

Energize the Chain Initiative

By Dr. Harvey Rubin and Judah Levine

People living in the rural regions of developing countries are often deprived of local healthcare facility access. With more than 2 million persons¹³ dying each year from the unavailability of vaccines, local solutions to ensure vaccines are available and efficient in rural and off-grid regions have to be developed. **Energize the Chain (EtC)**, a recently formed, not-for-profit organization, aspires to eradicate vaccine-preventable deaths worldwide by preserving the vaccination cold chain to ensure delivery of active vaccines. At the simplest level, EtC proposes to use power installations at cell towers as the energy source to power vaccine refrigeration units in remote locations that currently lack the energy infrastructure needed to preserve the cold chain. The project is currently seeking new partnerships with mobile operators and international foundations.

Preserving the Cold Chain for Vaccine Effectiveness

Many vaccines must be kept at a prescribed temperature to maintain their potency. Typical distribution models have relied for now on delivering vaccines to remote destinations in insulated cold-boxes. Disruption of the “cold chain” that ensures temperature-sensitive vaccines remain effective cripples these prevention efforts, and in the absence of thermo-stable vaccines, preserving the vaccination cold chain requires immediate focus. This approach requires that vaccines be administered almost immediately upon arrival, as the cold-boxes are limited in their ability to maintain the necessary temperature conditions (between 2°C and 8°C). Due to these limitations, vaccines often either freeze or exceed their upper temperature range and are rendered virtually useless.

The Vaccine Cold Chain Utilizing Cell Tower Power Facilities

Approximately 75% of the world is covered by a mobile cellular signal, and that percentage is expected to reach nearly 100% by 2015¹⁴. This expansion of mobile coverage transports the presence of energy by necessity to remote locations, many of which are otherwise without access to centrally provisioned power. In off-grid regions, cell towers offer a constant supply of energy, sourced from any combination of diesel generators, battery backup, gas turbine, renewable energy, and other options.

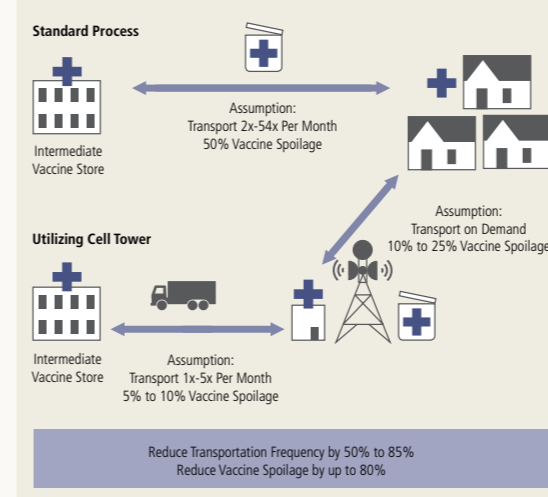
Figure 21. Energize the Chain Concept to use Cell Tower power for Vaccine Fridge



Source: EtC, HipConsult

Access to refrigeration at these remote destination points would enable vaccines to be stored for longer periods of time. This would allow for a critical mass of vaccines to be delivered at one time, warranting the use of a transportation vehicle (e.g. a refrigerated truck). This vehicle would provide more stable temperature conditions than a cold-box, thus preserving the integrity of the vaccines and eliminating the pressure to immediately administer them. All of this would not only improve the integrity of the vaccines but also reduce costs.

Figure 22. Illustrative View of Efficiency Opportunities in Vaccine Cold Chain Using Cell Tower Power Facilities



Source: EtC, HipConsult

A typical vaccine-storage refrigeration unit requires at least eight hours of daily power supply¹⁵. Harnessing the energy potential of cell tower facilities provides the means to power these refrigeration units. Research shows that base stations often have a surplus of power capacity of about 5kW for a diesel generator powered BTS and under 5kW for a BTS powered by alternative energy sources¹⁶. Considering that a refrigerator unit consumes between 0.5 – 1.9kW¹⁷, there is ample power at most cell tower sites today to supply refrigeration units. Many tower sites also have some spare land available to support an additional shelter for these units.

The Potential Socioeconomic Impact

The numbers of lives impacted by increasing the delivery and access to effective vaccines may extend well beyond the two million lives lost to vaccine-preventable illnesses each year. It is estimated that under the current coverage of vaccine delivery and utilisation, there are almost 400 million life years saved and 97 million disability-adjusted life years saved annually by vaccines. The same study showed that there are almost six million deaths prevented annually by vaccination¹⁸.

The Potential Business Impact

While the opportunity to extend and sustain the vaccination cold chain is clearly compelling from social and macroeconomic standpoints, the attendant challenge is to identify a suitable business model which will allow for a scalable implementation and sustainable operation of this concept. Due to the lack of proven business models, initial funding will need to come from governmental agencies, foundations and other public and private not-for-profit sources. Pilot programs will likely be funded by one time grants, with the goal of working the projects into a more sustainable government or NGO budget. Once the economics of a business model are solidified, then private enterprises may be compelled to enter this space, creating a more competitive and dynamic market which focuses on the cold chain application or uses it as an anchor tenant to support other services.

Energize the Chain is hoping to demonstrate a proof of concept that using cell site refrigeration will help to improve vaccine integrity and reduce costs in the cold chain. In order to do this, it will need to take on the capital and operating expense required to support the refrigeration site. Economic benefits from this are only realised if EtC participates in the portions of the cold chain where costs are reduced; primarily vaccine spoilage and transport efficiencies. While EtC's concept is in its nascent stage, many stakeholders have expressed enthusiastic interest in the program. Currently, EtC is pursuing multiple options for early sites, including locations in India and Africa, and is developing the initial pilot to take place in Andhra Pradesh, India. In many of the potential early locations, EtC is working with representatives from the government agencies that currently administer most of the vaccines.

13. WHO
14. World Telecommunication/ICT Development Report 2010. "Monitoring The WSIS Targets: A mid-term review." International Telecommunication Union.

15. UNICEF. "Handbook for Vaccine & Cold Chain Handlers 2010." Department of Health and Family Welfare. Ministry of Health and Family Welfare, Government of India.
16. "Community Power. Using Mobile to Extend the Grid." The GSM Association Green Power for Mobile. January 2010.
17. Harvey Rubin, Alice Conant: Energy for health: Cell phone expansion and disease prevention.
18. Table 4 in Ethreth, J., The Global Value of Vaccination. Vaccine (2003) vol. 21, 595-600.

Base Healthcare Model

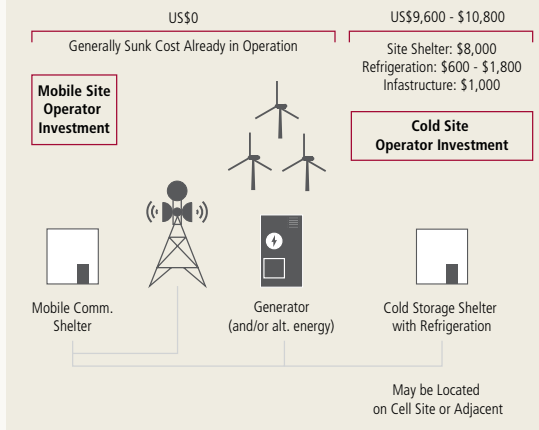
Cold Storage Provider

- Leases land and power from site operator
- Builds and maintains cold storage

Funding Sources

- Government funds via direct involvement, grants or sponsorship
- Private investment in non profit
- Hybrid government and private investment and/or use of government subsidies or incentives

Figure 23. Base Healthcare Model for Cold Storage at Cell Site



Source: ETC, HipConsult

Early initiatives will be primarily public sector funded, with private operations potentially developing once a business model is proven.

A mobile operator or tower company, which already operates the power generation at its sites, would be the logical support provider for co-located refrigeration shelters. In terms of pure business merit, supporting the power and shelter requirements for vaccination could represent a high margin business, but requires scale and contains risk (i.e. a simple reality whenever dealing with peoples' lives). However, there are other indirect benefits that may be attractive to operators, such as social responsibility and community goodwill.

The revenue opportunities in supporting this application are multi-fold. Initially there is the straight forward opportunity of selling power as well as leasing land and offering site management services. In the base healthcare model, the cold storage provider leases the land and power from the site operator. This may generate an additional US\$400 to US\$1,200 per month per site using excess power¹⁹. The margin on these services is high as the investment is sunk and the site is already in operation. Investment in additional power capacity to supply larger refrigeration units could double or quadruple revenue at somewhat lower margins provided demand exists. Beyond the direct revenue potential, there is an opportunity for the operator to offer value added data services related to the refrigeration units and the shelter, such as remote monitoring and alarming on temperature ranges and unit operation, inventory control and tracking, and security monitoring.

If you are interested in additional information about Energize the Chain, please contact:

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19. Estimates based on market land lease and power circuit rates