Put out the Fire

Developing a Sustainable Energy Policy for All Namibians

by Julie Nania & Doug Vilsack

1. Introduction: Energy and Climate Justice for All

Energy is necessary for sustainable development. At present, over two billion people, living predominantly in the rural areas of developing countries, do not have access to modern energy sources. Many of these people rely on fuels, such as wood, that are scarce due to environmental degradation and increasing population. Although culturally important for many peoples, burning wood in an open fire will not lead to the growth of sustainable rural communities in developing countries. Energy must provide heat, light, and power for the industrial processes that are necessary for growing economies; Needs such as healthcare, education, and communication, are dependent on reliable energy supplies; and Access to energy raises life expectancy, lowers infant mortality, and increases literacy in developing countries. Furthermore, when electric energy is available in rural areas, residents are less likely to contribute to rapid urbanization by seeking better living conditions in cities.[1]

The provision of energy in developing countries is much more than an issue of economic security; it is an issue of justice. Energy justice requires access to reliable energy supplies for all people. The concept regards the provision of energy as a human right, or at least a necessary step for the realization of other human rights such as education, health, and a clean environment. Although energy justice as a concept is most applicable to the populations of developing

[1] *See Access to Energy in Developing Countries*, POSTNOTE, No. 191, (Parliamentary Office of Sci. & Tech, London, U.K.), Dec. 2002, at 1, *available at* http://www.parliament.uk/post/pn191.pdf.

countries, there are people in need of energy even in developed countries. In the United States, the United States Department of Agriculture's Rural Electrification Program ("REP") brought subsidized electricity to remote corners of the country in the early 1900s, spurring economic growth and modernizing rural areas. But despite its general success, the REP failed to bring electricity to all Americans. More than 18,000 households on the Navajo Nation, or approximately forty percent, are still without grid electricity.[2] The reasons for this failure are many, including limited funding, long transmission distances, cultural resistance, and land disputes, among others. Many of these same barriers exist with regard to the provision of electricity to rural populations in developing countries. If America cannot provide traditional, grid-based energy to all, how can Namibia?

Beyond the fundamental issue of energy justice is the concept of climate justice. While energy justice requires us to address the question of energy access, climate justice focuses on how this access is to be achieved. The climate justice concept is illustrated by the debate between rich and poor nations at the recent climate change conference in Copenhagen. Developed countries like the United States, whose past economic growth increased carbon dioxide in the atmosphere and caused our current climate crisis, are hesitant to commit to binding emissions reduction targets because of potential adverse economic impacts. These countries argue that if climate change is to be addressed, developing countries must also commit to emissions reductions over time. However, many developing countries refuse to hinder their economic growth by establishing emissions targets or other expensive policies to limit their emissions growth. These countries argue that due to their limited economic circumstances and adaptive abilities, expensive carbon-reducing technology must be paid for by the developed countries that

[2] Troy Turner, *Are Navajo Blueeyes Seeing Red?*, THE DAILY TIMES, Jan. 19, 2008, *available at* http://www.daily-times.com/farmington-navajo_travel/ci_8023300.

caused the problem in the first place. If America built its economy on cheap energy from fossil fuels, why can't Namibia do the same?

Together, the concepts of energy justice and climate justice require us to develop solutions to this question: how does the international community ensure access to clean energy for the poorest residents of the poorest nations? There is no doubt that developed countries must take the lead in combating climate change and increasing energy access in developing countries. However, development assistance, when provided, is ephemeral and has done little to spur sustainable development. Aid to developing countries has consistently fallen short of United Nations ("UN") targets.[3] Further, the massive write off of third world debt in 2005 illustrates that the traditional system of development assistance is itself fundamentally flawed. The global economic downturn and stalled climate negotiations have reinforced the fact that funding for development is limited, and that even when funding is available, there is no clear strategy for how it can be effectively put to use.

An international focus on clean energy technology that addresses the needs of developing economies and the energy poor is the only way to achieve both climate justice and energy justice. First, developed countries must commit significant resources to the development of large scale, grid-based clean energy projects in developing countries. Prior to the implementation of these projects, developed countries must work with local governments to revise outdated energy policies that stifle renewable energy development by subsidizing electricity produced from cheap fossil fuels. The governments of these countries must educate their citizens about the benefits of

[3] *See* International Development Strategy for the Second UN Development Decade, G.A. Res. 2626 (XXV), ¶ 43, U.N. Doc. A/RES/25/2626 (Oct. 24, 1970), *available at* http://www.un.org/documents/ga/res/25/ares25.htm.

renewable energy and address barriers to renewable energy development, such as land tenancy issues, workforce development, and trade barriers.

Second, and more importantly, the international community and the governments of developing countries must shift their singular focus on providing electricity to large industry and promoting economic growth in urban areas to also promoting the utilization of cheap, reliable, small-scale renewable energy technologies to meet the needs of the rural energy poor. Energy poverty is acute: 1.3 to 1.6 million women and children die as a result of indoor air pollution each year caused by smoke inhalation from cooking fires,[4] while traditional three rock fires—so named because they are typically surrounded by rocks for the placement of a cooking pot—provide inadequate lighting and energy for study, commerce, communication, and industry. Furthermore, due to funding and other constraints, the reality is that on the current course, many rural communities will never have access to grid power.

While these problems seem insurmountable, inexpensive technologies are already available to address these issues. Modern wood-burning cook stoves can reduce soot by ninety percent and carbon dioxide emissions by up to eighty percent at a cost of less than US$20;[5] solar-powered lights can provide up to 1,000 nights of high quality illumination on one set of rechargeable batteries at a cost of less than US$20;[6] small solar panels can charge cell phones and radios at a cost of less than US$10;[7] and Solar Home Systems, albeit more expensive, can provide for numerous in-home energy needs.[8] Despite these technological breakthroughs, development assistance and climate change funding programs focus on the projects developing

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[4] *See* Lakshman Guruswamy, *The Need for Energy Justice*, *available at* http://cees.colorado.edu/ej_whitepaper.pdf.
[5] *See* Envirofit, Clean Cookstoves, http://www.envirofit.org/?q=our-products/clean-cookstoves (last visited Feb. 26, 2010).
[6] *See* Elephant Energy, Technology, http://www.elephantenergy.org/Technology.html (last visited Feb. 26, 2010).
[7] *See* Tough Stuff, Products, www.toughstuffonline.com/products (last visited Feb. 26, 2010).
[8] *See* Solar Electric Light Fund, Our Technology – Photovoltaics, http://www.self.org/solartechnology1.shtml (last visited Feb. 26, 2010).

countries demand: large-scale, sexy solutions to energy shortages and climate change that do not address the current inequalities of energy access.

Renewable energy development in Namibia is not a matter of charity. Namibia's energy supply sector is an old, centralized system, which relies largely on imported energy generated with fossil fuels from abroad. Namibia's supply is increasingly vulnerable to fluctuations in the regional supply market and to fluctuations in the price of fossil fuels. Large-scale fossil fuel generation will only continue to become more expensive over time. A renewable energy solution is already more cost effective over a twenty-year span, and conversely will become less expensive as time progresses.

Without a concerted effort by the international community to address energy poverty in concert with climate change, the climate solution will only exacerbate the problem. Massive investments in large-scale, grid-based renewable energy technology will reinforce an unjust system, where only the wealthy and urban people in developing countries are allowed to benefit from energy development. With inexpensive, durable renewable energy technologies now available to meet the needs of the rural poor around the world, any climate solution that fails to address the needs of rural communities is unjust and unacceptable.

2. Energy and Climate Injustice in Namibia

Katima Mulilo is the bustling capital of the Caprivi Region in Northeastern Namibia. (map cited [9]). The name, which means "put out the fire," was fixed to this particular crossing along the Zambezi River because unpredictable currents and winds tended to put out the fire of traveler's torches. Today, a new bridge links Katima with the neighboring country of Zambia, and at night the darkness is broken by a string of streetlights. The energy supply for these lights is no longer controlled by the elements, but by a generator in Katima and a power station in Zambia. Despite these twinkling lights, fire is still the most widely used energy source in Caprivi and the rest of rural Namibia. For many Namibians, energy access is limited by economic and geographic circumstances as uncontrollable as the waters and winds of the Zambezi River.

The energy situation in the region is constantly evolving. Energy impacts many facets of life. In neighboring Angola, the economy is emerging from a crippling, oil-fueled civil war; in Namibia's capital, Windhoek, policymakers have allocated money to build an emergency 20 megawatt ("MW") diesel generator to stave off power cuts; near Katima, legions of diesel-powered pickup trucks ply the road selling lifts to villagers; as fossil fuel use increases and the

[9] International Labour Organization, Subregional Office for Southern Africa, Namibia, http://www.ilo.org/public/english/region/afpro/mdtharare/country/namibia.htm (follow "Click for map of Namibia" hyperlink) (last visited Feb. 28, 2010).

cooking fires continue to smoke, a changing climate threatens food and water supplies. For good reason, energy and climate change are on the minds of the people and the politicians of Namibia.

(a) Climate Injustice in Namibia

Climate change models have predicted that temperature increases will lead to increased climate vulnerability in Namibia.[10] Willem Konjore of the Namibian Ministry of the Environment and Tourism ("MET") has warned that, "[t]he arid environment, recurrent drought and desertification and fragile ecosystem have contributed to making Namibia one of the most vulnerable countries to the effects of climate change . . . [C]limate change could potentially become one of the most significant and costly issues that affect the national development process."[11]

Namibia's key economic sectors are reliant upon natural resources, them vulnerable to the effects of climate change. Climate change will impact whole ecosystems, destabilizing wildlife and vegetation. The impact on the tourism sector from habitat loss and ecosystem change could be enormous. Furthermore, Namibia's economy is highly dependent on agriculture and livestock production. Rural livelihoods and food production will be threatened by erratic weather patterns and gradual climate changes. The marine industry and coastal economy is also forecasted to be adversely affected by rising sea levels and warmer water temperatures.[12]

These threats are even more harrowing because Namibia has inadequate technological expertise and few financial resources to address the impacts of climate change. Given this

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[10] Posting of Martin Nyambe to Climate Frontlines, *Energy Related Impacts to Climate Adaptations in Namibia*, http://www.climatefrontlines.org/en-GB/node/377 (Aug. 17, 2009, 15:37)..

[11] Willem Konjore, MP, Minister of Env't & Tourism of the Republic of Namibia, Opening Remarks at the Official Launch of the Climate Change Booklets and the Second National Communication (Feb. 20, 2007) [hereinafter Konjore's Opening Remarks].

[12] *Id.*

predicament, the Namibian government has urged that, "[i]n order not to be diverted from our national development objectives, we must further develop and adopt preemptive, preventative and corrective actions and activities to address environmental and climate change issues and problems."[13] The government has already taken some preventative measures, such as initiating an adaptation project to enhance the adaptive capacity of agricultural and pastoral systems in Namibia's drought prone regions.[14] However, the country remains far from prepared to deal with the magnitude of environmental changes forecasted.

Low-income rural households have the least capacity to cope with the adverse effects of climate change; rural agricultural areas generally suffer the most climate stress and are equipped with the fewest resources to mitigate climate change impacts. Most of Namibia's population, particularly in poor rural areas, is heavily reliant on natural resources such as water, biomass (particularly firewood), and range for grazing. Namibia's environment is already stressed by over-population in rural farming and herding areas. Climate change is expected to compound the severity of this resource scarcity caused by increased consumption. Subsistence farmers will also be among those hit the worst. Cycles of drought and flooding will result in poor harvests as most farmers lack irrigation systems to support their production. To compound the problem, it is these smaller farmers who do not have additional finances to supplement their income.[15] For Namibia's rural populations, climate change is another barrier standing in the way of "sustainable development," a promise made over and over by the international community and national government since the Brundtland Commission coined the term over twenty years ago.[16]

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[13] *Id.*
[14] Willem Konjore, Minister of Env't & Tourism of the Republic of Namibia, Statement at the Occasion of the High-Level Segment of the UN Framework Convention on Climate Change 3 (Nov. 15, 2006) [hereinafter Konjore's Statement].
[15] Posting of Martin Nyambe, *supra* note 10.
[16] *See* World Commission on Environment and Development, Aug. 4, 1987, Annex: Report of the World Commission on Environment and Development: Our Common Future, U.N. Doc. A/42/427, *available at* http://www.un-documents.net/wced-ocf.htm.

NAMIBIA FACTS: FROM CIA WORLD FACT BOOK[17]	
History:	South Africa occupied the German colony of South-West Africa during World War I and administered it as a mandate until after World War II, when it annexed the territory. In 1966 the . . . South-West Africa People's Organization (SWAPO) guerrilla group launched a war of independence for the area that became Namibia, but it was not until 1988 that South Africa agreed to end its administration in accordance with a UN peace plan for the entire region. Namibia has been governed by SWAPO since the country won independence in 1990. Hifikepunye Pohamba was elected president in November 2004 in a landslide victory replacing Sam Nujoma who led the country during its first 14 years of self rule. Pohamba was reelected in November 2009.
Constitution	Ratified 9 February 1990, effective 12 March 1990
Ethnic Groups:	Black 87.5%, white 6%, mixed 6.5% *note:* about 50% of the population belong to the Ovambo tribe and 9% to the Kavangos tribe; other ethnic groups include Herero 7%, Damara 7%, Nama 5%, Caprivian 4%, Bushmen 3%, Baster 2%, Tswana 0.5%
Population / Age:	2,108,665 Total (2009 est.) 0-14 years: 35.9% (male 381,904/female 375,059) 15-64 years: 60.2% (male 641,995/female 627,146) 65 years and over: 3.9% (male 36,894/female 45,667) (2009 est.)
HIV/AIDS:	Adult prevalence rate of 15.3%, 200,000 people living with HIV/AIDS .
Literacy:	Definition: age 15 and over can read and write total population: 85% male: 86.8% female: 83.5% (2001 census)
Climate/Land:	Desert; hot, dry; rainfall sparse and erratic / arable land: 0.99%

[17] CIA – The World Fact book, Namibia, https://www.cia.gov/library/publications/the-world-factbook/geos/wa.html (last visited Feb. 28, 2010).

Environmental Issues:	Limited natural fresh water resources; desertification; wildlife poaching; first country in the world to incorporate the protection of the environment into its constitution; some 14% of the land is protected, including virtually the entire Namib Desert coastal strip
GDP / per capita	$13.44 billion (2008 est.); $6,400 (2008 est.)
Economy:	The economy is heavily dependent on the extraction and processing of minerals for export. Mining accounts for 8% of GDP, but provides more than 50% of foreign exchange earnings. Rich alluvial diamond deposits make Namibia a primary source for gem-quality diamonds. Namibia is the fourth-largest exporter of nonfuel minerals in Africa, the world's fifth-largest producer of uranium, and the producer of large quantities of lead, zinc, tin, silver, and tungsten. The mining sector employs only about 3% of the population while about half of the population depends on subsistence agriculture for its livelihood. Namibia normally imports about 50% of its cereal requirements; in drought years food shortages are a major problem in rural areas. A high per capita GDP, relative to the region, hides one of the world's most unequal income distributions. The Namibian economy is closely linked to South Africa with the Namibian dollar pegged one-to-one to the South African rand. . . . Increased payments from [the Southern African Customs Union ("SACU") put Namibia's budget into surplus in 2007 for the first time since independence, but SACU's [payments will decline after 2008 as part of a new revenue sharing formula.] Increased fish production and mining of zinc, copper, uranium, and silver spurred growth in 2003-08, but growth in recent years was undercut by poor fish catches [and high costs for metal inputs.]

(b) Energy Injustice in Namibia

In an international climate change debate often focused on large-scale solutions in developed countries, it is often forgotten that over two billion people in the world lack access to sufficient energy resources. While more than seventy percent of Namibia's urban population has access to the national electric grid, only fifteen percent of rural households are connected.[18] Only one-third of Namibia's two million people have access to grid electricity.[19] A recent review of energy policy in Namibia found that "larger-scale off-grid electrification remains largely unaccomplished."[20] Despite this enormous gap in electricity supply between rich and poor, urban and rural, the optimistic target presented in Namibia's Third National Development Plan was only for twenty percent rural electrification by 2012.[21] Shockingly, many of these homes are not plotted to get access to grid electricity in the next twenty years, if ever. David Jarrett is a Senior Engineering Technician who works on electrification and renewable energy development at NamPower's Renewable Energy Desk in Windhoek. Jarrett explains that even if the Master Grid Electrification Plans goes as scheduled, "After 20 years there are still a number of areas that will never see the grid."[22]

In Namibia, it is difficult to provide grid access to everyone because the population of the country exists primarily in small, scattered pockets. NamPower, the sole electricity supplier in

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[18] DETLOF VON OERTZEN, DESERT RESEARCH FOUND. OF NAMIBIA, NAMIBIAN NATIONAL ISSUES REPORT ON THE KEY SECTOR OF ENERGY WITH A FOCUS ON MITIGATION 3 (2008), *available at* http://www.undp.org/climatechange/docs/Namibia/Namibian%20national%20issues%20report%20on%20key%20sector%20of%20energy.pdf.

[19] *Id.*

[20] JOSEPH IITA ET AL., PLANNING POWER: REVIEW OF ELECTRICITY POLICY IN NAMIBIA, RESEARCH REPORT NO. 11 11 (Matthias Schmidt ed. Sept. 2009), *available at* http://www.ippr.org.na/Research%20Reports/Review%20of%20Electricity%20Policy%20in%20Namibia.pdf [hereinafter PLANNING POWER].

[21] *Id.* at 5.

[22] Interview with David A. Jarrett, Senior Engineering Technician, Renewable Energy Development, Energy Trading, Electrification & Renewable Energy Development, NamPower Centre, in Windhoek, Namibia (Aug. 2009).

Namibia, is first connecting the areas closest to the grid with larger populations, while informal settlements are passed over in the electrification process. Many believe that NamPower intends to stop grid electric just off the beaten path. Werner Schultz owns and operates Terrasol, an independent solar supplier in Windhoek. Schultz explains that, "[a]s you come to the rural Caprivi area, the rural areas, the southern areas, you can forget about NamPower."[23] For those people living in rural areas or in informal settlements, the chances of grid connection in the near future are very slim.[24]

Electrifying all of Namibia with grid electricity is simply not feasible economically or logistically. As explained in the Electricity Control Board's ("ECB") Green Energy in Namibia paper, "economic considerations prohibit the country's complete electrification using conventional grid electricity."[25] Lahja Amaambo is Head of the Renewable Energy Development Section at NamPower. Ms. Amaambo suggests that renewables are a better solution for villages in many circumstances, especially when villages are isolated far from the grid.[26] Other developing nations in Africa have the same problem. A recent study in Dakar found that the cost of connecting a house to the grid when less than thirty meters away cost up to US$650.[27] Namibia's distances are dauntingly farther.

Harald Schütt, a local Amusha consultant in renewable energy and energy efficiency, explains that it is economically more viable to use small-scale technologies rather than hooking into the grid because of the vast distances between isolated populations. In Mr. Schütt's eyes,

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[23] Interview with Werner Schultz, Engineer & Owner, Terrasol, in Windhoek, Namibia (July 2009).
[24] Interview with David A. Jarrett, *supra* note 22.
[25] PLANNING POWER, *supra* note 20, at 14.
[26] Interview with Lahja Amaambo, Head of Renewable Energy Development, NamPower, in Windhoek, Namibia (Aug. 2009).
[27] Oscar Onguru & Touria Defrallah, *Findings of GNESD Peri-Urban Energy Access Study for East and Southern Africa*, *in* ENHANCING ENERGY ACCESS IN RURAL AREAS AND PERI-URBAN SETTLEMENTS: KNOWLEDGE-BASED POLICY ENGAGEMENT (2009), *available at* http://www.cemafrica.net/Events/Workshop_Report_Cape_Town.pdf (conference was sponsored by the UN Environmental Program and the UCT Energy Research Center).

"[i]t just doesn't make sense in Namibia to build up a nationwide grid."[28] Schütt explains his opinion using a hypothetical situation of connecting a community of one hundred people located ten kilometers away from the current grid. Using rough estimates, Schütt explains that building an eleven kilowatt ("KW") line from the grid to the community would cost about N$1,000,000 (roughly US$130,000), an estimate he deems conservative. If the community borrowed that money from the bank at twelve percent, the community would be paying N$120,000 per annum or N$10,000 per month. Out of the one hundred members in this representative community, approximately fifteen would have formal jobs, none of which are high paying. For these people to pay for the interest and credit, not to mention for the electricity, in addition to appliances and wiring of their houses, is what Schütt terms "economically absolutely impossible." The community would end up defaulting on the line almost immediately.

Access to electricity would provide many possibilities to improve the quality of life of Namibia's rural poor population. The September review of Namibia's national energy policy acknowledged that "[a] continued, systematic commitment by Government to systematically bring affordable energy services to rural Namibia is necessary, thereby also introducing new and decentralized livelihood, learning and business opportunities."[29] Namibians agree that with electricity comes community development and access to the outside world. Andreas and Viktoria Keding run the Namibian Desert Environmental Education Trust ("NaDEET"), an environmental center in the Namib Desert that educates children about sustainable living and the environment.[30] The Kedings believe electrification would have a great impact on people "living with the island system, isolated." It is their opinion that the ability to power cell phones alone would mean that rural populations "all of a sudden have access to the world. I think that's one big step of actually

[28] Interview with Harald Schütt, Energy Efficiency Consultant, Amusha cc, in Windhoek, Namibia (July 2009).
[29] PLANNING POWER, *supra* note 20, at 14.
[30] Interview with Viktoria Keding, NaDEET, in NamibRand Nature Reserve, Namibia (July 2009).

getting people out of poverty and education, also helping people regardless of their regimes and their politics."[31]

NamPower's Mr. Jarrett believes the potential benefits and uses of renewable energy in rural areas are abundant: photovoltaic ("PV") pumps can be used to irrigate farmland, increasing productivity; PV electricity can power enterprises such as haircutting businesses; eventually, people will be able to produce the resources they used to have to truck in, such as baking their own bread.[32] Mr. Jarrett explains that rural electrification "will facilitate the flow of information by providing communications for press conferences . . . . Even basic health care issues could be addressed, such as the refrigeration of medicine . . . so you get that first real development, urban development, taking place, but taking place in a rural setting."[33]

3. Business as Usual: SADC's Carbon-Intensive, Large-Scale, Urban-Focused Electrification Plan

(a) SADC Background and Energy Crisis

The South African Development Community ("SADC") is an alliance of states formed in 1980 to coordinate development projects amongst signatories and to reduce the region's economic dependence on apartheid South Africa. In 1992, the Treaty of SADC was adopted to create a legal body through which to implement SADC policies. Since 1980, the alliance has

[31] *Id.*
[32] Interview with David A. Jarrett, *supra* note 22.
[33] *Id.*

grown, expanding from the nine original member states to fourteen current members, including South Africa, which signed the treaty in 1994.[34]

As SADC has developed, so too has its energy demand. The Southern African Power Pool ("SAPP") was created by SADC in 1995 to optimize the use of regional energy resources and to provide a way for SADC members to support each other in power emergencies.[35] Today, the SADC region is home to around 300 million people, many of whom lack access to electricity.[36] SADC cannot consistently meet the growing demand and has recently suffered severe electricity shortages.[37] SADC's supply constraints have worsened as the South African electricity utility, ESKOM, is increasingly unable to meet local electricity needs.[38]

While rapidly increasing demand is one cause of the SADC energy crisis, a lack of investment in energy infrastructure has exacerbated the problem. South Africa and other SADC nations tend to subsidize electricity, charging ratepayers enough to cover operating costs, but not enough to provide funding for investment in new power plants. Generation is not the only problem: throughout the SAPP, nearly one-sixth of the installed capacity was unavailable during the crisis because of inadequate regional interconnection systems and outdated equipment.[39] At the SADC energy ministers meeting in 2008, the primary SADC issue of concern was the energy supply shortage plaguing the region.[40] SADC is attempting to address the electricity shortfall by installing 6,500 MW of additional capacity by 2012, with hopes to reach an

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[34] Southern African Development Community (SADC), Dep't of Int'l Relations and Cooperation of Republic of South Africa, http://www.dfa.gov.za/foreign/Multilateral/africa/sadc.htm (last visited Feb. 26, 2010).
[35] SADC, SADC ENERGY PROGRAMMES AND PROJECTS 1 (2006) *available at* http://www.gfse.at/fileadmin/dam/gfse/gfse%206/pdf/SADC_GFSE-6_Briefing_Paper.PDF.
[36] Interview with Conrad Roedern, Managing Director and Founder, Solar Age, in Windhoek, Namibia (July 2009).
[37] Petronella Sibeene, *5-Yearly Review for SADC Power Plan*, ALLAFRICA.COM, May 7, 2008, http://allafrica.com/stories/200805070805.html.
[38] VON OERTZEN, *supra* note 18, at 4.
[39] Richard Nyamanh, *Pooling of Resources Critical to Resolving SADC Energy Shortages*, SOUTHERN AFRICAN NEWS FEATURES, Dec. 2, 2008, *available at* http://www.sardc.net/editorial/newsfeature/08781208.htm.
[40] Press Release, SADC, SADC Energy Ministers Meeting, Kinshasa, Democratic Republic of Congo, 30 April 2008 (Apr. 30, 2008), *available at* http://www.sapp.co.zw/docs/Untitled.pdf.

additional 44,000 MW of capacity by 2025.[41] This additional supply will largely be achieved through the construction of large, coal-fired power plants, which take advantage of South Africa's abundant, cheap coal resources. Other hydropower projects have been proposed throughout the SADC region, although discussions concerning the the Inga 3 dam, which would have produced 5,000 MW at maximum capacity, collapsed when the Democratic Republic of the Congo pulled out of negotiations.[42]

(b) Namibia's Energy Crisis

NamPower is the government parastatal that acts as the single buyer of electricity in Namibia. NamPower is "the sole generator, energy trader and transmitter of electrical power in Namibia" and consistently benefits from government subsidies.[43] In addition to having a monopoly over the energy sector, NamPower is inseparable from the central government. NamPower is wholly owned by the Namibian government, and its "investment programme forms an integral part of the state budget." It is so closely intertwined with government that even its credit rating "is aligned with that of the sovereign, based on strong legal, operational and strategic links" while government policy is directly reflected in NamPower's decision making.[44] The ECB was created under the Electricity Act of 2000 to serve as a check on NamPower by acting as the sole regulator of electricity in Namibia.[45] The structure of the ECB was designed so that it would be independent of government as the body responsible for the control, regulation,

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[41] Brendan Peacock, *High Cost of Cheap Electricity*, SUNDAY TIMES (SOUTH AFRICA), Mar. 22, 2009 (Business and Finance section).
[42] Jo-MarÉ Duddy, *DRC Pulls Plug on Inga*. ALLAFRICA.COM, March 1, 2010. http://allafrica.com/stories/201003010977.html
[43] FITCH RATINGS, ELECTRIC-CORPORATE NAMIBIA CREDIT ANALYSIS. CORPORATES: NAMIBIA POWER CORPORATION (PROPRIETARY) LIMITED 2 (Apr. 20, 2009), *available at* http://www.nampower.com.na/revamp/docs/Fitch%20Research%20Report%20NamPower%202009.pdf.
[44] *Id.* at 2.
[45] The Electricity Act § 2 (2000) (Namib.), *available at* http://www.mme.gov.na/energy/acts/act-electricity-2000.html.

and promotion of Namibia's electricity supply industry.[46] The ECB currently sets all of Namibia's electricity tariffs.

In 2007, Namibia consumed approximately fifteen terawatt hours ("TWh") of energy.[47] Most of this consumption was attributable to imported liquid and gaseous fossil fuel use; twenty-five percent was electrical energy use, while biomass accounted for almost fifteen percent of consumption and renewable energy sources less than one percent.[48] Presently, Namibia's only real energy targets for the supply sector and generation targets are from the outdated 1998 White Paper on Energy Policy that set a target of seventy-five percent domestic energy self-sufficiency by 2010.[49]

Namibia's domestic electricity generation capacity is woefully inadequate to meet the country's peak demand. In 2008, Namibia's maximum demand reached 533 MW, 140 MW over the maximum capacity Namibia could produce in ideal conditions (393 MW).[50] In addition, Namibia uses energy intensively, even outside of the energy intensive mining industry. This is largely due to its dispersed population, which requires imported goods such as fuels and consumer goods to be transported over long distances.[51] As a result, almost fifty percent of the electricity Namibia consumes is imported.[52]

Namibia has been dependent upon South Africa's energy export for decades; the country is economically and politically tied to South Africa by the grid. Two transmission lines from South Africa supply over fifty-two percent of Namibia's energy demand.[53] Currently, 92.8 percent of the electricity that Namibia imports from South Africa is from coal fired power

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[46] ELECTRICITY CONTROL BD, GUIDELINES FOR ASPIRING NEW GENERATION APPLICANTS 3 (Sept. 28, 2007) (Namib.), *available at* http://www.ecb.org.na/pdf/ApplicantsGuidelineV4.pdf?m=8&sm=12 [hereinafter ECB GUIDELINES].
[47] VON OERTZEN, *supra* note 18, at 3.
[48] *Id.*
[49] PLANNING POWER, *supra* note 20, at 39.
[50] *Id.* at 7.
[51] VON OERTZEN, *supra* note 18, at 2.
[52] *Id.* at 3.
[53] Interview with Conrad Roedern, *supra* note 36.

plants.[54] The country's reliance on imported energy is particularly troublesome because "[t]he cost of sourcing electricity has almost tripled in the last eight years."[55]

Over the past few years, Namibia has directly experienced the shockwaves sent through the SADC power structure by South Africa's energy crisis. Pressured by domestic energy needs, South Africa has started to restrict the export of electricity to Namibia in order to satisfy its own increasing demand.[56] Under Namibia's current energy supply contract, South Africa has reserved the right to cut off Namibia's energy supply with twenty-four hours of notice.[57] This forces Namibia to meet its demand through purchases on the international spot market, which is very expensive.[58] In addition, other SADC nations are threatening to renege on their power purchase agreements with Namibia. Most recently, Zimbabwe threatened to withhold a substantial portion of Namibia's imported supply. In January 2010, Zimbabwe announced that it would no longer import electricity to fulfill its power purchase agreement with Namibia for MW daily.[59] This unstable energy supply situation has widespread repercussions throughout the country. Potential investors, looking to finance energy-intensive mining operations, are dissuaded because NamPower is unable to assure them that they will have the requisite energy available for industrial operations, much less provide them a general figure for the rate they would pay for that energy supply, if it were available.[60]

Namibia's energy sector has been slow to respond to the SADC energy shortage, even though the shortages Namibia is experiencing were predicted years ago. Little has been done to secure a reliable supply from abroad, and Namibia has not invested in substantial new electricity

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[54] *Id.*
[55] VON OERTZEN, *supra* note 18, at 4.
[56] Interview with Harald Schütt, *supra* note 28.
[57] *Id.*
[58] *Id.*
[59] Jo-Maré Duddy, *Power Panic Over Zim Report*, THE NAMIBIAN, Jan. 13, 2009, *available at* http://www.namibian.com.na/news/full-story/archive/2010/january/article/power-panic-over-zim-report/.
[60] *Id.*

generation capacity in nearly thirty years.[61] Namibia's national production capacity includes the Ruacana hydroelectric plant on the Kunene River, which produces 249 MW from its three turbines at maximum capacity,[62] the 120 MW coal-fired Eck power station, and the Paratus diesel power station, which can produce 24 MW.[63] Construction is scheduled for a fourth turbine at the Ruacana power plant to be completed in 2012,[64] while smaller systems are scattered about the country. However, this will not increase the overall amount of power to be released on the grid since the amount of power generated is limited by the volume of water available.[65] Currently, Ruacana can only operate at maximum capacity five months of the year because of limitations during dry periods.[66] The newly constructed turbine will allow NamPower to meet peak demand hours, but will also use water and deplete reserves faster.[67]

Over the next thirty years, the energy sector is predicted to grow by an average of three percent each year.[68] Peak demand has been conservatively forecast to reach at least 700 MW in 2011 and 850 MW by 2018.[69] Unless drastic steps are taken, unserved demand will rapidly increase. Additionally, because of the growing interest in mining activities on the western coast, an additional load of approximately 300 MW will be needed at the coast in the near future.[70] NamPower has responded to the threat of an energy crisis with quick fixes that are less expensive, but more carbon intensive.[71] Little investigatory time is spent on consideration of

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[61] VON OERTZEN, *supra* note 18, at 5.
[62] PLANNING POWER, *supra* note 20, at 3-4.
[63] *Id.* at 4.
[64] FITCH RATINGS, *supra* note 43, at 1.
[65] Interview with Harald Schütt, *supra* note 28.
[66] *Id.*
[67] *Id.*
[68] VON OERTZEN, *supra* note 18, at 3.
[69] *Id.* at 5.
[70] NamPower, Media Statement 4 (Dec. 11, 2008), *available at* http://www.nampower.com.na/revamp/docs/media/Projects%20update.pdf.
[71] Christophe de Gouvello, Felix B. Dayo, & Massamba Thioye, *Low-Carbon Energy Projects for Development in sub-Saharan Africa: Unveiling the Potential, Addressing the Barriers* xxvi (The World Bank 2008).

long-term policy implications, as providing the grid with electricity is the primary concern.[72] To boost supply, NamPower has initiated short-term energy generation projects to add an emergency capacity of 50 MW.[73] Among the projects NamPower is investigating are an expansion of the Paratus diesel-powered plant and building a coal-fired power station at Walvis Bay with anywhere from 300 to 800 MW capacity.[74] Both of these solutions increase Namibia's dependence on carbon-dioxide-producing, foreign-procured fossil fuels.

4. The Partial Energy Solution: Large-Scale Renewable Energy Development

(a) Namibian Renewable Resources and Technology-Specific Barriers

Namibia's environment is ideal for renewable energy generation. In Schütt's opinion: "Namibia is the one country in the world—due to its geographic, economic and social structure—which is best suited to be one hundred percent energized through renewable sources."[75] However, because the energy generated from renewables is intermittent and difficult to store, new power management strategies and hybrid systems to support low generation periods will be necessary. Wind turbines produce power around the clock, but generation is intermittent. Solar installations only generate electricity during sunlight hours. Storage of electricity is also a challenge, though reliable sources, such as hydro, diesel, and coal-fired plants can act as a buffer to be used when other renewable energy sources are not producing enough capacity. These difficulties aside, Namibia is blessed with tremendous renewable energy potential.

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[72] Interview with Antonia Baker, Project Coordinator: CPP & Climate Change, Manager of Research, Namibia Nature Foundation, in Windhoek, Namibia (July 2009).
[73] *Id.*
[74] VON OERTZEN, *supra* note 18, at 6, 8.
[75] Interview with Harald Schütt, *supra* note 28.

(i) Solar Power

Namibia is an ideal location for electricity generation from PV systems and concentrated solar power. On average, most of Namibia experiences more than 300 days of sunshine per year.[76] The South can have up to 360 days of sun. [77] Sunny days produce a daily radiation rate of about five to six KW hours per square meter, situating Namibia's solar regime amongst the world's best.[78] In terms of solar radiation, Schütt boasts that Namibia has "2.3 times what the Europeans have."[79] Namibia is already fairly advanced in terms of PV usage per capita. Conrad Roedern from Solar Age points out that, "[a]t two-million people, especially under the developed world, [Namibia is] in the top per capita range of using PV."[80] Various sizes of PV installations have been installed all over the nation; Windhoek's hospital installed solar panels, the University of Namibia as well as the Polytechnic of Namibia installed solar water heaters, and companies like Solar Age have installed hybrid systems in rural schools.[81] More recently, the University of Namibia has announced a N$1.8 million investment in PV for its new Northern Campus in Windhoek.[82]

Aside from PV installations, concentrated solar is attractive to many renewable energy advocates because it can produce large amounts of power at a considerably cheaper rate than PV and is relatively easy to store. However, to adapt the technology to Namibia's vast distances, smaller concentrating plants would have to be dispersed around the nation, "building fifty megawatts here, seventy there, twenty-five there and so on."[83] While Ms. Amaambo reported

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[76] Konjore's Statement, *supra* note 14, at 4.
[77] Interview with Harald Schütt, *supra* note 28.
[78] Baerbel Epp, *Solar Water Heaters Mandatory for Public Buildings* GLOBAL SOLAR THERMAL ENERGY COUNCIL Mar. 30, 2009, *available at* http://www.solarthermalworld.org/node/494.
[79] Interview with Harald Schütt, *supra* note 28.
[80] Interview with Conrad Roedern, *supra* note 36.
[81] Interview with Noddy Hipangelwa, Ministry of Mines and Energy, in Windhoek, Namibia (Aug. 2009).
[82] Interview with Harald Schütt, *supra* note 28.
[83] *Id.*

that NamPower was in the pre-feasibility stage of looking at concentrated solar,[84] her colleague, David Jarrett, seemed doubtful about the prospects of adding concentrated solar to NamPower's portfolio because "it's a very expensive technology."[85] Integrated solar combined cycle plants, which combine a conventional combined-cycle gas plant with a solar driven booster, are another option currently being investigated by NamPower, as are large-scale PV plants.

Small-scale solar systems and products are also an option for Namibia. Particularly, solar home systems and solar water geysers have been popularized by the Ministry of Mines and Energy ("MME") programs and a Cabinet directive passed in 2007.[86] PV pumps are also ideal for Namibia. Although more expensive than their diesel equivalent up front, they save on fossil fuels, are less time consuming to maintain, and have the added benefit of pumping water when it's needed the most, during direct sunlight. Solar water heaters are also perfect for Namibia's climate, but are too expensive for the bulk of Namibians.

Solar ovens and cookers are also available to meet rural and urban needs. However, these products are expensive and not widely available for purchase. While there have been some successes, like the Volambola Solar Stove project, other programs established to disseminate the ovens and cookers have struggled, largely due to a lack of funds for professional marketing and continuous education of customers.[87] In addition, there has been some pushback from Namibian's who feel that adopting these methods of cooking substantially change their daily social routines. Preparing food around the fire is traditionally a time for women to socialize.

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[84] Interview with Lahja Amaambo, *supra* note 26.
[85] Interview with David A. Jarrett, *supra* note 22.
[86] Interview with Noddy Hipangelwa, *supra* note 81.
[87] Interview with David A. Jarrett, *supra* note 22.

Uazamo Kaura, Designated National Authority ("DNA") for the Clean Development Mechanism ("CDM"), believes "at the end of the day, people would still rather cut down wood to cook."[88]

(ii) Wind Power

Namibians have been using wind power since before 1914 in the form of wind driven water pumps.[89] Today there are approximately 33,000 wind pumps running in the country.[90] Marina Coetzee, Chief Agricultural Researcher at the Ministry of Agriculture, explains that "[a] lot of farmers, especially in the past, have used wind generators."[91] However, Namibians just recently have begun to explore the opportunities offered by wind plants tied into the grid system.

Recent studies have suggested that several onshore wind farms of twenty to fifty MW capacities each seem possible if the grid capacity is strengthened to accommodate them.[92] Other energy consultants have estimated twice those figures.[93] However, there are several impediments to wind resource development. Geography is an issue. Wind farms may be well suited for the coastal regions, but because of a lack of transmission capacity, wind power is not ideal for areas away from the coast where most of the power demand exists. Mr. Schütt articulates Namibia's predicament: "The problem is not the wind . . . the problem is that we do not have the infrastructure to take off the energy . . . [and] the fact that wind energy is erratic."[94] Despite these challenges, NamPower has started to conduct feasibility studies in certain coastal areas.

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[88] Interview with Uazamo Kaura, Designated National CDM Authority, Ministry of Environment and Tourism, in Windhoek, Namibia (Aug. 2009).
[89] Interview with Viktoria and Andreas Keding, *supra* note 30.
[90] Interview with Harald Schütt, *supra* note 28.
[91] Interview with Marina Coetzee, Chief Agricultural Researcher, Ministry of Agriculture, Water and Forestry, in Windhoek, Namibia (July 2009).
[92] VON OERTZEN, *supra* note 18, at 6.
[93] Interview with Harald Schütt, *supra* note 28.
[94] *Id.*

(iii) Hydropower

Namibia has already developed hydropower resources and relies upon them heavily. Currently, the majority of Namibia's power is generated from the Ruacana hydropower plant on the Kunene River. The Namibian government is investigating the construction of a second hydropower plant on the Kunene River, the proposed Baynes hydro dam, which would have a generation capacity of some 360 MW.[95] Although hydroelectricity is generally thought to be one of the most reliable forms of renewable energy, decreased rainfall and drought has restricted hydropower capacity in recent years.

(iv) Geothermal and Wave Energy

Relatively little is known about Namibia's geothermal and wave energy capacity, both of which are largely unexplored. Hot springs north and south of Windhoek indicate that a rift exists, but no proper surveys have been conducted to determine whether this resource has any potential for utility-scale energy production.[96] Rough estimates have put the geothermal potential of Namibia at just over 100 MW.[97] Another understudied resource is Namibia's tidal and wave energy potential.[98] Harald Schütt explains that "[Namibia has] ocean stream energy, because the Benguela stream is coming over 7 km an hour 24/7."[99]

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[95] VON OERTZEN, *supra* note 18, at 5.
[96] Interview with Harald Schütt, *supra* note 28.
[97] VON OERTZEN, *supra* note 18, at 4.
[98] Interview with Noddy Hipangelwa, *supra* note 81.
[99] Interview with Harald Schütt, *supra* note 28.

(v) Biodiesel

Officials from different government Ministries are looking into developing biodiesel derived from the oil-bearing fruits of Jatrophas Curcas trees.[100] One of the concerns about adopting a biofuel program is how the fuel crop production will affect food security in Namibia and further deplete nutrients in Namibia's already poor soils.[101] Namibia's limited arable land and scarce water resources constrain the country's ability to produce food. The potential of non-native biofuel species to become invasive is also a concern.[102] Because of these concerns, the Directorate of Forestry has placed a blanket ban on Jatrophas Curcas production for biofuels until more is known about how production will affect Namibia's resources.[103] For the time being, "quite a number of private investors [are] looking at bio-fuels,"[104] though there remains a hold at the moment until the food security issues are dealt with.[105]

(vi) Biomass and Bush to Electricity

Converting invader-bush to electricity is currently one of Namibia's most promising renewable energy options. Namibia has over 26 million hectares (64 million acres) of land choked with invader bush. In energy terms, the ECB has estimated that this would be the equivalent to 1,100 TWh hours of biomass energy, about seventy times the amount of energy that Namibia consumed in 2007. [106] Reducing invader bush would be an added benefit because the bush is too dense to allow livestock grazing and makes the land unusable for agricultural

[100] *See* VON OERTZEN, *supra* note 18, at 8.
[101] Interview with Marina Coetzee, *supra* note 92.
[102] Interview with Uazamo Kaura, *supra* note 90.
[103] Interview with Antonia Baker, *supra* note 72.
[104] Interview with Marina Coetzee, *supra* note 91.
[105] Interview with Uazamo Kaura, *supra* note 90.
[106] Detlof Von Oertzen, *Green Energy in Namibia*, ENERGY CONTROL BOARD at 4 (May 2009).

purposes. It also reduces the penetration of rainwater, which is essential to recharge Namibia's underground water reserves.[107]

There is substantial interest in both incinerating and gasifying invader bush to produce power. Various small-scale pilot projects are being conducted by the Desert Research Foundation ("DRFN") and the Ministry of Agriculture. The ECB reported that a 250 KW invader bush gasification pilot plant is expected to be completed in 2010.[108] Schütt proposes that "[Namibia] should have small-scale scattered technology to produce electricity from that bush." There would be multiple ancillary benefits from a bush-to-electric program. Because the electricity production would take place largely on individual farms, it would also create decentralized jobs and reduce urban migration. Additionally, because the process of conversion could take place at will, the bush-to-electricity regime would allow for the production of power during peak demand times, when Namibia's grid needs the energy most. Schütt reports that, "[Bush encroachment] has cost the farmers' community 700 million dollars (Namibian) a year in lost revenue." Farmers would benefit from reclamation of their grazing lands.

(b) Breaking Down Barriers Hindering Namibian Renewable Energy Development

While Namibia has tremendous renewable resources, there are many barriers standing in the way of a large-scale renewable energy industry in the country. Many of these barriers are political, and are the result of outdated energy policies and development strategies. Other barriers are the result of the limited resources available to small, developing countries for energy development in general. Finally, many cultural barriers stand in the way of broad renewable energy development in the country. These barriers, and recommendations for the Namibian

[107] *Id.*
[108] *Id.*

government, civil society, and businesses on how to overcome them, are discussed in the following sections.

(i) Establish National Policies and Targets that Facilitate the Development of Renewable Energy

In 1998, Namibia created the White Paper on Energy Policy ("White Paper") that offered a strong foundation for a national renewable energy policy. Although it was quite progressive when it launched, the White Paper is in dire need of an update because of current circumstances surrounding the SADC energy supply crisis. In the White Paper, the Namibian government established a policy to promote renewable energy generation, but failed to set specific goals to further the policy.[109] According to a 2008 United Nations Development Program ("UNDP") report on mitigating Namibia's energy issues, Namibia currently has no national renewable energy targets in place, although NamPower has recently set a target of achieving ten percent of their capacity from renewables by 2011.[110] Many stakeholders are of the mindset that the MME should prepare an Energy Act to coordinate energy sector requirements and restraints into a coherent policy plan.[111] There are rumors that certain ministries are working to establish policies that would include renewable energy mandates. Mrs. Kaura at MET suggested that MET is in the process of developing a climate change policy and that MME has a draft energy policy currently in the pipeline."[112]

Despite indications that the government is becoming more receptive to alternative forms of energy production, a Western European development mentality lingers, driving government decision-makers toward coal and nuclear development. "The engineers at NamPower and the

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[109] ENERGY POLICY COMM. OF THE MINISTRY OF MINES & ENERGY, WHITEPAPER ON ENERGY POLICY § 3.5 (May 1998), *available at* http://www.ippr.org.na/Research%20Reports/Review%20of%20Electricity%20Policy%20in%20Namibia.pdf.
[110] FITCH RATINGS, *supra* note 43, at 7.
[111] VON OERTZEN, *supra* note 18, at 12.
[112] Interview with Uazamo Kaura, *supra* note 90.

decision-makers in our Ministry are usually trained in the way of Western Europeans . . . . they have a vision that development is one big [government-owned] power station in the middle with one cable to each building . . . ."[113] Discussing the barriers to renewables, Mrs. Coetzee comments that "[r]enewable energy is not very mainstream in the minds of the decision makers in Namibia."[114]

Andreas Weinecke, manager and researcher at the Habitat Research and Development Centre ("HRDC"), believes that an energy crisis is what is necessary to get the government to recognize the importance of integrating renewables into the national energy supply. "All we need is a good crisis . . . the best way to wake up is to have a crisis."[115] National policy statements which promote the development of renewable energy should be promulgated as soon as possible to provide a solid foundation for other policies and regulations supporting renewables. Laws and regulations should be passed that facilitate the development of renewable energy within Namibia and support renewables as Namibia's preferred route of development.

First, climate change legislation restricting Namibia's carbon emission output should be passed to solidify the press statements by Namibian leaders into a tangible piece of legislation. Such legislation would incentivize government officials, NamPower, and investors to create and support renewable energy projects in lieu of higher carbon fossil fuel alternatives. More direct approaches, such as legislation setting binding benchmarks for renewable energy development or requirements that renewables constitute a certain percentage of NamPower's distribution portfolio would have a more immediate impact on the adoption of renewables. A policy statement expressing a national goal of promoting renewable energy projects and a preference

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[113] Interview with Harald Schütt, *supra* note 28.
[114] Interview with Marina Coetzee, *supra* note 91.
[115] Interview with Dr. Andreas Wienecke, Manager of Research, Habitat Research & Development Centre, in Windhoek, Namibia (2009).

for renewables in private sector energy development would be a strong charter document that could encourage entities, such as the ECB, facilitate the development of clean energy.

(ii) Implement Policies to Overcome Cost Barrier to Renewables

The initial capital costs of renewable energy technologies are higher than their fossil fuel equivalents. In a country with a relatively poor population and much wealth inequality, differences in upfront cost are frequently determinative for those investing in energy sources. In addition, when choosing between energy sources, Namibians may not take into account many of the long-term benefits of renewables due to lack of education concerning their benefits. National energy planners and consumers must include the long-term benefits of renewables in energy supply analyses, revealing that these technologies are actually less expensive over time than traditional energy sources. Policies incentivizing renewables in the short term will be essential to their widespread adoption.

Even when the upfront costs of renewable technologies are comparable to traditional technologies, most Namibians do not consider the long-term operating costs of traditional technologies, even though these costs are generally higher than renewable technologies.[116] Raising awareness about the long-term benefits of renewables and using incentives to reduce the initial capital costs of renewables in the short term will help overcome the general perception that renewable technologies are too expensive for Namibians. Both the private sector and government agencies have attempted to raise awareness of the costs and benefits of renewables. These efforts should be continued and expanded.

One policy change that could assist the renewable energy industry in the short term has to do with Value Added Taxes ("VAT"), which are levied on goods imported to Namibia at a rate

[116] Interview with Werner Schultz, *supra* note 23.

of either fifteen percent or thirty percent, depending on the nature of the goods. The VAT is a huge burden on consumers when most renewable technologies are already comparably more expensive than fossil fuel products. Eliminating or reducing the VAT and import taxes on renewable energies would be a substantial step in making these technologies more affordable for Namibians. Recently, PV panels have been allowed to enter into Namibia free of customs.[117] However, taxes must only be reduced for quality products. In the eyes of many, an influx of cheap and unreliable solar technologies has harmed the credibility of renewable technologies. Some of the technologies imported to Namibia, Chinese PV panels in particular, have not been designed and tested for the intense Namibian sun.[118] Poor quality products reduce confidence in the technology as a whole, harming the industry.[119] In 2008, the National Technical Committee on Renewable Energy was established to monitor renewable energy products and services.[120] This committee could be used to determine which products are of sufficient quality to qualify for tax breaks.

In addition to tax breaks, subsidies reducing the up-front costs of renewables would make investment in the energy sector more attractive.[121] Subsidies that support dirty fossil fuels must also be removed. Namibia must stop subsidizing coal power imported from South Africa, and the ECB must bring tariffs up to reflect market value as soon as possible. Similarly, the price of diesel and other fuels must reflect market values. Andreas from NaDEET explains that even though "solar hot water heaters are so ideal for Namibia, even people who can afford it say why

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[117] Interview with Harald Schütt, *supra* note 28.
[118] Interview with Werner Schultz, *supra* note 23.
[119] Interview with Viktoria and Andreas Keding, *supra* note 30.
[120] *See* Joseph S. Iita, Permanent Sec'y of Mines & Energy, Inaugural Remarks at the Official Public Presentation of the National Technical Committee on Renewable Energy (NTCRE) 2 (July 3, 2008), *available at* http://www.reeei.org.na/admin/data/uploads/PS%20Remarks%20on%20the%20ocassion%20of%20the%20inauration%20of%20the%20renewable%20energy%20technical%20committee.doc.
[121] Interview with David A. Jarrett, *supra* note 22.

should I buy one when the power is so cheap from the grid?"[122] If NamPower, the government, and the ECB work to eliminate fossil fuel subsidies, renewable energy will become more attractive in comparison.

(iii) Promote Innovation at NamPower

A decentralized energy system would benefit independent power producers ("IPPs") in Namibia. NamPower recently began to engage in discussions of renewable energy as a viable source of national power production. Some individuals at the government parastatal, including Amaambo and Jarrett at the Renewable Energy Desk, consider renewables an important component of electricity supply. However, NamPower remains committed to a centralized grid and fossil fuel based energy system and should be consistently encouraged to incorporate renewables into its energy supply portfolio. There are three primary ways in which NamPower and ECB can work creatively to facilitate renewable energy development in Namibia: through incorporating renewable energy sources into its own distribution portfolio, actively promoting the development of IPPs, and restructuring tariffs to promote renewable energy sources.

(1) Incorporating Renewables into NamPower's Energy Portfolio

NamPower is currently in the process of experimenting with adding renewable energy sources to its energy production profile. Amaambo, head of the Renewable Energy Desk, explained that NamPower is investigating potential sites for large-scale wind farms near Luderitz and Walvis Bay with wind measurement stations. The company is also looking at the potential costs and benefits of concentrated solar tied into the grid.[123] However, Amaambo shares

[122] Interview with Viktoria and Andreas Keding, *supra* note 30.
[123] Interview with Lahja Amaambo, *supra* note 26.

NamPower's concern that some forms of large-scale renewables are not reliable enough to power the national grid. This concern is reflected in the parastatal's criteria for assessing which power development path to undertake; NamPower looks to see if the source is predictable, concentrated, and inexpensive.[124]

Jarrett describes Namibia as suffering from a lack of long-term planning. For effective energy planning, he urges that "[t]here has to be a balance between all three: short, medium, and long term." When attempting to finance renewable energy projects, renewables are generally considered a long-term investment—capital intensive upfront, but a good investment in the long-term. However, funds spent on a long-term generation goal would mean sacrifice in the short term.[125]

Some renewable energy stakeholders argue that NamPower has strong incentives not to promote renewables, pointing out that NamPower benefits more if people are paying for energy from the grid."[126] Others presented a more cynical view: "[t]here is a very strong lobby for coal. It provides jobs and supports the mining industry, and the people selling it are very close to the government."[127] In addition, "some of our top politicians have a vested interest in some of the petroleum import and distribution companies in Namibia."[128]

NamPower must refocus its priorities on long-term solutions to Namibia's energy problems or risk putting Namibia's economy further at risk. While the Southern African energy crisis must be dealt with swiftly, any solution that doesn't involve renewables will merely shift the problem elsewhere, from a short-term energy supply problem to a long-term dependence on foreign sources of fossil fuels.

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[124] *Id.*
[125] Interview with David A. Jarrett, *supra* note 22.
[126] Interview with Uazamo Kaura, *supra* note 90.
[127] Interview with Antonia Baker, *supra* note 72.
[128] Interview with Marina Coetzee, *supra* note 91.

(2) Promoting Independent Power Production

Many energy stakeholders believe that Namibia will only be able to incorporate renewable energy into the grid if a decentralized supply system is established. Roedern articulates that "[t]he solution is one hundred percent renewable . . . this only can be achieved with a decentralized energy system where all the companies and the monopolies are broken up."[129] A variety of factors are hindering the implementation of such a policy. Namibia's electricity sector is a strict monopoly, providing the national utility with incredible bargaining power when negotiating power purchase agreements.[130] Furthermore, NamPower operates under the single buyer function, which requires that all parties contributing to the country's generation capacity or using the transmission infrastructure make an agreement with the utility before feeding electricity into the national grid. Wienecke explains that consolidating this agreement is accompanied by high transaction costs.

There is a general perception from many stakeholders that the NamPower monopoly is not promoting the proliferation of IPPs on a good-faith basis. NamPower officials assure they are negotiating with potential IPPs in good faith and working to "convince or to encourage investors . . . to start introducing this type of large-scale [renewable energy] project to feed into the grid to sell [power] to the municipality or electrical authorities."[131] As a business, NamPower has incentives to encourage IPPs. Last year, Namibia's credit rating was affected due to lost ground from the "frequent utilization of costly thermal generation sources in the tight supply scenario

[129] Interview with Conrad Roedern, *supra* note 36.
[130] *See* VON OERTZEN, *supra* note 18, at 8.
[131] Interview with Noddy Hipangelwa, *supra* note 81.

that has emerged in the SADC countries."[132] Reducing reliance on imports would raise credit ratings and save operational costs by reducing reliance on expensive imported electricity.[133]

Namibia needs IPPs integrated into the energy sector to inject innovation into a generally stagnant system operated exclusively by NamPower. The government has recognized this need and made policy statements intended to attract IPPs to Namibia.[134] Despite this open invitation, IPP investment, particularly concerning clean energy projects, is absent in Namibia. Only in the last few years has legislation been passed to allow IPPs to start producing power in Namibia; now Namibia must work within the limits of NamPower monopoly to create a policy incentivizing IPP development.[135]

Recently, the ECB released an Independent Power Production Plan, "Guidelines for Aspiring New Generation Applicants," in an attempt to facilitate independent power production license applications. This plan has yet to be tested.[136] Currently, the MME uses the regulations established by the ECB to control licensing decisions that determine whether an IPP may sell electricity.[137] Without this license, an independent party may not generate, transmit, distribute, supply, export, or import electricity.[138] Although the ECB has received numerous applications for generation licenses, as of August 2009, no IPP agreements had been entered into.

Marina Coetzee believes that "everybody is just waiting for someone else first to go through all of the teething problems . . . someone just has to make the breakthrough of starting to sell power to NamPower."[139] The managing director of NamPower, Paulinus Shilamba, has publicly announced the Board's approval of the draft power purchase agreement between

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[132] FITCH RATINGS, *supra* note 43, at 1
[133] *Id.*
[134] *See* Konjore's Statement, *supra* note 14.
[135] Interview with Marina Coetzee, *supra* note 91.
[136] *See* ECB GUIDELINES, *supra* note 47.
[137] The Electricity Act § 17 (2000) (Namib.).
[138] ECB GUIDELINES, supra note 46, at 3.
[139] Interview with Marina Coetzee, *supra* note 91.

NamPower, Aeolus Associated, and United Africa Group.[140] Shilamba announced to the media that the successful completion of this agreement will ". . . pave the way for the development of the first ever IPP in Namibia."[141] This would be a tremendously important, and necessary, step in the development of Namibia's renewable energy resources.

(3) Increase Tariffs to Reflect Energy Costs in other Nations

Namibia's artificially low tariffs provide huge disincentives to potential renewable energy investors. IPPs will not start to invest in Namibia until tariffs become cost reflective. When investors compare the costs of conventional and renewable energy sources there is a distortion because conventional sources are highly subsidized.[142] Amongst Namibian stakeholders, it is generally accepted that tariffs must be raised to reflect the market price of electricity as soon as practicable. The historically cheap supply of energy from South Africa has allowed Namibia to maintain artificially low energy tariffs compared to other developing countries.

While NamPower has resisted higher purchase tariffs, made possible by using cheap hydroelectricity to subsidize expensive energy purchased on the spot market, the ECB is now working to incrementally raise Namibia's tariffs to reflect SADC market value. Last year, the ECB approved a fifteen percent tariff hike for NamPower. According to the ECB, this increase in rates was designed as a step to bring the tariffs up to a cost-reflective level by 2011 or 2012.[143] However, as illustrated by the CEO of the ECB, NamPower still needs large increases to reach cost-reflectivity, which will take place over the next few years.[144] Roedern from Solar Age

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[140] *IPP's Could Help With Security of Supply*, NAMPOWER'S ELECTRONIC NEWSLETTER, Jan. 2009, at 1.
[141] *Id.*
[142] Interview with Harald Schütt, *supra* note 28.
[143] PLANNING POWER, *supra* note 20, at 13.
[144] PLANNING POWER, *supra* note 20, at 59.

explains that the proposed fifteen percent increase over present inflation in tariffs annually "means about a twenty-five percent [total]" hike in current energy costs.[145]

Feed-in-tariffs would help subsidize the high upfront cost of renewable energy, making investment in IPPs and small systems more attractive.[146] This is one area where Namibia could benefit from following South Africa's example. South Africa's energy regulator, NASAU, just instituted a feed-in tariff with some of the most attractive tariff prices worldwide for both wind and concentrated solar power.[147] A Namibian renewable energy feed-in tariff could offer access to the grid for transporting electricity and a price sufficient to spur renewable IPP development. Feed-in tariffs may also incorporate standard offer contracts, allowing eligible IPPs to contract for extended periods of time (20 years, etc.) at a set purchase price per unit of energy generated. The rapid growth of the renewable energy sector would create jobs and has the potential to spur local manufacturing and innovation.

Amaambo remarked that NamPower has been working with the ECB on potential tariffs designed to incentivize the conversion to renewables.[148] Some of the new tariffs have been instituted already. The ECB created innovative time of use tariffs that have proven to be very effective in encouraging consumers to use less energy at peak usage times.[149] Together, the ECB and NamPower are even contemplating some form of an emissions tariff. While these steps by ECB are welcome, another complaint from stakeholders and potential investors is that the ECB and NamPower tend to calculate and plan future tariffs behind closed doors. Amaambo related that, although NamPower and the ECB do have projections on future tariffs, those documents are

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[145] Interview with Conrad Roedern, *supra* note 36.
[146] *See* PLANNING POWER, *supra* note 20, at iii.
[147] Interview with Conrad Roedern, *supra* note 36.
[148] Interview with Lahja Amaambo, *supra* note 26.
[149] *Namibia: Price of Electricity Up*, ALLAFRICA,COM, July 3, 2009, http://allafrica.com/stories/200907030674.html.

not disclosed to the public.[150] The fact that NamPower does not provide the public with access to information about the purchase price of electricity deters potential investors.[151]

To facilitate new investment, the ECB must stop delaying tariff increases. Although these increases might be detrimental to consumers in the short term, they will promote investment in IPPs in the long term, eventually passing lower costs from a diversified energy supply to consumers. Future predictions about tariff prices as well as the decision-making process in establishing the tariffs should be transparent to supply potential investors with necessary information to determine future costs.

(4) Allow Net-Metering

Net-metering allows renewable energy generators to feed excess generation into the grid to bank electricity with the utility. When generation does not meet consumption rates banked electricity is withdrawn from the grid. Currently, small-scale producers, including those with Solar Home Systems, are not compensated for power they feed back into the grid, although running the electricity meter backwards towards zero is allowed. Instead, when a system exports more energy to the grid than it has used, the meter stops at zero. Mr. Roedern from Solar Age explains that this system is not in the best interests of the client: "[y]ou can feedback, but you're not getting money out of it."[152] For clients who feed into the grid, Roedern would like to see net metering. Banking electricity could be permitted against a customer's annual consumption. In Namibia, most new residential connections are prepaid metering to avoid defaults on electricity bills. Ideally, what Roedern and other solar providers would like to see is "that prepayment

[150] Interview with Lahja Amaambo, *supra* note 26.
[151] Interview with Werner Schütt, *supra* note 28.
[152] Interview with Conrad Roedern, *supra* note 36.

meters could be used with net-metering. You could still pay for your basic service, but could be credited [for excess generation fed into the grid]."[153]

(iv) Promote Education and Awareness of Renewable Energy

There is a need to continue educational efforts that emphasize the long-term benefits of renewables and prove that these technologies actually work. In addition, efforts to train technicians and consumers about the operation of renewable technologies must be strengthened. Finally, the myth that solar and other renewable technologies are inferior to their traditional counterparts must be debunked.

(1) Bolster General Perceptions of Renewable Energy in Namibia

The level of awareness for renewable energies in Namibia varies depending on the topic and the group of people. Stakeholders agree that awareness has increased drastically in recent years but stress the need for continued educational campaigns.[154] In raising awareness, educators from all sectors have been working on effective ways to distribute basic information about renewables. When the MET released climate change booklets and a series of posters promoting climate change awareness, they translated and printed them in four different local languages for distribution during public educational activities.[155] The government has also incorporated limited discussion about renewable energy into the educational curriculum.[156]

Many stakeholders are engaged in campaigns to raise awareness about renewable energy. Solar Age, a private supplier of solar technologies, uses a radio hostess in the north to spread

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[153] *Id.*
[154] Interview with Noddy Hipangelwa, *supra* note 81.
[155] Konjore's Opening Remarks, *supra* note 11, at 9.
[156] Interview with Viktoria and Andreas Keding, *supra* note 30.

their renewable energy message.[157] The HRDC conducts presentations to raise awareness about green living.[158] NaDEET was designed specifically to teach children about renewable energy, the environment, and climate change. Aside from teaching children everything from how to conduct an environmental audit to how to calculate the carbon reductions from switching fuels, the center also develops educational materials for school children.[159]

One of the biggest hurdles educators face is convincing people that renewable energy technologies work. Coetzee explained, "people are intimidated by the technology. Seeing is believing."[160] While judging youth at the national science fair, Schütt pointed out that kids are taught about solar cookers in school and can request information on how to construct them. "A few years back, we said science fairs were becoming boring because every year you had a whole bunch of solar cookers."[161] Dr. Wienecke linked the recent theft of the HRDC solar panels and compact fluorescent light bulbs to Namibians starting to believe in the value of renewables.[162] However, education efforts concerning renewable energy must be strengthened and further supported by the national government to ensure that the benefits of renewable energy and the detriments of fossil fuels are understood.

(2) Train System Owners and Local Technicians

Essential to the longevity of any renewable energy system are the skills required to maintain and develop the technology. Namibia's labor force still needs to be trained in installing, troubleshooting, and developing renewable technologies. Namibia's engineering skills base remains small and underdeveloped, rendering most large-scale technology projects dependent on

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[157] Interview with Conrad Roedern, *supra* note 36.
[158] Interview with Dr. Andreas Wienecke, *supra* note 115.
[159] Interview with Viktoria and Andreas Keding, *supra* note 30.
[160] Interview with Marina Coetzee, *supra* note 91.
[161] Interview with Dr. Andreas Wienecke, *supra* note 115.
[162] *Id.*

foreign experts.[163] Small-scale technologies also face difficulties due to a lack of trained technicians to install and maintain the technology. Namibia's engineers and electricians, as well as end users, must be trained and educated about the basic use and maintenance of renewable energy technologies. Otherwise, as Jarrett explains, those untrained in the use of their solar home systems will have to constantly seek support or risk damaging the technology. [164] Common misuses of systems, such as replacing fluorescent bulbs with incandescent bulbs, or charging a car battery with solar panels, can ruin expensive technologies.[165] Without knowledge of proper use and maintenance practices, renewable technologies will not survive.[166]

The MME is currently attempting to tackle this problem with a program designed to train solar technicians. MME's goal is to establish at least one, ideally two technicians, in each of Namibia's thirteen regions.[167] To accomplish this goal, MME has been traveling from region to region conducting training sessions.[168] Unfortunately, many of the technicians trained in this program have already migrated to Windhoek in search of better employment prospects.[169] In response to this trend, the MME has adopted a new strategy of training primarily those who already have successful businesses and an incentive to remain in the area. [170] In addition, some solar suppliers train their customers because it saves businesses maintenance costs.[171]

Aside from basic installation skills, there is a need for better preparatory education to improve technicians' troubleshooting skills. One of the major gripes of solar suppliers is that they must teach basic math and engineering skills to their workers because the school system has

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[163] VON OERTZEN, *supra* note 18, at 2.
[164] Interview with David A. Jarrett, *supra* note 22.
[165] *Id.*
[166] Interview with Marina Coetzee, *supra* note 91.
[167] Interview with Uazamo Kaura, *supra* note 88.
[168] Interview with Noddy Hipangelwa, *supra* note 81.
[169] *Id.*
[170] *Id.*
[171] Interview with Viktoria and Andreas Keding, *supra* note 30.

not prepared them adequately. "If you talk energy, you talk engineering, you talk science, you talk math, which is a bloody mess here . . . nobody will go into electrical engineering."[172]

Training efforts must be maintained and expanded to teach Namibians about renewable energy technologies. Although Namibia's education system cannot be instantly overhauled, adequate math and science classes should be available to ensure the foundational skills to train the next generation of electricians and engineers. Renewable technology training programs should consider possible language barriers and target those invested in their local communities. Businesses should be encouraged to continue providing basic training for consumers and to "foolproof" renewable energy technologies to avoid maintenance costs and to preserve the reputation of their technologies.

(v) Discredit the Fallacy of Grid-Power for All

In Namibia there is a shared notion that development means grid power and that renewable energy is an inferior substitute for a grid connection. Renewables are occasionally scorned by communities as substandard substitutions for the "Western" development path.[173] Stakeholders seem to agree that if communities had a choice they would always hook up to the grid because it is perceived as more advanced. Mrs. Kaura grew up in an off-grid rural area. She explained that for Namibia's rural population, "development means electricity, and electricity means power lines—it doesn't really mean solar. Even if people have solar panels, at the end of the day, they still would like a power line running to the house."[174] Mr. Hipangelwa from the MME Solar Homes Program describes a project close to Windhoek where MME electrified

[172] Interview with Dr. Andreas Wienecke, *supra* note 115.
[173] Interview with Harald Schütt, *supra* note 28.
[174] Interview with Uazamo Kaura, *supra* note 88.

several villages with solar energy. The villages, which were seven kilometers away from the grid, were unhappy because the solar prevented them from grid access in the future. [175]

With these attitudes, Mr. Hipangelwa suggested that solar is only good as a primary means of electrification for remote areas, unlikely to receive future access to the grid. "Those communities are very appreciative of solar electrification efforts."[176] With rural electrification efforts, Mrs. Kaura believes that "people are happ[ier] with solar panels than having no electricity at all." [177] However, "[i]f you just gave me a solar panel for free, the mentality is [that] I still need [grid] electricity."[178]

For large-scale and small-scale renewable energy development to succeed in Namibia, these misperceptions must be vanquished. A promotional campaign equating these technologies to cutting-edge power production in the United States and Germany would dispel notions that solar home and off-grid electrification is a lesser form of development. Whenever possible, aid agencies and government should also avoid technology "handouts" which convey the idea that solar technologies are not valuable.

(vi) Other Ways to Promote Renewable Energy in Namibia

(1) Aggressively Combat the Theft of Renewable Energy Products

Perhaps one of the most tangible barriers to renewable energy development in Namibia is the one most commonly splashed across the pages of the Namibian newspapers: the theft of PV panels. In Namibia, theft is a major problem, especially in the north.[179] Werner Schultz tells about the installation of a solar water pump in Caprivi. Terrasol installed the pump to bring a tap

[175] Interview with Noddy Hipangelwa, *supra* note 81.
[176] *Id.*
[177] Interview with Uazamo Kaura, *supra* note 88.
[178] *Id.*
[179] Interview with Dr. Andreas Wienecke, *supra* note 115.

to a village where women and children had been carrying water 12 kilometers daily. The project went flawlessly until locals recognized that solar panels were easy money and *sold* the solar panels before trying to claim another set from the German Development Service.[180] Theft of communally-owned PV panels is common, leading some to believe that the combination of charitable handouts and a lack of personal ownership over systems facilitates theft. Individual ownership has proven to be somewhat more successful. "If they have to buy something . . . it doesn't get stolen. But if it's handouts, if it's standing two kilometers away . . . then solar panel theft is a big problem."[181] Others attribute the high rate of theft to opportunism paired with Namibia's incredible poverty. Mr. Jarrett believes that theft is exacerbated by the remote placement of systems.[182]

On the bright side, almost everyone agrees that the surge of equipment theft reflects a growing awareness that renewable energy products are valuable and functional. Mr. Hipangelwa from MME explains that "through the awareness, we now have got problems of theft . . . People now know the importance of the solar panels. They know that this is a very important component—it's a generator, and out of that you can generate electricity."[183] Nonetheless, fear of theft has a real impact when solar technologies are a major lifetime investment for most Namibians.

To combat the problem of theft, the Namibian government must fully invest in the system of solar-panel tracking set up by some solar-installers. In addition, there should be increased penalties for the theft of these systems due to the negative impact these types of crimes have on an industry that is important for the future development of Namibia. There should be similar

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[180] Interview with Werner Schultz, *supra* note 23.
[181] *Id.*
[182] *Id.*
[183] Interview with Noddy Hipangelwa, *supra* note 81.

penalties for suppliers or businesses that purchase panels for resale without checking their status in the database or if the tracking mechanisms (such as serial numbers, etc.) have been removed or tampered with.

(2) Promote Local Manufacturing of Renewable Energy Products

Namibia relies heavily upon imported manufactured goods. Local production of renewable energy technologies would provide jobs, skills training, and simultaneously make these products more affordable for Namibia's poorer population. When asked what would help facilitate the spread of renewables, Mr. Hipangelwa from MME suggested "[e]ncouragement of manufacturing of the products [in Namibia] . . . because you'd have jobs and you'd have infrastructure."[184] In his view, the country should manufacture "all the accents that are related to renewables [because] it provides energy security."[185]

Currently, local suppliers have difficulty manufacturing even the most basic products in Namibia. Werner Schultz explains that after he developed an efficient cook stove, Terrasol could not find a suitable place in Namibia to manufacture it. The capacity was simply unavailable. That said, a few programs have been established to manufacture basic technologies such as solar stoves.[186]

Namibia's lack of manufacturing capacity is a problem that reaches far beyond the issue of renewable energy development. However, the government could spur manufacturing in the country in general by promoting policies that encourage the expansion of both large-scale and small-scale renewable energy technologies and investing in the educational programs necessary to develop a work-force qualified to produce these types of products.

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[184] Interview with David A. Jarrett, *supra* note 22.
[185] *Id.*
[186] Interview with Noddy Hipangelwa, *supra* note 81.

(3) Work with Traditional Authorities to Address Land Tenancy Issues

Land ownership issues are a primary area of concern for potential renewable energy investors. Of special concern are laws that permit the government to expropriate land owned by citizens and foreign owners alike, even though these laws are largely unexercised.[187] A law allowing the government right of first refusal in private agricultural land sales raises transaction costs for investors by dragging out the time it takes to complete lease and purchase agreements. Finally, the legal interplay with land transactions and the Constitutional rights of traditional authorities is difficult for investors to navigate and can increase the number of parties in a land transaction.[188] In addition, Andreas explains that the price of land has been rising recently and that there are difficult issues associated with purchasing land from the government.[189] A combination of traditional law and Namibian Constitutional law makes land purchases "very complicated."[190]

Land tenancy issues have prevented investors from carrying out renewable energy projects in Namibia. Marina Coetzee explains that one group looking into biofuel production withdrew from Namibia after spending two years and roughly N$1 million working with local communities and completing an environmental impact assessment. After lawyers began drawing up individual contracts to plant Jatrophas Curcas trees on communal lands allocated to individual farmers, the company withdrew because they couldn't get final lease agreements for the factory.[191]

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[187] Agricultural (Commercial) Land Reform Act § 14(2) (1995) (Namib.).
[188] Interview with David A. Jarrett, *supra* note 22.
[189] Interview with Dr. Andreas Wienecke, *supra* note 115.
[190] Interview with Viktoria and Andreas Keding, *supra* note 30.
[191] Interview with Marina Coetzee, *supra* note 91.

While politically perilous, the government should begin a dialogue with traditional authorities relating to renewable energy development on communal land or risk further marginalizing rural populations. The government should also offer reasonable land security assurances to reassure aspiring investors that their investments will be secure. An easily accessible guide explaining the process and legal issues associated with land transactions would allow potential investors to more accurately predict the procedural and legal restraints associated with renewable energy development in Namibia.

(4) Promote Renewable Energy Projects that Account for Cultural Norms

For renewable energy to succeed in Namibia, it is essential that technologies be embraced by varied communities and cultures. Western technologies and models will not succeed unless they are adapted to the local conditions and cultures. Mr. Schütt explained that "European solutions for African problems usually don't work—you see that in the field of energy."[192] Namibians must be provided with options that can fulfill their wants and needs at an affordable price. If technologies are not culturally appropriate, they risk rejection. This is the lesson learned from solar stoves projects in certain regions where the project goals clashed with the culture of having a fire. Historically, fire also has been essential for providing light after sunset. Losing opportunities to socialize around the dinner fire was a substantial cultural cost to families cooking with solar stoves.[193]

Technologies successful in the private market are a prime example of "appropriate" local technologies. Solar home systems are growing in popularity, particularly with Namibia's middle and upper class, and are in constant demand. Viktoria from NaDEET relates, "[m]ost people get

[192] Interview with Harald Schütt, *supra* note 28.
[193] Interview with Viktoria and Andreas Keding, *supra* note 30.

one panel, a battery, and a television. That's it."[194] Solar Age's Mr. Roedern explains that, "Africa resists development until something more sustainable comes, and then it gradually will develop. But you cannot develop someone from the outside."[195]

Cultural and social norms can also operate to hinder renewable energy development under certain circumstances. The ecological benefits of converting to renewables, such as reducing GHG emissions and preventing local pollution, are not yet incorporated as normative values in larger Namibian society. Viktoria explains that, "[p]eople in Namibia in general do not look at pollution as a problem.[196] Dr. Weineke from the HRDC explains that Namibians focus on immediate costs and benefits.[197] "There is no future. You must understand the African way of living."[198] The Kedings at NaDEET agree that "future thinking is not African thinking . . . people think about right now . . . With renewable energy you have to also think about the future benefits."[199]

Promoting renewable energy technologies that are incompatible with cultural practices and values is an uphill battle. Although societal practices change over time and new technologies are adapted, attempting to force this conversion is likely to be futile. Similarly, adopting a societal norm which places a substantial value on the ecological benefits of renewables is something that must occur naturally and cannot be forced. Until Namibian society begins to consider the positive ecological benefits renewables offer, these benefits will not be factored into the costs of renewable energy technologies. In the meanwhile, many individual energy supply purchasing decisions will continue to be made solely on the basis of cost. As a result, while education is important, renewable energy planners and policymakers in Namibia must be patient.

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[194] *Id.*
[195] Interview with Conrad Roedern, *supra* note 36.
[196] Interview with Viktoria and Andreas Keding, *supra* note 30.
[197] Interview with Dr. Andreas Wienecke, *supra* note 115.
[198] Interview with Werner Schultz, *supra* note 23.
[199] Interview with Viktoria and Andreas Keding, *supra* note 30.

They must take into account traditional lifestyles and sentiments, or risk leaving behind large swaths of Namibia's tremendously diverse population in the shift towards a clean energy future.

(vii) Work to Reform the Clean Development Mechanism

The Kyoto Protocol of the United Nations Framework Convention on Climate Change ("Kyoto Protocol") was designed to be the foundation of an international framework to combat global warming through the reduction of greenhouse gas emissions.[200] To facilitate cost-effective reductions and involve developing nations in the climate change body, the agreement incorporated various flexibility mechanisms that countries could employ to meet their emission reduction commitments. The mechanism to create emission reductions in developing nations is the Clean Development Mechanism ("CDM").

The principal underlying the CDM is that all emissions, regardless of their source, contribute to global emissions levels, so emissions reductions should be achieved where they are most cost efficient. This understanding allows developed countries to achieve reductions by financing projects in developing countries, which generally cost the least. By utilizing the CDM, developing nations may participate in carbon reductions projects that ultimately lead to the generation of Certified Emissions Reductions ("CERs"), which can then be sold to countries with binding commitments to reduce emissions.[201] Ideally, developed countries benefit from the CDM by achieving reductions at a lower cost, while the support of financing and technology from developed countries allows developing countries to develop sustainably. For a country to be eligible to host a CDM project, the country must have ratified the Kyoto Protocol and have a CDM Designated National Authority ("DNA").

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[200] *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M 22.
[201] *Id.*

When the latest figures for Namibia's greenhouse gas emissions were released in 2000, Namibia was a net carbon sink, sequestering more carbon dioxide than it emitted.[202] This sequestration occurred largely because of land use changes and the proliferation of invader bush. Where emissions did occur, most came from agriculture (6,700 Gg) and energy (2,200 Gg).[203] Although historically low, Namibia's rapidly increasing use of fossil fuel-based energy and a growing need for local electricity generation is expected to increase Namibia's carbon balance in the years to come.[204]

Namibia ratified the Kyoto Protocol in 2003, and in 2007 established a DNA within the MET.[205] Uazamo Kaura is Namibia's temporary DNA, and describes her position as "quite new."[206] As of August 2009, Namibia had not yet established a CDM desk, despite having previously announced plans to do so in the Ministry of Trade and Industry ("MTI"). In addition, Namibia has yet to register a single CDM project. Representing Namibia at the Third World Climate Change Conference in September 2009, Selma Ashipala-Musavyi reported that:

> [In Namibia t]here has been modest reported progress and achievements especially with regard the Clean Development Mechanism (CDM) and Africa is still lagging behind in many aspects. Under the new Kyoto Protocol agreement, Namibia believes that there should be a simplification of CDM methodologies, and concentration of small scale CDM projects targeted for smaller economies. In the case of technology transfer, environmentally sound-technologies, suited to local conditions should be promoted. The removal of barriers to promote technology transfer including access to finance and a resolution on intellectual property rights is imperative.[207]

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[202] VON OERTZEN, *supra* note 18, at 2.
[203] *Id.*
[204] *Id.*
[205] Wezi Tjaronda, *Namibia: DNA and CDM to Facilitate Investments*, ALLAFRICA.COM, Aug. 9, 2007, http://allafrica.com/stories/200708090617.html.
[206] Interview with Marina Coetzee, *supra* note 91.
[207] Selma Ashipala – Musavyi, Permanent Representative of the Republic of Namibia to the UN, Statement Delivered on the Occasion of the Third World Climate Conference 5 (Sept. 4, 2009) *available at* http://www.wcc3.org/wcc3docs/pdf/HL_namibia.doc.

Mrs. Kaura has encountered numerous barriers to CDM projects in Namibia. Although Kaura has reviewed many projects, most of them are still currently at the start of the planning stage.[208] During the summer of 2009 Kaura estimated that Namibia had six projects in the CDM pipeline.[209] In addition, she had recently cleared two Project Idea Notes ("PINs"), one cement factory and one geothermal project.[210] However, during her interview, she did not seem overly optimistic that any of the projects in progress would succeed.[211] The CDM registration process is plagued by numerous barriers, including the complexity of the registration process, misconceptions about registration requirements, high costs of the registration process, difficulties in proving additionality, and an extremely low grid emissions factor.

Registering a CDM project is a long, drawn-out process, which can take substantial funds, institutional knowledge, and years to complete. For a small country, the CDM process itself is prohibitive because of the sheer number of steps and assessments that must be conducted. Kudakwashe Ndhlukula, Coordinator of the Renewable Energy & Energy Efficiency Institute, summarizes the situation, complaining that ". . . most of us . . . are quite overwhelmed with the process. [212] Mrs. Coetzee describes the CDM bureaucracy as "mindboggling" and explains that navigating this bureaucracy is very difficult for African countries.[213]

Furthermore, there are many misconceptions about the CDM process. Antonia Baker came to work at the Namibia Nature Foundation from the United Kingdom. In her opinion, without dissemination of educational material about CDM, it is no surprise that many projects

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[208] Interview with Uazamo Kaura, *supra* note 88.
[209] *Id.*
[210] Interview with Antonia Baker, *supra* note 72.
[211] *Id.*
[212] Interview with Kudakwashe Ndhlukula, MSc. Eng. (Renewable Energy), CEM Coordinator, Renewable Energy and Efficiency Institute, in Windhoek, Namibia (July 16, 2009).
[213] Interview with Marina Coetzee, *supra* note 91.

have not even considered using CDM. [214] One of these misconceptions is that projects are not even eligible for CDM registration unless an industrialized country invests in a Namibian project. This misconception has led potential project developers in Namibia to disregard unilateral CDM projects under the belief that such projects would be ineligible for CDM registration. In reality, developing countries do have the option to implement unilateral projects that are planned and financed within the country. Such projects require no foreign direct investment and produce the same type of CERs as other CDM projects, which can then be sold to industrialized countries.

There is a dire need for education concerning the CDM. As a first step, the MET is in the process of developing a website with the Namibian CDM rules and regulations, which are not currently available online.[215] Aside from educational and bureaucratic barriers, the primary reason offered for Namibia's lack of CDM projects is the large upfront investments in the CDM registration process without any assurance that the project will eventually be credited with CERs. "CDM, at the moment, is beyond our reach. It's a catch-22 situation. You can only get CDM credits if you can prove the project wouldn't have worked without them, but you can't get credits for the project until you are already producing."[216]

Scale and cost of the CDM registration process also hobble potential CDM projects.[217] Mr. Roedern laid out the problem succinctly: "CDM costs, for our size, too much." By his estimates, by the time a project made it through the CDM registration step alone, the cost of registration would have already amounted to N$100 million.[218] Ms. Baker, of the Namibia Nature Foundation, suggests that the CDM is only really viable for large-scale energy efficiency

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[214] *Id.*
[215] Interview with Uazamo Kaura, *supra* note 88.
[216] Interview with Antonia Baker, *supra* note 72.
[217] *Id.*
[218] Interview with Conrad Roedern, *supra* note 36.

or energy production projects."[219] Ms. Kaura laments that large projects eligible for CDM credits are too big for Namibia to handle.[220] Most single projects in Namibia are far too small to justify the cost, and for owners of multiple small projects, bundling has proven far too inefficient.

The CDM rules also require that any reductions achieved as a result of the project are "additional" to reductions that would have been achieved in the absence of the project. Mrs. Coetzee describes this requirement as "the fly in the ointment of the CDM process."[221] Additionality is a difficult concept to prove, and the information required to prove it is expensive to attain. The additionality requirement is also perceived as penalizing environmentally-friendly policymaking because projects.[222] For example, NamPower reduced Namibia's maximum demand from 449MW in 2007 to 430MW in 2008 through demand side management programs, including the mass distribution of CFL bulbs.[223] NamPower and the government worked together to implement this policy in order to reduce peak demand and expensive purchases on the spot market. Because these measures were cost-effective without CERs, the additionality requirement could not be satisfied. "NamPower, at the end of the day, does not get any CDM credits because they made it a *policy* to replace all the light bulbs."[224]

The grid emission factor, which is used to determine the carbon intensity of electricity produced on the grid, add to the difficulty of establishing CDM projects in Namibia. This emission factor is used to establish a baseline against which emission reductions are measured, ultimately determining the amount of carbon dioxide emissions offset when grid energy is displaced by a less-carbon intensive alternative. When calculating the grid emission factor, only the in-country carbon dioxide *sources* are assessed. Imported energy is not taken into account.

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[219] Interview with Antonia Baker, *supra* note 72.
[220] Interview with Uazamo Kaura, *supra* note 88.
[221] Interview with Marina Coetzee, *supra* note 91.
[222] Interview with Harald Schütt, *supra* note 28.
[223] NamPower, Media Statement, *supra* note 70, at 2.
[224] Interview with Uazamo Kaura, *supra* note 88.

Therefore, the carbon-intensive energy Namibia imports from South Africa, approximately fifty percent of Namibia's total energy consumption, is not factored into Namibia's grid emission factor when establishing CDM baselines.[225] This is a major barrier for renewable energy projects designed to displace Namibia's reliance on energy imported from South Africa. Namibia's grid emissions factor is so low it creates difficulties in satisfying the additionality requirement when new renewable energy producers appear to be displacing hydroelectricity.

The Namibia government must take steps on its own to streamline the CDM process and reduce the costs of implementation for interested parties. However, more importantly, the government must address the barriers to CDM implementation in the international community, during meetings following the Copenhagen Climate Summit. In general, Namibia must work to (1) to strengthen the DNA, (2) activate the CDM office at the MTI, (3) find an effective way to compare emission reductions to a baseline study, (4) establish feed-in tariffs for renewable energy through the ECB, (5) incentivize public and private partnerships, (6) raise awareness and knowledge of the CDM process, and (7) address issues like additionality, verification, and project scale, which all increase the costs of CDM projects, by communicating with the CDM Secretariat and advocating for streamlined CDM procedures that are more in-line with the realities of project implementation in rural sub-Saharan Africa.[226] Namibia should also consider working with Voluntary Emission Reductions ("VERs") to gain experience in the carbon markets. Voluntary standards are generally more flexible than CDM requirements, and may allow different procedures, such as accounting for grid emission factors on a regional basis.

[225] Interview with Robert Schultz, Senior Project Manager, Energy Desk, Desert Research Foundation of Namibia, in Windhoek, Namibia (August 6, 2009).
[226] Interview with Noddy Hipangelwa, *supra* note 81.

5. The Full Solution: A Carbon-Free, Small-Scale, Rural-Focused Energy System that Meets the Needs of the Energy Poor.

While the construction of large-scale, grid-based renewable energy projects are important for Namibia's future development, the constraints of grid-based power must not be underestimated. An energy policy that, by design, fails to meet the needs of seventy percent of the Namibia population is unacceptable. To truly meet the needs of the energy poor, the Namibian government must devote at least as many resources to small-scale, off-grid electrification as it does to satisfying the needs of residents of Windhoek and large industrial energy users. The installation of a multibillion dollar generating station to provide electricity for a large new industrial user, like a uranium mine, has the potential to provide hundreds of jobs to select Namibians in one region. Making a similar large investment in small-scale energy technologies for use by the over 1 million Namibians without access to grid electricity would have a positive effect on many more Namibians living in regions across the country.

Many agree that basic living conditions must be improved in Namibia's rural areas to staunch the flow of people to the informal settlements around Windhoek and other larger cities. There are complaints that the government's 2030 Vision is not actually targeting the needs and wants of the rural population. "Too many times people tell people what is good for them without finding out what they need."[227] "If we continue to provide systems that give people sub-standard living . . . [we are not] encouraging people to stay where they are and meet their needs."[228] It is important to provide every socio-economic class with adequate resources, including electrical energy.

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[227] Interview with David A. Jarrett, *supra* note 22.
[228] *Id.*

The general consensus is that Namibians find small-scale PV home, school, and business systems attractive.[229] In off-grid areas, a PV system can provide access to information and help connect remote areas to the rest of the world. In addition to educational benefits, one of the key benefits of renewables in rural areas is that they provide business opportunities. A large part of the local solar supply sector is selling solar systems to charge cell phones or power hair clippers at salons.[230] Even selling the water generated by a solar-powered pump presents a business opportunity.

(a) Governmental Efforts to Promote Small-Scale Renewable Energy

While government and private investment in small-scale renewable energy and off-grid rural electrification is tiny compared to the amount invested in obtaining grid-based energy supplies from fossil fuel sources, the government has taken some useful steps to deal with the rural electrification problem. "Rural electrification targets are well-defined, . . . [but] access to sufficient funding, systematic implementation, socio-demographic changes and developments, changing social upliftment priorities, and unplanned electrification activities remain the most important challenges."[231] The government must increase its support for programs that address the rural energy poor, including the Solar Revolving Fund and the Regional Energy Shops Initiative. In addition, mini-grids, such as the one to be established in Tsumkwe, should be set up in every region of Namibia to educate the public about the benefits of renewable energy and streamline the process of constructing such systems. The government must build on the success of these innovative programs, which have a tremendous impact on the lives of individual Namibians.

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[229] Interview with Conrad Roedern, *supra* note 36.
[230] *Id.*
[231] PLANNING POWER, *supra* note 20, at 11.

(i) The Off-Grid Master Plan and Solar Revolving Fund

Because of the cost, delay, and infeasibility of connecting many smaller isolated communities to the grid, the off-grid master plan was designed to electrify these communities through alternative means, namely through solar home systems or larger solar-hybrid systems.[232] The MME developed the plan in consultation with numerous stakeholders, including local authorities. Mr. Ndhlukula explains that the idea is to approach electrification in collaboration with the grid section to avoid

> the awkward situation when . . . a solar village, a few years down the line, [ends up with a] grid passing through the area. The master plan identifies for solar those areas that are not likely to be electrified in the next 20 years. Unfortunately, most of those slated to remain without grid access the longest are the poorest populations, the populations that in general cannot afford these systems.[233]

Since 1995, Namibia has had a solar revolving fund system designed to create a fund from which Namibians can borrow money for small-scale solar systems. Loans are available for solar home systems from MME, and also for solar cookers, solar water heaters, and solar water pumping. For solar home systems and solar water pumps, the fund will give loans up to N$55,000; for solar water heaters loans up to N$25,000 are available. Applicants can fill out applications in their rural area and suppliers will send them to the fund administrator in Windhoek. Administrators of the fund will then decide who receives loans on behalf of the MME.[234]

From the time of its creation, the solar revolving fund has been passed from one administrator to another. Poor management by select administrators in the past has created “a

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[232] Interview with David A. Jarrett, *supra* note 22.
[233] Interview with Dr. Andreas Wienecke, *supra* note 115.
[234] Interview with Noddy Hipangelwa, *supra* note 81.

cynicism about the fund being badly handled."[235] In the past, one administrator even went bankrupt.[236] Most recently, the fund was taken over by the First National Bank ("FNB").[237] FNB entered into an agreement with UNDP to provide N$6 million for administration and interest for the solar revolving fund. Loans were to be distributed at a rate of three percent over five years. In November 2009 the bank said it would no longer process new loan applications because of the difficulties it was having with applicants and solar installers.[238]

There is not enough money in the fund to go around. In August 2009, Mr. Hipangelwa estimated that during the fund's existence MME was only able to issue between 1,000 and 1,600 loans.[239] At that time the fund had a backlog of 1,000 applications; to grant each of those loans would amount to 20 million NamDollars.[240] "The solar revolving fund has been very successful, except the demand has completely outstripped the supply."[241] He explains that, "the contribution from the government, what they normally put into the scheme, is just peanuts, just a drop in the ocean, because the demand is so high."[242]

Along with a lack of funding, loans tend to be given to the customers that are the most likely to pay them back, generally prohibiting the rural poor population from accessing the fund. Mr. Roedern speculated that the initial stages of the fund were more effective because the fund discerned amongst customers to find "customers who need[ed] solar systems and who [could] pay for them." Werner Schultz explains that the fund was distributing larger loans to more stable borrowers, particularly those in larger-scale agriculture, who were preferred over more risky solar home system borrowers. Rural individuals, often sustenance farmers, had little upfront cash

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[235] Interview with Antonia Baker, *supra* note 72.
[236] Interview with Kudakwashe Ndhlukula, *supra* note 219.
[237] *Id.*
[238] Yanna Erasmus, *FNB Backs Out of Solar Funding*, THE NAMIBIAN, Nov. 18, 2009, *available at* http://www.namibian.com.na/index.php?id=28&tx_ttnews[tt_news]=61950&no_cache=1.
[239] Interview with Noddy Hipangelwa, *supra* note 81.
[240] *Id.*
[241] Interview with Antonia Baker, *supra* note 72.
[242] *Id.*

and sporadic incomes, generally prohibiting them from accessing loans. Werner Schultz complained that Terrasol "had customers wait two years to get their loans . . . because they [didn't] have a lot of money."[243]

It is undeniable that the fund has a considerable backlog, and will be unable to provide funds for Namibia's poor off-grid communities.[244] It is also evident from the number of applications submitted that the program could be tremendously successful if adequately supported by the government. While meeting the demand for solar home systems may be expensive, this cost pales in comparison to the cost of constructing new large-scale generating stations and associated transmission capacity. For there to be energy justice in Namibia, the government must invest as much in rural residents as they do in urban residents. The solar revolving fund is an established mechanism that could allow the government to meet the energy needs of the rural poor at a comparatively small cost.

(ii) Solar Water Heater Program

One of the government's most successful renewable energy initiatives is a cabinet directive ordering the replacement of electric water heaters with solar water heaters.[245] Enacted in June 2007, the directive makes it compulsory to install solar water heaters in every government or state-owned building that is newly constructed or remodeled, and to replace electric heaters that have broken down.[246] Solar water heaters mitigate the usual peak electric consumption caused by electric water heaters, which saves NamPower and consumers money

[243] Interview with Werner Schultz, *supra* note 23.
[244] PLANNING POWER, *supra* note 20, at 11.
[245] Interview with Conrad Roedern, *supra* note 36.
[246] Interview with Noddy Hipangelwa, *supra* note 81.

because electricity at peak energy hours is more expensive to generate than what it can be sold for.[247] The Namibian government should be applauded for taking this type of bold action.

(iii) Regional Energy Shops

MME is partnering with the Renewable Energy and Energy Efficiency Institute of the Polytechnic of Namibia ("REEEI") and local suppliers to establish energy shops in rural communities throughout each of Namibia's thirteen regions. Outside Namibia's larger urban areas, it is difficult to actually purchase renewable energy technologies, even if a person has the finances and desire to do so. To address this concern, in June of 2007, the government passed a cabinet directive to establish a series of off-grid energy shops, starting with one in every region. Upon completion of the project, there will be fifty-six energy shops in strategic locations around the country.[248]

Mr. Ndhlukula explains that Namibia needs these energy shops because Namibia's population is widely dispersed, making it difficult for people in rural areas to address technical problems or access renewable technology devices.[249] Energy shops will be based out of pre-existing shops run by locals and primarily stocked with smaller renewable energy components. Shops will also serve as information hubs for REEEI so that policymakers will be able to use them to gather information. REEEI will collect yearly information on installations and sales to create a profile on renewable energy in Namibia.[250] For financing, these shops will have access to the solar revolving fund, as will the rural Namibians looking to access small loans to purchase

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[247] Interview with Conrad Roedern, *supra* note 36.
[248] Interview with Noddy Hipangelwa, *supra* note 81.
[249] Interview with Kudakwashe Ndhlukula, *supra* note 212.
[250] *Id.*

renewable energy technologies. Public institutions are also expected to contribute grants for the shops, in lieu of supporting the grid electrification process.[251]

The "Energy Baskets" stocked at the Energy Shops will be tailored to the needs and conditions of each area. Mr. Ndhlukula explains that they will have different sizes of solar panels matched with the products, such as lightbulbs, that each basket is designed to power. He explains that "a customer can just come and say, ok, I need six lights . . . and to power a radio." The supplier will then give the customer his options for panels in terms of baskets A, B, or C. The first energy shops are expected to be up and running in August 2009.[252]

(iv) Tsumkwe Energy Project

Over 200 miles of unpaved road away from the highway, far from other development in the Otjozondjupa Region, lies Tsumkwe, which used to be known as "the last bastion before the border" during the Namibian border wars. Today it is known as Namibia's largest off-grid settlement, and a beacon of hope for Namibia's renewable energy sector.[253] Tsumkwe is on the road to becoming electrified by southern Africa's largest hybrid system. Designed and implemented by a coalition of the DRFN, NamPower, and the Otjozondjupa Regional Council, the Tsumkwe Energy Project is creating a mini-grid powered by a solar-diesel hybrid electricity generating station that will generate 130 KW upon its completion in 2011.[254] Mr. Jarrett was one of the people implementing the Tsumkwe Project. He explains that once the PV is up, the generator will be used only when necessary. As designed, the system could power a town of about 700 locals, roughly 800 boarding school students, a radio station, two telecom transmitters,

[251] *Id.*
[252] *Id.*
[253] Interview with David A. Jarrett, *supra* note 22.
[254] Desert Research Found. of Namibia, Tsumkwe Energy Project, http://www.drfn.org.na/htm/energy_desk/energy_tsumkwe_energy.htm (last visited Feb. 28, 2010).

and a TV transmitter. However, since the initiation of the project, plans for a brand-new courthouse, requiring more than half of the planned capacity of the project, have been approved.[255] Despite this hurdle, if the Tsumkwe project is successful, it will provide a blueprint for the development of additional distributed energy projects in Namibia's rural areas.[256]

(b) Namibian NGO and Private Sector Approaches

Namibian's NGOs and the private sector have worked to address many important issues, including education concerning renewable energy, climate change, and the establishment of profitable markets for small-scale renewable energy products. Donors and the Namibian government must continue to support grassroots efforts to educate the public, especially children, about the benefits of renewable energy. Environmental curriculum concerning renewable energy and climate change, like that developed by NaDEET, must be taught in schools across the country. Research like that conducted by the NNF, DRFN, and similar organizations must be supported by the government and donors. In addition, the government must provide incentives that allow small renewable energy to succeed. The government, donors, and investors must work to scale up these innovative initiatives and integrate them into a national strategy to address the needs of the rural poor.

(i) Namib Desert Environmental Education Trust

One of Namibia's most unique renewable energy projects is the Namib Desert Environmental Education Trust ("NaDEET"), an educational center located just south of the NamibRand Nature Reserve. Founded by Viktoria Keding and her husband Andreas, NaDEET is

[255] Interview with David A. Jarrett, *supra* note 22.
[256] *Id.*

on a mission "to empower Namibians to look forward to a sustainable future." The NaDEET center teaches visiting students about four focus areas: energy, water, waste, and biodiversity. Embracing a "practice what you preach" philosophy towards sustainable living, almost all of the NaDEET center's energy is generated from the sun of the Namib Desert. Mrs. Keding explains:

> We have solar energy, we use solar water heaters, we also have direct solar energy, which is through using solar ovens. In the mornings, when there's no sun, we do use a fuel efficient stove, but we use recycled paper to burn in those stoves… at the NaDEET center, under ideal conditions, unless something goes wrong, the only resource of fossil fuel that we use is our vehicles.[257]

Every year, the center educates around 700 children from all over Namibia. At the center, children engage in various experiments to learn how renewable energy works. NaDEET uses the Namib Desert as a classroom, linking the natural environment with renewable energy and sustainable living in general. "We use the Namib Desert, and the animals that live here support the foundation that nature has been doing this all along.[258]

(ii) Namibia Nature Foundation

Namibia Nature Foundation ("NNF") is working with the Ministry of Agriculture and farmers around Namibia to create a project that integrates invader bush into the nation's energy portfolio. Invader bush is an ecological nuisance, but a promising source of energy. Antonia Baker, Climate Change Project Coordinator for the NNF, explains, "in Namibia, we have a lot of encroaching bush plant. They cover large areas of land, soak up all the water, ruin the land for everything else, and turn it into desert. You can't farm on it." Her philosophy is that "if they

[257] Interview with Viktoria and Andreas Keding, *supra* note 30.
[258] *Id.*

can't get rid of it, might as well use it." NNF is currently investigating options for converting bush into biofuel, biodiesel, and biochar. "We have a couple of small-scale charcoal schemes. It would be community work, where [we] provide the training, and the stoves, and they sell the charcoal to the large companies." Another benefit of charcoal production is that it could be used as a fertilizer, Antonia explains. "Namibia has very dry sandy soil, and when you add a small amount of biochar, it increases the water retention, which increases the fertility of the land. It's not a fertilizer itself, but it's a catalyst, it helps use all the available nutrition."[259]

(iii) Valombola Solar Stove Project

In 1997, Mr. Schütt trained five women from the Valombola Vocational training center in Ongwadiva to start the Valombola Solar Stove project. The program was designed to combat deforestation, employ local woman, and reduce the wood-gathering workload of women and children by selling solar ovens. Women were employed and trained to construct the ovens and empowered as local entrepreneurs. The two women who currently run the project make two types of stoves: a "chicken-sized stove" that costs N$600 and a "goat-sized oven" which costs N$1,000. The women build about sixty stoves per year at the training center, with almost all Namibian materials. The women also attend trade shows and do cooking demonstrations, baking food samples so skeptics can try the food for themselves.[260] The project has become a local model for empowering entrepreneurs and Mr. Schütt has plans to expand, including the development of a commercial bread-baking device.[261]

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[259] Interview with Antonia Baker, *supra* note 72.
[260] Interview with Solar Stove Project in Ongwediva, Namibia (July 2009).
[261] *See Solar Stove Project*, SME BULLETIN, Aug.-Sept., 2007, at 3, *available at* http://www.kashona.com/images/august-septemeber.pdf.

(iv) Solar Age

Solar Age was established in 1989, and since then has earned a reputation as one of Namibia's most successful and trustworthy solar providers. Conrad Roedern, an Electrical Engineer from Germany, is the Managing Director and founder of the company. He created the company because he was passionate about bringing modern energy services to Namibia's rural areas and reducing Namibia's reliance on imported fuel sources. Today, the original store in Windhoek employs twelve people, and Solar Age has opened a second branch in Ondangwa to cater to the northern population and Angolans.[262]

Solar Age installs and maintains solar home systems, solar water geysers, and solar water pumps, specializing in PV and hybrid energy systems for rural areas. Among the company's many accomplishments is setting the standard for the Namibian home power program, and the electrification of more than 100 rural schools, clinics, and police stations with solar technologies. Perhaps more important than these accomplishments are the policies Solar Age abides by to contribute to sustainable development in Namibia. Solar Age has a policy that includes goals such as helping to mitigate climate change, encouraging policymakers to adopt a sustainable energy path, and offering skills training and employment to previously disadvantaged people, all while satisfying the energy needs of clients from a large swath of Namibia's population.[263]

(v) Desert Research Foundation of Namibia

Desert Research Foundation of Namibia ("DRFN") has a vision to enhance decision-making in Namibia in support of sustainable development. According to Robert Schultz,

[262] Interview with Conrad Roedern, *supra* note 36.
[263] *Id.*

DRFN's Energy Desk Senior Project Manager, renewable technologies play a central role in this vision. DRFN believes that innovative projects designed to solve Namibia's water, land, and energy problems are essential to achieving DRFN's sustainability goals. The Energy Desk is focused on three primary projects: the Tsumkwe project (discussed above), a bush to electric power plant effort, and a small-scale renewable technology project.[264]

DRFN has created a project called Combating Bush Encroachment for Namibia's Development to convert invader bush into electricity. This project uses a process of harvesting bush from commercial farms and then extracting gas using wood gasification. As Robert Schultz explains, the wood gas is then synthesized and run through a generator to produce electricity, which can then be fed into the national grid or used to serve the needs of a commercial farm. This farm-based production model is ideal to facilitate decentralized development. Schultz explains that because the average size of a commercial farm in Namibia is about 4,000 hectares (just under 10,000 acres), each individual farm would be able to power a plant using its own bush resources by harvesting and re-growing bush on a rotational basis. DRFN is also working to establish a large invader bush power plant which is estimated to consume between 300 and 700 hectares (approximately 740- 1,730 acres) annually. If DRFN's plan is successful, the plant will become the first IPP in the country.[265]

Another project DRFN has created is a small-scale project called Visions. Visions is designed to institute creative ways to use small solar PV technologies for income generation and entrepreneurial development in rural areas. The Visions program creates systems that are able to provide services such as charging cell phones, cutting hair, and charging electric lanterns. In August 2009, DRFN was even considering adding solar box cookers for the baking of bread and

[264] Interview with Robert Schultz, *supra* note 225.
[265] *Id.*

wood efficient stoves to cook the meat sold by food vendors by the side of the road. Although Visions appears remarkably similar to the MME's rural electrification packages, there are important differences. Each package is sold at around N$10,000, a slightly more reasonable price than other available packages. Visions packages are also tailored to promoting economic endeavors. As Mr. Schultz explains, "the idea behind the [DRFN] project is to prove that Namibians can earn an income by using solar systems." Schultz believes this new perspective will add value to renewables in the eyes of Namibians. [266]

(vi) Elephant Energy

Elephant Energy is a non-profit organization based in the United States and Namibia (see www.elephantenergy.org).[267] Its mission is to promote rural development and nature conservation in Africa through the dissemination of appropriate and affordable renewable energy technologies. Specifically, Elephant Energy works hand-in-hand with community-run nature conservancies in the Caprivi Region of Namibia to provide small-scale renewable energy products to rural communities. In Caprivi, many people also rely on costly paraffin candles for lighting and must spend disproportionate amounts of their income on batteries in order to enjoy simple luxuries like radio service. Rural Caprivi residents also face the problem of charging their cell phones without access to electricity.

Elephant Energy's first pilot program in Namibia, the Caprivi Solar Light Project, began in August 2008 with the distribution of 50 solar-powered lights to all registered conservancies in the region. Due to the tremendous interest in the solar-powered lights by community members, Elephant Energy initiated an expanded pilot project in June 2009. The expanded project aims to

[266] *Id.*
[267] Elephant Energy, About Us, http://www.elephantenergy.org/About_Us.html (last visited Feb. 28, 2010).

address the lack of much-needed energy in Caprivi by partnering with conservancies to distribute solar-powered lights. For the initial phase of the Caprivi Solar Light Project, Elephant Energy chose to partner with two of these conservancies, Sobbe Conservancy and Wuparo Conservancy. These conservancies were chosen based on initial scoping meetings conducted in each conservancy area, the degree of interest and capacity demonstrated by conservancy managers and residents, and recommendations from local non-governmental organizations, notably Integrated Rural Development and Nature Conservation.

Each conservancy was used to pilot a different model for distributing solar torches (flashlights). Both models were market-based, requiring the purchase of solar torches rather than a donation. However, in both cases, the cost of the torches was subsidized to ensure affordability based on anecdotal pricing data. Torches were sold for N$50 (approximately US$6.50) even though each torch actually costs approximately N$170 (approximately US $22.20) including shipping costs to Namibia. Additionally, detailed baseline energy surveys were conducted to sample for energy use, energy needs, and the ability to pay for energy products. Focus group interviews were later organized to ground truth survey results and collect additional qualitative data. Finally, a monitoring program was established at each conservancy to collect ongoing information about torch use and product performance.

Elephant Energy distributed nearly 1,000 solar-powered lights to communities in the Caprivi Region in 2009. Notably, participants who received a torch reported that they had since stopped using candles, and that they were using the torches every day for reading, studying, cooking, and bathing. People reported using the torches mostly for indoor lighting, but also used them for walking at night and avoiding elephants and snakes. They expected to use the torches even more to protect their fields from elephant damage during the growing season. Elephant

Energy plans to expand the Caprivi Solar Light Project and work to provide additional small-scale energy products to conservancy residents in the future, such as efficient cook stoves, cell phone chargers, and other lighting products.

6. Conclusion

Namibia has taken promising steps to meet the clean energy needs of all of its citizens. However, the government, civil society, and the private sector must now evaluate and build upon this good work. The first step towards climate and energy justice in Namibia is recognizing that large-scale renewable energy can meet the needs of much of Namibia's population, reducing costs over time, and decreasing dependence on foreign sources of energy. Large-scale, grid-based, fossil-fuel energy production is unacceptable, even in the short term. Namibia has tremendous renewable resources and the technology to harness these resources is now available and cost effective. While barriers exist, they can be overcome. For large-scale renewables, political will is required to allow energy innovation to occur. NamPower and ECB must be willing to adapt to changing times, policies incentivizing large-scale renewables must be implemented, and old, dirty technologies must be retired. Namibians must also invest in education relating to renewables, work to integrate new technologies into the country's diverse cultural landscape, and work to establish local manufacturing of renewable energy products. The government and civil society must also address other issues such as theft of renewable energy products and property rights. Finally, Namibians must press the international community to restructure the CDM to allow small developing countries the opportunity to benefit from carbon finance.

Namibians must also recognize that the large-scale, fossil fuel-based energy systems of the past will never serve to meet the needs of the energy poor. For most of Namibia's rural population, the grid will never come. The Namibian government, civil society, and private sector have taken the first steps to deal with this dilemma and prevent the type of energy injustice that still persists today, even in the United States. Initiatives like the Solar Revolving Fund and Energy Shops must be fully funded and expanded, education related to renewables must be available throughout the country, and programs to market and distribute small-scale renewable energy products must be supported. Namibia is ready to promote energy and climate justice for all. It is time to put out the fire and turn on the sun.