Sustainable Energy Ecosystems for Decentralized Healthcare

Energy Access – Healthcare Nexus

Two statistics highlight the growing imbalance of development in India today. First – over the past three decades, the growth of top 0.1% of our population is equivalent to that of the bottom 50%. Second - every sixth person does not have basic energy access, and every third person gets electricity that is very unreliable. These two are closely interlinked. The absence of reliable education, healthcare and livelihood opportunities keep much of the rural populations trapped in poverty.

Access to reliable electricity acts as a further barrier for the delivery of basic services for the poor. Access to basic healthcare in remote rural areas can be challenging for multiple reasons. A patient that might have sacrificed a day's work to travel many hours to the Primary Health Center (PHC) might be turned back or referred to the next tier hospital, either because there is no doctor available, or there is no infrastructure to treat the patient, or there is no electricity to run the equipment when needed.

The result is either inadequate healthcare for that patient, or an increase in expenditure to avail basic care. A 2015 NSSO survey found that over 72 % of the rural and 79 % of the urban population rely on private hospitals for treatment. The average cost of treatment in a private hospital is four times that of a public hospital, draining the poor of time and resources that could've been put to more productive use.

SELCO Foundation leverages sustainable energy as a catalyst for inclusive development, by building an ecosystem that develops highly replicable innovations for making reliable services available closer to the doorstep of the poor.

At SELCO Foundation, we believe that Decentralized Renewable Energy (DRE) can improve healthcare delivery in the following three ways:

IMPROVE QUALITY OF SERVICES:

Existing services at the health centers can be made more reliable. Patients would not need to be denied a service for otherwise unavailability of electricity. For example, a baby needs to be kept inside a baby warmer as soon as it is born – if there is no electricity during this specific time, then the baby warmer is useless and the baby might suffer. Patients also don't need to be turned back or asked to return multiple times for a simple lab test (For details refer to the case study on Private NGOs delivering basic healthcare in remote areas), which reduces healthcare expenditure for the patients. Diesel usage and the associated expenditure can be very high in centers which have high footfall or those that offer additional services. DRE can reduce these expenses while also reducing environmental pollution (For details refer to the case study on Secondary Care in Tribal Areas). Reliable electricity for cold chain equipments can also reduce the wastage of vaccinations, and reduce the time wasted in shifting the vaccines to ice boxes during power outages (For details refer to the case study on A Clean Energy Cold Chain Technology for Healthcare Services).

IMPROVE QUANTITY OF SERVICES:

As the patients come to know that certain services are definitely available at the health center during the specified hours, the footfall for the health center also increases. The marginal increase in revenues from higher footfall can improve the financial viability of providing certain additional services such as dental and eye care (For details refer to the case study on Public Private Partnerships and Additional Services at Primary Care). More people tend to prefer health facilities where services are offered in a timely manner. The number of people treated can be increased by keeping the center open for longer periods in the evenings. Availability of reliable electricity can also push the administrators to increase the number of services available at that center, such as additional diagnostic equipment, vaccinations, blood storage, etc.

IMPROVE DOORSTEP DELIVERY:

The conventional health system today requires the patient to travel to a stationary health center. There are contexts where healthcare is being taken closer to the people, in the form of mobile clinics, tele-health, boat clinics, etc. For such decentralized models of healthcare delivery, DRE can be a good complement as accessing diesel and other fuels in remote areas is often challenging (For details refer to case study on Mobility in healthcare).

There is a tendency of health services to be more centralized as most of the health equipments are large, and manufactured to operate in an unlimited electricity context. With advancements in equipment efficiency, portable point of care devices and information technology, the combination of ultra-efficient devices powered by DRE would make it possible to re-imagine the delivery of health services, by further empowering front line health workers such as ASHAs and ANMs

Sustainable Energy Ecosystem for Decentralized Healthcare

A combination of appropriate, efficient medical equipment powered by DRE can enable more effective delivery of healthcare at the last mile. The long term sustainability of such interventions rests on understanding and developing a supportive ecosystem, which include the following:

NEED BASED SOLUTIONS

Just as the characteristics of people in every region are different, the health needs of every region also vary. The health centers, which essentially respond to these local needs, also have varying characteristics and therefore different energy requirements. The requirements of each PHC need to be understood and the DRE system optimally designed.

FINANCING

Energy interventions in health centers have the potential to reduce expenses both tangibly and intangibly. Reduction in diesel and electricity expenditure is an example of tangible savings for the health center, where as the availability of reliable healthcare can result in more lives saved, or reduce the out of pocket expenditure for the poor, which is a bit more intangible to capture. From the government's' point of view, more footfall at the PHCs due to reliable healthcare could reduce the cost of healthcare per patient. The financial sustainability of energy interventions in healthcare therefore need to be understood from a State level, rather than at a project level.

APPROPRIATE TECHNOLOGY

Innovations in health technologies need to be designed keeping in mind the resource constraints, logistical challenges and usability in rural contexts. Efficiency and portability of equipment become especially important, and can drastically reduce the cost of powering these services through DRE.

SERVICE NETWORKS

In remote contexts, failures in either the equipments or the energy systems can result in significant downtimes which would have adverse effects on health services. Care has to be taken to ensure that equipment manufacturers have service engineers stationed as close to the sites as possible to provide maintenance support. Training and engaging local energy enterprises with good service history in the installation and maintenance of these systems can ensure periodic servicing for the energy systems, increasing their reliability and durability.

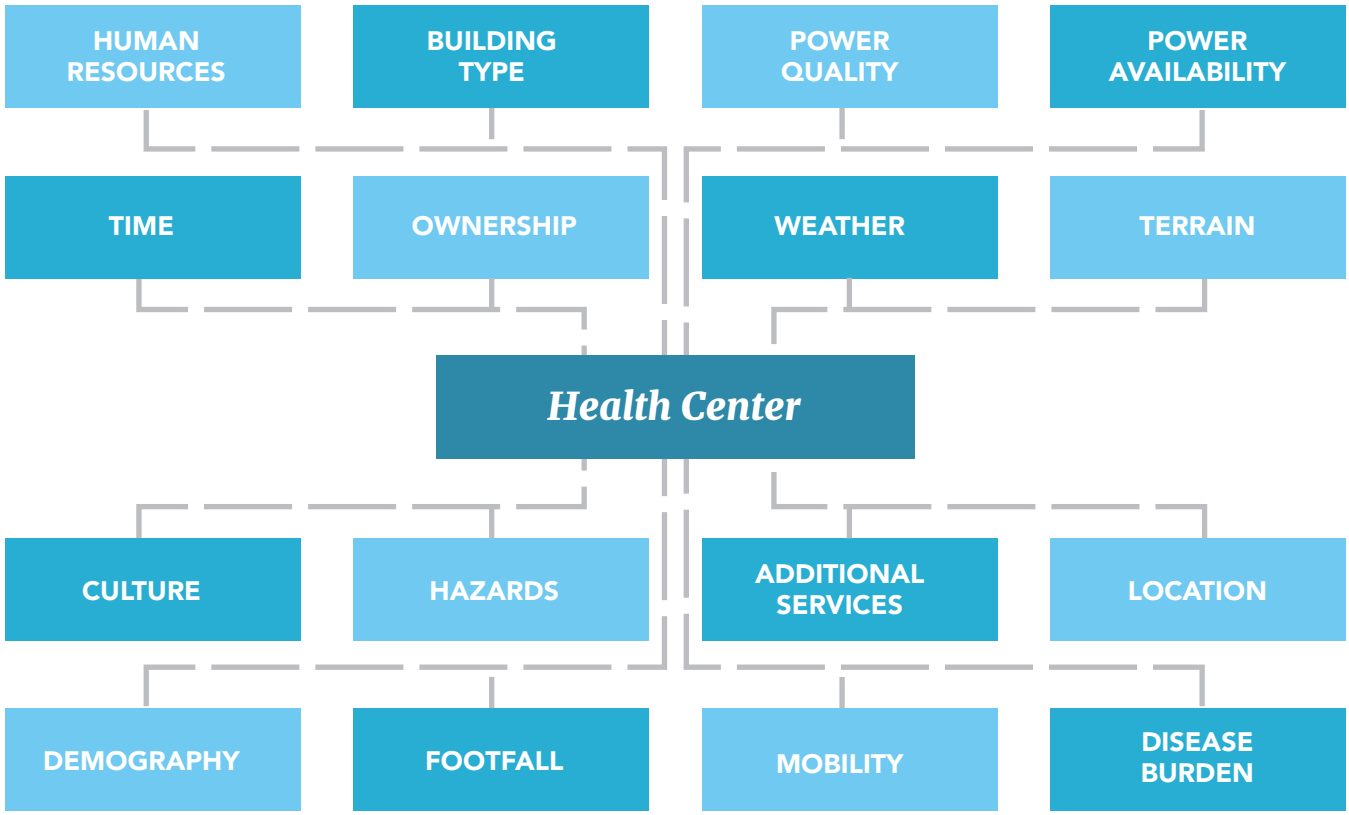
CAPACITY BUILDING

Training of local staff is crucial since they can optimize utilization of energy when power cut duration is more than initial design or during extended spells of bad weather. Being aware of basic maintenance procedures can help troubleshoot and resolve common problems such as burning out of fuse, refilling distilled water in batteries, etc.

Typologies of Healthcare Delivery

Indian Public Health Standard (IPHS) sets out guidelines for all PHCs, in order to address infrastructure deficiencies and nudge all centers towards a higher standard of care. In reality, each PHC would function slightly differently in response to the health needs and the local context of the location that the PHC is embedded in. The resulting differences in the type and extent of services delivered at the PHC can have certain specific energy needs which in turn have implications on energy system designs. A one size fits all approach to solar powering PHCs could result in the systems being either under designed or over designed, leading to sub-optimal use of financial resources and inadequate energy for critical health services.

A preliminary analysis of the typology of health centers resulting from SELCO's engagement with various health practitioners suggests at least 16 parameters around which health centers could vary. These parameters are related to the geographic (Location, Weather, Terrain), demographic (Demography, Culture, Footfall), operational (Ownership, Time, Building type, Mobility, Human Resources, Power Quality, Power Availability) and healthcare context (Disease Burden, Additional Services, Hazards) of the centers. The case studies that follow highlight a few of these typologies, and much work is needed to understand healthcare and energy needs in other contexts.



Case Study: Mobility in Healthcare

PARTNERS: *C-NES & Eastern Envo*

CONTEXT

The Brahmaputra River is one of the major rivers in Asia which flows through India, China and Bangladesh. This long and tiring journey has riverine islands inhabited by humans since a long long time. As the river flows through different channels it creates, it brings with it, seasons of aggression and peace putting human life and livelihood at great risks. For communities perilously living in flood prone areas, access to basic resources and opportunities is a perpetual challenge. River islands especially lack basic infrastructure and services such as healthcare, education, power, drinking water and sanitation. People risk the weather and flooding rivers, and make long journeys in difficult terrains to get basic health services such as vaccination, mother and child care, medicines, minor operations, etc. Medical emergencies can be particularly harrowing. Same challenges are prevalent across the sundarbans in Bangladesh, coastal areas of Rakhine in Myanmar, the lakes of Cambodia, and many other areas.

NEED

Centre for North East Studies and Policy Research (C-NES) in partnership with the National Health Mission, Government of Assam has been operating Boat Clinics providing primary health care to the remote island populace in the Brahmaputra and across it since 2005. The idea of boat clinics challenges conventional healthcare delivery models, which rely on a network of stationary primary health centers to which people must travel from far off places. A boat clinic takes healthcare to the doorstep of the people. Length of trips varying from a single day to several days, one of the biggest challenges that these clinics face is access to energy for powering basic health and communication equipment. Typically, all these loads are powered by a diesel generator, the use of which is limited by the amount of diesel that can be stored on the boat, resulting in the services being terminated early every day. Diesel is also difficult to procure on the islands, and the intense noise from the generator makes it difficult to work on the boat. Additionally, these loads being powered by a diesel generator is also harmful for environment and adds to the operational costs of the clinic as well as increases additional load on the boat.

SOLUTION

CNES and SELCO Foundation collaborated to understand the specific energy needs of such a mobile health delivery mechanism. The Jorhat boat clinic reaches out to around 17,000 people through 18-22 camps per month across 34 villages. The project took into consideration the need and utility hours of various energy driven equipments – lights, fans, laboratory equipments and audio-visual devices. An optimum solar system was designed keeping into consideration usage hours, criticality of the equipments and space available on the boat for the panels. In April 2017, with technical support from SELCO Foundation and Envo Business Solutions Pvt Ltd, the solar system was implemented and made operational. Retrofitting a boat with solar has certain technical challenges. Panels and batteries add over 500 kg, which needs to be balanced across the span - this is a worry for smaller boats than for larger ones. A waterproof space needs to be designed for batteries, panel mounting structures preferably made from aluminium to prevent rusting, and sturdy enough to withstand high wind speeds.

IMPACT

- All the equipments on the boat that used to run on diesel now run on solar, which means the boat itself has more diesel available to be able to stay on the river longer.
- In the evening, the services stay open till all patients are treated (especially for emergencies). The staff have more time at night to complete their work and for leisure, which has improved their wellbeing and level of satisfaction.
- The boat now has a solar powered vaccine refrigerator, making it possible to also start storing vaccines, medicines and lab reagents, which otherwise had to be stored in ice boxes for a limited time.
- The boat clinic is now upgrading the lab services to provide better diagnostic services to patients during their trips.
- The boat clinic at Jorhat is a pilot that will be submitted to the National Rural Health Mission for institutionalisation and implementation of other boat clinics in similar need and geographies.

Case Study: Secondary Care in Tribal Areas

PARTNERS: *Tribal Health Initiative & SELCO Solar Light Pvt. Ltd.*

CONTEXT

For communities living in remote areas, while accessing basic healthcare itself can be very challenging, availability secondary care is often lacking. For any basic surgeries or specialized treatments, people would need to travel to far away towns, often walking for long distances in the absence of motorable roads. This is the context of the remote, forested Sittilingi valley in Dharmapuri district of Tamil Nadu, inhabited primarily by around fifty thousand "Malavasis" or "Hill People". Here, the Tribal Health Initiative was started in 1992 by Dr. Regi George and Dr. Lalitha Regi to improve the lives of the tribal communities living in the Sittilingi valley and surrounding hills through a variety of programmes in health care and community health that will lead to better quality of life. What started as a small out-patient unit in a thatched hut is now a full-fledged 45 bedded secondary care hospital which sees more than 30,000 patients and does about 600 surgeries a year. The Base Hospital has two wards, a labour room, operation theatre and an ICU unit with ventilator beds. 24×7 running labour room is available with an attached neonatal ICU.

NEED

Being located in a remote location, the major issue the hospital faced was erratic power supply and low quality of power. Frequent voltage fluctuations and low voltage supply affected the functioning and the durability of sensitive medical equipment, especially in the operation theatre. Therefore, it was essential to run the Diesel Generator (DG) set for the entire day which costed THI on an average 15,000 INR/month as diesel expenses, and even more during summer when the power outages are more. Moreover, a dedicated person had to monitor the DG set during the surgeries making sure it runs continuously. Apart from being a highly polluting source of electricity, the noise from the continuous running of the DG set was not conducive for the peaceful hospital atmosphere.

SOLUTION

Primary solar system with maximum load capacity of 2500 watts and maximum 18 units per day has been installed. The system consists of a 6 kWp solar array, along with 200 Ah, 120 V battery bank & 10 kVA, 120 V Solar Inverter. During the operation time of the OT which runs twice a week, the solar system supports the loads like suction machine, anesthesia machine, patient monitor, shadow-less light, cautery, ventilator, air-conditioning machine and luminaries. On the day before the OT day, the same system powers an industrial grade autoclave to sterilize all the equipment required for the OT. In other times the system powers any load as required during emergencies. In this manner, the system is fully optimized to meet all the different functions of the OT. If one were to design for the OT and the autoclave loads simultaneously, the size and cost of the solution would be much higher.

IMPACT

- The biggest impact has been the assurance of smooth and reliability in the running of the Operational Theatre - increasing the confidence of the patients as well as the hospital staff.
- There had been instances when diesel would run out in the middle of the procedure and they would sometimes take 6-7 hours to get the diesel and refill (they need to travel to Salem to purchase diesel which is 80 kilometres away in a hilly terrain) and patients, doctors and relatives would have to wait. The operation theatre now provides uninterrupted service delivery.
- In an already resource constrained area, the process of procuring the diesel and operating the DG set would need to constantly engage one person, who now can be engaged for other purposes.
- Expenses on diesel have gone down significantly, as earlier they would have to purchase diesel once in every two weeks. The DG set is no longer used, except in the case of emergencies. THI is paying back part of the system cost over a period of three years, through the saving of INR 15,000 per month on diesel expenses. This can be a very replicable financial model for other hospitals in such contexts to produce their own energy and own the systems over time.
- Based on these impacts, THI is also considering solar powering their labour ward and the baby care unit. Energy efficient baby warmers and phototherapy units are being identified prior to designing the energy solution.

Case Study: Public Private Partnerships and Additional Services at Primary Care

PARTNERS: *Karuna Trust & SELCO Solar Light Pvt. Ltd.*

CONTEXT

Depending on the demographic characteristics of a region, there might be a need for additional health services such as eye care, dental care, blood storage, etc, which are typically outside the ambit of primary care. Consider an area with very high out-migration leaving behind number of elderly people who need eye care. The nearby PHC would most likely refer these cases to a higher hospital, which makes it difficult for the elderly to travel far and get treatment. An example of a PHC that goes the extra mile to provide these additional services is in Gumballi, in tribal dominated Yellandur taluk of Karnataka. Gumballi is unique compared to other PHCs since it runs eye care, dental care, and an eye operation theatre, in addition to regular services such as a 24x7 OPD, labour room, pharmacy and laboratory. This PHC is one of the pioneering examples of Public Private Partnership (PPP) between Karuna Trust and Government of Karnataka. Karuna Trust (KT) is a non-governmental organization established in 1986 to pursue innovative and sustainable approaches towards health and integrated rural development, reaching out in inaccessible areas where both public and private health services have hardly reached the poor.

NEED

Being located in a hilly region, poor quality of the power supply at Gumballi regularly affected the diagnostic services, dental services and minor surgeries in the eye OT. Despite schemes promising round the clock power supply, the center faces acute shortages in the summer. All the loads were powered by a diesel generator, which added to the operational costs of running the clinic. In case of prolonged power cuts or unavailability of diesel, the dental patients had to wait for hours or appointments had to be cancelled. Moreover, the population served by this health centre travel by bus, local transport or by walking long hours to reach the center. If an appointment is cancelled, the patient has to go back all the way and come another day, sacrificing that day's work.

"We are very happy that the dental unit is connected to the solar and now we have round the clock power to run the compressor and Dental chair. Before we used to send the patients back home due to power cuts, or they have to wait for long hours. Now more procedures can be done due to uninterrupted power supply. Now we also see many more patients, in fact double the previous numbers."

Dr. Sagar, BDS, Gumballi PHC

SOLUTION

In Gumballi, after a detailed audit of all the loads and their usage patterns, a 1.5 kWp Solar System was installed with 270 Ah, 48 V battery bank and a 2.2 kVA, 48 V Solar Inverter. The system can provide a back-up of 4.4 units of energy requirement of the PHC. The maximum load that can be connected to the system is 3200 Watt, and it includes equipments for dental care and eye care. The system sizing is considerably lesser in the case of Gumballi, as a much higher efficiency inverter was installed. In addition to the Gumballi PHC, Karuna Trust manages over 60 PHCs in different States, each operating in different contexts. SELCO Foundation is collaborating with Karuna trust not only to understand and bridge the energy gaps in some of these PHCs, but also to identify and test appropriate efficient technologies that can improve the quality or quantity of health services at the PHC, sub center and ASHA levels.

IMPACT

- In addition increased confidence among staff, the doubling of patients has also improved the financial viability of providing the dental service at the PHC. The dental service is now able to generate enough revenue to recover the costs. This makes a case for how such needed additional services can be viable in remote areas.

- Year on year comparison of the data at the PHC has shown improvement in terms of increased number of diagnostic tests done at the PHC and increased OPD patient footfall by 80% and 10% respectively. Moreover 14% reduction in referral rate is remarked when compared to previous year. It is difficult to link these improvements directly to the energy intervention, as there are other confounding factors which could affect the impact.

- On an average, around 27% of reduction in electricity consumption amounting to Rs. 800 was noted when compared to previous year, in addition to a saving of Rs. 3,500 per month on diesel expenses. In total, this amounts to almost 60% reduction in total expenditure on energy.

Case Study: Private NGOs delivering basic healthcare in remote areas

PARTNERS: *Swasthya Swaraj & Abha Innovations*

CONTEXT

Thuamal Rampur block In Kalahandi district of Orissa is a part of the Kalrapat wildlife sanctuary - incredibly beautiful during the winter months. However, the condition of the tribal households living here is in stark contrast to the green landscapes. Literacy levels are low, malnutrition high, and villages are rampant with malaria, scabies, tuberculosis and leprosy. Most of the women rely mainly on elderly women from the hamlet for delivery. Lack of awareness, combined with local social practices bring challenges around accessing the formal healthcare system itself, often necessitating doorstep delivery of health services. Swasthya Swaraj, a not-for-profit charitable society working in the region, was born out of the passionate desire and commitment of a small group of professionals (all women) to make a difference in the lives of the poor and poorest, the most neglected and the unreached. A team of doctors, nurses, paramedics and trained village youth run two 24x7 out patient centres. These centres provide primary health care of high quality; drugs and investigations free of cost or at affordable rates; laboratory and emergency facilities; and referral services.

NEED

While Thuamul Rampur block has a Primary Health Care center operated by the government, it is poorly staffed and not attended by doctors regularly. In these tribal regions, there is often no phone network to even call for ambulances, which are always in short supply. Even if ambulances are there, they cannot use these roads to get to the communities, and most people don't even own two-wheelers. Bus services, if they exist, would be to villages at least couple of kilometers away from these communities. Walking is often the only option left to seek healthcare. One cannot even imagine how it would feel to be turned away from clinics due to lack of electricity, after the sick have taken the effort to actually get there. Health centers at both these centers face severe power cuts, sometimes cut off for weeks at a stretch during monsoon. Critical electrical loads like microscope, centrifuge, colorimeter etc. are present in the laboratory; which need uninterrupted power supply without which the diagnosis would get delayed. Keeping aside the fact that reliably running tests or storing vaccines was not even a possibility, basic facilities such as lighting at night and fans for patients during severely hot days (over 45 deg C) also had to be run using petrol generator sets. Even when used conservatively, the center needed at least 10 litres of petrol every month, which had to be brought all the way from the district headquarters 70 km away.

SOLUTION

SELCO Foundation worked with Swasthya Swaraj to identify the specific devices that would need reliable, on-demand electricity access. With technical support from Abha Innovations, a 2kW solar system was installed to support the identified critical loads. The system was designed to also partly charge the batteries from the grid electricity. Because this region has very high voltage fluctuations, a voltage stabilizer was included in the package so that the batteries can charge effectively. A solar powered vaccine refrigerator was also installed here. The system is being upgraded now to also provide backup for higher power equipments such as slide warmer, drier and refrigerator. For remote areas such as this, systems should be designed with sufficient cushion and secondary back-up facility so as to not affect any services at any point.

IMPACT

- Number of lab tests and diagnosis have increased since having electricity access, therefore reducing the turnaround time for the patients. They are able to get the results faster, therefore saving an extra trip to the clinic.
- Private health clinics typically do not undertake immunization programs since it is the responsibility of the PHCs. In this region, since immunization has not yet covered a large number of population, and the fact that having a solar powered vaccine refrigerator now makes the storage of vaccines a possibility, Swasthya Swaraj is planning to also begin immunization.
- Diesel expenses have been reduced post the energy intervention.

Case Study: A Clean Energy Cold Chain Technology for Healthcare Services

PARTNERS: *Godrej Sure Chill*

CONTEXT

One of the key concerns in health care that arises due to lack of reliable energy is the need for cold chain technology to store vaccines and injections. The problem is widespread and the implications are very heavy. According to the country data report by WHO/NPHCDA, in India there are nearly 5000 health facilities that are not equipped with cold chain equipment like ILR (ice-lined refrigerators) and deep freezers. Nearly 3000 to 6000 individual pieces of equipment in health centres are not functional and need repair. The aforementioned health centres are equipped with undesirable technology (e.g. absorption refrigerators, domestic fridges etc.) which affects the quality of the immunization and increases the chances of adverse effects. Unreliable power supply also impacts the functionality and usability of ILRs and deep freezers. This hampers the effective routine immunization especially in remote and vulnerable communities.

NEED

During the existing interventions in the energy for health centres, practitioners mentioned a severe lack of a reliable cold chain technology. From sub centres, primary health care centres to district hospitals, this issue persists. The need for reliable and constant supply of energy is key as the vaccinations have a short shelf life, especially in hotter regions as the temperature needs to be kept at an optimum level. In case of prolonged power cuts, health centers spend a lot of time either in transferring critical vaccinations to ice boxes, or in some cases transfer all the vaccines to another health center close by. It is not uncommon for vaccines to be wasted in these scenarios. Finally, there is need for a reliable cold storage not only for vaccines, but also for lab regents, medicines, blood storage, etc.

SOLUTION

After a thorough market research, 'Godrej Medical Refrigerators with Sure Chill technology' for vaccine, medicine and blood storage was assessed as the most efficient as there are no inverters or batteries involved with a long hold over time of approximately 2 weeks without any sun either. The refrigerators have AC and DC versions suited for different types of energy solutions and are guaranteed to store as per medical guidelines. Benefits of the technology include -

- Non-freezing guarantee since freezing damages the potency of drugs
- Minimizes thermal shock by ensuring that the stored product is untouched by power fluctuations
- Thrives under difficult circumstances and weather conditions to suit various geographies
- Patented technology that has proven its efficacy
- Long term asset investment for medical storage
- Compliant with global standards - currently being tested for WHO prequalification
- Currently being used in over 30 countries

IMPACT

- These PHCs are now equipped an efficient cold chain technology to help store the vaccines, medicines etc with no repercussions due to power outage. There is no wastage of vaccine vials due to power cuts.
- Health centers which have not so far been involved in immunization programs are now considering starting immunization, because of the availability of a reliable storage mechanism through the surechill. This is true especially for mobile health services such as boat clinics, where the increased hold-over time is beneficial.
- The existing SureChill does not have a deep freezer, which is still critical in order to prepare ice packs so that the vaccines can be taken to the sub centers in ice boxes during immunization drives. Based on this feedback from the practitioners, Godrej is also working on a solar direct drive refrigerator that includes a deep freezer.

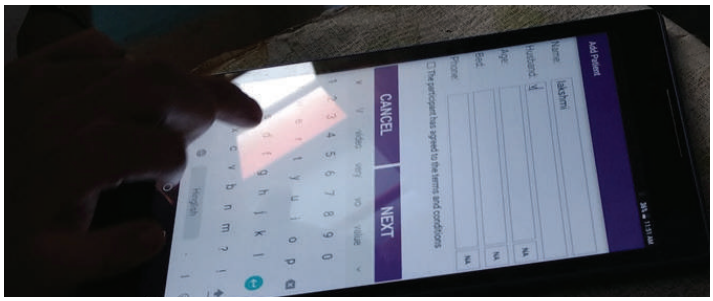
Ongoing Pilots

COMPREHENSIVE MATERNAL CARE KIT

A maternal kit with all the required equipment which are to be made available to ANM and ASHA auxiliary health workers which is portable and in place for any required assistance before, during or after childbirth. The kit will include the basic equipment for maternal and child care including ANC, PNC and Birthing, basic treatment kits for management of Eclampsia and PPH, e-Parotgraph (tablet), a Clean delivery kit, Baby warm Jacket and Ambu Bag and basic diagnostic kits. The equipment will be powered by Solar system (which includes solar panel, Li-Ion Battery, Charge Controller, AA/AAA battery charger, 12-volt DC points) it will also support charging point, 3 Watt LED Lamp and a headlamp

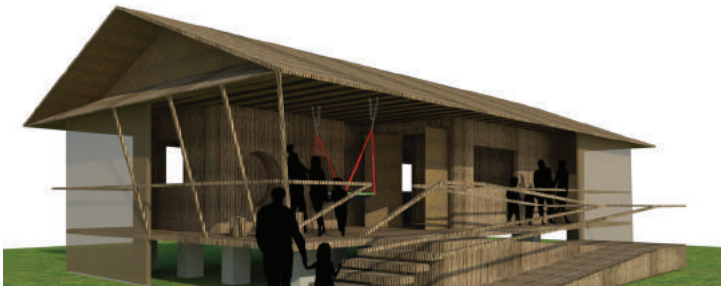
BREATH COUNTER

Pneumonia is one of the 3 major killers upto the age of 5. Counting breaths per minute is a simplest way to detect abnormal breathing which may be an early indication of pneumonia in infants. Health workers in remote communities have limited literacy and clinical skills. Maintaining coordination between counting breaths and keeping time while remembering cut-offs for different age ranges is difficult. In collaboration with Jan Swasthya Sahyog (Bilaspur), SHRC (Chhattisgarh), SF and Remedio have redesigned the breath counter, a device where health worker needs to input data for age range and press counter button for number of breaths observed. The counter switch counts up to one minute and gives alerts based on pre-fed data on cut-offs.



E - PARTOGRAPH (LABOUR CONNECT)

The partograph is a form on which labor observations are recorded to provide an overview of labor, aiming to alert midwives and obstetricians to deviations in labor progress as well as maternal and fetal wellbeing. Partograph use was associated with less maternal blood loss and neonatal injuries. When adequately used and timely interventions taken, the partograph was an effective tool. Labor Connect is a Mobile tablet based intelligent labor monitoring tool which not only allows the staff nurse to register and enter vital signs of a pregnant woman but also reminds to monitor the labor vitals, as per the standard WHO intrapartum protocol. It also generates alerts in case of complications, based on an in-built algorithm. The doctor at a remote location can also view the live labor progress and guide the staff nurse.



BUILT ENVIRONMENT- SUB CENTRE (SC)

Sub Centre is the most peripheral and first contact point between the primary health care system and the community. One Sub Centre is to cover a population of 3000 in Hilly / Tribal / Difficult areas and 5000 in Plain areas. Each Sub-Centre is required to be manned by at least one Auxiliary Nurse Midwife (ANM) / Female Health Worker and one Male Health Worker. The project aims to provide primary health care access to rural/tribal areas across the country through the provision of basic infrastructure and improving efficiency of the same. The project aims to demonstrate a scalable models that are customized to geographical requirements and improve efficiency of built structure with active involvement of the community partner and utilising the locally available materials.

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FOUNDATION

www.selcofoundation.org

For enquiries contact: info@selcofoundation.org

#690, First Floor, 15th Cross, 2nd Phase,
100 Feet Road, J.P Nagar, Bengaluru - 560078

Phone: +91 80 2649 3145