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Solar Lanterns in Blantyre, Malawi

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The Millennium Cities Initiative (MCI) is a project of The Earth Institute at Columbia University, directed by Professor Jeffrey D. Sachs. It was established in early 2006 to help sub-Saharan African cities achieve the Millennium Development Goals (MDGs).

As part of this effort, MCI helps the Cities to create employment, stimulate enterprise development and foster economic growth, especially by stimulating domestic and foreign investment, to eradicate extreme poverty – the first and most fundamental MDG. This effort rests on three pillars: (i) the preparation of various materials to inform foreign investors about the regulatory framework for investment and commercially viable investment opportunities; (ii) the dissemination of the various materials to potential investors, such as through investors' missions and roundtables, and Millennium Cities Investors' Guides; and (iii) capacity building in the Cities to attract and work with investors.

The Vale Columbia Center on Sustainable International Investment promotes learning, teaching, policy-oriented research, and practical work within the area of foreign direct investment, paying special attention to the sustainable development dimension of this investment. It is a joint center of Columbia Law School and The Earth Institute at Columbia University.

A separate MCI working papers series on the social sector is also available.

For more information, please refer to the MCI website at: http://www.earth.columbia.edu/mci/ and the Vale Columbia Center website at: http://www.vcc.columbia.edu/.

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List of abbreviations

CI	Confidence interval
COOP	Cooperative organization
CBS	Columbia Business School
HH	Households
IRR	Internal rate of return
MCI	Millennium Cities Initiative
MDGs	Millennium Development Goals
MERA	Malawi Energy Regulatory Authority
MIPA	Malawian Investment Promotion Agency
MOU	Memorandum of Understanding
MRA	Malawi Revenue Authority
MRFC	Malawi Rural Financing Company
MVP	Millennium Villages Project
MWK	Malawian Kwacha
NGO	Non-governmental organization
SMEs	Small and Medium Enterprises
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
UNDP	United Nations Development Programme
VAT	Value added tax

Executive summary

Based on a preliminary survey of low-income residents in the Millennium City of Blantyre, the Pangea team believes that there is sufficient demand to support a market-based approach to supplying and marketing solar lanterns in Malawi's largest urban market. The team recommends that the Millennium Cities Initiative (MCI) and Millennium Villages Project (MVP) work with the Blantyre City Assembly to pursue partnerships with motivated and capable enterprises in Blantyre. The project partners must coordinate with these enterprises to generate a flexible and sustainable supply chain that is not dependent on international or government aid.

However, significant challenges must be addressed to successfully implement this proposal. First, Malawi's current banking environment is impeding the importation of goods into Malawi, due to diminishing foreign exchange reserves which restrict liquidity. Second, recent legislation subjects solar products to certain import duties and value added taxes (VAT). To ensure affordability for low-income residents while maintaining the viability of the supply chain, the project partners must work with key stakeholders in Malawi to pursue a change to the legislation, or secure a special exemption. Nevertheless, based on an assessment of Blantyre's market opportunity and business environment, we believe introducing solar lanterns in Blantyre is executable and viable. The project generates attractive returns - according to our estimations, the importer and retailers would have an estimated internal rate of return (IRR) of 19.7% and 8.59%, respectively. We believe these levels can be achieved even under very conservative scenarios.

I. Project overview

A. Background and objectives

The Earth Institute at Columbia University launched the Millennium Cities Initiative (MCI) in 2006 to illustrate the importance of an effective, integrated approach to achieving the Millennium Development Goals (MDGs) in urban areas of sub-Saharan Africa. The MCI consists of investment and social sector components, which work together to improve the livelihoods of residents in the eleven Millennium Cities.

The MCI helps the cities to create employment, improve public health program planning and implementation, stimulate enterprise development, strengthen market linkages, and foster economic growth – especially by increasing flows of foreign and domestic investment to the cities and countryside – in order to eradicate extreme poverty, the first and most basic MDG. The MCI also works to strengthen farm-to-market linkages between the nearby Millennium Villages and regional capitals and, on the basis of careful needs assessments and costings carried out by the MCI, helps urban stakeholders in each municipality to devise integrated development strategies designed to reflect and realize their top priorities.

MCI is working with the Millennium Villages Project (MVP) to introduce solar lanterns in Blantyre, the main economic center of Malawi. Even in grid-connected areas, outages from load shedding are a daily occurrence. To this end, solar lanterns are a relatively new "green" technology that has the potential to positively impact energy consumption patterns in many communities around the world. They are an efficient, safe, cheap and environmentally friendly alternative to paraffin, candles and other basic (and sometimes dangerous) lighting sources.

In the Millennium Village of Mwandama in Zomba district, the MVP has successfully established a private sector-led solar lantern project working with the supplier d. Light. A household survey showed that people in the community saved an average of one hundred Malawian Kwacha (MWK) per week and were highly satisfied with their purchases. The study also suggested that the lanterns pay for themselves in less than a year.[1]

In order to create a business plan for the introduction of solar lanterns in Blantyre, a team from Columbia Pangea Advisors (Pangea), a consulting organization run by Columbia Business School (CBS) students, undertook a study with the following objectives:

- Investigate demand for solar-powered lanterns in Blantyre, Malawi;
- Recommend an appropriate and reliable supply chain to deliver lanterns to consumers in Blantyre; and
- Suggest subsequent steps to scale up distribution.

B. Methodology

The team performed a study of Blantyre to determine the demand for solar-powered lanterns in the largest urban center in Malawi. Specifically, the team investigated existing

[1] See Atkins, et al., "Off-grid energy services for the poor: introducing LED lighting in the Millennium Villages Project in Malawi," *Energy Policy,* 38 (2010), pp. 1087–1097.

residential demand for solar lanterns utilizing a market survey administered during a visit to the city in January 2010. Based on the results of the market study, the team identified options for marketing solar lanterns to Blantyre's residents.

In addition to framing the demand-side of an urban solar lantern market, the team determined an appropriate supply chain to reliably supply solar lanterns to the identified target market. The team worked with contacts provided by MCI to identify potential wholesalers and retailers in Blantyre.

In order to do this, a Pangea team member traveled to Blantyre between January 6, 2010 and January 13, 2010. Three additional team members traveled to the city between March 8, 2010 and March 12, 2010. During these visits, the team members met with the Malawi Investment Promotion Agency ("MIPA"), local importers of renewable energy products, and potential retailers. The team also conducted a preliminary demand survey, and visited the local cooperative organization ("COOP") set up in Mwandama to manage the distribution of solar lanterns in the village.

C. Key findings

1. Demand – Based on the results of the demand survey, the residents of Blantyre show interest in purchasing solar-powered lanterns.
2. Supply chain – Prospective business partners currently located in Blantyre are adequate to import and distribute the lanterns. The candidate pool includes partners with the level of capability, expertise, and interest required to become part of the project. Although there are a number of candidates to retail the product, the retail model should include more than one channel, due to the market characteristics and the economics of the project. Ideally, the primary partner should be capable of importing, distributing, and retailing the product to its own outlets as well working in partnership with other retailers.

D. Solar lanterns

The solar lantern introduced to the residents of Blantyre should provide high-quality light. Some top lantern models, such as the d. light Nova 200, the model distributed by the COOP in Mwandama, can double as a mobile phone charger. D. Light is based in China and imports through Dar es Salaam, Tanzania.[2] We recommend a solar lantern model that can provide up to twelve hours of bright light on a day's charge, and can recharge a mobile phone in as few as two hours. A recommended model would also provide white light projected at a wide angle, and would be able to effectively illuminate an entire room.

The recommended model should include an efficient, portable solar panel with a lengthy outdoor cable for convenient solar charging and should be encased in a sturdy housing unit that is water resistant and protects the interior from dust and large insects. It should come with an ergonomically designed handle and top strap so users can hang the device. Although the initial assessment has been done with the recommended d. Light 200 model, it is worth noting that there are other alternative models coming on the market that might be better alternatives for the long term. Although we are confident that the d. light Nova 200 lantern would be appropriate for an initial phase, we would recommend considering alternative models as the business model gains strength.

[2] For more information on d. light, see <http://www.dlightdesign.com/home_africa.php>.

II. Demand assessment

The objectives of the demand assessment were the following:

A. Objectives

1. Given the successful introduction of solar lanterns to Mwandama, the team endeavored to determine if demand of a similar product exists in an urban area such as Blantyre.
2. While more urban residents are connected to an electrical grid than rural ones, anecdotal evidence suggests that a significant percentage of the population continues to require some form of an off-grid lighting source. Thus, a key objective of the demand assessment was to confirm or refute this premise.
3. To help provide a framework for marketing and supply chain strategies, the demand study would be used to generate an estimate of the market potential for solar-powered lanterns.

B. Overview of methodology

To accomplish the objectives, the team created a survey covering two areas in Blantyre City. The survey was conducted by members of the Blantyre City Assembly using a questionnaire framework developed by Pangea. The questionnaire (see Appendix C) consisted of thirty questions and aimed to understand household composition (number of family members, marital status, etc.), income (monthly income level, occupation, etc.), energy use (connectivity to electrical grid, types of lighting used in household, monthly investment in paraffin fuel, etc.), and interest in the solar-powered lanterns (statement of interest, number of lanterns that would be purchased at MWK 5,800,[3] willingness to rent or lease the product, etc.).

Each surveyor was equipped with a solar lantern device, including a solar panel and cell-phone connector, to demonstrate the product. After demonstrating the capabilities of the product, the surveyor would execute the questionnaire.

To measure urban demand, the lowest-income market was targeted in the survey, as the working assumption was that the greatest utility would be gained by the lowest income residents as a substitute for current use of paraffin lanterns and other traditional forms of energy. Additional demand surveys would be required to establish an estimate of the demand among middle and upper class citizens of Blantyre. For the purposes of this demand assessment, these markets were generally ignored.

To measure the impact of demand based on in-house connectivity to the electrical grid, two low-income communities with access to the electricity network were chosen for the survey, Ntopwa and Mbayani. Both of these communities are high density squatter areas.

The Mbayani area is estimated to have over 2,000 households with access to the electrical grid. However, only 40% of these households have electricity in their homes. The other 60% generally find it too expensive to pay the electricity installation fee (which is about MWK 28,000) to the power supplier.

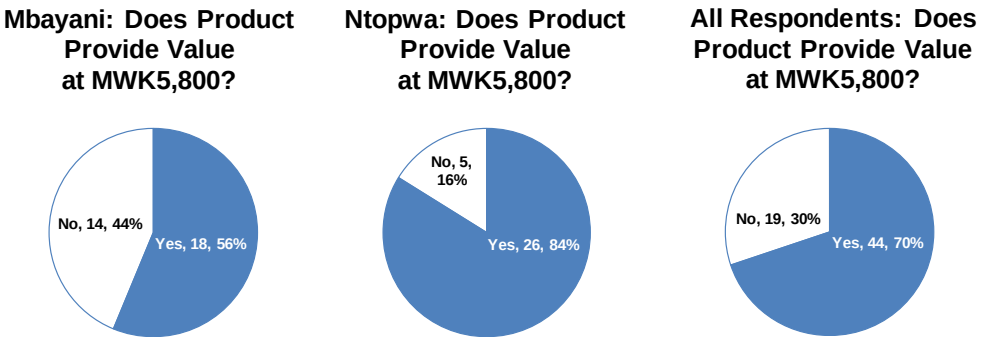
[3] Conversion used throughout this document of MWK 148 per US$ as of March 31st, 2010.

The Ntopwa area is smaller, with slightly less than 1,000 households, all of which have access to the electrical grid. However, similar to Mbayani, roughly 60% of households opt out of electrical grid connectivity due to the high upfront cost of installation. Overall, approximately 10% of households in the Ntopwa area have in-house connectivity to the electrical grid.

C. Results of survey

When asked, "At MWK 5,800, do you believe this product provides value to you?" the following answers were provided by the sixty three subjects of the survey:

Figure 1: Demand analysis

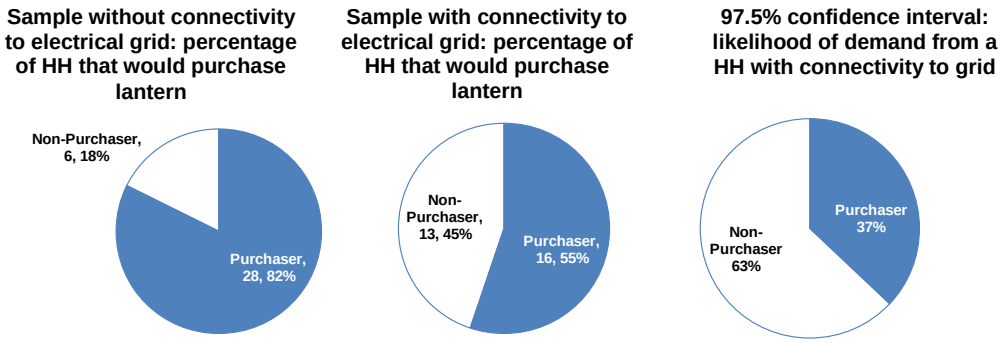


Source: MCI survey conducted by Pangea Advisors (January 2010).

Based on these results, a disparity seems to exist in demand for the solar-powered lantern between the two communities. To test the hypothesis that connectivity to the electrical grid is a factor in a potential consumer's desire to purchase the product, a regression on the data demonstrated the following:

- With 97.5% confidence, there is a negative correlation between connectivity to the electrical grid and a willingness to pay for the product. The ninety-five (95%) confidence interval is negative fifty percent (-50%) to negative five percent (-5%). The coefficient of correlation is -0.271, with a P-value of 0.019.
- Thus, in determining the overall demand for the product, we recommend segmenting the market into on-grid residents and off-grid residents.

Figure 2: Demand analysis continued



Source: MCI survey conducted by Pangea Advisors (January 2010).

Qualitative evidence from interviews with respondents and surveyors suggest that some minimum level of education is required for people to understand that a solar panel can recharge the battery. Also, although previous government advertising campaigns trumpeted the benefits of solar-powered energy, this was the first time most of the respondents had seen a solar lantern in use.

Due to some inconsistencies in the way qualitative information was collected, the survey provided a limited ability to establish deterministic relationships between household composition and level of interest in the product. Thus, we have ignored some of the qualitative results in our measurement of overall demand. However, given that 70% of all respondents were willing to purchase the product at MWK 5,800, we are confident that demand exists for this product.

D. Abstraction to overall demand

Utilizing the preliminary demand survey findings, we assume that, at MWK 5,800, demand exists for this product from 37% of households with connection to the electrical grid. Due to the small sample size of the survey, we also bring down the ratio of purchasers from non-connected households from 82% to 70%, which was the proportion of respondents willing to purchase the product at that price. Using the 95% confidence interval for likelihood to purchase, and estimating that 1.5 lanterns are purchased per household off the grid and 1 lantern per household on the grid, we estimate the total market in Blantyre for this product is between 123,000 and 179,000 lanterns. Table 3 provides a detailed breakdown of the sample results by on-grid and off-grid residents.

Applying the lower bound of the confidence interval to the overall population of Blantyre, we estimate that, based on a conservative estimate, 30% of households in Blantyre are connected to the electrical grid, and approximately 84,000 households in Blantyre would purchase the solar lantern product. (See below Table 1 for calculation of total market demand in Blantyre city.)

Table 1: Market demand in Blantyre

Blantyre	Population	Population/ household	Total # households	% That would buy	Total HH that would buy	Lanterns / HH	Total lantern demand
On-grid	219,750	5	43,950	37.10%	16,293	1.0	16,293
Off-grid	512,750	5	102,550	69.50%	71,312	1.5	106,968
Total households with demand in Blantyre			146,500	59.80%	87,605		123,261
Years to full market penetration							3
Approximate average monthly demand							3,424

Source: MCI survey conducted by Pangea Advisors (January 2010).

Abstracting these same results to the entire Malawian population, we estimate that 1.6 million households would purchase a lantern at MWK 5,800. Assuming ten years for a distributor to penetrate the entire market, we estimate that demand outside Blantyre would equate to approximately 17,000 units per month.[4] (See below Table 1 for calculation of total market demand in Malawi.)

[4] We assume that during the first three years, Lilongwe and Mzuzu would be the initial targets of distribution along with Blantyre. Following the first three years, an average of 3 or 4 municipalities

Table 2: Market demand in Malawi

Blantyre	Population	Population/ Household	Total # of Households	% That would buy	Total HH that would buy	Lanterns / HH	Total Lantern Demand
On-Grid	595,000	5	119,000	37.10%	44,116	1.0	44,116
Off-Grid	11,305,000	5	2,261,000	69.50%	1,572,270	1.5	2,358,405
Total households with demand in Blantyre			2,380,000	67.90%	1,616,386		2,402,521
Years to full market penetration							10
Approximate Average Monthly Demand							16,597

Source: MCI Survey conducted by Pangea Advisors Team (January 2010).

Table 3: Statistical analysis

	Resident Access to Grid? Yes	No	Total
Sample size	29	34	**63**
Probability of purchase	55%	82%	**70%**
Number of households (000s) (Team estimates)			
Blantyre	44	103	**147**
Malawi	119	2,261	**2,380**
95% Confidence interval - probability of purchase			
Upper CI	73%	95%	
Lower CI	37%	70%	
Total Blantyre market size (000s) [a]			
Upper CI	32	146	**179**
Sample probability	24	127	**151**
Lower CI	16	107	**123**
Total Malawi market size (000s)			
Upper CI	87	3,228	**3,315**
Sample probability	66	2,793	**2,859**
Lower CI	44	2,358	**2,403**

[a] Assumes 1.5 lanterns purchased per HH off-grid; 1 lantern per HH purchased on-grid.

Source: MCI Survey conducted by Pangea Advisors (January 2010).

III. Supply chain

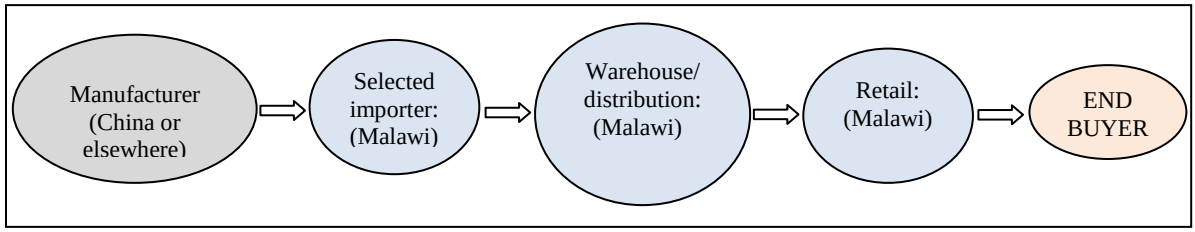
A. Overview

There is an identified market in Malawi and significant interest from importer organizations and NGOs to develop a solar lantern scale-up project in Blantyre. After thorough analysis, we have identified two scenarios that would best facilitate the importation, distribution and final sale of solar lanterns to end consumers at a

could be included in the business plan. However, this timeline and business plan is subject to revisions by future project partners.

reasonable price. These recommendations are based on a careful assessment of meetings with Malawian importers and NGOs in January 2010 and March 2010.

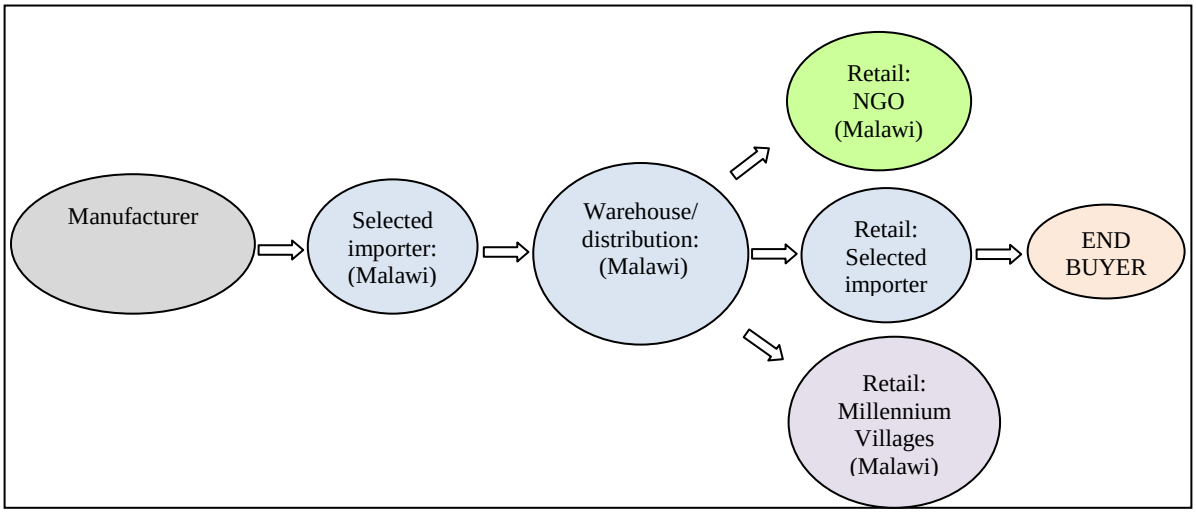
Figure 3 - Scenario A: One player in Malawi



Source: Pangea Advisors.

Scenario A includes a manufacturer and one key player, labeled the "selected importer" in Malawi. The main challenge is to identify the selected importer that is best positioned to import, warehouse, distribute, and retail the solar lanterns. This one-importer scenario was chosen to minimize the markups reflected in the final price of each lantern (detail on pricing can be found in Appendix A). We estimate, based on a price of US$22 per unit (cost to the manufacturer) from China that the end user would be charged between US$35 and US$40 to purchase one unit. Furthermore, by working exclusively with one company in multiple roles, the process would be relatively streamlined at the onset.

Figure 4 - Scenario B: Multi-retail outlets in Malawi



Source: Pangea Advisors.

Scenario B differs from Scenario A at the retail level of the supply chain, as it targets multiple retail channels. By diversifying the retail network, this initiative will have a higher likelihood of penetrating the broader market demand, including the identified demand from the MVP endeavor in Mwandama. After meeting with the Mwandama COOP, we learned that they would ideally like to order 400 lanterns per month. By supporting the expansion of the MVP mission and supplying the COOP with those lanterns, we assure the importer that half of the total order will have a buyer.

An NGO or another microfinance institution would be the third retailer in the model. The NGO would be able to inventory lanterns at its headquarters, functioning as a warehouse to supply its members. The participation of a micro-finance institution in such a scenario would prove critical given that a majority of people surveyed in the city expressed interest in acquiring lanterns by credit. This strategy would both effectively allocate lanterns to different target markets and introduce competitive pricing. Similar to Scenario A, based on the $22 cost from the manufacturer, the retail price would be between US$35 and US$40 per unit. Given potential channel conflict, we propose considering a retail price ceiling on the lanterns.

B. Recommended plan of action

Of the two proposals presented, we believe that Scenario B is more likely to achieve MCI's final objective – a supply chain that efficiently and affordably delivers solar lanterns to people in need throughout Blantyre and, eventually, throughout Malawi. In our view, this process will create a sustainable business model in the medium- to long-term. By using several retail options, this strategy will thoroughly penetrate the market in Blantyre, supplying more pockets of demand throughout the city.

1. Pilot program

This project would scale up over time. In a first phase, we foresee an initial order of 750 units, of which 400 would be supplied to MVP, 300 to the selected importer's retail outlets and the remaining 50 to the retail NGO. This pilot phase would be completed within 6-9 months of delivery, and will give the supply chain participants an opportunity to work out any issues. We expect strong demand, and therefore, plan to import one full container by year two.

2. Time frame

Before this first step of ordering and importing the lanterns commences, a number of outstanding issues must be resolved, including:

1. A request for a VAT waiver on imported solar lanterns from the Malawi Revenue Authority ("MRA").
2. A confirmation on unit pricing from the manufacturer.
3. Supplier agreements reached among all the entities.

Once final agreements are reached, importation of the goods can commence. This process can begin as soon as T + three months. Air shipment will take three to four weeks, so the product can arrive in Malawi by T + four months. The importer must work with the retail system to project the demand, and reorder with the manufacturer before inventory runs out. The timing and quantity of the inventory replenishment will require open communication among the entire supply chain to ensure success.

3. Immediate next steps:

- VAT issue: A letter to the MRA requesting a VAT waiver for this initiative has been drafted. This letter must now be circulated to enlist the support of the Malawi Energy Regulatory Authority (MERA) and MIPA in discussions with the Director of Energy and MRA.[5]

[5] Note that as of September 2010, it appears unlikely that the VAT exemption will be granted.

- Confirm players involved: Members of the Pangea Advisors team have reached out to all the aforementioned potential players. The team is still awaiting information from some of these potential partners, including company information, written statements of interest, and demonstration of capabilities. Once these responses are procured, MCI can work with other partners to analyze the responses and determine the best roadmap forward. In particular, MCI can help facilitate discussions between all of the major players, verify participation, outline next steps, and confirm a time frame for the commercial launch of the project.
- Reach out to Blantyre City Assembly officials for support with initiative. This is a key step that must be given high priority.
- Discuss partnership with MVP. MCI should collaborate closely with MVP in the planning and execution of all steps.
- In particular, the Pangea Advisors team recommends that MCI facilitate initial discussions between key players. If MCI's assessment is consistent with the Pangea team's preliminary assessment, discussions can be facilitated between:
    - The manufacturer and selected importer
    - Selected importer and selected distributor/retailer, and
    - Selected importer and MVP

  Another potential option would be to organize a facilitation workshop between all parties.
- Memorandum of Understanding ("MOU"): as the parties negotiate supplier arrangements, MCI can help facilitate the MOU process if necessary.

IV. Marketing plan

The objective of a marketing plan for the solar lanterns initiative in Blantyre is to support the distribution of the lanterns themselves, to educate consumers about the benefits, and to guide customers to locations to purchase the lanterns. The marketing plan should outline simple yet effective initiatives that target the appropriate population. The plan will help people, particularly those at the lowest-income levels, recognize the need for lanterns, provide them with useful background information, and communicate the benefits of an innovative alternative to their current lighting sources. Furthermore, the marketing plan should support the sales process by engaging potential consumers and persuading them to buy the product.

In our view, the importer should spearhead the marketing plan. The marketing plan would not differ significantly between urban and rural areas, as individuals located in both regions have access to newspapers, radio, and other forms of advertising, like billboards and posters. The majority of marketing efforts would take place during the spring and summer when liquidity is usually greatest and people have savings from harvests to purchase lanterns.

In addition, if the City Assembly shows interest in collaborating on the project, it could also potentially provide marketing support.

A. Objectives

1. To educate and create awareness about solar lanterns in Blantyre
2. To communicate the benefits of switching from traditional lighting sources to solar lanterns
3. To inform potential customers about lantern availability in their communities
4. To communicate financing opportunities available to acquire the lanterns

B. Target markets

For the initial phase, the model would target areas in Blantyre where access to the electrical grid is not feasible or where connectivity is expensive (e.g. Mbanyani). Within these communities, the plan should target both households and commercial locations that need lighting. For future phases, the model could be replicated in other urban and rural areas of Malawi.

C. Situation analysis

The SWOT analysis in Table 1 below summarizes the strengths, weaknesses, opportunities and threats of the business plan to introduce solar powered lanterns to Blantyre. The internal components refer to factors that are controlled by the players involved in this initiative and the external factors apply to issues that cannot be controlled by the parties involved in the project.

Table 4: SWOT Analysis

	Internal	External
Positives (+)	**Strengths** • Proven track record in Mwandama • Experience and support from the Mwandama COOP • Established partnership with the manufacturer • Part of larger initiative (MCI and MVP)	**Opportunities** • Enter a new market as leader • Initiate a community-led business model • Deliver a product that people want • Target underserved market • Provide an evident need recognized by everyone • Provide a business model that is readily replicable
Negatives (-)	**Weaknesses** • Doesn't offer immediate return to participants • Expansive retail network unavailable • Possible partners haven't worked with each other • Limited experience dealing with government agencies	**Threats** • Lack of funds o Potentially complicated financing arrangements • Potential reluctance by some people to invest aggressively at an early stage • Potential quality issues could be catastrophic to supplier support • Low-cost competition o Limbe electronics shops import cheap products directly o Residents want to pay less o Once quality issues surface, could hurt demand for product o Could be mitigated if the manufacturer invests heavily in branding

***Source*:** Pangea Advisors.

D. Strategies

Households – In selling to households, marketing efforts must highlight the advantages that lanterns provide in terms of additional hours of lighting (e.g. entrepreneurship, academic development, etc). The sale could be performed by sales representatives who offer merchandise door to door, at local markets or in small local businesses.

Small businesses – To recruit small businesses to sell the product, marketing efforts must highlight the opportunity to promote solar power usage and be an example for the target community. These small businesses would not only be doing demonstrations but also selling the product to other small businesses in the area.

E. Activities

1. Newspaper advertising
    a. Definition: Marketing ads published in popular local newspaper(s).
    b. According to respondents working in the industry, newspaper advertising has proven to be successful in increasing awareness for this type of product.
    c. The estimated cost of putting an ad in the local newspapers runs from MWK 35,000 for a quarter page ad in black and white to MWK 54,000 for a quarter page in color.
2. Radio advertising
    a. Definition: Short sale pitches with catchy jingles announcing the product.
    b. Even low-income residents in Blantyre have radios.
    c. The estimated cost of running 30-second spots on the radio is MWK 3,500, which is much more affordable than newspaper advertising.
3. Public relations
    a. Definition: Educational demonstrations of about 5-6 people spearheaded by a community leader or the City Assembly.
    b. Given the clients targeted, another marketing activity could involve focus groups with community leaders or the City Assembly sharing their own experience by word of mouth. Reliable community leaders can be effective outlets for educating and persuading residents.
    c. Ideally, this activity should be designed in such a way that it doesn't generate costs for the project. However, the importer may consider free samples to certain factions of the communities.
    d. Involve the City Assembly in public relations and outreach.
4. Promotional ads (billboards, posters, etc)
    a. Definition: Color printed, promotional ads located in strategic locations such as Asian shops, the weekly market and food stores.
    b. These advertisements would be strictly informative in nature and help to increase awareness and interest among the target market.
    c. The estimated cost of distributing posters in the local shops is MWK 45,000 for 500 copies.

F. Tracking and evaluation

In order to track the progress of the marketing plan, possible indicators could be established, including:

- Total sales;
- Sales by channel;
- Sales growth.

V. Performance Indicators

Performance indicators could be established to track key project objectives and the implementation process, as outlined below.

Table 5: Performance indicators for facilitation process

Objective	*Target Date*	*Party/parties responsible*
MIPA letter		
MRA – tax benefit		
Selection of importer		
Selection of retailers		
Completion of first order		

***Source*:** Pangea Advisors.

Table 6: Performance indicators for implementation process (to be given to importers and retailers)

Objective	*Indicator*	*Target*
Tax charge	• % Sales	
Total sales	• MWK • Units	
Sales by sales channel	• MWK • Units	
Sales growth	• (Sales month2 – Sales month1)/Sales month1 * 100% • Units	
Sales growth per channel	• Per channel: (Sales month2 – Sales month1)/Sales month1 • Units	
Repeat purchase	• Lanterns/household	
Warranties claimed	• Warranties claimed / Total units sold	

***Source*:** Pangea Advisors.

Below are suggested monthly sales projections for this initial phase based on the assumption that the importer will place an order with the manufacturer every three months. This implies having an inventory of at least 2 or 3 months of sales.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M1	M12	Total Y1	Total Y
Growth Rate		0%	0%	50%	0%	0%	60%	0%	0%	25	10%	10%		
Estimated Units Sold Per Month	500	500	500	750	750	750	1,200	1,200	1,200	1,50	1,650	1,815	12,315	21,780

VI. Risks and challenges

A. Potential risks and solutions

1. Manufacturer: Based on initial feedback, there is a high level of acceptance and enthusiasm for the product. However, there is also some skepticism in particular about the battery and the bulb life. To mitigate this risk, sufficient assurances must be received from the manufacturer, including a commitment to high quality

standards and product warranties. It is worth noting that warranties would only work if there is a chain backwards from consumer to manufacturer.

2. Importer: With only one manufacturer and one importer, the entire supply chain could be at risk if operational issues arise. Additionally, if demand exceeds expectations, the supplier might not be able to meet the requirements.

3. Retailer: Even if the business is a huge success in Blantyre, the profit margins at the retail level might not provide sufficient incentive to sell the product in other areas of the country. If this happens, the long term objectives of the project would be compromised. To mitigate this risk, an assessment of the retailer's commitment to the long-term expansion of the project is crucial.

B. Challenges

The foreign exchange situation in Malawi has been raised as one of the biggest challenges for the business at this time. The country's level of foreign exchange reserves is very seasonal as it depends on income generated by tobacco, tea, and cotton crops, so the country frequently suffers from shortages. Because the Malawi Central Bank maintains a fixed exchange rate that requires significant bank reserves, the seasonal capital flows into and out of the country will hamper the free movement of goods into the country.

Currently, even though importers have the local money to pay suppliers, they are unable to do so because they can't procure the foreign exchange. The short-term solution is to wait for the crops to harvest; however, the long-term solution is to promote an increase in exports and international investors entering the country. However, given that the supply chain depends on the importation of goods from abroad, this will be an ongoing challenge for the importer.

Additionally, a new legislation was approved and made effective in January 2010 that subjects some solar products to import duties and VAT taxes. Without a change in the legislation or an appeal for an exemption granted, the substantially higher costs could jeopardize the viability of this project and make the product unaffordable for the target client.

VII. Conclusions

After thorough analysis, the Pangea team recommends introducing solar lanterns to the Millennium City of Blantyre, Malawi. Based on a survey, the demand for solar lanterns in low-income neighborhoods justifies introducing the product to the city's residents. Additional analysis will be required to identify the neighborhoods where demand for the lanterns is highest. However, based on the results of the demand survey, residents in low-income squatter communities without connectivity to the electrical grid are most likely to express interest in purchasing the product. Introduction of lanterns will not only benefit the immediate users, but also the entire community by reducing carbon emissions, providing energy to low income people through promoting entrepreneurship, and enhancing educational opportunities by providing additional study hours.

Additionally, the team's assessment of the local business community in and around Blantyre suggests that local institutions are in place to generate a flexible and viable supply chain. Blantyre's importers have the motivation and capital required to invest in

such a project. Additionally, a number of NGOs in Blantyre have the mandate, membership, and capital required to provide retail assistance for the project.

To maximize the long-term benefits of this initiative, we suggest pursuing the partnerships outlined in Scenario B, discussed in Chapter II. The supply chain partners identified in this chapter have shown great interest in the project, and MCI should reach out to these potential partners for further discussions.

VIII. Appendices

A. Pricing structure

Proposed business plan in Blantyre		
Cost from manufacturer	$	22.0
Cost to import (S&H)	$	2.0
Import duties	$	-
Landed cost - Blantyre, Malawi	$	24.0
Distribution and warehouse cost	$	5.0
Importer/distributor markup	$	5.0
Price to local 'retailer' / COOP markup	$	34.0
Marketing	$	1.0
Retailer' / COOP mark up	$	5.0
Price to consumer in cash	**$**	**40.0**
VAT @ 16.5%	$	7
Final price to consumer	**$**	**46.6**

[6]

Economics for importer / distributor		
Cost from manufacturer	$	22.0
Cost to import and distribute	$	7.0
Markup	$	5.0
Price to retailer	$	34.0
Margin to importer		17.24%
IRR for importer / distributor		19.66%

Economics for retailer		
Cost from manufacturer	$	34.0
Marketing costs	$	1.0
Markup	$	5.0
Price to consumer (without VAT)	$	40.0
Margin to importer		14.29%
IRR for retailer		8.59%

***Source*:** Pangea Advisors estimations (March 2010).

[6] There are other scenarios where price to retailer and prospective importer could impact pricing models. Price variability is highly possible and should be considered when revising this model.

B. Letter from Malawi Revenue Authority

03/02 2010 12:33 FAX 01 KEZA MRA ☑001

Malawi Revenue Authority

Head Office
Chayamba Building
Victoria Avenue
Blantyre, Malawi

Private Bag 247, Blantyre
Phone: (265) 01 822 588
Fax: (265) 01 822 302
E-mail: mrahq@mra.mw
Website: www.mra.mw

Your Ref:

Our Ref: MRA/CE/TECH/38.00 1st February, 2010

The Managing Director,
Solair Corporation,
Preenas,
P.O. Box 166,
LILONGWE

Attention: Mr. Hament Tanna

Dear Sir,

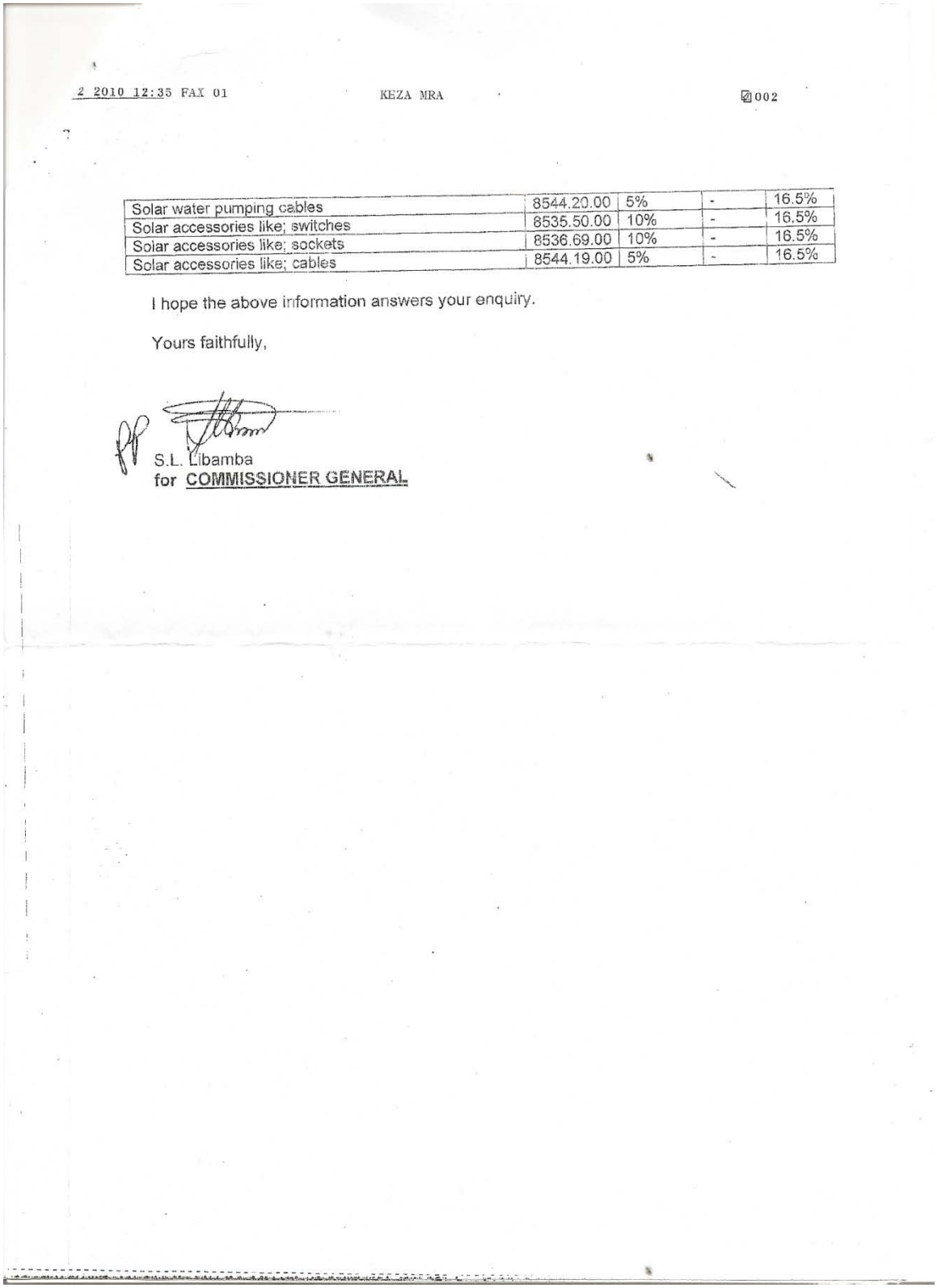
RE: TARIFF CLASSISIFCATION OF SOLAR GOODS AND THEIR DUTY RATES

Reference is made to your letter dated 25th January, 2010 in respect of the subject captioned above.

The Tariff classification and duty rates on goods under enquiry are as follows:-

Item	Tariff Heading	Duty Rate	Excise Rate	VAT Rate
Solar Panels	8541.40.00	Duty Free	-	16.5%
Solar Regulators	9032.81.90	5%	-	16.5%
Solar Batteries	8506.80.10	Duty Free	-	16.5%
Solar Inverters	8504.40.20	Duty Free	-	16.5%
Solar lights both fluorescent and CFL lamps	9405.40.90	25%	-	16.5%
Solar Lanterns	9405.40.30	Duty Free	-	16.5%
Solar Refrigerators	8418.21.00	25%	20%	16.5%
Solar Street lights	8539.21.10	5%	-	16.5%
Solar Water Pumps	8413.81.10	Duty Free	-	Exempt
Solar wind Generators (of an output exceeding 375 kw)	8501.34.00	Duty Free	-	16.5%
Solar Cell phone charges	8504.40.00	5%	-	16.5%
Solar DC light fittings and tubes	9405.40.90	25%	-	16.5%
Solar Voltage Droppers (Similar to regulators)	9032.81.90	5%	-	16.5%

ALL CORRESPONDENCE SHOULD BE ADDRESSED TO THE COMMISSIONER GENERAL



2 2010 12:35 FAX 01 KEZA MRA ☑002

Solar water pumping cables	8544.20.00	5%	-	16.5%
Solar accessories like; switches	8535.50.00	10%	-	16.5%
Solar accessories like; sockets	8536.69.00	10%	-	16.5%
Solar accessories like; cables	8544.19.00	5%	-	16.5%

I hope the above information answers your enquiry.

Yours faithfully,

pp

S.L. Libamba
for COMMISSIONER GENERAL

Source: Malawi Revenue Authority.

C. Sample survey

MGA-YANI 12/12/2013

M19

Blantyre City Assembly

Millennium Cities Initiative(MCI) Programme

Preliminary Questionnaire for Demand Estimation

Form itself will include key details on interviewee:

Name: MRS F. Mikangano

Address: 0993294370

Age: 20 YEARS

*Gender: Male*_____ *Female* ✓

Education: JCE

Marital status: Married ✓ *Single*_____ *Divorced*_____ *Widowed*_____

Accommodation/Living/Housing conditions

- Separate House ✓ Multi-family_____
- Access to electric grid
  Yes_____ No ✓
- Number of people living in the same residence: 3
- Family composition
  Husband ✓ Wife ✓ Children ✓ Grandparents____ Others_____

Employment/Economical conditions

1

- Employed – Yes ✓ No _____ Self employed _____
- Total number of people employed in family/residence 1
- Profession: Bread winner (husband)
- Occupancy
  Full-time ✓ Part-Time: _____ Distant _____
- Average monthly income per family/residence [min/max/fixed part]
  K20,000.00 p/m
- Main monthly spending:
  Groceries ✓ Rent ✓ Utilities ✓ Transportation _____
- Access to social benefits :
  Secondary and higher education ✓ Healthcare plan ✓ Pension plan _____

Power consumption/Demand-driving needs

- What is the power consumption per family/residence, kwph/month – [min/max/average]
- What percentage of monthly family income is spent on power sources
- How much is spent monthly on alternative light sources – [candles/paraffin/~~kerosene~~]
  K750.00 p/m ✓
- What activities, require light – [cooking ✓, reading, studying ✓, crafts, take-home work, etc]

- What activities require power source – [crafts/sewing, radio, cell-phones, etc]

  _____

- Would you be interested in having extra light hours for performing extra duties e.g– [chores/education/working hours]

  _____

- Do you think you will need a kerosene lamp if you purchase this product?

  _____ No _____

Utility/Preferences

How important/desirable are 2 extra hours of light a day for [education/reading/chores/work/crafts]?

Not important_____ Somehow important _____ Important_____

Very important_____ Life-saving_____

Purchasing Questions

- Where do you buy products like this lamp?

  _____ BT or Chemuse Market _____

- Would you buy this product? Yes_____ No_____ Maybe_____

- Would you be willing to buy multiple lamps? If so, how many?

  Yes_____ No_____

  If yes, how many _____2_____

- At MK 5800.00 do you believe the product provides value to you?

  Yes_____ No_____

- Would you rent this product?

  Yes_____ No_____ Maybe_____

- Would you take on debt to purchase this product?

  Yes_____ No_____

3

***Source*:** Pangea Advisors.

D. Pro forma projections[7]

	Mo.1	Mo.2	Mo.3	Mo.4	Mo.5	Mo.6	Mo.7	Mo.8	Mo.9	Mo.10	Mo.11	Mo.12	Total Yr. 1	Total Yr. 2
Growth rate		0%	0%	50%	0%	0%	60%	0%	0%	25%	10%	10%		
Estimated units sold per month	500	500	500	750	750	750	1,200	1,200	1,200	1,500	1,650	1,815	12,315	21,780
Cost from manufacturer	11,000	11,000	11,000	16,500	16,500	16,500	26,400	26,400	26,400	33,000	36,300	39,930	270,930	479,160
Cost to import (S&H)	1,000	1,000	1,000	1,500	1,500	1,500	2,400	2,400	2,400	3,000	3,300	3,630	24,630	43,560
Duties, VAT, etc	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Landed cost - Blantyre, Malawi	**12,000**	**12,000**	**12,000**	**18,000**	**18,000**	**18,000**	**28,800**	**28,800**	**28,800**	**36,000**	**39,600**	**43,560**	**295,560**	**522,720**
Distribution and warehouse cost	2,500	2,500	2,500	3,750	3,750	3,750	6,000	6,000	6,000	7,500	8,250	9,075	61,575	108,900
Importer/distributor markup	2,500	2,500	2,500	3,750	3,750	3,750	6,000	6,000	6,000	7,500	8,250	9,075	61,575	108,900
Price to local retailer	**17,000**	**17,000**	**17,000**	**25,500**	**25,500**	**25,500**	**40,800**	**40,800**	**40,800**	**51,000**	**56,100**	**61,710**	**418,710**	**740,520**
Marketing	500	500	500	750	750	750	1,200	1,200	1,200	1,500	1,650	1,815	12,315	21,780
Retailer' / COOP Markup	2,500	2,500	2,500	3,750	3,750	3,750	6,000	6,000	6,000	7,500	8,250	9,075	61,575	108,900
Total revenues	**20,000**	**20,000**	**20,000**	**30,000**	**30,000**	**30,000**	**48,000**	**48,000**	**48,000**	**60,000**	**66,000**	**72,600**	**492,600**	**871,200**

Assumptions

1. We assume that the cost from the manufacturer is $22 per lamp, which is the same price that the Millenium Villages Project is currently working with as o
2. Our estimations on Cost to Import and Distribution and Warehouse are based on the discussions held with the potential importers and distributors.
3. We assume that the initiative will maintain the "no import duties" benefit as it is a renewable energy related project.
4. Our estimations for the Importer and Distributor markup are based on the requirements expressed by them in order to get involved in the business
5. Marketing Expense estimations are based on costs for placing newspaper ads, radio announcements, and posters distribution.
6. Retailer markup estimations were defined based on accepted margin ranges
7. Growth rates were estimated based on conversations with MCI team, assuming that orders are made to manufacturer every three months
8. We assume that sustainable, long term demand levels per month are reached by the end of the first year.
9. We assume no economies of scale, but we are aware significant savings can be achieved.

Source: Pangea Advisors.

[7] Note that as of September 2010, it appears unlikely that the VAT exemption will be granted.

X. References

Edwin Atkins, et al., “Off-grid energy services for the poor: introducing LED lighting in the Millennium Villages Project in Malawi,” *Energy Policy,* 38 (2010), pp. 1087–1097.

D. Light webpage, http://www.dlightdesign.com/home_africa.php (last visited April 2010).

Malawi Revenue Authority webpage, http://www.mra.mw (last visited June 2010).