Searching for a Win-Win-Win: Rethinking Energy Crisis Solutions in West Africa

by Johnny J. Wandasan, Karie Hawk and Michael J. Cheatham

Access to electricity is fundamental to opportunity in this age. It's the light that children study by; the energy that allows an idea to be transformed into a real business. It's the lifeline for families to meet their most basic needs.

— Barack Obama

On March 9, 2017, venture magnate Elon Musk sent shockwaves through the energy production world. With a simple tweet, Musk accepted an unprecedented challenge from fellow billionaire Michael Cannon-Brookes in response to rolling blackouts experienced in South Australia—100 megawatts (mW) of power installed and working 100 days from contract or it is free. In the U.S., where electricity is a ubiquitous commodity, Musk's bold assertion garnered a mild reaction. However, the implications of Musk's system to provide clean, renewable, and affordable energy should not be understated. Power diffusion of electricity-producing technology is an essential element to meeting modern energy needs and achieving U.S. National Security Strategy (NSS) goals.

The U.S.'s desire for a stable Africa is a consistent NSS theme. Shaping Africa's stability ensures foundations for peace, security, prosperity, and improved democratic governance and the rule of law in a dynamic region. The U.S. employs a variety of foreign aid hard and soft power instruments to

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achieve its interests. In vulnerable regions within Africa, soft power—the ability to influence others to do what is in our interests without the use of "sticks" and "carrots" associated with traditional national instruments of power—is more advantageous to gaining and maintaining a positive U.S. narrative than traditional hard power. A prime example of innovative U.S. soft power in Africa is the Millennium Challenge Corporation's (MCC) efforts to increase energy production in the West African nation Liberia.

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The "Liberia Compact" is a $257 million, Liberia-focused, MCC-led effort designed to encourage economic growth and reduce poverty in Liberia through three separate but mutually-supportive goals: enhance power generation; strengthen the capabilities of sector investment planning, asset management, and regulatory and social institutions; and support the development of policymaking institutions as the sector modernizes and becomes more commercially viable.[1] In Liberia, MCC's main effort focuses on funding the rehabilitation of the Mt. Coffee Hydroelectric Plant to increase power production and access and to decrease energy tariff costs. In comparison to its African state peers, Liberia lags behind in energy production, accessibility, and cost per kilowatt-hour (kWh).

The need for vastly improved infrastructure and reduced tariffs in Liberia is obvious. Excessive energy costs limit nearly all other aspects of modern progress including medical care, education, and industry. MCC's efforts serve both the interests of the U.S. and the needs of Liberia. The MCC-Liberia partnership—the Liberia Compact—is win-win. However, with Musk's recent revolution in energy affairs, MCC should reevaluate its current and future energy compacts. The advancements and availability of energy production and storage technologies open previously impractical opportunities for MCC to expand U.S. soft power influence, support innovative U.S. technology maturation with private/public partnerships, and expedite affordable energy production solutions in weak states—a win-win-win.

This article examines the relationships between U.S. interests, Liberia's self-interests, private sector innovation, and MCC's approach to soft power. It briefly outlines background information of Liberia's current state, MCC and its ongoing efforts, and Musk's SolarCity company. Five core questions guide the discussion to determine if private industry-led innovations in new, hybrid solar/battery technologies should be the primary MCC energy-production solution in Africa:

- What current Liberia conditions drive the need for MCC assistance?
- What is MCC, its capabilities, and intent?
- What is the Liberia Compact and its intent?
- What is SolarCity, and how could its technology aid MCC efforts?
- Should technological advancement guide MCC operations?

Liberia's Current State

Liberia, like most of Africa, is on the rise but well behind the rest of the modern world in many respects. With an estimated gross domestic product of just $3.881 billion and a 2 percent economic real growth rate, Liberia struggles to sustain the basic human needs of its 4.3 million population.[2] Liberia is unable to sustain itself economically under its own weight and relies heavily on foreign assistance.

While Liberia boasts large freshwater reserves, mineral resources, and other natural resources, it lacks the infrastructure to capitalize on them. Leading up to 2005, civil war, political infighting between native Liberians and descendants of former slaves, and government mismanagement steadily degraded or destroyed what limited infrastructure existed. Despite a steady economic build-up over the next decade, the recent Ebola crisis wiped out most gains and forced the government to abandon public investments to support disease prevention. Liberia's economic development is caught in a revolving door and is struggling for survival. Fortunately, U.S. NSS interests in Africa and historic ties to Liberia make the U.S.-Liberia partnership a natural endeavor. However, determining where and how to provide assistance to Liberia is a difficult task.

Although simplistic, Maslow's classic Hierarchy of Needs Theory offers a basic lens to understand Liberia's current state. Organized into a pyramid, Maslow's theory asserts there are five basic human needs placed in an ascending order of precedence. Survival needs such as oxygen, water, food, heat, and sleep form the first basic tier. The second tier requires safety needs such as protection, law and order, stability, and safety. Tiers three, four, and five are social and self-interested characteristics born from a stable pyramid base. Through Maslow's lens, Liberia is foundering in the riptide between tiers one and two—physical and safety needs.

U.S. foreign aid targets Maslow's tiers one and two. The U.S. Agency for International Development (USAID) supports tier one and two concerns generally; MCC targets tier two improvements specifically. Tier one activities are essential for survival but do not solve the problems driving foreign assistance needs. For Liberia, the focus on tier two activities—specifically energy production—is of greatest importance long-term to help it not just survive, but thrive.

Energy production is a missing link between Liberia's current state and future economic prosperity. Liberia's current total power production is a paltry 335-mW.[3] Reliability and access to what energy is available are far from stable. The Liberian power grid experiences frequent blackouts, and what businesses remain in country frequently rely on solitary diesel generators that drive energy operating costs substantially higher. Even more surprising, current estimates indicate only about 2 percent of Liberians have access to the electric grid.[4] Liberia's low power production should not be understated. Arkansas, a U.S. state relatively proportional in land mass and population to Liberia, generates more than 4,200 mWh of electricity per year at an average cost of $0.08 per kWh.[5] However, access to power alone is not enough to create change. Liberians with electric grid access have only a limited advantage over those who do not.

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Although average effective electricity tariffs in Africa hover around $0.14 per kWh, the Liberian electricity tariff remains above $0.52 per kWh. The cost difference is significant, especially when coupled with the stunningly-low living wages of Liberia. The official United Nations threshold for extreme poverty is less than $1.90 per day.[6] In Liberia, 84 percent live on less than $1.25 per day, averaging $434 annually.[7] At the current state, Liberians who gained access to electricity are unlikely to afford it.

The need for vastly improved infrastructure and reduced energy tariffs is evident. Excessive energy costs limit nearly all aspects of modern progress including medical care, education, and industry. However, Liberia lacks the resources

to create significant change unilaterally. Liberia relies on two external forces for change—power diffusion and foreign assistance.

Power diffusion of technology, such as the 1,000 percent drop in technology costs from the 1970s to today, applied to energy production is a predictable, long-term tendency. Over the past 25 years, new technologies, such as wireless devices, went from unaffordable to ubiquitous—even to Liberians. Liberians who struggle financially and physically have access to cellular technologies unimagined 30 years ago.[8] The potential for power-producing technology to become instantly accessible by the poorest of countries is not likely, but we are seeing a power diffusion transformation taking place now.

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Until energy production experiences drops in technology costs similar to the cell phone, Liberia must rely on foreign assistance. For the needs of Liberia, U.S. foreign assistance in the form of the MCC offers a viable alternative to simply meeting survival needs. By targeting the right projects at the right times, MCC is leading a small change that has big implications for a fledgling country.

MCC Capabilities and Intent

In January 2004, bipartisan Congressional support paved the way for the formation of a foreign assistance program aimed at fighting global poverty through the principles of sound policies, ownership and accountability for approved country partners, and measurable outcomes.[9]

The process for receiving U.S. assistance through the MCC is comprehensive, and the programs are scalable.

In providing aid to the most impoverished countries across the globe, the MCC considers the commitment of potential candidates to improving their country's conditions in the following three areas: 1) democratic governance, 2) investments in its people, and 3) economic freedom as measured by different policy indicators.[10] To be considered a candidate, several other evaluation criteria apply.

Each year, MCC's Board of Directors evaluates all low-income countries and lower-middle income countries. For consideration for assistance, MCC defines low-income countries as the 75 countries with the lowest gross national income (GNI) per capita, and lower-middle income countries as all remaining countries with a GNI per capita that is lower than the World Bank's threshold for upper-middle income countries. Only countries that meet these income tests and are otherwise eligible to receive assistance under the laws of the U.S. are considered candidates for MCC assistance.[11]

Based on the rigorous assessment that the MCC conducts for prospective countries, two forms of grants are provided when partnerships are approved. The most robust grants offered are known as "compacts," which are grants that entail a five-year maturation period for the execution of large-scale projects for those countries that meet the MCC's requirements for eligibility.[12] Not meeting the rigorous standards does not automatically disqualify a country from being an MCC recipient. In this instance, smaller grants, known as "threshold programs," are offered to assist countries that demonstrate a commitment to improving their policies toward the three considerations and are close to meeting eligibility requirements.[13]

Attaining MCC partnership eligibility for compacts or threshold programs is an important first step. However, as a way to ensure accountability and continued commitment to democratic values, MCC continues to monitor

and evaluate engaged countries during both the development and execution of these programs.[14] Failure of a country's reform and policy efforts to increase good governance carries a range of implications. Warnings may be issued, and suspension or termination of eligibility for MCC programs may result.[15] However, countries that show consistent improvement may become eligible for compact renewal.[16] The signing of a compact with Liberia in October 2015 is among MCC's recent success stories.

Liberia Compact

A liberalist approach to the international system undergirds the current NSS. Through this lens, the U.S. grand strategy depends on active involvement with the international system's political and economic self-interests. Active engagement fosters internal stability within weaker states and grows interdependence. Interdependence between states shapes conditions for peace and regional stability consistent with U.S. interests.

Besides virtuous reasoning, why should the U.S. care about Liberia? In an era punctuated by terrorism, growth of peers and near-peers, and burgeoning federal spending deficits, the U.S. government's support to Liberia through the MCC is a suitable approach, given that critics of assistance there view Liberia as a "peripheral" U.S. security interest.[17] Across the spectrum of U.S. national interests, peripheral implies that resources should be applied judiciously. As an instrument of U.S. government soft power, the MCC is a proven model for advancing democracy and U.S. values abroad in a cost-effective manner that bolsters self-sustaining growth in partnered nations.

The Liberia Compact between the U.S. and Liberia is codified in a 50-page document that outlines the funding protocols and expectations of both governments toward their goal "to reduce poverty through economic growth in Liberia (the "Compact Goal")."[18] The Liberia Compact is a $257 million grant that covers four major areas to reduce poverty and stimulate economic growth: 1) funding for the rehabilitation of the Mt. Coffee Hydroelectric Plant, 2) developing a training center for technicians in the electricity sector, 3) supporting the creation of an independent, energy-sector regulator, and 4) providing development support for an approach to nationwide road maintenance.[19]

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In fulfillment of MCC's principled approach, the Liberia Compact supports the two key U.S. initiatives of supporting Ebola recovery efforts and furthering the "Power Africa" initiative in the region. Still recovering from the Ebola outbreak in 2014, Liberia continues to receive support from the U.S., and access to electricity is key to sustaining this effort.[20] The completion of the Mt. Coffee Hydroelectric Plant restoration will also enable expanded participation in "Power Africa," a 2013 Obama administration initiative.[21] The MCC expects that the Liberia Compact will benefit over 460,000 people over the next two decades.[22] This number could be higher, and MCC's goals could be accomplished sooner, however, if funding and resources were invested in more current innovations that leverage cutting-edge technologies and capitalize on greater efficiencies in power generation and storage. SolarCity is an example of one such corporation that can offer the MCC access to expedited timelines and reduced costs in achieving its program goals and objectives in Liberia.

SolarCity: Background and Technology

SolarCity began as an idea conceived by billionaire Elon Musk, who saw opportunity in providing cost-effective and highly-efficient solar-panel systems that incorporate battery-pack technologies direct to consumers.[23] Peter and Lyndon Rive, both cousins of Musk, co-founded SolarCity Corporation in 2006 and leveraged access to low-priced solar panels to gain initial successes in the photovoltaic industry.[24] Over the years, SolarCity would become the first in the industry to provide an all-in-one, direct to consumer, photovoltaic system solution that integrates design, sales, financing, installation, monitoring, and other services.[25] The company's investments toward in-house production of solar panels enabled significant growth, which increased further after Musk's company, Tesla, acquired the company in 2016.

SolarCity founded the Give Power Foundation to expand and leverage the use of clean energy technologies to improve the quality of life for people living in underdeveloped and impoverished communities.

In August 2016, Tesla shareholders approved a proposal by Musk to acquire SolarCity and merge the two companies to allow them to scale both battery and solar-panel system operations.[26] This conglomeration availed access by SolarCity to cutting-edge, energy-storage systems by Tesla. Successful collaboration with Panasonic on a battery pack known as "Powerwall" resulted in Tesla producing a game-changing, energy-storage device that is currently without any near-peer competition.[27] On average, the "Powerwall 2" has a 5 kW greater capacity and costs approximately $800 less per kWh to operate than its current nearest competitors, while including an integrated inverter at a competitive price point.[28] "Powerwall" is billed as "a completely automated system that installs easily and requires no maintenance."[29] It will be only a matter of time before this technology finds application in the nonprofit segment of SolarCity's operations. Since December 2013, SolarCity has been supporting efforts by the United Nations to fight climate change and ensure that people around the globe have access to electricity by 2030 through the company's "Give Power Foundation."[30]

SolarCity founded the Give Power Foundation to expand and leverage the use of clean energy technologies to improve the quality of life for people living in underdeveloped and impoverished communities.[31] The Give Power Foundation focuses on sectors that are essential for bolstering stability, security, and good governance. The seven objective areas include water, food, health, education, conservation, economic development, and telecommunications."[32] Access to solar-power applications is at the center of these efforts.

The Give Power Foundation started with a commitment that for every mW of residential solar power installation sold by SolarCity in 2014, the Give Power Foundation would donate a solar-power and battery-pack system to a school without access to electricity, beginning with communities in Haiti, Mali, Malawi, and Nepal.[33] Achieving similar success with expansion and growth as its for-profit segment, SolarCity's Give Power Foundation has expanded its philanthropy beyond these initial four countries. Today, the organization has benefitted developing communities around the world in 13 countries, bringing power to 1,500 schools and benefitting over 200,000 people.[34]

The alignment of Tesla, SolarCity, and the Give Power Foundation could mean a brighter future for the communities of West Africa. Enabled by the energy conglomerate's technologies, the Give Power Foundation

continues to expand its efforts through two main types of partnerships. The first partnership type is the "Funding Partner," which consists of both "Power Partners," who sponsor projects from one of the seven sectors and "Signature Partners," who fund entire projects.[35] The second partnership type consists of "Program Partners," who are individuals or organizations that nominate projects that could be "strengthened by clean technology" and is "relevant to the community."[36] The Give Power Foundation has completed philanthropic work in the West African nations of Burkina Faso, Ghana, Mali, Nigeria, and Senegal.[37] Successes at home are exportable abroad, and a proof-of-concept for large-scale, grid-connected, and reliable power-generation solution exists on the U.S. west coast in Ontario, CA.

To reduce reliance on fossil fuels, Tesla worked with utility company California Edison to complete the Mira Loma substation, regarded as among the largest energy-storage facilities in the world.[38] The impressiveness of the storage capacity resulting from this project is perhaps paralleled by the short amount of time needed to complete the project. The planning and building of this 1.5-acre project took only six months to complete and can provide 80 mWh of power to the city.[39] Beyond speed and capacity, advances in technology are making solar farms similar to Mira Loma more expedient. Evidentiary is the offer by Musk to build, in under four months, a battery farm capable of producing 100 mWh.[40] For organizations like MCC looking for a cost-effective approach to the application of soft power for peripheral interests, Tesla offers a viable option to increase access to energy in developing nations.

Future MCC Outlook

The future of MCC should include modifications to its current compacts. If MCC is unwilling to modify its current compacts, then at the very least it should consider adding new compacts regarding the rapid advancements in technology as a way forward. As a soft power tool, it makes sense to achieve the goals of the NSS as expeditiously as possible to stabilize low and lower-middle income countries.

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On its current trajectory with MCC, Liberia is on the verge of a revolution facilitated over a period of 20 years; however, that revolution is complicated by weak government and the growth and expansion of terrorism. A new compact through partnership with Tesla, SolarCity, and Give Power Foundation can expeditiously aid that revolution while combatting weak governance and instability by advancing technology and clean energy alternatives similar to Mira Loma. This clean energy solution via battery-enabled solar power can assist Liberia to achieve such exponential leaps in the future that the once impossible are now possible. There are numerous advancements that can benefit Liberia and ultimately improve the overall standard of living for its society as a whole.

One of the most important factors Liberia faces is the increased ability to foster expanded educational opportunities. Research shows a direct correlation between increased education and increased wages. Increased wages boost and stabilize the economy. Those who seize the opportunity to become more educated will be immediately invest in Liberia's economic growth. Those who do not choose to seek higher education still benefit because they are embedded in a society that is increasing its knowledge base. A rising tide raises all boats.

Better incomes also increase standards of living. Increased standards of living are evident in the advancements in technology. Having educated and certified engineers leads to

building more medical facilities. Trained and qualified medical staff and personnel increases care. Increases in infrastructure boost capabilities to provide simple preventative care, such as refrigerated vaccinations, or fight complex diseases such as Ebola.

Advancement in technology and partnerships—which begins with MCC partnering with Tesla, SolarCity, and Give Power Foundation—brings Liberia full circle. Technology begets technology. All parties involved win by creating stabilization of the nation through the development and support of an independent electricity sector, economy, and government.

Conclusion: Creating a Win-Win-Win

The impact of adopting a battery- and solar-powered alternative for the economy is favorable and creates a win for both Liberia and the U.S. As a result of increased education and educational opportunities, the economy in Liberia will increase and stabilize the government and protect it from being vulnerable to other state and non-state actors operating within the region. The economy in the U.S. is furthered through peaceful economic relations as well as through the SolarCity employees who manufacture systems, train Liberians on system usage, install new systems, and reclaim old ones for refurbishment.

Battery-solar power can create jobs. As an example, the Ivanpah Solar Power Facility—the world's largest solar-thermal power station—was developed by Brightsource and Bechtel and is estimated to "involve some 1,000 jobs at the peak of construction, 86 permanent jobs, and total economic benefits of $3 billion."[41]

Hydropower generation through MCC's current plan to renovate the Mt. Coffee Hydroelectric Plant will lead to these same ends. However, time is a factor—and its plan is staged to achieve this over a 20-year period. It is possible that the terrorist organizations operating within the area, such as Boko Haram, could grow and negatively impact the populous within that timeframe. Implementing the same capability to foster climate growth and change in an expeditious manner with SolarCity and Musk's ambition would offer the ability for stability within the government and economy. It creates a more timely win, allowing Liberia to achieve stability sooner—in perhaps 1–5 years.

Besides boosting the economy of Liberia and creating stability within the nation in a timely fashion, there is the other aspect of creating a win fiscally for both Liberia and the U.S. Manufacturing battery- and solar-powered systems is possible at costs less than that currently invested in the Mt. Coffee Hydroelectric Plant rehabilitation project. The end result of clean solar energy is long-term affordable energy to Liberians, especially since there are no manufacturing costs or refurbishing costs.

A solar-energy consortium project between West African nations implemented by MCC, in cooperation with private industry corporations such as Tesla, SolarCity, and Give Power Foundation, would be much more advantageous to create stability, energy security, national security, and subsequent secondary and tertiary effects on political, military economic, social, information, infrastructure, physical environment, and time/sewage, water, electric, academics, trash, medical, security (PMESII-PT/SWEAT-MS) throughout the region. By reassessing its current Mt. Coffee Hydroelectric Plant compact or creating a new compact with regard to advancements in technology, MCC will be able to better exercise its soft power capabilities throughout Liberia. Time factors into the equation to offer stability, energy independence, and security as expeditiously as possible. MCC should look toward the future through advancing technology not only to achieve NSS goals within Liberia, but also throughout the West Africa region. ***IAJ***

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