Broad Peak Energy Solutions

A Social Business Plan

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Master of Arts in Law & Diplomacy, 2013

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Master of Science in International Business, 2013
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EXECUTIVE SUMMARY

The issue of power shortages is widely prevalent throughout South Asia and particularly in Pakistan. In order to have power when grid electricity is not available, many households use Uninterruptible Power Systems (UPS). UPS are devices that store a small amount of power from the grid for use during power outages. They have the perverse effects of drawing power from an overtaxed grid, adding costs to the consumer and increasing the burden on the overall system.

Broad Peak Energy views this situation as an opportunity to introduce solar power as means to improve the quality of life of those affected by power cuts. Broad Peak aims to become the premier solar retail brand in Pakistan. By being the first to introduce the widespread use of small scale solar power, Broad Peak will also raise awareness of the social and environmental benefits of solar power. Should Broad Energy’s product become widely used, it would have wider societal benefits beyond those using it directly. By replacing grid electricity which in Pakistan, is generated mostly with fossil fuels, it could relieve the grid during peak demand hours thus decreasing power outages and the need to install new centralized power generation plants. Broad Peak has received several awards and grants totaling over $17,000, including the Dow Sustainability Student Innovation Grand Prize and funding from the Hitachi Research Institute.

Broad Peak's preliminary research indicates that frequent fluctuations in voltage damage, and sometimes destroy, the UPS inverter and/or batteries. By retrofitting UPS with solar panels, Broad Peak will provide a more stable and dependable source of backup electricity. With a $533 price point, Broad Peak's product is 1/3 the price of the least expensive solar systems currently on the market. It has an attractive payback period of less than 4 years versus over 10 years for other solar installations. Our value proposition and innovation is to use solar power to extend the lifetime of installed UPS systems, provide users with a more predictable electrical backup output than that provided by the grid and offer savings on electricity bills. We believe this model will provide a strong incentive to cost-conscious consumers in emerging markets like Pakistan to adopt residential solar power for back-up power.

By investing heavily in marketing, Broad Peak Energy aims to educate an urban demographic that is not usually targeted about the social and environmental benefits of solar power. It also seeks to promote the wider use of this sustainable technology to an audience that will drive much of the world’s future energy demand. Given the wide use of UPS in South Asia, this project is highly scalable.

As a socially driven business, Broad Peak’s solar powered UPS also have compelling environmental benefits. They will directly replace use of grid electricity, 2/3 of which in Pakistan, is generated with costly and polluting fossil fuels. If widely installed, it could relieve the grid during peak demand hours thus decreasing power outages and the need to install new centralized power generation plants. By extending the useful life of lead-acid batteries in the UPS, it could reduce the environmental harm resulting from their disposal.

Broad Peak’s entry strategy is restricted to Lahore, as this is familiar with the market and it has an established partnership with Eco-gen a local energy service company. Lahore suffers from regular and increasing power outages and UPS use is extremely common. Estimate range from 300 to 350 thousand currently installed units.
Lahore also has other attractive features for this venture. It is a large city, with over 10 million people, located close to the equator. It has very regular solar exposure and very few days of precipitation per year. Lahore’s small number of high rises maximizes the number of homes that can have optimal solar exposure for any installed domestic PV system by minimizing interference from other buildings.

COMPANY OVERVIEW

Company description and history:

Broad Peak Energy was conceived in January 2011 by two Fletcher graduate students with a passion for private sector solutions to sustainability issues: Ahmed Malik & Jonathan Torn. The team received its first seed funds by winning the $10,000 grand prize of the Dow Student Sustainability Competition. In October of the same year the venture received additional $7400 of funding from the Hitachi Research Institute and the Center for Emerging Markets Enterprise at Fletcher to conduct research in Pakistan. Following a field trip to Lahore, Pakistan in December and January (2012), the team gathered important market data via surveys and set up a prototype of its solar powered UPS in collaboration with its local partner company Eco-gen. The prototype is currently under testing to assess the exact output of the solar system and gage potential energy savings and additional electricity output for future customers.

This venture seeks to drive positive environmental change by using strong market based incentives. In so doing, it will promote the wider use of solar energy to an audience that will drive much of the world’s future energy demand. Given the very wide use of UPS in urban South Asia, this project is highly scalable. (Given the long lifespan of energy infrastructure, the choices that are made now will impact the regional and world environment for decades to come.)

Product description:

Pakistan has a history of energy shortages that have worsened in the past few years. There is large pent-up demand for improved energy services in Pakistan. Broad Peak’s solar powered UPS address the widespread problem of intermittent electricity for urban residential households. Whereas solar power has traditionally focused almost exclusively on off-grid rural areas, urban areas constitute a large underserved market which concentrates most of the demand for energy services.

In order to have power when grid electricity is not available, many households use Uninterruptible Power Systems (UPS). UPS are devices which, combined with a lead-acid battery, store a small amount of power from the grid for use during power outages. (The entire system, UPS & battery is referred to as UPS as shorthand). They have the perverse effects of drawing power from an overtaxed grid, adding costs to the consumer and increasing the burden on the overall system. We view this situation as an
opportunity to introduce environmentally sustainable alternatives to improve the quality of life of those affected by power cuts.

The value proposition is to extend the lifetime of the UPS system and provide users with a more predictable electrical backup output than that provided by the erratic grid, protecting the battery from damage due to excessive discharge and reducing electricity expenditures. We believe this will provide a strong incentive to cost-conscious consumers in emerging markets like Pakistan to adopt residential solar energy.

Broad Peak’s preliminary research indicates that frequent fluctuations in voltage damage and sometimes destroy the UPS inverter and/or batteries. By retrofitting UPS with solar panels and a small device to shut off the UPS when the battery is drained, we will provide a more stable and dependable source of backup electricity. This product also increases the electricity delivered from the UPS during extended daytime power outages. It is not uncommon in summer for outages to exceed 8 hours in a row. This summer one power cut lasted over 16 hours.\footnote{http://www.thenews.com.pk/NewsDetail.aspx?ID=23905&title=Loadshedding-disrupts-life-in-Lahore} A traditional UPS, a fully charged 12V/100a/h battery will run out of power within 1-2 hours. However, during the daytime, the same system retrofitted with 200W solar panels, will be continuously charged at the same rate as it would from the grid. It would offer 1-2 hours of extra usable time per day resulting in a significant quality of life gain. A switch will be installed so as to ensure the battery can still be charged if no solar power is available. Solar powered UPS offer efficiency gains when charging batteries. Classic UPS transform grid A/C electricity to DC to charge batteries resulting in conversions losses whereas solar panels generate DC electricity and charge batteries with few losses. The product will be easily accepted as customers will not experience any change in the way they use their UPS.

![Photograph of Solar powered UPS prototype. For full explanation see video.](image)
Competitive advantage:

By leveraging the existing inverters and batteries within installed UPS, we will be offering by far the lowest cost retail solar installations in Pakistan. No such offering exists in the market currently. Potential competitors only sell whole independent solar power systems which include inverters and batteries. Our primary research indicates that the lowest cost option currently on the market is over $1600 and very few have been sold. Our system would drastically reduce the cost of a retail solar installation to $533. Our lower price point opens up a broader market segment for solar energy in Pakistan. Partly because our system preserves and enhances the value of already installed UPS, the payback period is less than 4 years. Standard industry payback periods for retail solar installations without subsidies are at least 15 years.\(^2\)

Potential competitors are not interested in the kind of small-scale installation we aim to do. We will therefore have a compelling first mover’s advantage in this market. In additions, there are no strong & trusted brand names in the retail solar market. We will be able to build strong brand image so as to better compete with potentially larger companies. We also are savvier when it comes to marketing to the first segment users segment of this market. We believe young professionals who are aware of environmental issues will be the early adopters of our product. Our surveys indicate that at this price 50% of those surveyed in our target market would be interested in purchasing a product like ours. Broad Peak has better access to classic media such as television or radio and awareness of digital marketing. It also has contacts with environmental groups like the Pakistan Sustainability Network and KnowElectricity who can help promote our product to our target market.

Entry, growth and exit strategies:

Entry Strategy: Broad Peak's entry strategy is to enter the market early and establish brand through an aggressive PR campaign and price point. Salespeople will be offered attractive commissions in order to boost sales. We will also offer cash rewards for any person whose refers us a new client.

Short Term Growth Strategy: Broad Peak aims to build a brand name known for reliability, cost-effectiveness and expertise in solar power. As a first mover, the business will be able to establish this image in the market and capitalize on rising grid energy costs and decreasing solar to become the premier retail solar panel distributors in Pakistan. By offering 1-2 year installment plans Broad Peake will broaden the market reach of solar power UPS. To do so Broad Peak will leverage Mr. Malik’s background and connections in the banking sector. Starting in year 2, Broad Peak will increasingly target small businesses. They stand to benefit particularly from the increased electricity output feature offered by solar power UPS, enabling them to work longer through power cuts.

Medium-Long Term goals: Since UPS are widely used throughout urban Pakistan and South Asia, Broad Peak believes this model to be highly scalable. Once the model is proven, Broad Peak plans to open subsidiaries outside of Lahore. The long term goal is to continue providing sustainable retail energy solutions using solar power as well as other technologies. Capitalizing on a strong brand name and the inherent advantages of distributed power generation in this region, we envisage offering a variety of customized energy solutions to small as well as larger scale organizations.

Exit Strategy: The success and scalability of this venture in the long run will depend on the level of cooperation and partnership attained with investors and partners on the ground. Hence, the exit strategy will be to forge meaningful partnerships in order to execute large scale implementations and diversification of our product offerings.

INDUSTRY, MARKETPLACE, COMPETITOR ANALYSIS

Industry analysis:

The solar Industry is in its early stages in Pakistan and was estimated to be approximately $35-40 million in 2011. The vast majority of sales have been for small-scale utility size projects and rural off-grid electrification. Demand is driven mostly by non-governmental organization (NGOs) and Government sponsored projects that focus on utility scale projects.  

Some companies, such as Akhter Solar, assemble solar cells into panels but no cells are currently manufactured in Pakistan. The Industry is highly fragmented. Many companies operate a solar division as part of their larger electronics or engineering business interests. Retail sales are almost non-existent in urban areas. Companies contacted all reported under 5 systems sold in Pakistan principal urban areas - Karachi, Lahore and Islamabad, all of which were to institutional clients such as universities.

Current trends:

Pakistan is undergoing severe and worsening power crisis. The shortfall in 2011 was estimated at about 4000MW for 14,000MW of output capacity, resulting in widespread rolling blackouts. Many areas were left without electricity for over 10 hours per day. Largely driven by circular debt problems, power outages cost Pakistan’s economy an estimated 3-4% of GDP. Retail electricity prices have been heavily subsidized but these

3 From interview with various private sector players: Akhter, DACC and the CEO of Alternate Energy Development Board (AEDB), Arif Allaudin
4 http://www.rural-electrification.com/cms/upload/pdf/Lis-solar-companies-Pakistan040407.pdf
5 http://www.economist.com/node/21531495
subsidies are being removed resulting in a rapid increase in retail electricity prices of 1.7% per month. Retail electricity prices were approximately $0.13/kWh as of December 2011. Current peak load power costs utilities $0.41/kWh with transmission and distribution losses of 25-30%. This trend is clearly unsustainable. Broad Peak believes that the attractiveness of household solar power will greatly enhance as electricity prices continue to increase and quality of service keeps worsening.

In order to boost solar power use and encourage private sector investment, the government of Pakistan has offered incentives such as eliminating duties. In 2011, the cost of solar panel prices worldwide dropped rapidly to approximately 1$/watt. Industry analysts believe prices will continue decreasing through 2012 at a slower pace of 13%.

Marketplace analysis:

Broad Peak’s target market is Lahore, a city of over 10 million inhabitants. Since the product the company will sell is based on retrofitting existing UPS, the size of the market is determined by the number of UPS currently installed. Installed UPS retail at around $400. While exact figures are not currently available, our primary research indicates that conservatively, 20% of households have a UPS installed. With an average household size of 7, Lahore has at least currently 300,000 installed UPS. concentrates a large market of UPS users with more disposable income than average.

Our survey indicates that while UPS are the most economical way for those connected to the grid- to have some electricity during power cuts, users face numerous problems. UPS face a variety of technical problems that require users to pay for repairs and replacement on a yearly basis. Our surveys indicate a yearly average of $68 spent keeping UPS up and running. Lastly UPS do not always cover needs during long power cuts. UPS owner report an average of 2.5 hours/day when the UPS does not function during power cuts due to the battery being drained. Beside our product, there are no alternatives currently available in the market place to improve UPS economic and output performance.

Competitors:

Competitors are not a barrier to entry. This venture has no real direct competitors in Lahore as of now. Other solar companies only offer entire solar systems when it comes to retail solar. The least expensive system on the market is $1600, mostly due to the high cost charged for solar panels, up $3.5/watt. Payback times for these systems are

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6 January 4th Interview with AEDB CEO, Arif Allaudin
well over 10 years. There are no large international players in this market. The three main local companies that operate in Lahore that deal with solar energy are Izhar, IJSS and Solar System Pakistan. (For list of additional companies dealing with solar power in Pakistan, appendix I). For two of these companies solar is not their main concern, rather an outgrowth of an existing business. Through these businesses they have an existing distribution network and a solid technical knowledge of electronics.

These companies could become potential competitors if they chose to emulate Broad Peak's Model. However, these competitors do not have any strong brand recognition in the retail market nor are they particularly large established players.

MARKETING ANALYSIS

Target market strategy:

The entire target market for solar powered UPS is the 300,000 UPS owners in Lahore. However, the company’s initial primary target market is middle and upper middle class, urban, retail residential UPS users. Broad Peak believes this market segment concentrates about 20% of total UPS in Lahore or approximately 60,000 UPS. We will particularly focus on young professionals (25-40) who value electricity services and have disposable income to pay for a product that improves their UPS performance. 88% of those surveyed said they owned one or several UPS, averaging to 1 UPS per household. Broad Peak’s surveys indicated that 53% of UPS owners were willing to pay for an enhanced UPS performance product. This market segment is also more likely to be aware of environmental issues and be sensitive to this aspect of the product. Over 65% of those surveyed indicated that if such a product had environmental benefits it would encourage their purchase. Thus Broad Peak estimates its initial target market as these 30,000 UPS owners. Broad Peak also believes this market segment to be key influencers who can bring awareness to other market segments such as older demographics or small business owners. Broad peak will build on this customer base to broaden the appeal of its product.

Product/servicing strategy:

Broad Peak’s Solar Powered UPS, is markedly different from what is currently offered in the market. It leverages user’s prior investment in an electronic appliance, the UPS. It works back from existing deficient product and improves its performance and lifespan in a sustainable manner.

It is user friendly and there is no switching cost. Purchasers will not experience any change in how they interact with their UPS. They can adopt solar power without having to switch to an entirely new and unfamiliar system.
Competitors offer whole solar systems with batteries & inverters priced at least at $1600. Broad Peak’s product is only $533 because it makes use of existing battery and inverter in the UPS system. Our payback period, for the same amount of installed watts is much shorter than competitors. Solar powered UPS make home solar economically attractive on a small scale today and without any subsidies.

As an added value, Broad Peak will also include a switch to turn off the system if the battery is too low to function properly. This feature will extend/protect the battery lifespan from damage due to over drainage and save appliances from exposure to low voltage. Fahad Rafiq, director of sales for Royal Fans one of the largest fan companies in Pakistan has confirmed the damaging effect of UPS on his product.\(^8\)

This product will improve the output and lifespan of classic UPS in an eco-friendly manner. Broad Peak will include with each system a 1 year technical warrantee. Panels will be under a 20 year manufacturer-backed warrantee.

**Pricing strategy:**

Broad Peak’s pricing strategy is aimed at drastically reducing the costs of adopting small-scale solar power while maintaining gross margins of over 30%. These margins are a hedge against working in an often unstable environment and a way to attract potential investors. As noted earlier, this product is about 1/3 the price of the least expensive.

Broad Peak also aims to install smaller systems than its competitors. The smallest home solar system available in the market currently is 500W. Based on the average size of UPS and batteries, ours will be around 200W. This will enable those interested to try solar energy to experience tangible benefits for a much lower cost. This pricing is also part of the branding strategy. By being the first to introduce solar power to retail markets, Broad Peak aims to create repeat customers should they choose to expand their solar systems.

**Distribution strategy:**

The venture’s distribution strategy is based upon its partnership with Eco-Gen, a Lahore-based retail energy company. Mr. Malik has a strong family connection to this company. Eco-gen has an established presence in Lahore and the surrounding area as well as experience selling and servicing retail energy products such as UPS and diesel generators. Eco-gen is also currently performing tests on the first prototype solar UPS.

Initially, Broad Peak will rent warehouse space from Eco-gen to store imported solar panels. Broad Peak will rely on its technicians to deliver, install and perform

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\(^8\) From Interview Dec 30\(^{th}\), 2011
maintenance on the systems. In exchange, Broad Peak will pay Eco-gen a fixed fee of $34 per installation. This ensures Eco-gen a fixed stream of risk-free income and Broad Peak a distribution mechanism that requires little up-front capital expenditures.

Broad Peak’s model will be order based-deliveries. Broad Peak’s sales department will forward orders to Eco-Gen who will deliver the system within 24hrs. Payment is to be made upon delivery.

**Advertising/promotion:**

Broad Peak’s business plan calls for an aggressive marketing campaign in order to reach our target demographic. Broad Peak’s comprehensive marketing strategy capitalizes on emerging consumer trends and focuses on its target market. It combines the use of fashionable/respected media outlets that have a wide reach with sustainability conscious consumers through environmental NGOs.

During the first year of operations (year 2 of pro-forma), Broad Peak will spend over US$21,000 on advertising, promotion and events to build brand awareness and educate potential customers. This ambitious advertising campaign will be maintained throughout the first years of operation so as to establish strong brand awareness.

We will advertise on traditional media such as popular radios that cater to our target market such as CityFM89 and on local news channels. Broad Peak has very good contacts with respected channels in Pakistan, especially with Express News. During the initial marketing campaign Broad Peak can get one of these channels to report on Solar Powered UPS. Broad Peak will make full use of social media such as its website, Facebook and Twitter to raise awareness and organize events.

These efforts will be complemented by collaborations with NGOs working in the sustainability and environmental awareness space who will carry out campaigns in educational institutions, offices and public places. The product will also be presented in coordination with the Pakistan Sustainability Network, which is a popular source of information for sustainability conscious consumers. Broad Peak also plans to partner with KnowElectricity, an organization started by a Pakistani student at MIT.

Lastly, the Alternate Energy Development Board (AEDB), a highly respected government body, has endorsed Broad Peak on record. This will enhance the products credibility as Broad Peak markets it to the public.

**Sales Strategy:**

In addition to marketing efforts, sales will be driven initially by 2 dedicated sales staff. This number will increase with sales, (see financials). They will perform outreach, field calls, answer questions, take orders and perform after sales customer service. They
must be knowledgeable about the product and be able to answer questions and educate consumers on how the product works and its benefits.

In order to ensure this, Broad Peak's founders will train them; In addition, a manual will be made which will be used as a training tool and kept for reference during inquiries. We will hire degree holders with sales experience preferably in electronics markets, and proven communication skills. The sales force’s pay structure will be base monthly salary of $400 and an $11 sales commission. Bonuses will be distributed at the end of the year if sales targets are exceeded. (For sales targets see Financials)

In addition, if an existing customer becomes a “sustainability ambassador” by referring a new customer, they will also be eligible for an $11 cash reward or can pass savings on to the new customer.

OPERATIONS PLAN

Operations strategy:

Broad Peak will offer an economical product and superior sales/after sales servicing. Broad Peak will leverage Eco-gen’s existing infrastructure, technical expertise and distribution network. Eco-gen has agreed to work on a per installation basis fee. Broad Peak will shoulder the financial risks associated with materials purchases.

Broad Peak’s operations strategy is premised on keeping low fixed overhead costs and upfront capital. Initially, Broad Peak will rent office and warehousing space from Eco-gen at low cost. This arrangement will also ensure Broad Peak ease of installation and coordination with Eco-gen for day to day operations.

Eco-gen acts as a logistical hub between import and final sale. Broad Peak will act as an interface between solar panel manufacturers, Eco-gen and the end customer. Broad Peak will be in charge of importing solar panels, sales and customer service. Technicians from Eco-Gen will deliver, install and perform any required maintenance on the systems. Eco-gen will be paid a fixed fee of $34 per installation. This agreement ensures that Broad Peak keeps its fixed overhead costs down and Eco-gen is assured risk free revenue.

Initially, Broad Peak will purchase as much equipment through the local market as possible, ensuring attractive prices with electronics suppliers. This strategy seeks to minimize large inventories that tie up a lot of the enterprise’s cash. This is especially important given that Broad Peak will have a significant amount of cash tied up in solar panel inventories.

Ongoing operations:
When a sale is made, Broad Peak employees will input customer information in a database and pass the order and delivery schedule to an Eco-gen technician. Delivery and installation will be performed within 24hrs of order. Payment will be collected upon delivery.

Inventory management:

New panels will be ordered based on pace of sales. It takes an estimated 3 months for panels to arrive once an order is placed. Broad Peak will place an order when it estimates having 4 months worth of panels. This will ensure it has stock if the delivery is off schedule while avoiding excessive inventory accumulation. Other parts can be purchased on credit in the local market with few delays. Some stocks of these will be maintained.

DEVELOPMENT PLAN:

Timeline:

Dec-Jan 2012: perform market research, set up prototype, Outreach and surveys.

Jan-April 2012: Prototype phase. Work out any potential technical problems and assess benefits of installation with greater precision. Finalize design

May-October 2012: Field testing, pilot project. Install 5 systems in different areas of Lahore and collect data on system performance and customer experience. Make required adjustments.

June 2012: incorporate Broad Peak in Pakistan.

July-August 2012: Design/set up website

August-September 2012: Launch initial digital Marketing campaign. Collaborate with Pak Sustainability Network (crosslist) and knowelectricity.org

September-December: Source solar panels

October-December: Create training manual and protocols for sales/after-sales personnel

December 2012: Company founders graduate

January 2013: Order first shipment of 100w solar panels + charge controllers. One 20ft container, 596 100 w panels. Launch full out promotional campaign. Take early orders.

February-March 2013: Hire & train salespeople and customer service. Set up office

April 2013: Receive solar panels. Begin installations.
COMPANY ORGANIZATION:

Broad Peak is a corporation with 2 founding partners: Ahmed Malik & Jonathan Torn

Ownership structure:

Mr. Malik will have a 75% and Mr. Torn 25% profit shares in Broad Peak’s operations in Lahore. This split is based on equity stakes and active involvement on the ground of both partners.

Both partners will receive the same base salary as sales people starting at $389/month in the first year and increasing in time.

If any Broad Peak partner decides to expand operations to other locations outside Lahore, the sleeping partner will have a 10% stake in the new venture unless there is an additional equity buy-in.

Ahmed Malik bio & role:
Ahmed Malik is currently pursuing a Master of International Business at Tuft’s Fletcher School, focusing on strategic management and energy policy. He hails from Pakistan, where he has worked at Citibank, as well as the Textile industry. He brings to Broad Peak a strong finance background as well as practical field knowledge of the business environment of Pakistan.
At Broad Peak, Ahmed will focus on running local operations including sales, supply chain and marketing.

Jonathan Torn bio & role:
Jonathan Torn brings over three years of field experience working in the renewable energy sector in South Asia. In Bangladesh he worked with Grameen Shakti and as an energy consultant to Gemcon, one the country’s largest conglomerates. He brings practical and technical experience of successful implementation of renewable energy projects.
At Broad Peak Jonathan will focus on the technical aspects of the venture as well as sourcing panels, raising funds and international expansion.

The Broad Peak team will also be comprised of 2 highly qualified and skilled sales personnel. Broad Peak will attract strong sales personnel through an attractive base salary combined with sales-based commissions.

Broad Peak is fortunate to have a number of high level advisors and active supporters who are listed below:
Antje Danielson, the co-founder of Zipcar and Director of the Tufts Institute of Environment
William Moomaw is a Fletcher professor of Environment Policy, Co-recipient of Nobel Peace Prize for work with ICCP and established authority in renewable energy field.
Bhaskar Chakravorti, Executive Director of Business in the Global context, Ex-McKinsey partner recognized authority on strategy and innovation.

Arif Allauddin, Director of the Alternate Energy Development Board has endorsed this venture on record.

Wardah Inam, PHD candidate MIT, electrical engineering advisor.

CRITICAL RISKS & MITIGATION STRATEGIES:

**Threat:** Competitor retaliation: model easily replicable. Competing with bigger players, could offer lower prices.

**Response:** Broad Peak will make full use of its core competency in marketing, its strong local partnership, first mover advantage and the use of an aggressive marketing strategy to become the most established brand for retail solar energy product.

**Threat:** Inability to raise investment for venture in Pakistan:

**Response:** Broad Peak will underscore the venture’s social and environmental value. It will reach out to alternate funding mechanisms besides pure venture capital. It will approach social investment funds like, Acumen Fund and Ashoka as well as to Government and non-government organizations in the energy space.

**Threat:** Security risks of operating in unstable country:

**Response:** In order to minimize security concerns, Broad Peak will have office space in outskirts of Lahore and limit trips to more central locations to the minimum required to conduct business. No business will be conducted outside of main urban centers.

**Threat:** Inventory pile up

**Response:** Broad peek will limit large orders of solar panels with suppliers. This will be a hedge against cash getting tied up in inventory, foreign exchange risks and commodity price fluctuations.
### Financial Analysis:

**Pro-forma Income Statements:**

**Year 1 Detailed assumptions**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenues</strong></td>
<td>No revenues for first year</td>
</tr>
<tr>
<td><strong>Cost of Goods Sold</strong></td>
<td>No Sales, so no cost of goods sold</td>
</tr>
<tr>
<td><strong>Field testing</strong></td>
<td>Installation of 5 systems for pilot testing</td>
</tr>
<tr>
<td><strong>System monitoring</strong></td>
<td>Meters/ regular checkups of the previously installed 5 pilot systems</td>
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<tr>
<td><strong>Company Incorporation</strong></td>
<td>Cost of company incorporation</td>
</tr>
<tr>
<td><strong>Office Equipment</strong></td>
<td>Cost of two personal computers, 2 cell phones and 2 landline connections</td>
</tr>
<tr>
<td><strong>Website design &amp; set up</strong></td>
<td>Hire website developer and pay over three months until website is up and running</td>
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<tr>
<td><strong>Travel to Pakistan</strong></td>
<td>$1700 per trip per principal to go to Pakistan after graduation</td>
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<tr>
<td><strong>Transportation</strong></td>
<td>Cost of fuel and/or local transportation for the team</td>
</tr>
<tr>
<td><strong>Salaries</strong></td>
<td>Rs.35,000 ($389) per sales/customer service person</td>
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<tr>
<td><strong>Rent &amp; Facilities</strong></td>
<td>Small office portion at Eco-Gen (our technical partners), plus Broad Peak's portion of facilities</td>
</tr>
<tr>
<td><strong>Net Income</strong></td>
<td>The net income is expectedly negative in the first year</td>
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</tbody>
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#### Broad Peak Energy Solutions

**Income Statement (in US$) for period ending April 30, 2013**

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<th>Ma</th>
<th>Jun</th>
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<td>Cost of Goods Sold</td>
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<td><strong>Gross Margin</strong></td>
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**Startup Expenses**

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td><strong>Field testing</strong></td>
<td>78</td>
<td>8</td>
</tr>
<tr>
<td><strong>System monitoring</strong></td>
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<td>833</td>
</tr>
<tr>
<td><strong>Company incorporation</strong></td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td><strong>Office Equipment</strong></td>
<td>1,6</td>
<td>1,68</td>
</tr>
<tr>
<td><strong>Travel to Pakistan</strong></td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>Salaries</strong></td>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total**

<table>
<thead>
<tr>
<th>Amount</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2,77</td>
<td>2,77</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>833</td>
<td>833</td>
</tr>
<tr>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>1,6</td>
<td>1,68</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>
Website design & set up  96  96  2,90
Travel to Pakistan  3,4  3,40
Total startup expenses  3,6  1,4  96  96  3,4  1,6  12,0

Operating Expenses

Local transportation  389  389  389  389  6
Salaries  778  778  778  778  1
Rent & Facilities  500  500  500  500  0
Total Operating Expenses  166  166  166  166  6,66

Net Income  11  67  91

Year 2: Detailed assumptions

<table>
<thead>
<tr>
<th>Cost of Goods Sold</th>
<th>Please see the Cost of Goods sold schedule in appendix III, table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>2 sales persons, plus principals get the same salary</td>
</tr>
<tr>
<td>Local Transportation</td>
<td>Cost of fuel and/or local transportation for the team</td>
</tr>
<tr>
<td>International Travel</td>
<td>One trip per principal for trip to US for fundraising</td>
</tr>
<tr>
<td>Rent &amp; Facilities</td>
<td>Rs. 90,000/month for warehouse &amp; office rent &amp; facilities</td>
</tr>
<tr>
<td>Advertising &amp; Promotional</td>
<td>Contract with advertising agency specializing in digital media. Expenditure is high due to need for establishing a strong brand name in the start.</td>
</tr>
<tr>
<td>Taxes</td>
<td>10% annual taxes, as confirmed by a practicing tax auditor in Lahore.</td>
</tr>
</tbody>
</table>

### Broad Peak Energy Solutions

### Projected Income Statement (in US$) for the period ending April 30, 2014

<table>
<thead>
<tr>
<th>US$ rate in Pak Rs.</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>100</td>
<td>280</td>
</tr>
<tr>
<td>Q2</td>
<td>32,258</td>
<td>47,872</td>
<td>52,632</td>
<td>149,066</td>
<td></td>
</tr>
</tbody>
</table>
Cost of Goods Sold 10,957 21,677 32,170 35,368 100,173
Gross Margin 5,348 10,581 15,702 17,263 48,894

**Expenses**

<table>
<thead>
<tr>
<th>Expenses</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>4,668</td>
<td>4,668</td>
<td>4,668</td>
<td>4,668</td>
<td>18,672</td>
</tr>
<tr>
<td>Local Transportation</td>
<td>1,957</td>
<td>1,935</td>
<td>1,915</td>
<td>1,895</td>
<td>7,702</td>
</tr>
<tr>
<td>International Travel</td>
<td>0</td>
<td>3,500</td>
<td>3,500</td>
<td>3,500</td>
<td>7,000</td>
</tr>
<tr>
<td>Rent &amp; Facilities</td>
<td>2,935</td>
<td>2,903</td>
<td>2,872</td>
<td>2,842</td>
<td>11,552</td>
</tr>
<tr>
<td>Advertising &amp; promotional</td>
<td>6,522</td>
<td>6,452</td>
<td>4,255</td>
<td>4,211</td>
<td>21,439</td>
</tr>
<tr>
<td><strong>Total Operating expenses</strong></td>
<td>16,081</td>
<td>19,458</td>
<td>13,711</td>
<td>17,115</td>
<td>66,365</td>
</tr>
<tr>
<td>EBIT</td>
<td>(10,733)</td>
<td>(8,878)</td>
<td>1,992</td>
<td>148</td>
<td>(17,472)</td>
</tr>
<tr>
<td>Interest expense</td>
<td>783</td>
<td>774</td>
<td>766</td>
<td>758</td>
<td>3,081</td>
</tr>
<tr>
<td>Earnings before Taxes</td>
<td>(11,516)</td>
<td>(9,652)</td>
<td>1,226</td>
<td>(610)</td>
<td>(20,552)</td>
</tr>
<tr>
<td>Taxes</td>
<td>(1,152)</td>
<td>(965)</td>
<td>123</td>
<td>(61)</td>
<td>(2,055)</td>
</tr>
<tr>
<td>Net Income</td>
<td>(10,364)</td>
<td>(8,687)</td>
<td>1,103</td>
<td>(549)</td>
<td>(18,497)</td>
</tr>
</tbody>
</table>

**Year 3, 4 & 5 detailed assumptions**

<table>
<thead>
<tr>
<th>Number of units sold</th>
<th>Estimates based on the assumption higher sales will be attained by establishing a strong brand name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>Sales force will be 4, 6 and 9 personnel for 2015, 2016 and 2017 respectively. Their monthly salaries will increase by $50 in each respective year. One manager will be hired in 2016 and paid $700 and $750 per month in 2016 and 2017 respectively.</td>
</tr>
<tr>
<td>Local Transportation</td>
<td>Cost of fuel and/or local transportation for the team</td>
</tr>
<tr>
<td>International Travel</td>
<td>One trip per principal for trip to US for fundraising</td>
</tr>
<tr>
<td>Rent &amp; Facilities</td>
<td>Monthly rental of office space/warehouse + utilities to increase by 25% each year</td>
</tr>
<tr>
<td>Advertising &amp; promotional</td>
<td>Taken to be 5% of annual sales</td>
</tr>
</tbody>
</table>

**Projected Income Statements (in US$) for the period ending April 30:**

<table>
<thead>
<tr>
<th>US$ rate in Pak Rs.</th>
<th>100</th>
<th>105</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016</td>
<td>2017</td>
</tr>
<tr>
<td>Number of units sold</td>
<td>600</td>
<td>1,080</td>
<td>1,944</td>
</tr>
<tr>
<td>Revenues</td>
<td>315,000</td>
<td>567,000</td>
<td>1,021,484</td>
</tr>
</tbody>
</table>
Cost of Goods Sold | 217,500 | 391,886 | 712,211
---|---|---|---
**Gross Margin** | 97,500 | 175,114 | 309,273

**Expenses**

<table>
<thead>
<tr>
<th>Description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>32,400</td>
<td>36,700</td>
<td>73,350</td>
</tr>
<tr>
<td>Local Transportation</td>
<td>7,320</td>
<td>8,580</td>
<td>10,200</td>
</tr>
<tr>
<td>International Travel</td>
<td>3,750</td>
<td>4,000</td>
<td>4,250</td>
</tr>
<tr>
<td>Rent &amp; Facilities</td>
<td>13,500</td>
<td>16,071</td>
<td>19,176</td>
</tr>
<tr>
<td>Advertising &amp; promotional</td>
<td>15,750</td>
<td>28,350</td>
<td>51,074</td>
</tr>
<tr>
<td><strong>Total Operating expenses</strong></td>
<td>72,720</td>
<td>93,701</td>
<td>158,050</td>
</tr>
<tr>
<td>EBIT</td>
<td>24,780</td>
<td>81,413</td>
<td>151,222</td>
</tr>
<tr>
<td>Interest expense</td>
<td>720</td>
<td>686</td>
<td>655</td>
</tr>
</tbody>
</table>

Earnings before Taxes | 24,060 | 80,727 | 150,568
Taxes | 2,406 | 8,073 | 15,057
Net Income | 21,654 | 72,654 | 135,511

**Capital requirements, capital budgeting, ROI and payback period**

The initial capital requirements for the business are as below. These amounts will be needed at the start of each year:

<table>
<thead>
<tr>
<th>Capital Requirements (US$)</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup costs</td>
<td>18,758</td>
<td>-</td>
</tr>
<tr>
<td>Ordering 150 systems- less container load</td>
<td>36000</td>
<td></td>
</tr>
<tr>
<td>Cash for monthly expenses</td>
<td>66,365</td>
<td></td>
</tr>
<tr>
<td><strong>Total capital required</strong></td>
<td>18,758</td>
<td>102,365</td>
</tr>
</tbody>
</table>

In order to meet the above capital needs, Broad Peak proposed the below capital budget:

<table>
<thead>
<tr>
<th>Capital Budgeting (US$)</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owners Equity</td>
<td>9,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Grants &amp; Awards</td>
<td>10,000</td>
<td>50,000</td>
</tr>
<tr>
<td>External Equity</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td>32,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total capital raised</strong></td>
<td><strong>19,000</strong></td>
<td><strong>102,000</strong></td>
</tr>
</tbody>
</table>
Here, the expectation is to raise the maximum amount through grants, awards and other non-dilutive funding in order build a self-sustaining business model. This will also minimize the need to raise external capital. Given the above scenario is true, the total equity would be $39,000.

Broad Peak’s sales will be on a cash on delivery basis, which is the norm for consumer products in Pakistan. Hence, this cash, along with additions to equity in form of profits will be ploughed back into the enterprise.

The table below shows ROI calculations for the first 5 years of operation:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>(18,758)</td>
<td>(18,497)</td>
<td>21,654</td>
<td>72,654</td>
<td>135,511</td>
</tr>
<tr>
<td>Owner’s Equity</td>
<td>18,758</td>
<td>20,000</td>
<td>41,654</td>
<td>114,309</td>
<td>249,820</td>
</tr>
<tr>
<td>ROI</td>
<td>-100%</td>
<td>-92%</td>
<td>52%</td>
<td>64%</td>
<td>54%</td>
</tr>
</tbody>
</table>

The first two years have an expected negative return, whereby the next 3 years exhibit high returns as per forecasted financials. Once again, in a high risk environment investments are only considered attractive if they have higher returns than less stressed markets.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>(18,758)</td>
<td>(18,497)</td>
<td>21,654</td>
<td>72,654</td>
<td>135,511</td>
</tr>
<tr>
<td>PV at 12% discount</td>
<td>(16,748)</td>
<td>(14,746)</td>
<td>15,413</td>
<td>46,173</td>
<td>76,893</td>
</tr>
<tr>
<td>Cumulative PV</td>
<td>(16,748)</td>
<td>(31,494)</td>
<td>(16,081)</td>
<td>30,092</td>
<td>106,985</td>
</tr>
</tbody>
</table>

In the above table, it can be seen that the payback period for the equity investment of $39,000 is roughly 4.1 years if adjusted for time value of money. However, after that period, the present value is significantly higher. Despite a longer payback period for a relatively smaller equity investment, much higher returns in later years make this a lucrative proposition.
APPENDIX 1: List of major solar companies in Pakistan

Mr. Shaaf Abdul Aziz Mehboob
Adaptive Technologies (Pvt) Ltd.
Suite #3, 4th floor Dean Arcade,
Block – 8, Clifton,
75600 Karachi
Pakistan

Mr. Sharjeel Ahmed Sulehri
Manager Projects
Akhter Solar Limited
Buland Markaz, 33-Blue Area
Islamabad - 44000
Pakistan

Bashir A. Syed
Vice President, Member ASES, ISES
Alt-Energy Tech Inc. Pakistan (PVT) Ltd.
Office Address:
Alt-EnergyTech
Maqam-e-Farhat
R-85 Block 13-B-1
Gulshan-e-Iqbal, Karachi 75300, Pakistan

Muhammad Ammad Riaz
Director System Engineering
Clean Power (Pvt.) Ltd.
216, Street 74, 1-8/3, Islamabad

Mr. Zafir IQBAL
Manager
Crest International Trading Co.
136/B, Cho Rehmat Ali Road, SMCHS, 2nd floor
Karachi 74400, Pakistan

Electro Control Industries (Pvt) Ltd.
ECI House #1,Street #95,Sector I-8/4 Islamabad, Pakistan

Mr. Feroz Shah
Director (P&D)
NATIONAL ENGINEERING CORPORATION
202  Sea  Breeze Plaza,
Main Shahrah-e-Faisal,
Karachi – Pakistan

Ms. Shazia Khalid
GM (Contracts & Implementation)
Socio-Engineering Consultants
4-B, Street # 48, F-7/4
Islamabad
Pakistan

Naeem Mukaddam
CEO
Synercon: Solution to Energy Saving
551-A-I, Johar Town, Lahore, Pakistan

Trillium Pakistan (Pvt) Ltd
10th floor, AWT plaza Rawalpindi, 5-The Mall, Pakistan
CONSENT FORM

STUDY DETAILS:
- CONSENT TYPE: STANDARD ORAL
- CONDUCTED BY: Center for Emerging Markets Enterprise
- LOCATION: INTERNATIONAL (Lahore, Pakistan)
- PARTICIPANTS: ADULT MEMBERS OF PAKISTANI SOCIETY
- COMPENSATION: NONE

CONSENT TO PARTICIPATE IN RESEARCH STUDY

BACKGROUND AND PURPOSE: You are being asked to take part in a research project, which is being organized by the Center for Emerging Markets Enterprise, a center at Tufts University. The purpose of this research project is to learn more about how intermittent electricity is affecting your UPS performance and your quality of life.

PROCEDURES: The format of the interview will be a series of questions. We expect that the interview will take approximately 10 minutes. With your permission, we will record your answers in writing solely for the purposes of accurately transcribing your answers.

CONFIDENTIALITY AND RISK: If you wish pseudonyms to be used to protect your privacy and confidentiality, we will be happy to do so. Please know that you do not have to answer any questions or discuss any topics that make you feel uncomfortable.

WITHDRAWAL OF PARTICIPATION: Should you decide at any time during the interview that you no longer wish to participate, you may withdraw your consent without prejudice.

COSTS AND BENEFITS: There are no costs involved with participation, and also no direct benefits to you. However, your participation will contribute to gaining a better understanding of the challenges facing Lahore’s electricity sector. Since the research aims to be used for finding solutions to address the power crisis in Pakistan, the answers can contribute to alleviating the current situation.

REQUEST FOR MORE INFORMATION: You may ask more questions about the
study at any time. Please contact the research team by emailing or calling
ahmed.malik@tufts.edu tel: +92-42-3522-5556 . You can also contact Stacy Neal at
the Center for Emerging Markets Enterprise in the US by calling + 1(617) 627 4417.
This study has been approved by the Institutional Review Board at Tufts University,
so you many also contact the IRB Administrator, by calling + 1(617) 627-341
Household Questionnaire

Name: _________________________                    Neighborhood / Town:__________________
Head of household: Yes/No                                     Occupation: ____________________
Please specify the full name of the person who sent you the survey:_______________________

1) Do you have a UPS installed at home?
   - Yes
   - No
   If yes, please mention how long you have had a UPS: ___ years

2) If the answer to Question 1 was ‘yes’, please choose the specification of your UPS
   number of appliances run by UPS. (For example: 400 Kva or 2 lights, 2 fans)
   - 600 Kva
   - 800 Kva
   - 1000 Kva
   - 1200 Kva
   Other: _____________________________

2) a. Please detail the number of appliance run by your UPS
   Fans:
   Lights:
   Other:

3) How many batteries are connected to your UPS?____________

3a.) What is the capacity of your battery(ies)?
   _____ Amp-hours (AH)   _____ Voltage (V)
   If two different battery sizes please detail:

4) At a stretch, for how many hours can your UPS run at full capacity?
   _____ hours.
5) a. On average, how many hours of power cuts do you experience during day time?
0-2 hours
2-4 hours
4-6 hours
6-8 hours
8 hours +

5) b. How many hours of power cuts do you experience during night time?
0-2 hours
2-4 hours
4-6 hours
6-8 hours
8 hours +

6) Does your UPS function during the entirety of power cuts?
-Yes
-No
6)a. If No, how many hours are you left without any electricity? ____

7) Do you face any technical problems with your UPS?
-Yes
-No
If yes, please choose one or more options from below:
- There’s a problem with the battery (Event frequency: __ times each week/month/year)
- There’s a problem with the UPS inverter (Event frequency: __ times each week/month/year)
- There’s a problem with maintenance (battery water, acid etc)
- There’s a problem with voltage fluctuation
- Other: ____________________________

8) On average, how much do you spend per year on maintenance of your UPS & battery?
9) During the below mentioned time periods, please tick the appropriate box for the last time you replaced your UPS inverter and/or battery?

<table>
<thead>
<tr>
<th>time period</th>
<th>ups</th>
<th>battery</th>
<th>cost</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 mths</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-12 mths</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12mths +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10) Would you be willing to pay 15,000 for a device for a device that guarantees to increase your UPS daily power output by 2 hours, for the next 10 years?
   - Yes
   - No

11) Would you be willing to pay Rs. 800/month for 2 years for the same device?
   - Yes
   - No

12) If no, why not?

13) Would this device being good for the environment impact your decision to purchase it?
   - Yes, it would encourage me
   - No, I am indifferent

14) Do you own any of the following items? Please check, if yes.
   - Generator
   - Motorbike
   - Car
   - Residential Plot
   - House
   - Agricultural land