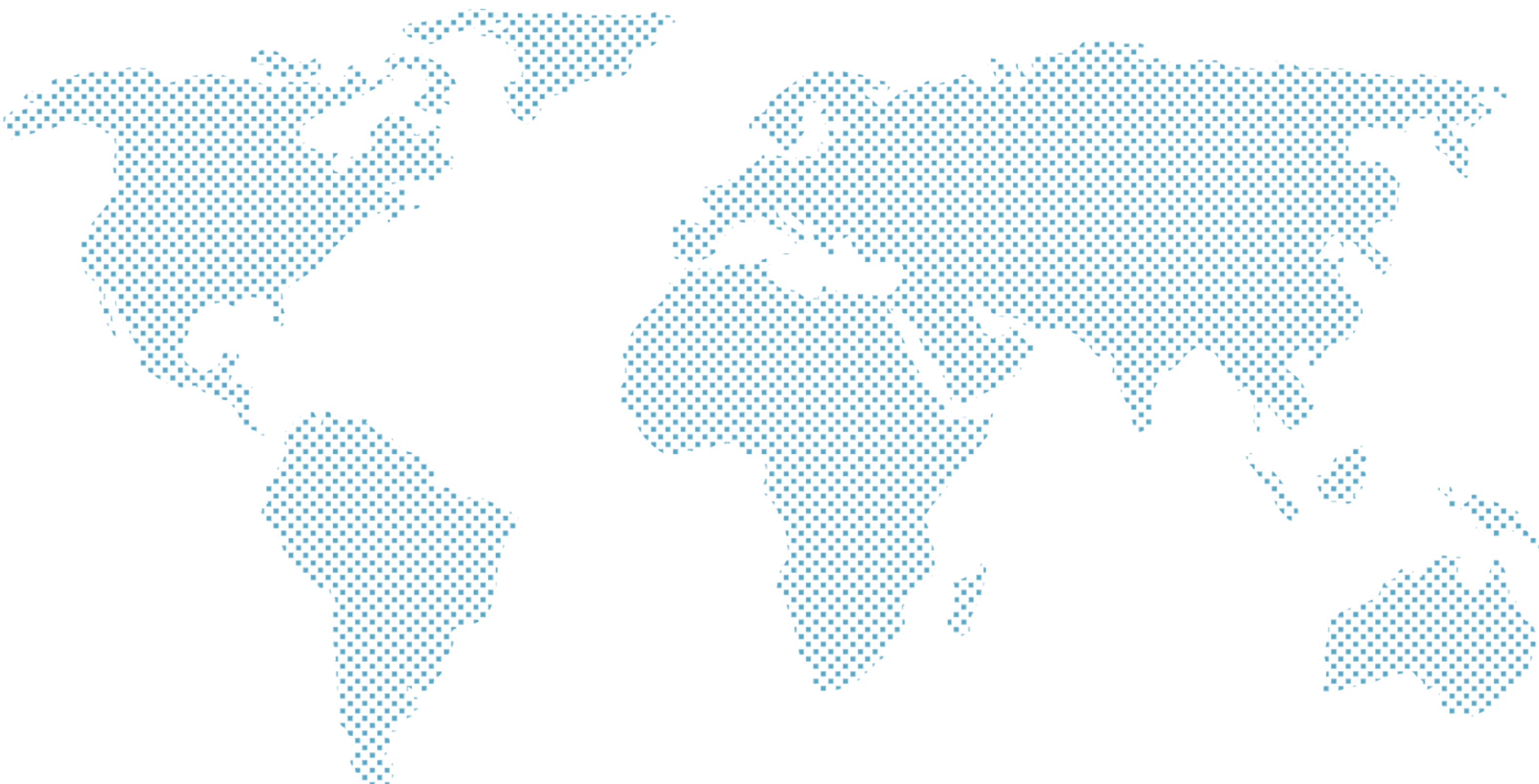
Team Rubicon

Special Projects Team 1



Emergency power Leyte philipines

Proposal

IN THIS SECTION:

Team Rubicon and Special Projects Team 1

"Team Rubicon is a 501(c)3 nonprofit that utilizes the skills and experiences of military veterans with first responders to rapidly deploy emergency response teams. Founded in 2010, Team Rubicon has deployed across the United States and around the world to provide immediate relief to those impacted by disasters and humanitarian crises.[1]"

Special Projects Team 1 is a new addition to the Team Rubicon global performance model. This team was founded by various leaders within the staff of Team Rubicon. Each staff member brings a special skill set to this diverse team. This is a team designed to develop next-gen technological solutions to enable seamless power supply in disaster prone areas around the world. Most recently they were assigned to the village of Leyte in the Philippines.

[1] https://teamrubiconusa.org/about/

Executive Summary

With an increase in population and demand, the Philippines are in the midst of a lengthy energy crisis. Located along the Pacific Rim, the country faces typhoons and earthquakes on a regular basis which routinely disrupt and destroy the already limited rural infrastructure. According to UNISDR[2], the Philippines remains the fourth most disaster-prone country with 274 natural calamities recorded between 1995 and 2015. One byproduct of these situations is the desperate need for a safe, reliable emergency power supply. When Typhoon Yolanda made landfall in 2013, power lines were damages and many remote rural areas became isolated. As a result, rural citizens were forced to travel long distances by foot just to be able to charge their batteries for cell phones and flashlights, necessities during crisis situations. Nearly a third of the barangays, independent villages integrated into the metropolitan area, in Tacloban are constantly vulnerable to flooding and storm surges because of their location[3]. Reliable power sources are an essential function necessary as part of a comprehensive response to a variety of disaster response operations to support communications, search and rescue operations, emergency medicine, water filtration, and other logistical needs.

With such high need for a reliable and sustainable power supply in the disaster-prone town in Leyte, we, as Team Rubicon's Special Projects Team 1, seek to improve the resilience and independence of rural disaster-prone communities in the Philippines. This will be accomplished through the provision and installation of green power supply that meets the needs of the town. More importantly, this serves to provide immediate and reliable power in crisis situations to meet in the urgent power needs and in the aftermath to substantially speed up the rehabilitation process. In the past experiences of the Leyte Province, it takes about two months on average for power to be restored in far-flung towns after being hit by calamities, such as typhoons. With our project's establishment of supplementary green power supply in the forms of Solar Panel Systems and Powerwalls, we project the average number of days without power to be between 0-7 days annually. That way, the selected town in Leyte is to become more resilient from disasters, positively impacting the daily political economic affairs of the town and the quality of life of its residents with the introduction of a more reliable and sustainable power supply and generation systems.

[2] https://www.unisdr.org/2015/docs/climatechange/COP21_WeatherDisastersReport_2015_FINAL.pdf
[3] http://tacloban.gov.ph/trrp/key-planning-consideration/

Problem Statement

Since the 1980s, the Philippines regularly faced energy problems, stemming from both insufficient power supply and an inefficient power transmission system - reflected in the forms of rolling blackouts and high power rates. To make matters worse, this long-standing energy crisis is further emphasized in times of calamities. Located along the Pacific Rim, the country faces typhoons, volcanic eruptions, and earthquakes on a regular basis. According to UNISDR, the Philippines remains the 4th most disaster-prone country with 274 natural calamities recorded between 1995 and 2015. In fact, the Philippines is hit by roughly 20 typhoons each year, thereby increasing the country's susceptibility to flash floods and landslides As such, while there is a general problem in terms of energy generation for the country, this becomes even more urgent and observable in crisis situations.

This condition highlights the need for an emergency power supply, most notably during calamities. This was observable when Typhoon Yolanda made landfall in 2013, resulting in the tripping of power lines and the isolation of many remote rural areas. Due to this, rural citizens were forced to travel long distances by foot for basic needs, including limited charging stations for phones and flashlights, as well as kerosene to light their homes – a scarce, inefficient, and potentially volatile energy source. 82 barangays out of 138 in Tacloban, the hardest hit area, were still without power after two months.

The lack of a sufficient power supply in these disaster-affected areas lead to a myriad of problems and increases the difficulties of enacting disaster-relief operations, as well as in rebuilding the affected communities. Indeed, reliable power sources are an essential function as part of a comprehensive approach to a variety of disaster response operations to support communications, search and rescue operations, emergency medicine, water filtration, and other logistical needs.

In this project, we are specifically targeting a town in the province of Leyte, an area which possesses a high-susceptibility to flooding and landslides. In addition, Leyte also holds a reputation of being prone to regular power shortages and outages. While this has been a continuing issue, externalities add to these problems with the most recent example in 2017, when a magnitude 6.5 earthquake struck the province and damaged the geothermal plant responsible for the province's power supply.

Hence, the project is geared to addressing the power supply needs of the residents of this selected town in Leyte, especially in times of disaster. Overall, the problem affects the residents, business-owners, and the disaster-relief team to name a few - target groups which we aim to help with the enforcement of this project. With the issue being highly applicable and important to Leyte due to their annual problems of quakes and typhoons, we see the pressing need to address the issue. After all, a delay in power supply leads to a slew of political economic problems affecting local businesses, personal livelihood, and the daily operations of the selected town. More specifically, in times of emergency, a lack of power has the potential to negatively impact the functionality of communications, search and rescue operations, water purification, and the storage and provision of critical health procedures and medicine - with potential life or death implications. Finally, post-disaster response and resilience, to a high degree, is dependent on a sustainable power supply. From the annual experiences of Leyte, two months of having no energy supply is too much of a problem to overcome every time a natural calamity occurs. Coming in, the goal is to cut this time down to about 0-7 days annually.

Project Preparation

Testing this project through our response model, we have conducted "Phase 1" feasibility tests in the United States which confirmed the feasibility of the resilience building model. With the completion of our successful operational test and evaluation, "Phase 2" consists of testing our global standard operating procedure at a smaller scale developing country, in order to check its applicability in a different context. Finally, "Phase 3" is the roll out for our global resilience building missions to complement the emergency response package our organization is an industry leader in.

Specifically, "Phase 3" is the focus of this project in a selected town in Leyte, Philippines. Team Rubicon has already field tested the proposed technology, designed a deployable kit, and developed an English training manual. To apply the project in the Philippines, we have partnered with local experts in translating all training manuals into multiple languages used in the Philippines, keeping in mind the intricacies of local dialects in our selected area of operations.

After these off-site preparations, we have decided to launch an advanced preparations team in the country, conducting initial research, site visits, and network-building to ensure the smooth flow and acceptance of our proposed project. The first order was to connect with the necessary departments of government to acquire all required documents. This includes work from the national government agencies all the way down to the *barangay* level (local community villages) for permits. At this stage, our advanced preparations team managed to meet with several officials, including those from the Department of Energy (DoE) and the National Disaster Risk Reduction and Management Council (NDRRMC). That way, we were able to gain a better understanding on the region's power supply and generations system, as well as the usual processes used in times of crisis.

Then, the team moved to the selected Leyte town for a site-visit and network-building. During this stage, the team, along with some local government officials, visited potential sites for the installation of the technology. These were aimed to gather more information on flooding- and landslide-prone sites and lands which are available for use, considering the private and public properties in Leyte. In addition, the team conducted a power test to gauge the current energy situation of the town. Partnering with locals on this stage is vital, owing to the importance of local culture, belief systems, and practices which are prevalent in the region and hold implications on the acceptance of our project.

In line with this, we have also held town-hall meetings, informal interviews, and informal luncheons with the residents of the selected town to discuss their previous experiences and their perceptions of the pressing energy supply problem. That way, local participation was ensured, specific concerns were considered, and a better understanding of the issue was acquired. These town-hall meetings and informal interviews were exploratory and investigative in nature. Lastly, we introduced aspects of our project methods to gauge interest and acceptance. Through this, we have seen some aspects which needed minor adjustments and modified accordingly. Overall, the problems and concerns raised by the locals remained consistent with the views and goals of this project.

Project Plan

Our objective is to enable rural, disaster-prone communities with the ability to maintain resilient, independent, and environmentally-friendly backup power generating systems. Our intention is to build a backup power supply system based upon existing technologies from private sector partners, including Tesla (PowerWall and solar capturing devices).

Outputs

1. We will measure our progress through outputs that can be measured and verified. It is our mission to ensure a continual presence of electrical power to the community. Related infrastructure needs to remains operational at all times. We will strive to provide ongoing support in the form of technology through contracts. Identifying, with local villagers, a suitable location for the microgrid installation and associated infrastructure. The local villagers need to provide permissions and grant Special Projects Team 1 authority to operate in their zone to install emergency backup power generation and delivery systems.

   There is a simple indicator that can show success or failure at the surface layer. The presence and functionality of installed microgrid components, including Tesla Powerwalls and 6kw solar farm alone is defined as a success. Deeper measures include speaking with villagers after installation to confirm the unit functionality, not stolen, or in disrepair. Monthly tests of the system can be done remotely to confirm villagers reporting.

2. Developing an individual expertise base within the village population is key for optimal participation and ongoing local support. We see that developing several measurable outputs including initial 3-week maintenance training program with certification upon completion, protocols for training replacement maintenance workers within the village, and integrating responsibility for maintenance within the village government system.

   Viewing indicators for these objectives will pose a challenge. Installing, training, and first year maintenance will be easy indicators to objectively view. However, it is expected that the first individuals trained will perform their duties diligently for many years. The first class of trainees can and will perform knowledge and tactile competencies involving maintenance and repairs of the system. The first class size goal is 21 local citizens and that they attend 100% of all training and earn the certification.

   Verifying competencies is relatively straightforward. If 21 local students are able to demonstrate proper operation, maintenance, and earn 80% on their end of course exams, we will be able to verify a competent workforce. Ongoing site visits to reinforce training will either expose needed training opportunities or competence. Viewing monthly training logs held by the local government will solidify the verification of task competencies.

3. The final of the initial outputs is incorporating the village into an active support network. This needs to be more in depth than offering a few phone numbers, websites, or the like. Providing human points of contact with Special Projects Team 1, Team Rubicon, Tesla, and other NGO's operating in the area. Having these interpersonal connections in place is critical for future continuity. As initial training evaluations, continuing education, and after outage reports, this integrated support network will need surveillance equipment and capabilities. Security is required because of the high value equipment and safety concerns.

   As a part of the initial training and government relationships everyone will be aware that there are security measures in place for safety and security. The indicators are being able to have Special Projects Team 1 personnel located at Team Rubicon Headquarters access the security remotely. This needs to be done while the installation team is present for obvious reasons. Special Projects Team 1 installation teams should refrain from explaining every security measure for security reasons.

   Indicators of success can be verified like the other outputs with remote sensors, security feeds, and human to human interactions. The human aspect can be done face to face with ongoing system assessments and through satellite communications.

Monitoring

Monitoring a project with many stages of implementation, training, and operations is challenging. We have defined benchmarks within timelines and verification stages. The biggest piece of the monitoring triangle is managed by our remote monitoring "black box" system. When the existing power supply stops and our energy begins flowing, we receive notification directly from the system.

Black Box Capabilities

1. Satellite communications capable - short messaging service (SMS)
2. Short-term backup battery
3. Maintains monitoring with minimal power draw from primary power supply
4. Sends signals to Special Projects Team 1 systems related to power switches from primary to backup to primary
5. Remote diagnostics of the system are in development, but not operational at this time

Telephonic communications from the Special Projects Team 1 to Leyte Village Government and lead volunteers operating our system will occur through existing emergency satellite phone capabilities. These phone calls are critically important during real-world emergencies just as during training simulations. A readiness evaluation will be developed based upon each training evolution and real-world events. This data will be made available to Philippine Governing officials, NGO counterparts operating in the same region, our partners, donors, and general public.

Operation Plan

Our goal is to break this cycle of tragedy by rebuilding these communities' power infrastructures and ensuring these systems have the resilience to survive future disasters. We will tackle this problem from three angles: infrastructure, expertise, and integration.

First we will provide these communities with the green technology you donate to us. According to Tesla's energy websites, two fully-charged Powerwalls are sufficient to power a 2,000 sqft home equipped with air conditioning for approximately seven days assuming 35 kWh usage. The addition of just two highly efficient Tesla solar panels are enough to maintain off-grid power longer. A basic clinic can be run on 8.5 kWh of power per day while basic lighting and charging uses only about .17 kWh per day[4]. This means that with 19 6kw solar panel systems we could generate enough electricity to light approximately 5500 households during an emergency and provide basic health services.

Next we will develop local expertise through training programs administered by our experienced teams of first responders and veterans on how to maintain and repair this technology. This technical education will be supplemented by information on how to conserve energy for essential functions of the rural village, so the village will have life-sustaining power during short (<8 days) and extended (<60 days) outages.

Finally our global network of volunteers will continue to be available to these communities electronically to ensure that they remain integrated with your distributors at Tesla until they have the capability to engage with suppliers independently.

Our project exists over a one-year timeline with the bulk of our work concentrated in a one-month period at the front end of the project. Our goal by the end of the second month is to have most of the capacity already built up so that the remainder of the project can be spent assessing and refining this capability. This hopefully will reduce the disruption for the community, reduce our costs and empower the community to take ownership of the project while guaranteeing they still have access to the resources, they need to be successful.

Over the course of our project a few of the key activities which contribute to our outputs can be monitored to ensure we're hitting our short, medium and long-term goals. These activities are the system installation, the maintenance trainings, the building of community protocols around the system, and the integration of maintenance responsibilities into local government duties. The attached timeline outlines our anticipated project progression.

With regards to the system install, the first stage of the project will be the confirmation of already arranged agreements. As mentioned in our project preparation we have been working with locals on the ground to secure support and permission for the physical installation, but we will spend the first week verifying these agreements to ensure mutual understanding before the install. During the second week we will begin work on the site, clearing the land and preparing the site as necessary and making sure its in line with our teams' expectations. The long-term viability of the project hinges on making sure the system is in a location that will continue to be accessible and is resilient to disaster. Once the site has been inspected and prepped our volunteer

[4] http://tools.poweringhealth.org/

team can begin installing the system over a three-week period. By the beginning of the second month our goal is to be able to complete the "Eye-Test" discussed in our means of verification. From this point on we will do monthly remote status tests using our black box monitoring systems and quarterly on-site status tests.

For the expertise building output of our project, we will be conducting trainings on how to maintain and repair the equipment we will be providing. These trainings will start one week after arrival so that we have time to advertise, schedule and identify an appropriate venue for the training that suits the communities needs. During the first week these trainings will be done in a classroom setting to establish a foundation. The second week of the trainings will coincide with the beginning of the installation and we will use this as an opportunity to provide practical training in the infrastructure. As we move into the third week of the training, we will shift some of the installation responsibility to the local trainees, under the guidance of our team, so they have direct experience working with the technology. The final step of the training will be a test to certify their competency which will double as another means of verification for our project. These tests and recertifications will continue quarterly until the end of the project to refresh the participants.

Another activity at the heart of our project is building up community protocols for the long-term maintenance of this system. We do not want to dictate how their community incorporates the system in, but we do want to begin to build a social framework for them to engage with the management. To do this we will conduct meetings with the community while we are on the ground discussing various aspects of our project with the long-term goal of shifting these meetings to community led forums. At the first meeting during week one, we will introduce ourselves to the community to begin building a rapport. At the second meeting, we will shift in to focusing on the technology to build introduce alongside the start of our trainings. Finally at the third and fourth meetings, we will attempt to shift the organization of the meetings to the community so that they can determine the most relevant topics. These forums could hopefully also serve as a source of qualitative feedback on our project on our return trips alongside the surveys we will conduct.

Finally, the last key activity that we will be conducting over the course of the project lifespan is the development of a legal framework to codify the maintenance of this infrastructure into the local government's responsibilities. This activity was added to connect the long-term success of the project to accountable individuals in the community. While we will continue to be accessible, we want this project to become a part of the fabric of this community and we believe this is the most effective way to shift the power and responsibility into their hands. We hope to move through the process of codifying these roles during the first month, but this is the activity which requires the most flexibility because the community will play a central role in determining how these jobs and tasks are assigned. Our role will be to drive the process and verify that it is being followed as the project runs its course.

Activity	Week 1	Week 2	Week 3	Week 4	Month 2	Month 3	Month 6	Month 9	Month 12
Install Systems	Confirm local property agreements	Inspect/Prep site for install	Begin install	Continue install	Complete install, "Eye-Test"	First on site status test	Second on site Status test	Third on site Status test	Final on site status test
Training		Begin 3 week training, Classroom stage	Begin practical training alongside install	Increase local role in install	Test participants, issue certificates	Refresh, Recertify	Refresh, Recertify	Refresh, Recertify	Refresh, Recertify
Establish Continuity Protocols	Community meeting to introduce team	Community meeting to provide overview of tech	Community meeting to impress importance of maintenance	Encourage continued meetings to ensure information shared		Host community forums to survey	Host community forums to survey	Host community forums to survey	Host community forums to survey
Integrate maintenance	Engage local leaders in project	Begin crafting binding legal framework	Engage community of framework	Institute newly defined government role	Adjust requirements as necessary	Collect timesheets, ensure compliance	Collect timesheets, ensure compliance	Collect timesheets, ensure compliance	Collect timesheets, ensure compliance

Budget

For this project, we will be working from a total project budget of $420,000 US Dollars. Most of our budget will go toward in-kind donations of Tesla technology, which our team will install on site. We are asking the Tesla Foundation for a donation of 20 6kw systems which have a market value of $260,000 as well as 17 Powerwalls at a market value of $115,000 for power storage. This amount is approximate and based on market prices so if company can donate at cost, our project expenses could be significantly reduced. Finally, we're asking for a donation of $45,000 US to cover the costs for transporting and housing our team for the three months we spend on the ground. This includes return trips to monitor the status of the technology and villagers.

Our decision to ask for 20 6kw systems reflects the needs of the target community. Each system can generate between 17.4 and 27.6 Kwh of electricity per day and we based our calculations on a conservative estimate of 17.4 Kwh. Our target community has a population of approximately 12,000 people making up 5500 households. Community agency is key to our proposed project and we will not dictate how the power is utilized, but our models are based on the goal of ensuring a small clinic can remain functional and each household can be lit.

We calculated that a small clinic can be run on 8.5 Kwh per day and 5500 homes can be lit for three hours per day on 330 Kwh. To generate this amount of power we would need 20 6kw systems operating at minimum efficiency. If the systems operate at maximum capacity, then emergency power can be provided by only 13 systems and the remaining systems can provide additional power to be utilized as necessary. This also builds in redundancy to the backup grid should some systems be damaged.

We are asking for 17 Powerwalls because this is the number recommended by Tesla to conservatively power 338.5 Kwh per day for a more than seven-day period assuming no power is generated by the panels. This amount of time should cover the immediate aftermath of any disaster and give the participants from our trainings time to get the system online without any power interruption. In the event of a longer emergency, the stored power could be prolonged by reducing the demands on the system to below our 5500 lit household threshold.

Relative to our equipment costs we have very limited personnel costs. This is do in part to the voluntary nature of our organizations which reduces our need for generous compensation but also to the limited nature of our on the ground work. The majority of personnel cost is transportation into the remote region via flights from the US. In total we will need to fly in and out the country four times, once to install the infrastructure and three times for our follow up surveys. Our in-country expenses will be limited because of the low cost of living, for example monthly housing per person is approximately $62 US.

This program is highly scalable. At a minimum we would like to provide the infrastructure to power essential services like clinics and ensure households have access to limited power however the more technology you provide the larger the scope of our project can be.

Category	**Projected**	**Notes**
Funding		
In Kind	$375,000	At market value
Monetary	$45,000	

Expenses		
Equipment		
Solar Panel Systems	$260,000	20 6kw Systems
Powerwalls	$115,000	17 Powerwalls

Personnel		

Transportation	$35,000	Flights into/out of Tacloban, travel to village
Housing	$5,000	Housing can be found in the city for approximately $60 US/month
Stipend	$5,000	Very low cost of living in region

Sustainability

Once installed, this project requires minimal expenditures for upkeep and ongoing maintenance. A benefit of this renewable energy source is that its moving parts are extremely limited, as the vast majority of the mechanics are static in nature. These staff members responsible for retaining control of such devices are individuals who will acquire the technical skills to conduct such maintenance be certified to do so. Providing a modest stipend to existing municipal employees, as described elsewhere in this proposal, would be an adequate amount of incentive beyond ensuring continuity of emergency response to a disaster in their own area. These laborers will be responsible for successfully preserving and managing this system's potential output if and when needed. With this structure in place, there is little need for assistance beyond the macro level. Regarding personnel financing, the municipality has agreed to provide this staffing and, in fact, has already allocated the funds necessary to accomplish this. Regarding land use, two acres have been designated by Leyte for this project, and will in no way be taxed, resulting in no property investment. Finally, this equipment has an expected life of 10-20 years if it were used daily. However, by only using it if/when there is an outage, the expected life of this 17 PowerWall system is approximately 50-75 years.

Evaluation Plan

Installation of our system

This is the easiest evaluation our team will produce. The evaluation will provide more than simple yes-no answers. The installation process will provide additional inputs to help Special Projects Team 1 develop legacy programs which can be replicated at other sites around the world. Utilizing these lessons learned are critical to understand so they do not recur.

Training Locals

The evaluation tools embedded with our robust training program will provide feedback which needs to be considered for the ongoing training. Understanding learning styles and cultural norms can only be planned to a specific point. The evaluation of the training program will take the understood values and determine changes for the future.

Real-world and simulated power outages

Evaluating the system in action is relatively straightforward. The Black Box will send messages regarding any changes to the electrical systems. This is the evaluative cue to trigger Special Projects Team 1 to reach out through satellite phones to the Leyte's to understand the current situation at the village. This two-way feedback can provide Special Projects Team 1 with needs that our NGO partners in the region may be better able to assist with. If the system malfunctions in normal-operating conditions, we can provide technical support by phone. If phone support does not solve the problem, we can deploy our subject matter experts to work with the trained villagers to correct any deficiencies.