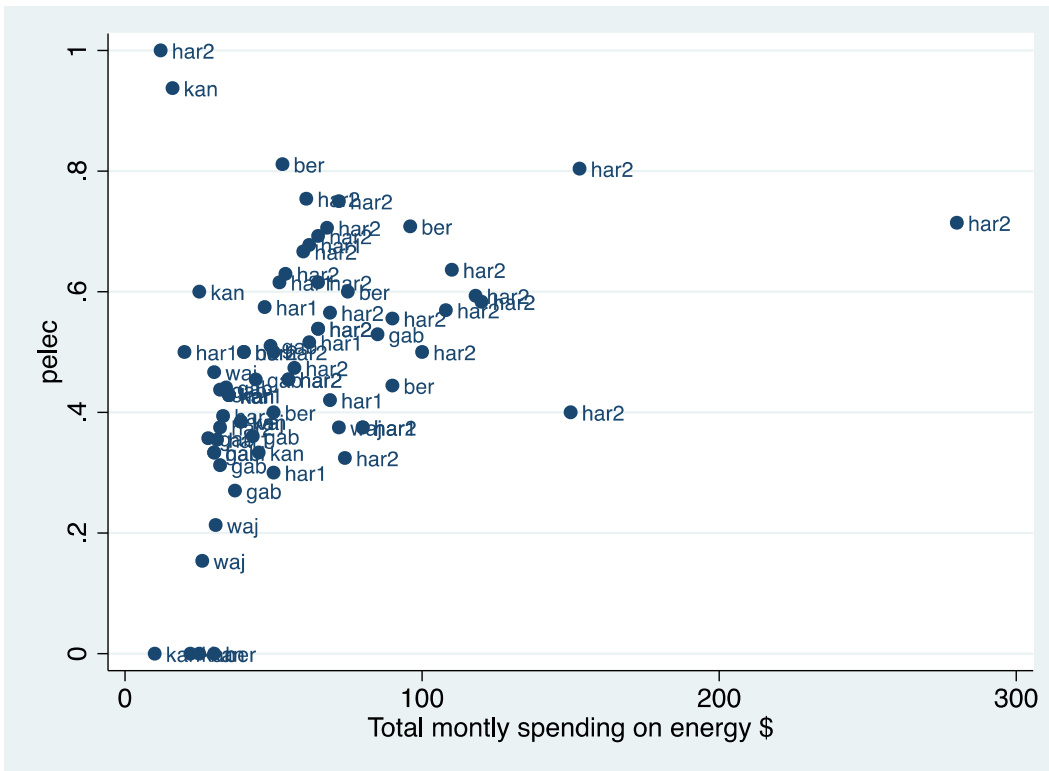


Figure 17: Percentage of electricity consumed relative to total energy consumed after dropping outlier

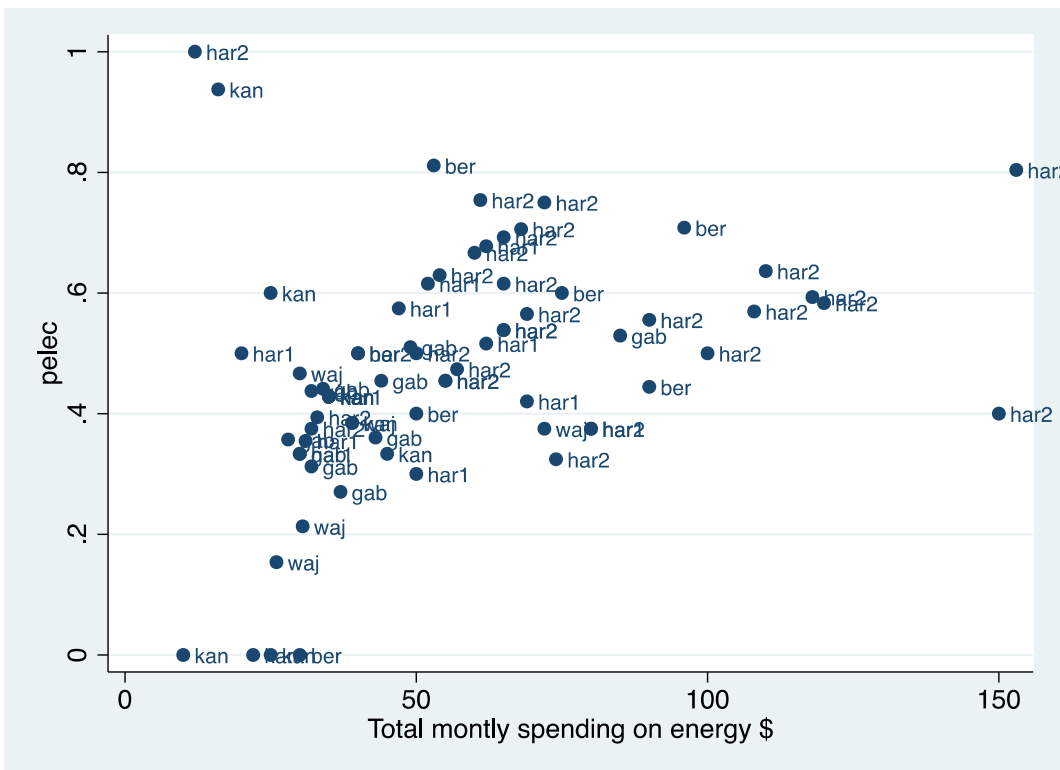




Figure 18: Monthly expenditure on charcoal and electricity

Figure 18: Monthly expenditure on charcoal and electricity

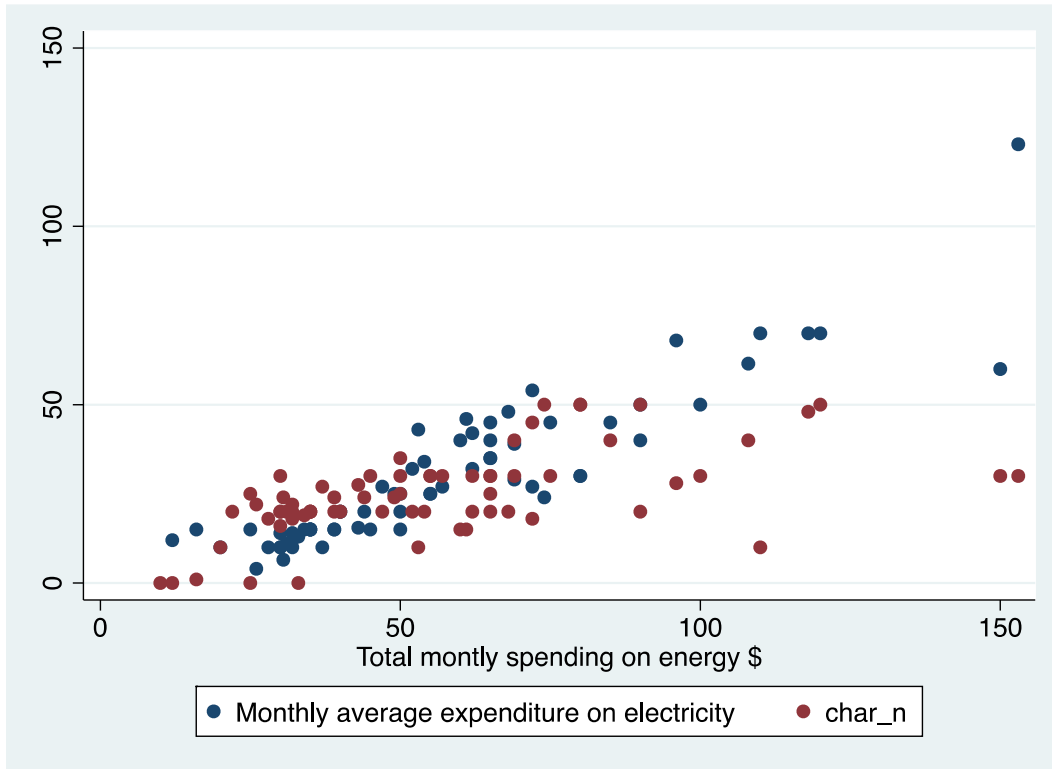


Figure 19: Average monthly expenditure of interviewees by fuel type

<i>Spending</i>	<i>Low Income</i>	<i>Mid Income</i>	<i>High Income</i>	<i>Berbera</i>	<i>Gabiley</i>	<i>Wajaale</i>	<i>Small Businesses</i>	<i>Total</i>
Average Monthly Costs	\$39.29	\$71.38	\$168.33	\$62.00	\$41.40	\$39.50	\$1,364.57	\$58.77

<i>Average Monthly Cost by Fuel</i>	<i>Low Income</i>	<i>Mid Income</i>	<i>High Income</i>	<i>Berbera</i>	<i>Gabiley</i>	<i>Wajaale</i>	<i>Small Businesses</i>	<i>Total</i>
Paraffin/Kerosene	\$5.00							\$5.00
Gas		\$27.00	\$60.00				\$108.00	\$32.50
Firewood							\$3,000.00	
Solar System								
Electricity	\$19.89	\$38.71	\$125.67	\$39.33	\$17.45	\$13.30	\$862.29	\$32.63
Batteries	\$3.00							\$3.00
Car Batteries	\$10.00							\$10.00
Charcoal	\$23.21	\$28.32	\$22.67	\$28.29	\$23.95	\$26.20	\$300.00	\$25.88

*\*total does not include small businesses*

## 5 Bibliography

- 109th Congress. *Energy Policy Act of 2005*, 2005.  
<http://web.archive.org/web/20110429035824/http://www.doi.gov/pam/EnergyPolicyAct2005.pdf>.
- Abdullahi, Mohammed. "Ethiopian Electricity Export to Somaliland: Dream or Reality?" *Ethiopian Observer*, December 27, 2014.  
<http://www.ethioobserver.net/somaliland-reality.htm>.
- African Development Bank Group. "South Sudan: An Infrastructure Action Plan." Temporary Relocation Agency, 2013.  
<http://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/South%20Sudan%20Infrastructure%20Action%20Plan%20-%20A%20Program%20for%20Sustained%20Strong%20Economic%20Growth%20-%20Full%20Report.pdf>.
- Ashine, Argaw. "Ethiopia in Deal to Export Electricity to Somaliland." *Africa Review*, March 12, 2012. <http://www.africareview.com/Business---Finance/Ethiopia-to-export-electricity-to-Somaliland/-/979184/1364598/-/1119m2oz/-/index.html>.
- Atmospheric Science Data Center. *NASA Surface Meteorology and Solar Energy*. Atmospheric Science Data Center. Latitude 10/Longitude 44.5: NASA, n.d.  
[https://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?&num=225101&lat=10&hgt=100&submit=Submit&veg=17&sitelev=-999&email=skip@larc.nasa.gov&p=grid\\_id&step=2&lon=44.5](https://eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi?&num=225101&lat=10&hgt=100&submit=Submit&veg=17&sitelev=-999&email=skip@larc.nasa.gov&p=grid_id&step=2&lon=44.5).
- Bacon, Robert. *The Impact of Higher Oil Prices in Low Income Countries and the Poor: Impacts and Policies*. Knowledge Exchange Series. ESMAP, August 2005.  
[http://www.esmap.org/sites/esmap.org/files/KES01\\_The%20Impact%20of%20Higher%20Oil%20Prices%20on%20Low%20Income%20Countries%20and%20the%20Poor.pdf](http://www.esmap.org/sites/esmap.org/files/KES01_The%20Impact%20of%20Higher%20Oil%20Prices%20on%20Low%20Income%20Countries%20and%20the%20Poor.pdf).
- Beck, Fredric, and Eric Martinot. "Renewable Energy Policies and Barriers." *Encyclopedia of Energy* 5 (2004): 365–83.
- Canadian Trade Commissioner Service. *Power Sector Market Report - Ethiopia*. Enterprise Canada Network, 2013.  
[http://www.enterprisecanadanetwork.ca/\\_uploads/resources/Power-Sector-Market-Report-Ethiopia.pdf](http://www.enterprisecanadanetwork.ca/_uploads/resources/Power-Sector-Market-Report-Ethiopia.pdf).
- Carr, Nigel. "Somaliland: The Opportunity for Renewable Energy." *Somaliland Sun*. February 7, 2013.  
<http://www.somalilandsun.com/index.php/economic/2263-somaliland-the-opportunity-for-renewable-energy>.
- Dahir, Barkhad. "Increasing Charcoal Production Worries Somaliland Officials." *Sabahi*. December 6, 2012.

- [http://sabahionline.com/en\\_GB/articles/hoa/articles/features/2012/12/06/feature-02](http://sabahionline.com/en_GB/articles/hoa/articles/features/2012/12/06/feature-02).
- DAI. "Somaliland Poised to Pass First-Ever Energy Law in 2013." *DAI*, February 8, 2013. <http://dai.com/news-publications/news/somaliland-poised-pass-first-ever-energy-law-2013>.
- . *Somaliland Private Sector Development Assessment*. Partnership For Economic Growth. USAID, July 2011.
- . "Somaliland Wind Speed Database." Accessed September 20, 2014. <http://www.csafrica.co.za:8080/DAI/index.html>.
- . "USAID Project Supports Construction of Major Wind Farm in Somaliland." *DAI*. June 5, 2014. [http://dai.com/news-publications/news/usaid-project-supports-construction-major-wind-farm-somaliland?utm\\_source=twitter&utm\\_term=news26514](http://dai.com/news-publications/news/usaid-project-supports-construction-major-wind-farm-somaliland?utm_source=twitter&utm_term=news26514).
- Daisy Ouya. "Unpacking The Evidence On Firewood And Charcoal In Africa." *World Agroforestry Centre*, October 3, 2013. <http://blog.worldagroforestry.org/index.php/2013/10/03/unpacking-the-evidence-on-firewood-and-charcoal-in-africa/>.
- Dumper, Michael, and Bruce E. Stanley, eds. *Cities of the Middle East and North Africa: A Historical Encyclopedia*. Santa Barbara, Calif: ABC-CLIO, 2007.
- Eberhard, Anton. *Electricity Market Structures and Investment Challenges in African (& Many Other Emerging Countries)*. UCT Graduate School of Business: University of Cape Town, n.d.
- Electrical and Compute Engineering Ideas. "Power Sector Reform in Ethiopia." *Electrical and Compute Engineering Ideas*, February 2013. <http://fasilla.blogspot.com/2013/02/power-sector-reform-in-ethiopia.html>.
- Electropaedia. "Electricity Generation From Fossil Fuels." Woodbank Communications Ltd. Accessed July 20, 2014. [http://www.mpoweruk.com/fossil\\_fuels.htm](http://www.mpoweruk.com/fossil_fuels.htm).
- Elizabeth Cecelski. *Enabling Equitable Access To Rural Electrification: Current Thinking And Major Activities In Energy, Poverty and Gender*. Breifing Paper. Washington, D.C: The World Bank, January 26, 2000. <http://edu.2conserve.org/wp-content/uploads/2014/03/ENABLING-EQUITABLE-ACCESS-TO-RURAL-.pdf>.
- English, Erik. "Facing An Electric Paradox." *Somalilandventure.tumblr.com*, June 26, 2014. <http://somalilandventure.tumblr.com/post/89963092814/facing-an-electric-paradox>.
- EUEI PDF, UNDP, GTZ. *Strategy on Scaling Up Access to Modern Energy Services in Order to Achieve the Millenium Development Goals*, 2009. [http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/strategy-on-scaling-up-access-to-modern-energy-services/EAC%20Regional%20Energy%20Access%20Strategy\\_2006.pdf](http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/strategy-on-scaling-up-access-to-modern-energy-services/EAC%20Regional%20Energy%20Access%20Strategy_2006.pdf).
- Federal Democratic Republic of Ethiopia. "The National Energy Policy." Federal Democratic Republic of Ethiopia. Accessed December 23, 2014. <http://www.mowr.gov.et/EEA/LEGAL/The%20national%20Energy%20Policy.pdf>.

- Government of the Republic of South Sudan, Ministry of Environment, and United Nations Development Programme. *Environmental Impacts, Risks, and Opportunities Assessment: Natural Resources Management and Climate Change in South Sudan*. Government of the Republic of South Sudan, January 2012.  
<http://www.ss.undp.org/content/dam/southsudan/library/Reports/southsudan/otherdocuments/EIRO%20Report-fr-website.pdf>.
- Harvard University. *The Ramsey Pricing Rule For Monopolies*. Cambridge, MA: Harvard University. Accessed March 8, 2015.  
<http://isites.harvard.edu/fs/docs/icb.topic90998.files/ramsey-pricing.pdf>.
- Hatcher, Jessica. "Ending Somali-US Money Transfers Will Be Devastating, Merchants Bank Warned." *The Guardian*. February 6, 2015.  
<http://www.theguardian.com/global-development/2015/feb/06/somali-us-money-transfers-merchants-bank-remittances>.
- Helen Clark. "Sustainable Energy." *United Nations Development Program*, 2014.  
[http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/focus\\_areas/sustainable-energy.html](http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/focus_areas/sustainable-energy.html).
- Hertzmark, Donald. "Electricity at the Right Price." National Bureau of Asian Research, 2012.  
[http://www.nbr.org/downloads/pdfs/eta/PES\\_2012\\_summitpaper\\_Hertzmark.pdf](http://www.nbr.org/downloads/pdfs/eta/PES_2012_summitpaper_Hertzmark.pdf).
- Ingrid Hartmann, and Ahmed J. Sugulle. *The Impact of Climate Change on Pastoral Societies of Somaliland*. Candlelight for Health, Education & Environment, 2009.  
[http://www.preventionweb.net/files/13863\\_FinaldraftEffectsofclimatechangeonp.pdf](http://www.preventionweb.net/files/13863_FinaldraftEffectsofclimatechangeonp.pdf).
- IRENA. *Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries*, December 2012.  
<http://www.irena.org/DocumentDownloads/Publications/IRENA%20report%20-%20Financial%20Mechanisms%20for%20Developing%20Countries.pdf>.
- IRIN News. "Somalia: Somaliland Needs Own Plan For Climate Change." *IRIN News*. May 7, 2014. <http://www.irinnews.org/report/89052/somalia-somaliland-needs-own-plan-for-climate-change>.
- . "Somaliland Rolls Out ARV Treatment, But HIV/AIDS Education Lagging." *IRIN News*. August 22, 2007.  
<http://www.irinnews.org/report/73857/somalia-somaliland-rolls-out-arv-treatment-but-hiv-aids-education-lagging>.
- Islamic Debt Solutions. "Islam Prohibits Interest," n.d.  
<http://www.islamicdebtsolutions.co.uk/>.
- Karekezi, Stephen, and John Kimani. "Have Power Sector Reforms Increased Access to Electricity Among The Poor in East Africa?" African Energy Policy Research Network (AFREPREN), 2004.  
[www.afrepren.org/project/gnesd/esdsi/afrepren.pdf](http://www.afrepren.org/project/gnesd/esdsi/afrepren.pdf).
- Kessides, Ioannis N. "The Impacts of Electricity Sector Reforms in Developing Countries." *The Electricity Journal*, 2012.

- Lacey, Marc. "The Signs Say Somaliland, but the World Says Somalia." *The New York Times*, June 5, 2006, sec. Africa.  
<http://www.nytimes.com/2006/06/05/world/africa/05somaliland.html>.
- Long, Nick. "Rwanda Solar Grid Capitalizes on Limited Sunshine." *Voice of America*. September 12, 2014. <http://www.voanews.com/content/rwanda-solar-grid-capitalizes-on-limited-sunshine/2447290.html>.
- Maidowski, Paul. "How To Create Efficient, Reliable And Clean Electricity Markets: A Regulation Design For Mongolia And Northeast Asia." Master's Thesis, Tufts University, 2012.
- Mark Anderson. "Somaliland Passes Central Banking Law, Eyes Foreign Banks." *Reuters*. April 23, 2012.  
<http://www.reuters.com/article/2012/04/23/somalia-somaliland-banks-idAFL5E8FN8T720120423>.
- Ministry of Infrastructure. "National Energy Policy and National Energy Strategy 2008 - 2012." Republic of Rwanda, January 2009. [http://www.euei-pdf.org/sites/default/files/files/field\\_pblctn\\_file/EUEI%20PDF\\_Rwanda\\_Energy%20Policy%202008-2012\\_Final\\_Jan%202009\\_EN.pdf](http://www.euei-pdf.org/sites/default/files/files/field_pblctn_file/EUEI%20PDF_Rwanda_Energy%20Policy%202008-2012_Final_Jan%202009_EN.pdf).
- Ministry of Mining, Energy and Water Resources. *Electrical Energy Act 2012 (Draft)*, 2012.
- . *Somaliland Energy Policy*, 2010.  
[http://www.energyfacilitymonitoring.eu/index.php/en/publications/project-publications/doc\\_download/14-somaliland-energy-policy-november-2010](http://www.energyfacilitymonitoring.eu/index.php/en/publications/project-publications/doc_download/14-somaliland-energy-policy-november-2010).
- Ministry of National Planning and Development. "National Development Plan, 2012 - 2016." Republic of Somaliland, December 2011.
- Ministry of Trade and Investment. *Somaliland Investment Guide*. Hargeysa, Somaliland: Ministry of Trade and Investment. Accessed June 20, 2014.  
[http://somalilandinvest.net/somaliland\\_investment\\_guide.pdf](http://somalilandinvest.net/somaliland_investment_guide.pdf).
- Modi, V., S. McDade, D. Lallement, and J. Saghir. *Energy and the Millennium Development Goals*. New York: Energy Sector Management Assistance Programme: Energy Sector Management Assistance Programme, United Nations Development Programme, UN Millennium Project, and World Bank, 2006.  
[http://www.unmillenniumproject.org/documents/MP\\_Energy\\_Low\\_Res.pdf](http://www.unmillenniumproject.org/documents/MP_Energy_Low_Res.pdf).
- Norwegian Refugee Council. "NRC's Country Programme in Somalia." *Norwegian Refugee Council*, August 15, 2014. <https://www.nrc.no/?aid=9147659>.
- Omar, Abdikarin Aden, and Ahmed Jama Sugulle. *Impact of Charcoal Production on Environment and the Socio-Economy of Pastoral Communities of Somaliland*. Case Study. Hargeysa, Somaliland: Ministry of Pastoral Development & Environment and Candlelight For Health, Education & Environment, January 2004.
- Owuor, Victor. *Wind Energy*. Shuraako, October 2012.
- Paul L. Joskow. *Lessons Learned From Electricity Market Liberalization*. Special Issue. The Energy Journal. Massachusetts Institute of Technology: IAEE, 2008.  
<http://economics.mit.edu/files/2093>.
- Pauly, Bertrand, Getachew Achebe, Tawfik Azer, Brahim Bounah, James Diu, Bangui Livingstone, Njejwa Mumbana, Isidore Prisookotto, and Morgan Sithole.

- Power Sector Reform in Africa*. Abidjan, Cote d'Ivoire: UPDEA, June 2009.  
[http://www.acpbusinessclimate.org/pseef/documents/UPDEA\\_Best\\_Practice\\_en.pdf](http://www.acpbusinessclimate.org/pseef/documents/UPDEA_Best_Practice_en.pdf).
- REEEP Policy Database. *Ethiopia Policy and Regulatory Overviews*, 2014.  
<http://www.reegle.info/policy-and-regulatory-overviews/ET>.
- . *South Sudan Energy Overview*, 2012. <http://www.reegle.info/policy-and-regulatory-overviews/SS>.
- Republic of Somaliland. "Republic of Somaliland, House of Representatives," 2012.  
<http://www.somalilandparliament.net/>.
- Ross, Marc L. *Working With Islamic Finance*. Investopedia. Accessed March 8, 2015.  
[http://www.investopedia.com/articles/07/islamic\\_investing.asp](http://www.investopedia.com/articles/07/islamic_investing.asp).
- Schwartz, Claudia. "Energy And Entrepreneurship In Somaliland." The Institute For Global Leadership, Tufts University, June 24, 2013.  
<http://www.tuftsgloballeadership.org/blog/energy-and-entrepreneurship-somaliland>.
- Serafeim, George, Rebecca Henderson, and Shannon Gombos. *Omar Selim: Building a Values-Based Asset Management Firm (A)*, January 16, 2015.
- Shankleman, Jill. *Oil and State Building in South Sudan: New Country, Old Industry*. Special Report. United States Institute of Peace, 2011.  
[http://www.usip.org/sites/default/files/Oil\\_and\\_State\\_Building\\_South\\_Sudan.pdf](http://www.usip.org/sites/default/files/Oil_and_State_Building_South_Sudan.pdf).
- Shen, Lester. "Power and Energy Primer: Part 3 - Load Curves and Generation." *CEE: Center for Energy and Environment*, November 1, 2012.  
<http://www.mncee.org/Innovation-Exchange/ie/November-2012/A-Primer-about-Power-and-Energy--Part-3---Loads-Cu/>.
- Somaliland Development Fund. *Projects*. Somaliland, March 10, 2014.  
<http://www.somalilanddevelopmentfund.org/projects-overview>.
- Somaliland.org. "Ciidamo Kasoo Goostay Puntland Oo Soo Gaadhay Laascaanood." Somaliland.org, November 28, 2007.  
<http://arc.somaliland.org/2007/11/28/ciidamo-kasoo-goostay-puntland-oo-soo-gaadhay-laascaanood/>.
- Southern Sudan Legislative Assembly. "The Investment Promotion Act," 2009.  
[http://www.southsudanembassydc.org/PDFs/Laws/INVESTMENT\\_PROMOTION\\_ACT,\\_2009.pdf](http://www.southsudanembassydc.org/PDFs/Laws/INVESTMENT_PROMOTION_ACT,_2009.pdf).
- Teferra, Mengistu. "Power Sector Reforms in Ethiopia: Options for Promoting Local Investments in Rural Electrification." *Energy Policy* 30 (2002): 967–75.
- The Economist. "Can't Get No Recognition." *The Economist*. January 9, 2014.  
<http://www.economist.com/blogs/baobab/2014/01/somaliland>.
- The Minister of Transport, The Minister of Electricity and Dams, and The Minister of Housing and Physical Development. "Opportunities for Investors in Infrastructure." Accessed December 27, 2014.  
<http://www.southsudanankara.org/docs/SOUTH%20SUDAN%20INFRASTRUCTURE%20OPPORTUNITIES.pdf>.
- The Ministry of Trade and Investment, and The Government of Somaliland. "Somaliland Windpower vs Diesel Financial Scenarios." Republic of Somaliland, 2014. <http://somalilandinvest.net/wp->

- content/uploads/2013/08/Somaliland-Windpower-vs-Diesel-Financial-Scenarios.xls.
- The Red List. *Nanger Soemmerringii*. The IUCN Red List of Threatened Species, March 2014. <http://www.iucnredlist.org/details/63541/0>.
- The World Bank. *New World Bank GDP and Poverty Estimates for Somaliland*. Washington, D.C: The World Bank, January 29, 2014. <http://www.worldbank.org/en/news/press-release/2014/01/29/new-world-bank-gdp-and-poverty-estimates-for-somaliland>.
- The World Bank, International Finance Corporation. *Doing Business In Hargeisa 2012*. Washington, D.C: The World Bank, 2012. <http://www.doingbusiness.org/reports/subnational-reports/hargeisa>.
- Timelines of history. *Timeline Somaliland*, April 19, 2015. <http://timelines.ws/countries/SOMALILAND.HTML>.
- Trabish, Herman K. "A Rising Tension: 'Value-of-Solar' Tariff Versus Net Metering." *Green Tech Media*, April 10, 2014. <http://www.greentechmedia.com/articles/read/A-Rising-Tension-Within-the-Solar-Industry-Value-of-Solar-Versus-NEM>.
- Transitional Federal Government. *Millenium Development Goals Progress Report Somalia*. Mogadishu, Somalia, 2010. <http://www.so.undp.org/content/dam/somalia/docs/MDGs/2010%20SOMALIA%20MILLENNIUM%20DEVELOPMENT.pdf>.
- United Nations. "UN Millenium Development Goals." United Nations, 2014. <http://www.un.org/millenniumgoals/>.
- USAID. "What Power Africa Means for Ethiopia." USAID, April 9, 2014. <http://www.usaid.gov/documents/1860/ethiopia-power-africa-fact-sheet>.
- USAID/EGAT Office of Infrastructure & Engineering, Energy Team. "Electricity Sector Reform." USAID, March 2009.
- U.S. Energy Information Administration. "Electricity Prices for Households for Selected Countries." U.S. Department of Energy, June 10, 2010. [http://www.eia.gov/countries/prices/electricity\\_households.cfm](http://www.eia.gov/countries/prices/electricity_households.cfm).
- Wilfred H. Schoff. *The Periplus Of The Erythraean Sea: Travel And Trade In The Indian Ocean By A Merchant Of The First Century*. Kessinger Publishing, LLC, 2010.
- World Bank Investment Climate. *South Sudan Takes On Business Friendly Reforms In Strategic Sectors*. World Bank. Accessed December 8, 2014. <https://www.wbginvestmentclimate.org/advisory-services/investment-generation/agribusiness/south-sudan-takes-on-business-friendly-reforms-in-strategic-sectors.cfm>.
- Worldwatch Institute. *Policy Support for Renewable Energy Continues to Grow and Evolve*. Washington, D.C, August 22, 2013. <http://www.worldwatch.org/policy-support-renewable-energy-continues-grow-and-evolve-0>.
- Y. Garow MD MPH. "HIV/AIDS in Somaliland Too Good To Be True." *Somaliland Times*. 2003, 74 edition. <http://somalilandtimes.net/2003/74/7415.shtml>.



