PROJECT EVEREST

Handover summary

Energy Assessment | Malawi

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Foreword

The team has been working on a small scale solar solution to address the issues of energy security. Blackouts can vary between 10 minutes a day to eight hours of electricity in three days. Some of the wealthier Malawians we interviewed are able to spend up to 10,000 MK per four days to power various luxury appliances such as TVs while others struggle to pay 100 MK to charge their phones. The team in December saw an opportunity to create a basic solar product to aid communities in the lower income bracket with basic necessity such as lighting and phone charging. The product aims to empower the people to greater energy security, which could help improve work, health and education. The team has created and sent the prototype to communities, such as Nancholi and Mlanga, to test. The prototype was well received but work still needs to be done before it can hit the market. The two main focuses for the incoming team should be the logistics of becoming a business in Malawi and the technical aspects of making a safe and effective solar system.

1. Executive Summary

Energy assessment in Malawi is currently focused on providing greater energy security and access throughout Malawi, with the current idea being ModSol. The goal of ModSol is to establish the feasibility of developing a small scale solar charging system. Financial difficulty coupled with lack of energy infrastructure means 90% of the population is not connected to the national grid, ESCOM. This is particularly difficult for those that live rurally, which means that cycles of inequality continue, with little chance for education and work to break these entrenched systems.

Through the team's research a need for energy security was identified, and a space for social impact defined. From this the project team has created an affordable off-grid energy solution. This is initially aimed at powering lights and phones, but with the possibility of expansion into larger scale systems.

For this project to move forward there are two equally important aspects that need to occur. The first is sorting out business logistics and creating a legitimate business in Malawi, and the second is improvement through market research and ensuring that the solution the team creates adds the social benefits to the greatest extent possible.

2. Ownership structure

Project Everest is in the process of registering an international business in Malawi. Future ownership structures will evolve with the business.

3. Products and services

ModSol will offer small scale modular solar products that are marketed in liaison with proposed strong educational and after sales service programs. The current prototype that has been used for market validation needs to be further developed into a baseline product.

3.1. Current prototype

Made out of a solar panel, a lead acid battery, a USB car charger and an improvised casing (see appendix), this device will generate an average of 20 to 40Wh a day, depending on the season and weather data specific to Blantyre. However, it may peak at around 60-80Wh under ideal conditions (see current prototype yield). Hence, without considering conversion losses, the prototype can charge 2 to 8 phones (assuming 10Wh required for charging a 2000mAh

phone) in a day or charge the buffer battery in 1 to 4 days, weather dependant. The assumption of 200mAh is based on a smartphone typical of developed countries, it is more likely that the phones needing to be charged will be closer to 800mAh, but more research on the exact type of phones that will need to be charged needs to be conducted as in the areas already connected to the grid there is a level of smartphone saturation.

3.2. Future development of baseline product

Cost reduction and price per watt are critical success factors for the baseline product. Eliminating the battery reduces cost substantially. Likewise, designing a 5V (6V Voc) solar panel may eliminate any conversion requirements and should be sufficient to charge a phone or a battery light in less than a day. Such a solar panel, equipped with a female USB socket may become the baseline product of ModSol to start with, in order to establish the starting price point and provide a low cost solution (see appendix).

Out of these panels, an array of panels in parallel can be created to enable modularity using Y-USB cables. A modular battery based on NiMh or Li-Ion cells may be offered as a complimentary product. A charge controller (5V to 4.2V for Li-Ion) may be designed. Battery cells could then be stacked on in a ‘lego’ like design, which arranges cells in series (see appendix). These designs are open to change, such as replacing the Y-USB cables with alligator clips or other methods of connecting solar panels in parallel.

4. The Market

Unifying factors across the whole market are frequent blackouts, little exposure to solar and high entry barriers to solar products caused by absence of education, limited availability and high prices of low quality products. As a result, penetration of solar solutions is extremely low to non existent.

For maximum social impact, ModSol should initially target the segment of people (see customer profiles below) within reach of the electricity grid due to the higher spending power and device ownership. However, the other segment will be just as viable in a later stage once the product is bundled with sound financing options. Therefore, the relationship to village elders in Mlanga, a community without access to grid electricity, should be upheld and further surveying is recommended.

In a later stage, ModSol may also target more affluent segments with larger solar solutions able to power entire households.

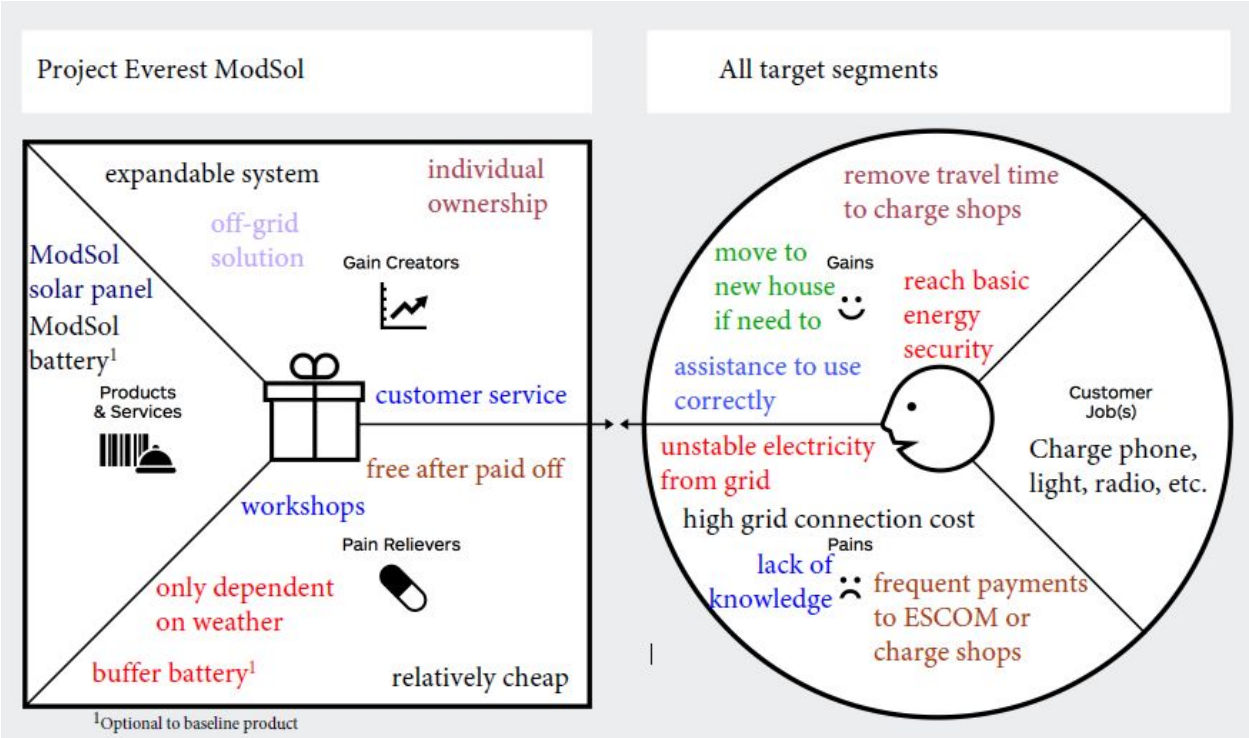
See Appendix for a more detailed description of the market and Mlanga.

Variable\Segment	Within reach of grid	Without reach of grid
Location	Suburban - rural	Suburban - rural
Household size	6	5
Spending on charging phone, batteries per month	MK 3,420	MK 1,751
Spent on grid electricity per month	MK 3,190	-
Has a phone	Yes	Likely (66%)
Has a torch/lights	Very likely (85%)	Likely (60%)
Would buy ModSol for MK 15,000	Somewhat (54%)	Yes (93%)

5. Market Research

Out of the surveys, customers' jobs, pains and gains evolved. In response, a value proposition for ModSol was developed. The biggest pain was unavailability of electricity from the grid, either because respondent were not connected or due to the frequent blackouts. ModSol would relieve this pain by offering an off-grid solution that only depends on weather conditions. With an optional buffer battery, dependence on weather can be further reduced so that customers would eventually reach energy security.

Raw survey data can be found here and a description of the survey process can be found in the appendix.



6. Marketing Strategy

The main goal is to create a strong brand reputation through close customer relationships that converts customers need for electricity into a want for solar products. Initial sales are likely to be made through endorsement by community leaders and village elders, particularly those that we are currently surveying with. This will allow close contact with those the sales are made to initially and a solid feedback loop from them. This will likely lead to word of mouth sales as well. The most likely marketing channels when the business is fully running are the following:

6.1. Channel 1: Flagship stores

One viable channel would be opening up ModSol owned and operated flagship stores at central locations within the communities (e.g. at community centres, markets, etc.). Customers may come to these places for other purposes, see the store and would probably start engaging with the products on display. Sales personnel must be well educated and should provide counseling as well as sales services.

6.2. Channel 2: Workshops / Educational Programmes

Since knowledge around solar is limited within the target group, educational workshops will help potential customers to understand the product, which may lead to creating a want based

on their need for electricity. Similar to flagship stores, workshops must be organized at central locations within the communities, e.g. community centres, schools, churches, etc. ModSol products should be available for sale after each workshop.

6.3. Channel 3: Social media / Telemarketing

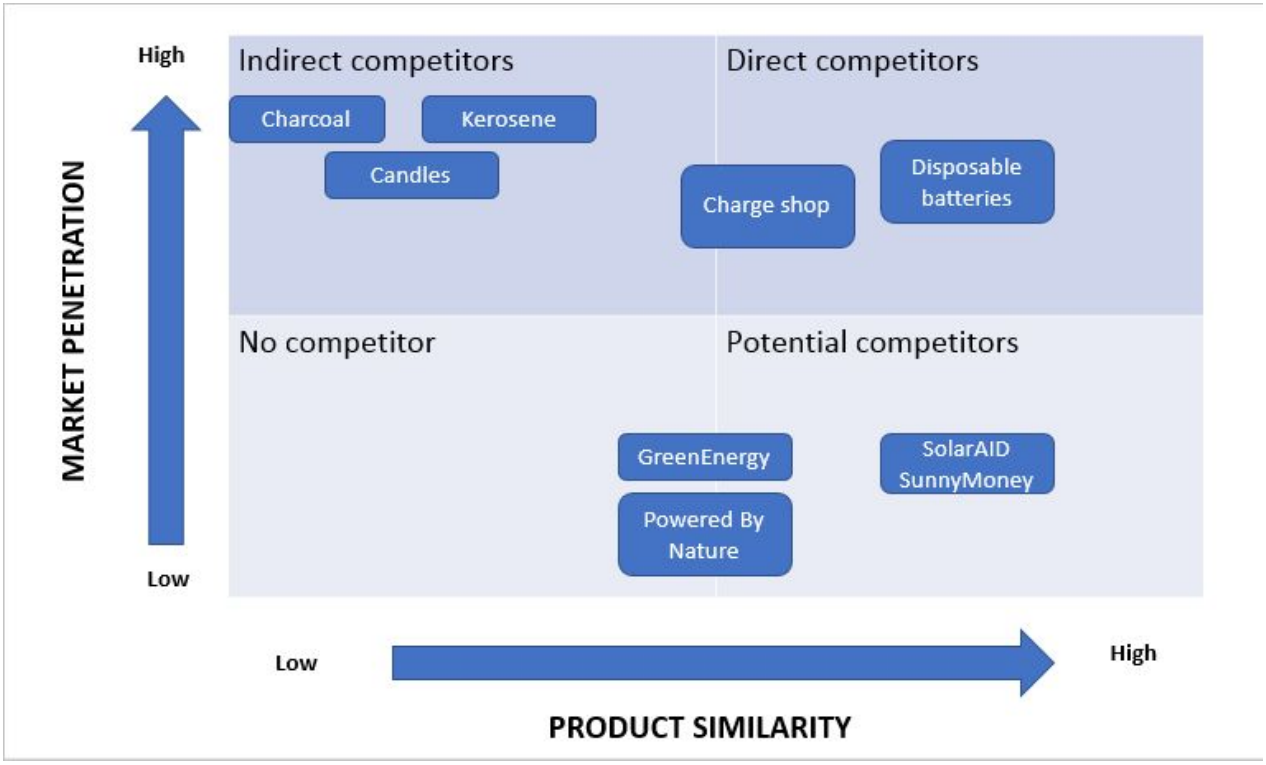
Facebook, WhatsApp as well as traditional calling and texting should be explored as crucial marketing channels. A Facebook page in liaison with FB Messenger/WhatsApp can be costly to operate but could be used for advertising as well as providing customer services. For the large portion of customers without a smartphone, a customer service hotline should be considered. Viability must be tested and cost discovered.

6.4. Channel 4: Word of mouth

Word of mouth should naturally evolve from the other channels, particularly the educational channel.

7. Competitor Analysis

In terms of enabling lighting, kerosene lamps and candles dominate the competitive landscape. Next to these traditional solutions, phone charge shops and disposable batteries power small electronic devices. Three major players, SunnyMoney, Powered by Nature and Green Energy, are active in Malawi with different solar product ranges. However products or advertising were almost completely absent in the areas surveyed and day to day observations. As a results, there is a huge undersupply of solar products in many areas of Malawi as these companies struggle to penetrate the market. Below graphics shows the competitive landscape.



8. Operations and Logistics

Supply chain and associated logistics will develop as ModSol grows. In the short term, Project Everest will take responsibility of all parts of the supply chain enabling ModSol to become a business. At this stage, strongly cooperating with Polytechnic University, RENAMA, an NGO promoting and distributing Pico Solar systems in Malawi, and community centres (e.g. NAYO in Nancholi) would be beneficial.

In the long term, parts of the supply chain may be outsourced to third parties either creating industry infrastructure or transforming existing infrastructures. Further detail can be found in the appendix.

Supply Chain	Design Product R&D	Importing / Materials sourcing	Assembly	Distribution	Retail
Short term	ModSol will own and operate product engineering functions. In the short-term MVPs need to be developed and test.	ModSol will use in place importers for parts sourcing. Consumables may be sourced through Polytechnic.	PE Trekkers and may be interns from Polytechnic will assemble the first 50-100 units. Workspace may be available at Polytechnic or must be developed at PE house.	ModSol will use direct selling techniques for the first 10 units. Distribution systems for the next 50-100 units must be developed. A potential partner would be RENAMA.	ModSol will sell the first 10 units directly to leads in Nancholi or through NAYO clinic. The next 50-100 units may be sold in cooperation with RENAMA or other organizations.
Long term	ModSol or a local subsidiary in Malawi will conduct R&D in the long term.	ModSol will either obtain an importing license or create long-term partnerships with established importers for bulk importing.	Ideally, student interns may be converted into entrepreneurs who continue to assemble for PE, either under a license or make-to-order regime.	Distribution channels must be developed to enable retail sales. The existing charcoal distribution channel may be considered as a viable push system.	ModSol may open flagship stores for own retail in communities. Flee markets, electronic stores, charcoal sellers may be used in conjunction if properly educated.

9. Cost and pricing strategy

9.1. Cost of Goods Sold (COGS)

Only determined for the minimum viable product, i.e. a solar panel with USB socket, the COGS range between MK 2,313 (USD 3.19) and MK 5,148 (USD 7.10), largely depending of the quality of the solar cells and panel configuration. For an overview of cost estimates see here.

9.2. Operating Expenses

Using market based pricing, operational expenses are limited to the extent customers can pay and should not exceed 50% of total revenue (before taxes).

In the short run, the burden of operating expenses is carried by Project Everest's start-up structure. Hence, Trekkers will be responsible for the operations. Expenses to be determined in the future are related to the following activities:

General / business admin	Sales & Marketing	After Sales
• Operation license • Pensions • Taxes • Insurances • HR/management • Accounting • Admin • R&D • Transaction costs • Stakeholder relationship management	• Shop space/rent • Wages (Shopkeeper/sales people) • Training • Utilities • Advertising • Furniture & equipment (e.g. registers, PCs) • Office supplies • Billing • Workshops / education programs	• Wages (Customer service staff) • Phone/internet bill • Transport (customer visits) • Returns/warranty • Payment collection • Retention programmes

9.3. Pricing strategy

Sales prices should be determined by a combination of cost based and market based pricing strategies. In other words, pricing strategy should reflect the amount customers spent currently on electricity for lighting and charging phones, which is MK 3,422 on average per months across the initial target group. This translates to roughly MK 20,000 over 6 months and MK 40,000 over 12 months, if a payment plan is used. However, risk associated to consumer lending is currently priced at 27.5% p.a. in Malawi (Phiri, 2017). Thus, after deducting the risk premium, customers are able to spend MK 17,250 or 29,000 repaid over 6 months or 12 months respectively.

The segment without grid connectivity may be converted into viable customers by offering only a payment scheme over 12 months or longer due to the average monthly energy spending of MK 1,751.

10. Financial Analysis*

The cost and pricing strategy allows for a sensitivity analysis by assuming three scenarios.

1. **High:** ModSol is sold for the maximum the market can bear whilst produced at highest cost
2. **Low:** ModSol is sold for a lower price and made out of the cheapest materials
3. **Ideal:** ModSol is sold for a lower price whilst produced at highest cost

Based on these assumptions the following income statements per unit were calculated. Since sales forecasts were not conducted exceeding the first two sales phases of 10 and 100 units per phase. Pro forma income statements for both phases and more explanations can be found here.

*These assumptions were made based on desktop research on a theoretical business based on the limited research conducted. Reasonings for these numbers can be found in the appendix, but this needs verification before it can be assumed as true.

	High	Relative High	Low	Relative low	Ideal	Ideal relative
Sales	MWK29,000	100%	MWK17,250	100%	MWK17,250	100%
Revenue after VAT	MWK24,215	84%	MWK14,404	84%	MWK14,404	84%
COGS	MWK5,148	18%	MWK2,313	13%	MWK5,148	30%
Gross	MWK19,067	66%	MWK12,091	70%	MWK9,256	54%
Operations	MWK12,108	42%	MWK7,202	42%	MWK7,202	42%
EBIT	MWK6,960	24%	MWK4,889	28%	MWK2,054	12%
Corporate tax (30%)	MWK2,088	7%	MWK1,467	9%	MWK616	4%
Net profit	MWK4,872	17%	MWK3,422	20%	MWK1,438	8%

11. Contingency planning

There were various risks found within this business, and these can be divided into operational risks and risks when the business interacts with the market.

11.1. Operational Risks

There are various licenses that are required to operate within solar in Malawi, and if these are not obtained ModSol will be unable to become a legitimate business. A license is required from MERA to import, sell, install and maintain solar products. A licence is also required by the MBS to ensure products are compliant to Malawian standards. If either of these licences are unable to be obtained the business will need to reevaluate its main products, or follow up on suggestions by the relevant authorities.

11.2. Market Risks

There are always risks working in a foreign market. In the manufacturing aspects the main risk is a lack of knowledge about the local work culture, with risks such as individuals not turning up to work shifts or scheduled meetings high. This means that there needs to be a recon period where local culture is established, and a fudge factor created for unexpected surprises.

The other aspect of market risks is that our target demographic doesn't understand our product enough to use it appropriately. Part of the licensing requirement is a warranty, but there needs to be clear education programs and instructions so that consumers are unable to break the product and blame it on Project Everest, as well as ensuring that they are getting the greatest benefit out of the product possible.

12. Next steps

The next team should sell 10 MVP units within a month on project. Therefore, obtaining an operational license is crucial and the process must be initiated immediately upon commencing project. The waiting period should be filled with gaining access to Polytechnic's students and workshops for developing the MVP. From there on, parts need to be sourced. Based on the input parts, the cost of making an MVP need to be established, which would then be used to set appropriate pricing. After a cash flow analysis and sales preparations, the team should rent or sell 10 units to test the MVP. Included in this document is the suggested actions for the next month, with the full roadmap for the business being available in the appendix.

PROJECT EVEREST

13. References

Kerosene VS Solar | SunnyMoney - Life is Getting Brighter. 2017. Kerosene VS Solar | SunnyMoney - Life is Getting Brighter, Viewed 19 December 2017 http://www.sunnymoney.org/index.php/about/kerosene-vs-solar/.

Phiri, G. (2017). More banks cut base lending rates. The Nation, [online]. Available at: http://mwnation.com/banks-cut-base-lending-rates/ [Accessed 20 December 2017].

14. Appendices

Prototype Schematics and plans for future development

Summary of Draft Malawi Renewable Energy Strategy

Roadmap

Useful readings - small scale solar solutions & concepts