S-Lab: Laboratory for Sustainable Business
Spring Semester 2013

Final Report

Hope Energy

Designing a Methodology to help
Develop Customized, Optimal Energy
Technology Solutions

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1. Executive Summary

Hope Energy is a startup offering customized sustainable energy solutions to customers in South Africa. They operate using the Energy Service Company model (ESCO) with potential clients, and use Power Purchase Agreements (PPAs) with suppliers to gain access to a variety of technologies. Their business model is explained further in the Value Proposition section.

At the commercialization stage of Hope Energy business model, the S-Lab project was designed to assist in developing a methodology to systematically customize optimal energy solutions for Hope Energy’s clients. Together with Hope Energy, our S-Lab team has designed a six-step methodology guide to enable Hope Energy employees to systematically analyse the needs and opportunities for clients, and recommend energy solutions which include both energy efficiency and sustainable energy options.

In order to enable Hope Energy to explain its business model to its potential clients, our S-Lab team assisted in the developing value propositions for five market segments. Additionally, a series of guiding questionnaires were developed to be used for engagement with interested customers.

As this project timeline coincided with Hope Energy’s existing efforts to secure three strong prospective clients, our S-Lab team is looking forward to seeing how Hope Energy continues to utilize the methodology and recommendations from this project to progress with its business growth.

2. Background

Established in August 2012, Hope Energy is a startup currently pursuing business clients as a sustainable energy solution provider. Its mission statement is to fill Africa’s energy gap with sustainable forms of energy and energy efficiency.

Energy is required at all levels to alleviate poverty, deliver education, create jobs, and grow businesses, but there is an existing gap between energy need and availability in South Africa and other African countries. Hence, there is a strong demand for solutions to reducing energy supply risks and costs. The business model of Hope Energy capitalizes on these energy risk issues by satisfying needs for energy security and energy efficiency.

Electricity blackouts and national load-shedding incidents have occurred multiple times, beginning with Western Cape in 2006 and on the national scale two years later. These incidents brought home to South Africans the tenuous security of energy supply within the near future. Without access to reliable, clean, affordable, safe and ample energy, the economy cannot develop efficiently, and thus a lack of energy security feeds into the cycle of poverty. South Africa’s energy security risk consistently has been higher than the OECD average for almost the
entire period from 1980 to 2010; furthermore, this risk is worsening, in absolute terms as well as relative to the OECD countries.

As a sustainable energy solutions provider, Hope Energy develops optimal combinations of clean energy sources and energy efficiency solutions customised to customers’ needs, thereby delivering maximum value of reducing energy demand and delivering clean power. Hope Energy does not promote a specific type of sustainable technology, but rather recommends a combination of technologies suited for the customers’ specific needs and situations. Hope Energy has established collaborative arrangements with suppliers of renewable energy and energy efficient products. These collaborations give Hope Energy access to best technologies at competitive costs, and enable Hope Energy to provide customized solutions to meet different customers’ needs.

In addition to minimizing energy risk, Hope Energy would be able to participate in the opportunities to help South Africa and Africa as a whole leapfrog the dirty fuels and go straight to clean energy, in the same way Africa bypassed land line phones and went straight to mobile phones. As of 2010, 90% of South Africa’s electricity production was coal-based, which is not surprising considering the country’s large deposits of coal. The electricity sector in South Africa is dominated by state-owned national utility Eskom, which owns and generates more than 90% of generation assets, the whole transmission grid and a significant proportion of the distribution industry.

Having secured strategic partnerships with suppliers of renewable energy and energy efficient technologies, Hope Energy is at the stage of bringing its collaborative value proposition to customers in five broad market segments: 1) large corporations, 2) medium businesses, 3) small businesses, 4) rural communities and 5) private schools. The focus is currently on small and medium businesses as these segments face the highest energy risk and pay the highest tariffs, and therefore have the most to gain. Electricity prices in South Africa have rocketed by more than 170% over the last 5 years, while prices in the other large fast-growing countries (Brazil, Russia, India, China) have decreased by more than 36% in the past decade. The large price hikes have contributed to the closure of 440,000 small businesses in the 5 years leading up to 2011.

While Hope Energy is starting to begin by securing customers in South Africa, it is also drawing up plans to replicate its business model to the rest of Africa and looking for opportunities to invest in commercially viable renewable energy technology.

3. Approach

Our six-week-long project was divided into three phases, to reflect a similar process that Hope Energy engages in with clients. First, in order to continue developing clients in a systematic manner as Hope Energy gets more interest from various segments, we put together a methodology guide that enables Hope Energy employees to make sure they implement all the steps, from client engagement to project implementation. Next, in order to explain what benefits
clients could potentially get from utilizing Hope Energy’s services, as well as explain Hope’s business model, **value propositions** were created for each of the 5 market segments. Once there was level of interest from the client for further scoping of current energy use and potential savings, a Hope Energy team would obtain data with the help of a **guiding questionnaire**, in order to obtain data (i.e. energy bills, for example, which would reflect whether it is more effective to reduce peak load or overall energy consumption, depending on the energy pricing structure for that segment) from interested clients.

When co-creating the methodology guide, value propositions and questionnaires together with Hope Energy, we used a combination of the on-the-ground experiences Hope Energy has had thus far, as well including recommendations from concepts discussed in our Sustainability-Lab class, including life cycle analysis and certifications.

While in Cambridge, we managed to speak with several people who had previously been involved with energy and/or lighting experience in Africa. This includes Dr. Rob Stoner, VP of MIT’s Energy Initiative, as well as several current MIT students: Caroline Mauldin on an MIT-alum’s energy start-up in Tanzania, Elyse Tyson on experience with lighting in Tanzania and South Africa, and Alex Borschow on a similar customized energy solutions model in the US.
4. Methodology

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5. Value Propositions

Hope Energy’s value proposition (refer to Appendix 1 for sample of Medium Business Value Proposition) provides the reason for customers to consider Hope’s energy solution and the how this solution differentiates their product from competitors. This value is captured from their ability to provide a customizable full energy solution to customers. Each solution is tailored based on a number of customer characteristics.

Hope Energy’s business model follows the Energy Service Company model (ESCO). This approach offers a broad range of energy solutions including the upfront costs to implement the energy-saving technologies. The capital saved from the energy improvements are used to pay back capital and time invested by Hope Energy. This strategy limits the liability for the potential customer. While this method adds substantial risks to Hope Energy, it provides credibility that is often difficult to establish for a new startup like Hope Energy. The ESCO model has been seen in the United States as well as other regions in Africa. The energy broker also offers various financing options to customers to match their financial situations. For example, for energy efficient lighting, Hope Energy can arrange to finance 15% of the capital expenditure that customers need to come up with, whereas Eskom provides 85% of such investment through rebates. This allows customers to only pay when the energy savings are actually realized and further enhances Hope Energy’s credibility.

Hope Energy also provides the connection to energy suppliers through Power Purchase Agreements (PPAs). Consumers are able to gain a reliable energy source while cutting energy costs. From a supplier’s point of view, Hope Energy provides an avenue for the sustainable energy supplier to expand their market.

To better meet their customer’s needs, Hope Energy has segmented their targeted markets. These markets consist of small businesses (e.g. churches), medium sized businesses (e.g. brick factory and a Ford dealership), housing communities, and government communities (e.g. the school system). These markets were selected due to their inability to secure stable access to the grid thus far. Medium businesses, small businesses, communities and even schools often have limited access to grid energy due to regulation from government and large corporations’ ability to pay a higher price for energy.

Hope Energy has pitched to several prospective clients during the six-week project. The startup has many potential clients but has found it difficult to reach agreements on energy solutions beyond efficient lighting. Many customers have stated that they would like to see a payback
within three to five years. This is difficult to produce and even more difficult to prove prior to technology installments. These difficulties have led them to research and invest in less frequently used energy sources such as biomass. While Hope Energy does not have very many competitors in South Africa, this will likely not last long if they are successful. Hope Energy’s continued focus on biomass may lead to a significant differentiating factor once other firm join the South African ESCO market.

One major hurdle in this market is demonstrating enough value from unfamiliar renewable energies to break the dependence on established conventional sources even though these typical sources are expensive and unreliable. Hope Energy needs to establish that despite higher upfront costs, renewable energy sources, implemented correctly, will add value to a business. Since renewable energies are different, have relatively long payback periods, and not yet accepted by much of the public, this added value proposition requires clear and compelling reasoning.

The following are recommendations by our S-Lab team, drawn from lessons learned in the Sustainability Lab classroom.

**Opportunity costs**
The MIT-S Lab team recommends that Hope Energy indicate the idea of opportunity costs as an incentive for customers to turn to sustainable, efficient energy. This idea builds on the capital saved once the payback has been reached. If the resources spent on energy were used on alternative investments, the firm or community may earn further benefit. For instance, the Ford Manufacturing (example mentioned in the Methodology section) could provide additional services or advertisements using the capital saved from energy savings from using solar hot water.

**Hidden costs**
Hope Energy’s business strategy revolves around the current unreliability and future uncertainty of the South African energy grid, and in particular the inconsistency of the grid energy supplier, Eskom. Other unstable industries that renewable resources may solve are supply lines, waste disposal, and storage. For example, a firm which reduces its waste by using renewable energy can avoid later costs tied to fluctuations in waste disposal.

**Ancillary benefits**
Ancillary benefits are difficult to quantify but these are benefits that are important to note for value propositions. Examples such as increased productivity, less absenteeism, and ability to attract and retain employees or students.

**Sustainable behavior**
An important aspect of sustainability is human behavior. This is a very interesting value that Hope Energy can provide in terms of using less energy. One of Hope Energy’s most significant contributions is reducing the amount of high-priced energy or peak power that a firm or community uses. This only addresses part of the sustainability issue. The other piece is the
reduction of energy use. Recently, Hope Energy has approached a Brick Factory which sees its energy use peak in the later afternoon which is the highest costing time on the Eskom grid for that municipality. Hope Energy should approach this in two manners. One is to shift this energy need to renewable and more efficient supplies. The other is to work with the factory to diminish their need for energy. This would be the behaviour modification.

**Reinforce differentiating factor**

Hope Energy’s differentiating factor is the ability to give a complete energy solution while supplying the up-front costs to incorporate these improvements. When competitors enter the market or Eskom begins to add renewable sources to their grid, Hope Energy will need to establish why they are should be the standard for renewable energy. This may well be their expertise in biomass, the ability to quantify savings using the scientific method, and their hands on approach to customize the needs for each client. This differentiating factor is very important and should be highlighted in the value proposition.

**Distinct market needs**

Each market segment has different energy priorities and pain points. These should be spelled out in the value proposition for each segment.
6. Questionnaires

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7. Recommendations

1. **Balance the need for clients to improve cash flow, with developing a longer term push towards Hope Energy’s goals of providing customized solutions for affordable renewable energy to several market segments.** While Hope Energy has the opportunity in the next few weeks and months to develop proposals and implement solutions for a variety of clients, ensuring that the methodology is updated with learnings from these experiences will be crucial to allow Hope Energy to continue to serve future clients in the best way, bringing all its experience to the table. Hope Energy needs to continuously enhance and institutionalize its processes to ensure sustainability of the business. As such, there is an urgent need to build up the team, especially now that Hope Energy getting a lot of interest from prospective customers as well as business partners who are keen on collaboration.

2. **Planning:** As Hope Energy aspire to **expand beyond South Africa**, into other parts of Africa, a strategy for such move needs to be drawn up soon. Utilizing both Hope Energy’s experience within South Africa, as well as some experience outside of South Africa, Hope Energy can continue to test the viability of their model in other regions where affordable renewable energy is needed by these various market segments. Securing an anchor client that helps establish a reliable test case and Hope’s capability to deliver a project will be critical to its success.

In addition, as Hope Energy expands geographically, it needs to think about how to **complement the current approach of partnering with existing technologies**, with the longer term goal of investing in technology that could potentially be commercialized so that Hope Energy has its own distinct products to offer as well. This could be done through identifying potentially commercially viable technologies during trials with potential clients. In addition, Hope Energy needs to figure out its own capital structure requirement to be able to capitalize on such opportunities. Bringing investors is a option to beef up its financial muscle.

3. **Funding:** Hope needs to think of more feasible solution to help customers deal with the long payback period of renewable energy capital investment (typically ~7 years for solar energy, and usually longer for other types), which most chief financial officers have difficulty dealing with. For now, Hope Energy can help defray the upfront costs for smaller energy demand clients, until they begin cost savings. As Hope Energy expands to more clients with greater energy requirements, there is scope for Hope Energy to either partner or recommend different financial services in order to facilitate the financial feasibility of high capital up front investments with savings over multiple years. For example, Hope Energy could bring in financial investors to fund the capital investment for clean energy, and offer power purchase agreement to customers.
8. Project Reflections

The S-Lab team has been very fortunate to have the opportunity to work very intimately with Susan Lasecki-Coiro, Hope Energy’s founder, and Anthony Coiro, Application Physicist. They have both consistently dedicated weekly hour-long conference calls as well as electronic follow ups throughout this project, ensuring that we had clear expectations and understanding of each other’s work throughout the project.

In addition, the S-Lab team has gotten the opportunity to investigate the energy market in South Africa, and clean energy technologies. With respect to clean energy technologies, the project team has been able to leverage MIT’s resources to speak with, as well as link up Hope Energy with, Dr. Robert Stoner, Associate Director of the MIT Energy Initiative. This will allow Hope Energy to build on the specific potential options in solar energy that could be viable in South Africa, as well as think more deeply about the feasibility of larger scale biomass gasification energy.

The updates have enabled the S-Lab team to appreciate and wrestle with the challenges a start-up such as Hope Energy is facing; and feed off the passion and enthusiasm the founding team have for this business. The S-Lab team has also been exposed to dynamic nature of a startup, which necessitates the flexibility to pivot on the fly, for example to cope with the rapidly changing demand landscape.

There have been challenges for our project team to make real time contributions and feedback due to the time difference between Johannesburg and Boston. While there have not been established clients at this stage that we could work with, we did have the 3 strong prospects in 3 different market segments. This allowed us the opportunities to co-create as well as refine the overall methodology design, the value propositions and the questionnaires.

Meanwhile, feedback from Hope Energy has been encouraging. They commented that working with our S-Lab team has helped them to get their process in order. The tight timeline nudged our joint team to go through the rigour of articulating the Hope Energy business model and processes, which were enhanced through suggestions from our S-Lab team. In the past, Hope Energy had been operating on a reactive mode without the overall methodology framework, and without having fully developed the value propositions and questionnaires. In addition, the S-Lab project has forced them to think and reflect on the overall business opportunities and the approach. They were very receptive towards the perspectives offered by the S-Lab team comprising people from diverse professional backgrounds, complemented with suggestions from classmates and others from the MIT community.

Additionally, the deliverables of this S-Lab project have already been useful to the Hope Energy team on the ground. They used the value proposition and methodology that we co-developed in a presentation to a prospective client recently, generating excitement and a desire to move forward quickly. The description of Hope Energy’s business model in the final report has given them a greater appreciation of different ways of communicating Hope Energy’s business model, which will help going forward to tailor the pitch given to different prospective clients.
9. References


“High costs 'causing businesses to close down'.” SME South Africa. 1 November 2011.

10. Appendices

Appendix 1 Medium Business Value Proposition
Helping Businesses to emPower Africa’s Sustainable Future

Electricity rate hikes have all businesses and manufacturers facing rising uncertainty, resulting in profitability and cost stability challenges. Business owners have to pay more without any added benefit, hurling the bottom line. Unfortunately in South Africa, the proposed electrical hikes are completely out of the customer’s hands.

Furthermore, Eskom is preventing future growth at some locations by restricting power allotments, even if the business is willing to pay. If diesel generators are employed to cover the electrical gap, the power cost is four to five times that of standard utility rates. Also, customers are charged for more than just their monthly energy usage. A demand charge is a penalty paid for your largest spike in power draw per month. For some users, this can be 50% or more of electricity costs.

Luckily, there is Hope for a sustainable, secure, and cost-effective future.

Opportunities

By combining energy efficiency (to reduce demand) and renewable energy (to produce power), Eskom’s customers take control of their energy situation. This combination is the key to reducing or even eliminating the pressure they face. Best of all, South Africa has reached the crossroads where clean energy solutions are not only the environmentally and socially correct approach, but they are now economically feasible, offering savings, consistency and reasonable payback periods.
These benefits are well within your reach, but only with a partner with all the necessary skills and qualifications to plan and oversee the implementation. Hope Energy is a complete solution provider that specialises in a systems approach, combining the optimal types of technologies to fit our client’s needs.

Hope Energy will conduct an energy audit and during this process, we will determine what areas are most in line with your energy savings goals and provide you with a clear, concise plan for implementation. After this detailed analysis, Hope Energy then manages the project through completion, ensuring the best technologies in one complete solution.

Solutions

Unlike other sustainable energy providers, Hope Energy doesn’t attempt to sell you a product. We deliver a single solution to meet your specific situation. Our solutions offer, but are not limited to:

- Savings by reducing energy demand
- Cost competitive sources of clean energy
- Security and independence in the midst of rising energy prices/shortages
- Optimal choice of green technologies for a clients unique needs
- Turnkey solutions - one trusted partner
- Provide sustainable delivery of electricity and water

We provide these results through many different technologies. Including:

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<th>Lighting</th>
<th>Solar Hot Water &amp; Heat</th>
<th>Solar Thermal</th>
<th>Waste Heat</th>
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<td>• Reduce your lighting electric bill by 50%-90%&lt;br&gt;• No capital outlay required&lt;br&gt;• Payback in 2-4 months&lt;br&gt;• Solar robots will pay 85% of the total capital costs&lt;br&gt;• The remaining 15% is paid only when you begin saving money</td>
<td>• 20-60% of your electric bill depends on the operation&lt;br&gt;• Solar robots available and applied&lt;br&gt;• High Capital investment&lt;br&gt;• Payback in less than 6 months</td>
<td>• Price of solar panels have dropped 80% in the last 2 years&lt;br&gt;• Cost of energy from solar is reaching parity with Eskom’s prices&lt;br&gt;• On going costs of power is linked to 5% and Eskom’s uncertain rate increases</td>
<td>• Convert heat into energy&lt;br&gt;• Recover heat to benefit other processes&lt;br&gt;• Can potentially offer very attractive payback periods</td>
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Biomass Utilisation:

- Delivers power at prices competitive to Eskom.
- Power is available 24/7.
- Gas can be used for cooking, heating or electricity generation.
- Eliminates the cost of waste disposal saving on electricity costs.

Biomass Digestion:

- Utilises waste to produce gas and electricity.
- Gas can be used for cooking, heating or electricity generation.
- eliminates the cost of waste disposal saving on electricity costs.

Water Efficiency and Purification:

- Considers the whole water action.
- Utilises rainwater, greywater and bore hole sources.
- Recycles water whenever possible.
- Cost effective sanitation.
- Water security in face of water shortages.

Power Factor Correction:

- Reduces power demand and makes electrical usage more efficient.
- Ideal for clients with large electrical motors, AC units or heaters.

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Appendix 1 (continued)
Financing flexibility

The final component of the Hope Energy complete solution comes in the form of flexible financing options. As a part of the detailed analysis, Hope Energy will provide your board of directors with a detailed breakdown of expenses, return of investment, and financing options.

- Capital purchase – direct acquisition of capital equipment
- BOOT – Build own operate and transfer
- Power purchase agreement – buying power through an OPEX budget

Hope Energy Executive Summary

Hope Energy is a sustainable energy solutions provider. Our mission is to fill Africa’s energy gap with sustainable forms of energy, leapfrogging to clean energy in the same way that Africa bypassed landlines and went straight to mobile phones.

Our unique proposition is twofold. First, we look to deliver the optimal combination of sustainable energy and energy efficiency to meet our client’s needs. This allows us to deliver maximum value by reducing energy demand and delivering clean power. We do not promote any specific type of sustainable technology (solar, wind, bio-mass, etc.), but instead analyse the opportunities to deliver the best solution, or combination of solutions, to fit our client’s particular situation. Second, we actively collaborate through strategic relationships with the leading suppliers in each area of sustainable energy and energy efficiency. This collaboration gives Hope Energy access to the best technologies, delivered with high quality and reliability, at competitive costs. Our partnerships give us greater access to financing, efficiencies, and rapid expansion to broader markets across Africa, while allowing Hope Energy to be the single face to the customer.

Our customers can rely on Hope to provide on one point of contact and responsibility. Most importantly, they receive one complete solution for all their energy needs.

Appendix 2 Medium Business Questionnaire