Solar Electric Light Fund

2016 Annual Report

2016 Accomplishments

- SELF began restoring solar electricity to 12 health centers on Haiti's Southwest Coast that were damaged by Hurricane Matthew.

- The village of Fe-Yo-Bien in the Central Plateau of Haiti used the micro-grid that SELF installed to power homes and businesses.

- SELF continued to solarize the Haitian vaccine cold chain to assure that inoculations are widely available.

- A new Solar Market Garden (SMG) was installed for the twin villages of Lou and Danganzi in Benin, making it the 12th SMG being managed by our local partner, ADESCA.

- A new Micro-Enterprise Center (MEC) was installed for the villages of Lou and Danganzi, making it possible for vendors to sell goods and services requiring electricity.

- SELF and Benin partner ADESCA installed three clean water stations in the Kalalé District. Powered by solar pumps, the water stations help eliminate water-borne diseases.

- SELF engineered an energy harvest device that can safely divert surplus electricity from solar direct-drive vaccine refrigerators to help power medical equipment and lights in remote clinics around the world.

- SELF finalized and translated its solar training curriculum from English to French in preparation for the opening of the National Solar Training Center in Port-au-Prince, scheduled for September, 2017.

LETTER FROM OUR EXECUTIVE DIRECTOR

Dear Friends,

The Solar Electric Light Fund (SELF) is committed to bringing the power of the sun to rural communities in the developing world that are fighting for their very survival. With the ability to harness solar power for improved healthcare, education, food production, and clean water, our beneficiaries dare to dream of a brighter future.

In Benin, we installed a Solar Market Garden for the villages of Lou and Danganzi—providing year-round agriculture for women to feed their families and earn an income. We also built a solar-powered Micro-Enterprise Center to create commerce, provide new goods and services, and encourage entrepreneurs. And we installed solar pumps in three villages to deliver clean water—helping to eliminate water-borne diseases.

When Hurricane Matthew hit the southern coast of Haiti in October, many dreams were dashed as residents lost their homes and the scourge of cholera ravaged the region. Soon after, SELF started to restore the hurricane-damaged solar systems that we previously installed in 12 health centers in the area, with the anticipation that we would make more extensive repairs to other coastal installations in 2017. At Fe-Yo-Bien in Haiti's Central Plateau—far from the hurricane—we witnessed the excitement of local residents and businesses that connected to the solar micro-grid that we installed—providing them with abundant, new opportunities that come with energy access.

In Haiti, SELF also continued to solarize the national vaccine cold chain to assure that inoculations are widely available. On a broader scale, we engineered a new technology in association with solar direct-drive, battery-free refrigerators that could bring electricity to 100,000 remote clinics around the world. But I'll let Steve McCarney, SELF's Director of Cold Chain Solutions, tell you more about that on page 4. He and other members of our team are bringing you introspective accounts of their experiences in this year's Annual Report.

Like those we serve, the SELF staff can dream boldly. We are continually searching for the most creative, effective ways to craft energy solutions for the world's poor. On behalf of our staff and the people we serve, thank you for making dreams happen.

Warm Regards,

Bob

Robert A. Freling
Executive Director

2016

APPROACHING THE ULTIMATE SOLAR HURDLE: SUSTAINABILITY

Jeff Lahl, Project Director

Imagine that your assignment is to install a solar system on a Haitian mountaintop village that has no passable roads. And it's raining. And your transport vehicle is stuck—its wheels spinning and splattering mud in every direction while people in the community above you wait anxiously for your promise of electricity. Eventually, pack mules are commandeered, and the solar equipment procession continues laboriously up the mountain.

SELF projects invariably pose a variety of challenges. We need to move people and materials around the globe, work with different national and local governments, navigate a variety of cultures and languages, and overcome the logistical challenges of accessing sites which are often difficult to reach. We sometimes have to endure harsh climates and do our best to avoid exotic diseases. And because our work cuts across a wide spectrum of sectors (health, education, agriculture, income generation, etc.) each project often presents a unique set of challenges.

SELF has met these challenges by designing high-quality systems and working with local people to install and maintain them. The challenge that remains is helping ensure the long-term sustainability of the solar systems. Although they require less maintenance, time, and expense than alternatives (usually diesel generators), photovoltaic (PV) systems still require maintenance. Eventually their batteries, and sometimes their electronics, need to be replaced. We train local people to operate and maintain their systems, emphasizing that batteries need to be used carefully to achieve the longest life. While solar modules last for over 25 years, batteries are the most expensive system components, requiring periodic replacement.

Impassable roads present logistical challenges for solar system deliveries.

Users pay a small fee for the water they collect, creating enough revenue to ensure the long-term sustainability of their solar-powered water stations.

That is why we encourage project donors to include adequate funds for replacing batteries and providing ongoing maintenance support for our projects, especially for schools and health centers that do not have the capacity to generate revenue to pay for maintenance. While many funders support us with these sustainability measures, some do not address long-term support issues. The good news is some governments, like Uganda, are realizing the critical role that electricity plays in the areas of health care and education. They are starting to allocate funds for maintaining solar infrastructure in their national budgets. To encourage such practices in more countries, it will be helpful if large multi-national donors insist that funds for maintenance be incorporated into solar project budgets.

For installations that generate income—such as Micro-Enterprise Centers, solar water stations, and village micro-grids—community members are willing to pay affordable fees to collectively support solar installations so that they can reap the benefits of electricity access.

There is a great deal of work being done to develop efficient, longer-lasting batteries that will someday make our goal of reaching project self-sustainability more attainable. In the meantime, SELF will continue to face the challenges associated with bringing electricity to the most remote places on earth.

Without power, medical professionals in remote areas are unable to use diagnostic and treatment technology.

BLAZING NEW TRAILS AND BRINGING DOWN OLD BARRIERS

Steve McCarney, Director of Cold Chain Solutions

Most of the world's remote, rural health posts lack clean, reliable electricity. However, thanks to immunization programs supported by UNICEF and the World Health Organization (WHO), an increasing number of rural clinics have been provided with solar-powered, battery-free vaccine refrigerators. Because these units generate electricity, there has historically been a temptation by rural medical personnel to siphon electricity from them to power medical devices, lighting, and communications. Who could blame them when their patients needed the benefits these electrical devices offered? However, the WHO, fearing this extra load would compromise the amount of electricity needed to keep the refrigerators' vaccines at the proper temperature, mandated that the solar refrigerators' electricity be used exclusively for keeping vaccines cold. I was determined to change the WHO mindset. And for good reason.

Solar direct-drive vaccine refrigerators need a sizable solar array to turn on the compressor when the sun rises each morning; but during the rest of the day, they often use just 50% of the energy generated by their solar panels. As a consequence, the solar-powered direct-drive refrigerators waste about half of their solar array's output on any given day, while at the same time these clinics lack basic amenities requiring power.

When I shared this observation with SELF Executive Director Bob Freling, we envisioned an invention that would "harvest" the wasted energy for other critical electrical needs of the clinics while prioritizing and protecting the vaccine refrigerator. If we pulled this off, we could convince the WHO to change its rules and allow energy harvesting to become part of its solar vaccine refrigerator program and help thousands of rural clinics to get electricity for essential basics.

Babies are at serious risk without the benefit of vaccine refrigerators in remote communities.

SELF partnered with PATH, a Seattle-based NGO that creates healthcare technology, to invent, test, demonstrate, and report on the new invention's success. It worked! We generated enough reliable data to convince the WHO to approve the use of the energy harvest device in the new generation of solar direct-drive refrigerators. To guarantee that the refrigerator manufacturers would be on board after the WHO's approval, we designated the technology as open source—available for anyone to freely use.

In 2016, the WHO removed a decades-old institutional barrier preventing solar refrigerators from powering other needs. Gavi (the Global Alliance on Vaccines and Immunization) expects to include energy harvesting in its largest-ever vaccine refrigerator procurement program ($250 million over five years). We estimate that more than 100,000 off-grid health facilities around the world will be getting solar vaccine refrigerators that include the energy harvest feature—thus, vastly improving the quality of remote healthcare that electricity makes possible.

Vaccines must be stored at a constant temperature from the time they are manufactured until they are administered to patients.

JOURNAL FROM THE FIELD

(NOTES FROM A SOLAR NEEDS ASSESSMENT VISIT IN UGANDA)

Darren Anderson, Project Manager

It's going to be one of those days. Little sleep followed by a long, hot, smelly drive. Diesel fumes and body odor, the scent of the continent. There's no air conditioning, and I've made a poor choice in clothing for this trip - jeans, socks, shoes.

Then to top it off, there's not going to be any meals today apart from the year-old granola bar I always have stashed somewhere in my bag, and I've got stomach cramps after days of eating marginal food in the field. Awesome.

So, I'm grumpy and not particularly looking forward to this expedition my boss has sent me on to meet with a small NGO north of Jinja. The need is endless, and the resources are always too few. I mean, every square inch of this country, of all these countries really, is crying out for intervention, resources, funds, anything...

Those living in places like this Ugandan resettlement camp for internally displaced people are in dire need of basic resources, including electricity.

With electricity and connectivity to the internet, young students have the potential to positively influence the future of Uganda.

But then I finally arrive at my destination, and before I can even get my bearings I'm rushed into a room full of women who are clapping, singing, and dancing my welcome. A big smile grows on my face and my road weariness disappears. Ah, this is Africa! This is what I love!

And they proceed to show me their need - the dirty watering hole that is their only source of water for the community, shared with livestock and wild animals alike, polluted by nearby rice fields, where small children drown and girls are raped in the dark while they go to fetch water. The cheap kerosene lamps that spew toxic fumes into their homes, damaging their lungs, their eyes, and are easily spilled by curious little ones, causing life-changing and agonizing burns. The malnutrition and hunger they experience during the dry season when they cannot grow food and have no income to purchase it, all exacerbated by the shifting and now unpredictable rains due to climate change.

Certainly some of their plight they must own, but culture and gender roles run deep here, especially for women, more than any of us in the West can fathom. So while I look around and wonder why they don't just 'do this' or 'do that' to ease their burden, it is not my place. They have called me here to witness, observe, and report. This I will do for them. And maybe more.

Women have worked tirelessly to help the recovery of Haiti.

HAITI: RECOVERY AND BEYOND

Jean-Baptiste Certain, Project Manager

In addition to being impaired by two centuries of debt, revolution, poverty, violence, corruption, exploitation, and environmental degradation, Haiti is a magnet for natural disasters. It straddles the fault line between the North American and Caribbean tectonic plates, creating devastation like we last saw in the January 2010 earthquake, when 250,000 souls perished and entire communities were reduced to rubble.

It also lies firmly in the center of the region's hurricane track, putting it in the cross hairs of powerful storms like Hurricane Matthew. That last assault—a Category 4 storm with 145-mile-per-hour winds—made landfall in October, 2016 on the southwest region of Haiti. It destroyed homes, businesses, and infrastructure, creating a humanitarian catastrophe.

I have spent the last seven years managing SELF's solar installations in remote Haitian villages that are far removed from the power grid. From this experience, I grew accustomed to seeing the dire consequences of energy poverty—food and water insecurity, no access to modern medicine diagnostics and treatment, inadequate education resources, and extreme insecurity for women and children—all dashing hope for a better life. But nothing prepared me or my Haitian crew for the desolation that struck a large coastal area spreading from Roche-A-Bateau to Tiburon in the wake of Hurricane Matthew.

Families sat dumbstruck in the intense heat wondering where their houses were. The entire footprint of their neighborhood had been wiped away. What had once sheltered them was now a pile of useless debris. Not only could they not look back at what was once theirs; they couldn't look forward either. All that waited for them was an impending cholera epidemic that would cruelly take thousands of lives.

Disaster relief was the first essential requirement to address the suffering, but it was a band-aide solution to a much larger problem. Unfortunately, most remote rural areas of Haiti have never gotten past the band-aide phase, making them ripe for destruction when the next disaster strikes.

After Hurricane Matthew, overcrowded hospitals lacked electricity.

However, post-Hurricane Matthew, the Haitian government wants to create long-lasting solutions to break the cycle of suffering by strengthening the country's infrastructure – notably, its energy development. With support from institutions like the World Bank, Inter-American Development Bank, and various United Nations agencies, Haiti is banking its future on solar electricity. The country's unlimited sunshine, along with the versatility and low generating costs of solar power, bring hope and promise to even the most remote villages.

SELF spent the remainder of the year repairing our solar installations that were damaged by Hurricane Matthew. At the same time, we were strategizing about the long-term impact we hoped to make in Haiti. Our friends there deserve a future of hope and promise, not lost dreams.

Over 500 schools were completely destroyed and 3,400 public and private schools were damaged by Hurricane Matthew.

PRIMING THE SOLAR PUMP FOR KALALÉ'S FUTURE

By Amidou Mama Sambo, Director, ADESCA
Zacharie Serotamou, Technical Director, ADESCA

Working for L'Association pour le Développement Economique Social Culturel et l'Autopromotion (ADESCA), SELF's partner in the Kalalé District of Benin, we often hear about entire villages suffering from water-borne diseases, children dying from chronic diarrhea, and women and girls walking miles into the remote bush to find clean water at the risk of being assaulted by humans and animals. Knowing that we live in sub-Saharan Africa, where the dry seasons are brutally hot and excessively long, you might assume that the reason that 54% of the population lacks access to clean water is that we simply do not have it. But that would be wrong.

We have significant ground water resources in many of our communities. What we lack is the electricity needed to pump the water from underground aquifers. Living in a remote, rural area, we are far removed from the electric grid, and as 52% of the population lives on less than $1 per day, the residents cannot afford expensive, unreliable diesel fuel to power pumps. They tried the foot- and hand-pedal pumps, but the pumps were often not strong enough. When they broke, there were no replacement parts. There are some shallow "open" wells that often run out of water during the dry season and tend to be polluted. The wait to get water from them is long, because filling one's basin requires lowering the "puisette" (a bag made from the inner tube of a tractor trailer tire) to the bottom, and waiting for the water to trickle in before hauling it up and lowering it again. Clearly, our options have been limited – until now.

When hand pumps break, a lack of replacement parts makes it impossible to draw water from wells.

ADESCA and SELF are installing clean water stations by using solar-powered pumps to draw water from deep boreholes. The systems not only deliver clean water, but valuable time to the women using them. (Before the solar pumps, women and girls in Kalalé spent 26% of their day collecting water.) By adding cisterns to the wells, we assure that the pumps continue to draw and store water even when no one is using the well. This way, when women arrive to collect water, all that is required is the turn of a spigot.

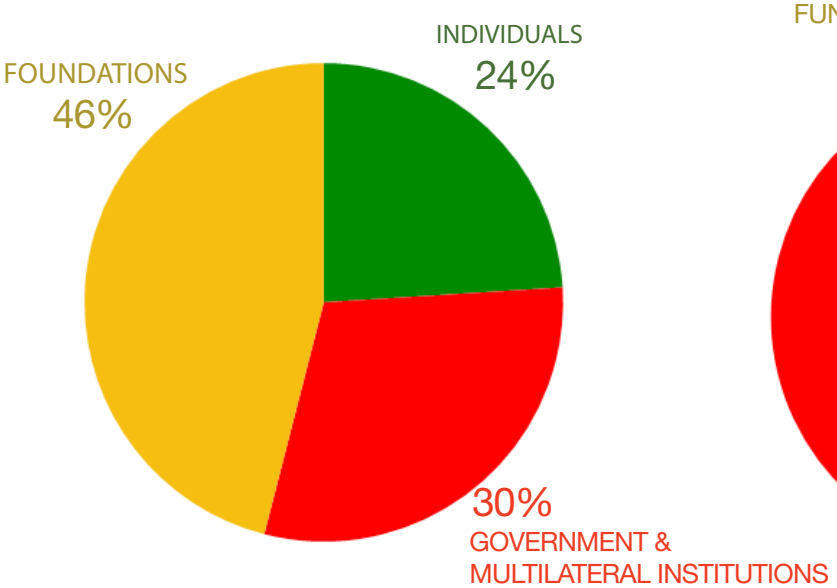
The 12 water stations that we have installed so far are generating enough revenue (customers are charged a modest fee for their water) to not only become sustainable, but to invest in the construction of even more water stations which will, in turn, generate funds for more water stations. We would say that, considering the water stations' sustainability potential, Kalalé has a bright future.

Young girls who use the solar water stations are spared the threat of human and animal assaults that occur when they travel in search of water.

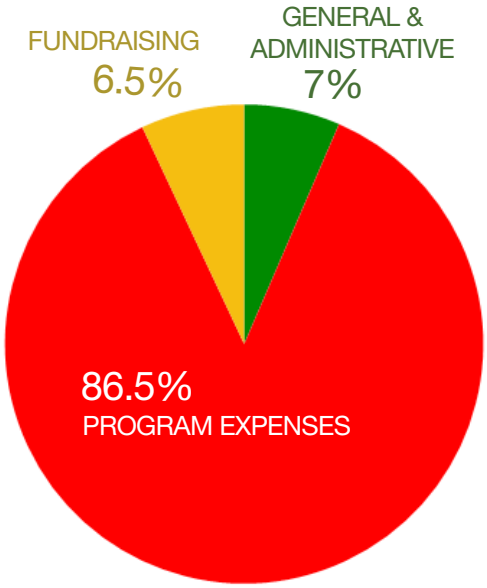
Assessing a borehole's water pressure prior to installing a solar pump attracts a crowd of local people hoping to take advantage of the free, clean water.

FINANCIAL HIGHLIGHTS

SELF Revenue in FY16



SELF Expenses in FY16



In 2016, SELF received its largest award ever for $3.6 million from the United Nations Foundation (UNF) to electrify health clinics in Ghana and Uganda. Thanks largely to this project, total revenue increased by 7% from 2015, and given existing and anticipated new contracts, we expect that trend to continue into the next year. The ratio of program expenses to overhead expenses also increased.

The financial results depicted on the next page are derived from the SELF audited December 31, 2016 consolidated financial statements, which received an unqualified opinion. SELF's complete, audited financial statements can be found on our website www.self.org.

FINANCIAL HIGHLIGHTS

STATEMENT OF ACTIVITIES
For the Period Ended December 31, 2016
(With Summarized Financial Information for the Year Ended December 31, 2015)

	UNRESTRICTED	TEMPORARILY RESTRICTED	2016 TOTAL	2015 TOTAL
REVENUE AND SUPPORT				
Contracts	$ 1,973,028	$ -	$ 1,973,028	$ 1,429,319
Grants and donations	880,485	175,252	1,055,737	1,389,195
In-kind revenue	85,953	-	85,953	90,012
Interest and other income	998	333	1,331	1,433
Net assets released from restrictions:				
Satisfaction of program restrictions	475,823	$ (475,823)	-	-
TOTAL REVENUE AND SUPPORT	3,416,287	(300,238)	3,116,049	2,909,959
EXPENSES				
Program Services	2,834,931	-	2,834,931	2,557,995
Management and general	231,076	-	231,076	227,946
Fundraising	217,679	-	217,679	247,013
TOTAL EXPENSES	3,283,686	-	3,283,686	3,032,954
CHANGE IN NET ASSETS	132,601	(300,238)	(167,637)	(122,995)
NET ASSETS, BEGINNING OF YEAR	188,932	755,414	944,346	1,067,341
NET ASSETS, END OF YEAR	$ 321,533	$ 455,176	$ 776,709	$ 944,346

ORGANIZATION

Board of Directors

Freeman J. Dyson
Professor Emeritus
Institute for Advanced Study

Roger A. Enrico
Former Chairman & CEO
PepsiCo, Inc.

Robert A. Freling
Executive Director
Solar Electric Light Fund

Jonathan W. Postal
Senior Vice President
Clean Energy Collective

Jonathan Silver
Senior Advisor, Energy Investments
The Riverside Company

Mary Green Swig
President & Chief Executive Officer
Mary Green

Steven L. Swig, Chair
President Emeritus & Co-founder
Presidio World College

Staff

Karen Allen
Development Director

Darren Anderson
Project Manager

Jean-Baptiste Certain
Project Manager

Kathy Cesere
Project Administrative Assistant

Lisa Esler
Finance Director

Katie Fotofili
Office Manager

Robert A. Freling
Executive Director

Jeff Korcan
Design Engineer & Project Manager

Victoria Knabe
Office Manager & Development Associate

Jeff Lahl
Project Director

Claudalex Lauture
Senior Technician, Haiti

Claude Rodne
Senior Technician, Haiti

Steve McCarney
Project Manager &
Director of Cold Chain Solutions

Interns

Cassidy Gasteiger

Yalun Feng

Aditya Srikanth

Elizabeth Vargo

Volunteers

Vanna Camille Curi

Osiris McCarney

Photo Credits

Alex Adams Photography
(Cover - top right)

Darren Anderson
(Pages 6 and 7)

Arthur Rhodes
(Page 9 - bottom)

Lynn Johnson/Ripple Effect Images
(Cover - bottom, Page 10)

Zacharie Seramatou
(Cover - top left, Pages 3 and 11)

Nadia Todres
(Page 4, Page 5 - top right, Page 8)

Solar Electric Light Fund

www.SELF.org

Solar Electric Light Fund
1612 K Street, NW
Suite 300
Washington, DC 20006

202.234.7265
202.328.9512 Fax

INFO@SELF.ORG