

CAPSTONE PROJECT SUMMARY

Feasibility Study for Clean Energy Backup Power in Brazil, Argentina and Mexico

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PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF BUSINESS ADMINISTRATION

In the Executive MBA Program
of the
Faculty
of
Business Administration

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EXECUTIVE SUMMARY

The Client provides clean energy backup power products enabling optimized power systems for a range of applications. Products deliver incomparable performance, durability and versatility.

Clean energy systems can provide backup power solutions for wireless telecommunication (telco) providers, and other vertical industries, delivering solid reliability at an attractive lifecycle cost. The Client offers a comprehensive portfolio of clean energy generation products for backup – as well as continuous power – applications. The Client provides complete, proven solutions that can be implemented rapidly and easily, providing end-to-end support for a range of application requirements.

The Client is active in many regions of the world and has two years' experience in Mexico. Brazil and Argentina present new opportunities that the Client has not fully explored. The Client is considering entering Brazil and Mexico; in addition, the Client would like to further explore potential new opportunities in Mexico. By understanding the competitive situation and contextual conditions in Mexico, Brazil, and Argentina, the company can better evaluate if it should enter or remain (as in the case for Mexico) in these markets.

Major growth in mobile usage in Latin America is driving telecommunication service providers to invest in infrastructure in order to meet increased demand for smartphones and tablets.

Telecom providers, however, are not necessarily the ones investing in infrastructure but are partnering with third party providers to build and maintain towers and base stations. In addition, new regulation in Brazil, Argentina and Mexico are changing the way telecom providers utilize this infrastructure, forcing many to consider a shared or co-located model for use of tower space and base station equipment, including backup power solutions.

Despite its very poor macroeconomic climate, Argentina appears to be the most attractive market, driven by government regulation and extremely high mobile penetration, for the Client to

enter as a provider of clean energy backup power. In contrast, Mexico and the developed areas of Brazil do not have drivers for adoption of extended back-up power. Where demand for extended back-up products proves real, the use of a local distributor is recommended, and if traction is gained, a local sales agent further recommended to the Client.

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PROBLEM STATEMENT

The Client, who provides clean energy backup power products enabling optimized power systems for a range of applications, is considering entering Brazil, Argentina and Mexico with its product line.

OBJECTIVE

The Client requested the AMBA team provide a market analysis on the opportunities for clean energy telco backup products in Mexico, Argentina and Brazil, to gain a better understanding of the competitive situation and contextual conditions.

PROJECT DESCRIPTION

The project consisted in performing a market analysis on the opportunities for Clean energy telco backup products in Brazil, Argentina and México ("BAM" Market) with a particular focus on preferred channel access and efficient product delivery systems;

ANALYSES USED AND DATA COLLECTED

The analysis utilized focused on assessing market size and value, channel access, and competitive conditions. Industry trends, grid reliability, and specific market conditions and market size were also evaluated for each country.

STRATEGIC ANALYSIS OF THE CLIENT

In order to understand the client, the first step was to perform a strategic analysis of the client.

Several tools and frameworks were used for this assessment; these included:

- Identification of Client's service offering
- Client's product customer matrix

- Identification of Client's competitive advantage
- Identification of Client's core competence
- Porter's Five Forces (+ external forces) – (see appendix Figure 1)
- Client's Activity Map – (see appendix Figure 2)
- Client's Value Chain and analysis – (see appendix Figure 3)
- CAGE Framework
- Vertical Decisions Tree regarding expansion into volume production and global sales
- Telco back-up power Business Model Canvas
- PEST Analysis of telco back-up power in Latin America – (see appendix Figure 4)
- SWOT analysis of telco back-up power

BASELINE CLIENT / INDUSTRY RESEARCH

The initial task in collecting data was to perform an overall industry investigation. The areas of focus were:

- Telecom tower and industry overview
- Telecom service overview by country
- Client's strategy overview
- Client's overview of activity in telecommunications back – up power
- Client's telecom Client's clean energy backup power solution back-up power product platform overview
- Client's clean energy backup power solution value proposition
- Client's sales channel overview
- Market trend: clean energy & telecom
- Macroeconomic overview: Brazil, Argentina and Mexico

HYPOTHESIS FRAMEWORK

With the team having a solid understanding of the Client, their business, and the environment/industry they do business in, the next step was to use a hypothesis-driven analysis and mutually exclusive and collectively exhaustive (MECE) issue trees in order to develop several hypotheses as to the potential constraints and opportunities the Client would have in entering BAM with their back up power solution. The approach taken is called the *Hypothesis-based Problem Solving* developed by the McKinsey consulting group (Friga 2009)

This was the most important step the team completed as it drove the research and analysis required to provide the Client with the final recommendations

The objective to solve was:

Evaluate the business case for Client's clean energy backup power solution clean energy Telecom Backup products entry in BAM Market (Brazil, Argentina, and Mexico) and identify the preferred sales channels.

Based on the above objective, the team identified five issues:

1. Value proposition
2. Acceptance and adoption of emerging technologies, including green telco backup power solutions
3. Complex channel mechanisms
4. Distribution network for fuel sources
5. Regulatory environments in BAM countries

Further to the issues identified, the team then developed hypotheses for each issue and questions that would either prove or disprove the hypothesis. As this was a critical step, the full

listing of the issue trees are found in the Appendix under the heading Figure 5: Hypothesis-based Problem Solving Approach.

In order to obtain data on the five issues, the team performed further research using the internet as well as interviewing key industry experts in Brazil and Mexico. Unfortunately, information on Argentina was difficult to obtain as the team did not have any contacts within the country and various internet searches proved difficult to validate.

PROJECT MANAGEMENT

After completing the analysis and identifying the data to be collected, the rest of the time was focused on obtaining the information. To achieve this goal, a work plan was developed based on the HBPS. The work plan also included the drafting of a ghost deck (i.e., PowerPoint that walked the Client through the findings and final recommendation), as well as the identification of key milestone dates.

FINDINGS AND RECOMMENDATIONS

The team did not provide a very “rosy” picture to the Client and provided findings and recommendations for each of the BAM countries. In addition, the team provided a set of criteria or factors to watch out for in the future that would make the proposition to enter BAM markets more lucrative. Below is a country-by-country breakdown of the findings.

Brazil

- Market entry is not compelling in developed areas as there are as few as 600 sites with extended backup power according to our industry expert;
- Further investigation of Claro (Telco service provider) is required as Claro is less likely to share infrastructure (towers and base stations) and may be more prone to using extended diesel back-up systems than its competitors;

- There is a long term possibility to create new business model with tower providers in order to supply, at shared sites, a robust backup power. Thus telcos could use the minimum advisable batteries in their individual installations. This model could potentially work for sites with only new low-power equipment, little or no 24V equipment, no A/Cs etc.;
- Further investigation is required for remote areas where grid power is less reliable and repair service may be slow. Up to 6,000 Sites. Jtel Serviços em Telecomunicações Ltda is a possible partner.

Argentina

- Argentina offers the most promising opportunity, and the only one for which we identified a driver for adoption of the Client's backup power solution; this incentive is a government regulation that promotes the use of hydrogen, a key fuel source for the Client's backup power solution. Rough estimate of ~15,000 tower sites in Argentina;
- Continue investigation to confirm that regulations have desired effect, and market for backup power solutions is worth pursuing.
- If opportunity is verified, partner with a distributor with longstanding relationships and proven service record with the telcos. This can be an equipment distributor or an infrastructure servicer (e.g. diesel refueler/battery servicer). If traction develops, hire a local representative to grow the business and better represent the Client on the ground and to develop the customer relationships.

Mexico

- The Client, in the near term, needs to focus is on interaction with the Telcos, primarily Telcel, as the dominant player with 70% of the market and 14,000 towers;
- Repair the relationship with Telcel, if possible. The Client has a history with Telcel that is not positive; this is having a major impact in the Client's ability to enter Brazil and

Argentina (as well as other Latin American countries), as Telcel is a major player in the mobile market for Latin America.

- The Client will need to satisfy Telcel, to ensure access to the rest of the Americal Movil empire (Claro) in the rest of Latin America
- Telcel was interested in the Client's backup power solution in the past, they might see opportunity & value that was not uncovered. The Client's internal estimates for sites with value proposition are somewhat more favourable, but still within the same order of magnitude;
- Lastly, in the "high context," Latin American cultures value long term relationship and reputational capital is a more important component in doing business.

Overall Long Term Trends

- The telco markets are undergoing de-regulation in certain markets which may prompt a wait-and-hold approach to passive infrastructure spending until the details of the regulations become known to industry insiders.
- The growth of competition and the higher barriers to entry faced by the competitors is forcing upon many players the use of shared sites by smaller telcos. For example, Telcel's competitors have sold their towers, primarily to American Tower.
- The shared site or co-located model may create new business model with tower providers in order to supply at shared sites a robust backup power, similar to Brazil.
- At this time American Tower is the only large player, with ~8,000 towers, while Mexico Tower Partners, which has only 600 towers, has no international presence to build on.
- There is huge growth potential and demand for tower sites, and small tower installations on rooftops are a likely growth opportunity for Telcel competitors.

FACTORS TO WATCH FOR IN THE FUTURE

Brazil

- Short term: Law Of Towers due to pass 2014 potentially leads to significant growth in towers
- Long term: 1), Changes in regulatory environment for backup power; 2), grid reliability may decrease with growing strain on infrastructure; 3), telcos moving to shared site model, potentially leading to shared back up power

Argentina

- Short term: Enforcement of penalties will have an impact on backup power adoption – are telcos getting fined?
- Long term: telcos moving to shared site model, potentially leading to shared back up power.

Mexico

- Short term: Effect of competition laws may lead Telcel to share tower infrastructure
- Long term: 1), Telcos moving to shared site model, potentially leading to shared back up power; 2), Telcos need to address coverage which will lead to various modes of growth in cell phone towers.

PROJECT REFLECTION

In any project, especially with people of diverse backgrounds, being aligned or on the “same page” can be challenging. This was compounded by the fact that we were all from different countries with different cultures, spoke different languages and were separated by thousands of miles. One way we attempted to mitigate this challenge was to set up weekly calls using a variety of technologies. The technology we used (e.g., Skype, Google hangouts, etc.) did not

function properly either; many dropped calls or static caused many delays during meetings. Eventually, we learned to use and trust Webex as the communication tool of choice. We also determined that Whatsapp was a great tool for communicating on a day-to-day basis for quick conversations about issues, quick wins, etc.

Once we set our communications protocols, we needed to level set on roles. This is an area I felt strongly about and made several attempts to solidify both functional and project roles but to no success. This caused many issues on our project and we did not really overcome them. That said, everyone stepped up when they needed to but the skill set was not always present and some steps were missed. This caused a certain amount of frustration for the team and I had to be a mediator on several occasions between Latin America and North America.

Related to the challenge above was setting expectations. We did not do a good job of setting up expectations. What one team member felt was good enough was not readily accepted by others. In fact, on several occasions, one team member would submit a piece of work only to be completely re-written by another team member. This was not a good approach as it caused team member to question why they should do any work in the first place if it was “not good enough.” In retrospect, more direct feedback and communication between the drafter and the reviewer may have led to more engagement and buy in from all members of the team.

Another challenge was the teams amazing ability to go down “rat holes.” In other words, we would go down tangents that had no value whatsoever. For example, we would debate on the use and definition of a word for days! What we needed was someone to play the role of time keeper or scheduler to keep the team on track – again this is related to the challenge of establishing roles on the team.

Lastly, a challenge for the team was having one team member working for the Client. This caused several issues. First, it was sometimes difficult to get objective information. Some data

was kept from the team that if it had been provided at the onset of the project, the team would have had an easier time validating the hypotheses that were developed. Second, by not painting a “rosy picture,” the team felt that we were putting the individual who worked for the Client at risk of some kind of reprimand. Third, the team was unable to have direct communication with the Client. All questions were filtered through one individual and we could not get straight answers or any answers on several occasions. Despite these challenges, the team pushed forward and did accomplish its goal of providing final recommendations to the Client.

All the above said, I will always refer to the learnings of the project when working on international assignments and/or when working with people of different backgrounds and cultures. More importantly, the network of business connections and the friendships created are indispensable to me. Regardless of the issues we had as a project team, the experience is one I will always cherish.

APPENDIX

FIGURE 1: PORTERS 5 FORCES

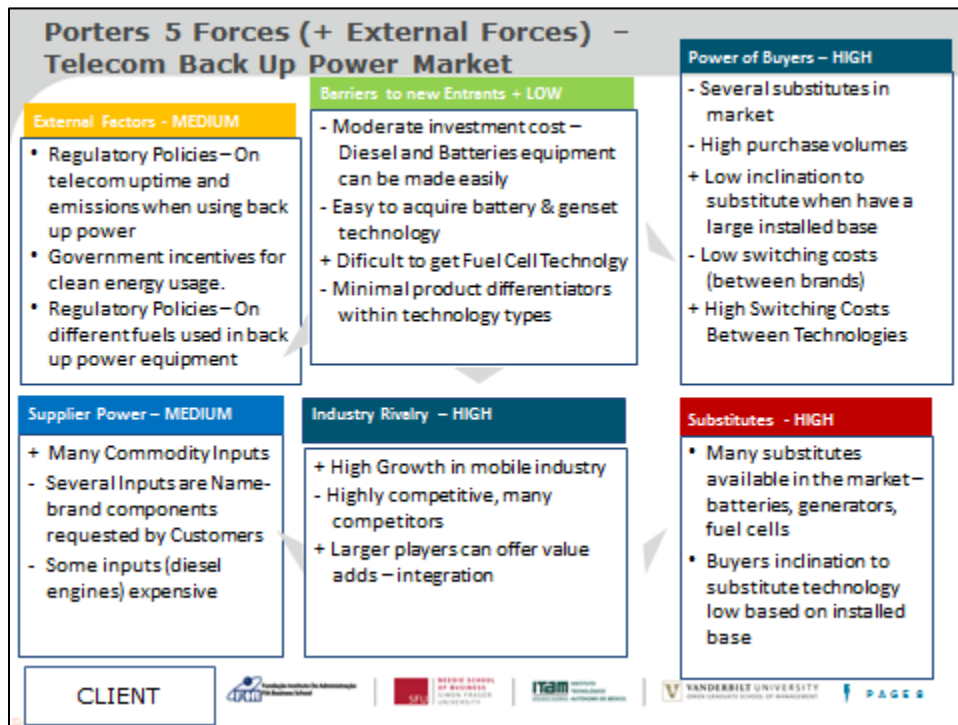


FIGURE 2: ACTIVITY MAP

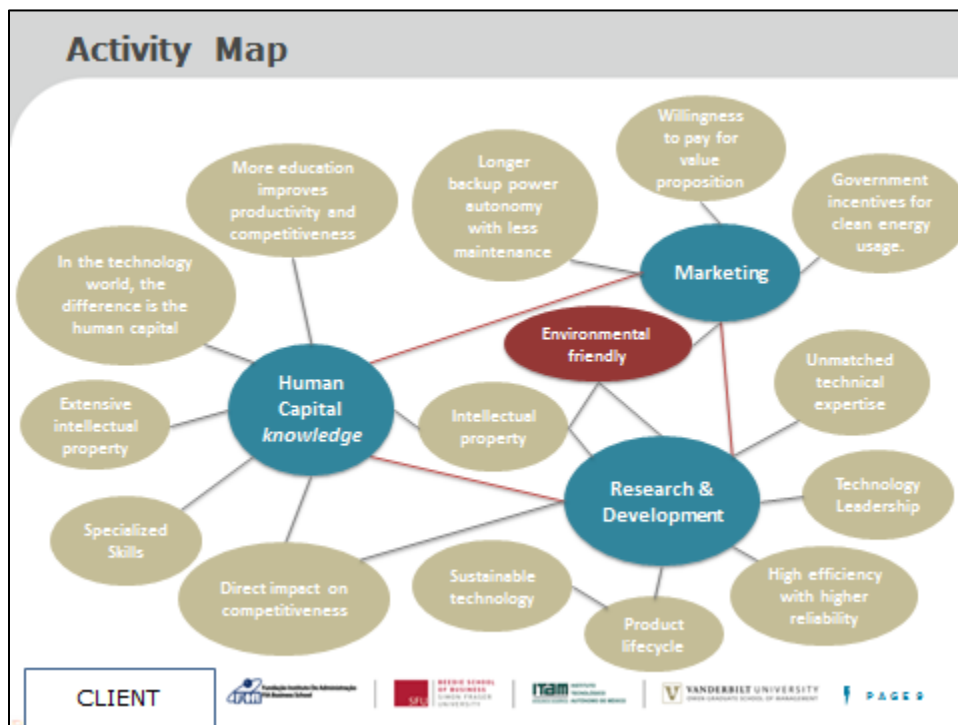


FIGURE 3: VALUE CHAIN ANALYSIS

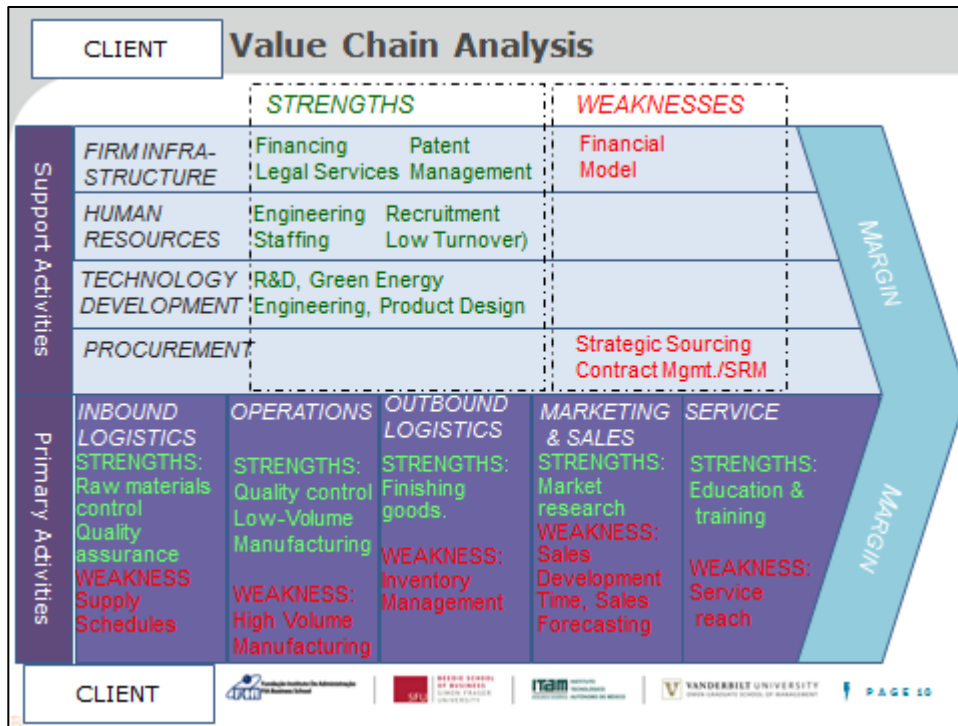


FIGURE 4: PEST ANALYSIS

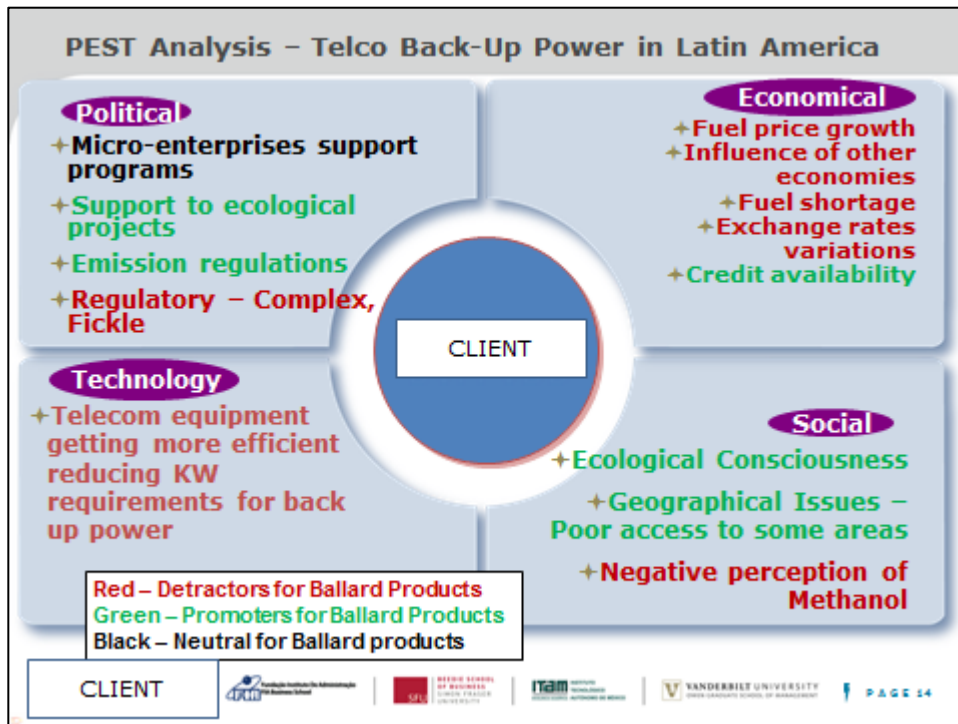
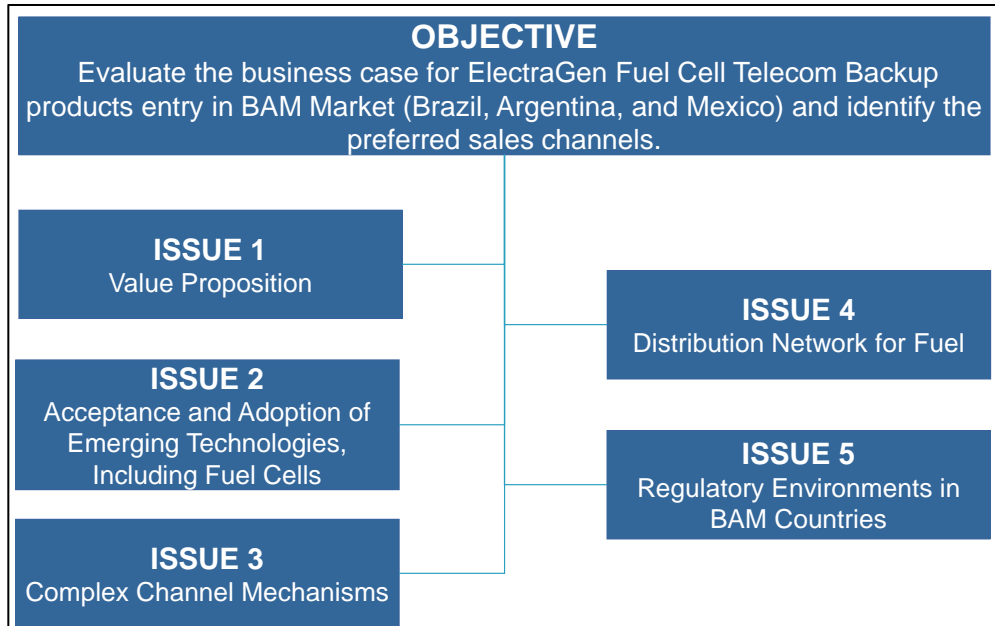


FIGURE 5: HYPOTHESIS-BASED PROBLEM SOLVING APPROACH



ISSUE 1: Value Proposition	<p>HYPOTHESIS 1.1</p> <p>Target customers believe the cost of Client's clean energy backup power solution systems outweigh the benefits.</p>	<p>KEY QUESTION 1.1.1</p> <p>What characteristics/features do customers in BAM value?</p>
		<p>KEY QUESTION 1.1.2</p> <p>How do BAM customers evaluate value – OpEx / CapEx ?</p>
		<p>KEY QUESTION 1.1.3</p> <p>What is, or would be, the Capital Cost of Client's clean energy backup power solution in each BAM Market? How does this compare to competing solutions?</p>
		<p>KEY QUESTION 1.1.4</p> <p>What is, or would be, the operating cost of Client's clean energy backup power solution in each BAM market? How does this compare to competing solutions?</p>
		<p>KEY QUESTION 1.1.5</p> <p>What market niches have a higher value proposition than typical "general application" back-up power?</p>
	<p>HYPOTHESIS 1.2</p> <p>Customers will not purchase Client's clean energy backup power solution due to fears over low availability of service and maintenance</p>	<p>KEY QUESTION 1.2.1</p> <p>How important is service & maintenance availability to the customer?</p>
		<p>KEY QUESTION 1.2.2</p>

	<p>support – in early years / period of infancy of market</p>	<p>From whom do BAM customers procure equipment service and maintenance today (e.g. OEMs, equipment vendors, 3rd party, or in-sourced) ? What are the fee structures?</p>
		<p>KEY QUESTION 1.2.3</p> <p>What service availability do customers require of back up power equipment vendors in BAM markets?</p>
<p>ISSUE 2: Acceptance and Adoption of Emerging Technologies, Including Clean energy</p>	<p>HYPOTHESIS 2.1</p> <p>The industry in BAM countries is not ready to accept clean energy technology.</p>	<p>KEY QUESTION 2.1.1</p> <p>Who are the key decision makers who need to accept the technology in BAM Markets?</p>
		<p>KEY QUESTION 2.1.2</p> <p>Are target customers actively looking for new solutions, or are current solutions generally satisfying the markets in BAM?</p>
		<p>KEY QUESTION 2.1.3</p> <p>What are the evaluation criteria and main factors required for the decision maker's acceptance or rejection of new technology?</p>
		<p>KEY QUESTION 2.1.4</p> <p>In countries where the technology has been accepted, what key factors contributed to the acceptance? What factors led to rejections of this technology?</p>
		<p>KEY QUESTION 2.1.5</p> <p>Were the evaluation criteria and main factors in 2.1.3 and 2.1.4 the same or different for <i>replacement of old technology vs. new installations</i> back-up equipment.</p>
	<p>HYPOTHESIS 2.2</p> <p>Other emerging technologies, e.g., solar, wind, new batteries, other clean energy technology, etc. are competing in same market.</p>	<p>KEY QUESTION 2.2.1</p> <p>Other than clean energy, what other emerging technologies are relevant?</p>
		<p>KEY QUESTION 2.2.2</p> <p>Do any of these relevant technologies present a superior value proposition compared to Client's clean energy backup power solution Systems?</p>
		<p>KEY QUESTION 2.2.3</p> <p>What other clean energy systems are competing with Client's clean energy backup power solution? How successful are they?</p>

		<p>KEY QUESTION 2.2.4</p> <p>Do any competing clean energy systems present a superior value proposition compared to Client's clean energy backup power solution Systems?</p>
	<p>HYPOTHESIS 2.3</p> <p>Emerging technologies are competing for limited dollars earmarked for pilot/ demonstration programs.</p>	<p>KEY QUESTION 2.3.1</p> <p>Are any of the technologies being pilot tested by BAM customers?</p>
		<p>KEY QUESTION 2.3.2</p> <p>Which organizations are doing pilot projects?</p>
		<p>KEY QUESTION 2.3.3</p> <p>How much budget or funding is earmarked for demonstrations in BAM countries?</p>
		<p>KEY QUESTION 2.3.4</p> <p>If applicable, what is the process for accessing the pilot programs.</p>
<p>ISSUE 3</p> <p>Complex Channel Mechanisms</p>	<p>HYPOTHESIS 3.1</p> <p>Distributors are the best alternative to sell in these markets because they have the structure and knowledge necessary to maximize sales.</p>	<p>KEY QUESTION 3.1.1</p> <p>What channels are available to buy/sell backup power systems in BAM Countries? What channels are missing?</p>
		<p>KEY QUESTION 3.1.2</p> <p>What channels are customers using for teleco back-up power products in BAM? Telco Equipment Manufacturers, Distributors, Service providers, etc.?</p>
		<p>KEY QUESTION 3.1.3</p> <p>What relevant distributors are there in the markets and what type of products do they offer?</p>
		<p>KEY QUESTION 3.1.4</p> <p>How much do distributors mark up back up power products in BAM markets?</p>
		<p>KEY QUESTION 3.1.5</p> <p>Do available distributors in BAM markets have the ability to effectively market and sell back up power product?</p>
		<p>KEY QUESTION 3.1.6</p> <p>Would the local distributors need local Client employees for support?</p>
	<p>HYPOTHESIS 3.2</p> <p>Client will have to develop its own sales force</p>	<p>KEY QUESTION 3.2.1</p> <p>Which type(s) of company (e.g. telco companies, tower providers,</p>

	to sell into BAM market.	telco radio equipment manufacturers, maintenance service providers, etc.) specify the backup power products that will be used in the BAM markets? KEY QUESTION 3.2.2 Which type(s) of company actually procure (purchase/lease/rent) the back up power products in BAM markets?
ISSUE 4 Distribution Network for Fuel	HYPOTHESIS 4.1 Required HydroPlus fuel infrastructure is not available in Brazil & Argentina	KEY QUESTION 4.1.1 Is the required purity of methanol available in Brazil and Argentina? Is Methanol supplied with unsuitable additives in Brazil or Argentina?
		KEY QUESTION 4.1.2 Will Methanol suppliers mix HydroPlus fuel?
		KEY QUESTION 4.1.3 Will the distributor or service provider mix the HydroPlus fuel ?
		KEY QUESTION 4.2.1 Who are the industrial gas suppliers in BAM countries?
	HYPOTHESIS 4.2 Required hydrogen grade is not available in BAM markets or its availability is limited.	KEY QUESTION 4.2.2 Can these suppliers provide the required Hydrogen grade?
		KEY QUESTION 4.2.3 How much does the required hydrogen cost?
		KEY QUESTION 4.2.4 What is the distribution network for Hydrogen?
		KEY QUESTION 5.1.1 Are Client's clean energy backup power solution products certified to any NA, EU, or BAM standards?
ISSUE 5 Regulatory Environments in BAM Countries	HYPOTHESIS 5.1 Client's clean energy backup power solution products need to be certified to BAM national standards, by local agencies, prior to sale in BAM markets.	KEY QUESTION 5.1.2 Are there national standards applicable to telecom back up power equipment in BAM?
		KEY QUESTION 5.1.3 Can Client's clean energy backup power solution products be sold in these markets without certification to standards?
		KEY QUESTION 5.1.4 Are NA or EU certifications acceptable substitute for local

		certification?
		<p>KEY QUESTION 5.1.5</p> <p>Who determines if certifications/standards are required in BAM?</p> <p>Local AHJ's or individual Telco companies?</p>
	<p>HYPOTHESIS 5.2</p> <p>Telecom companies do not fulfill their regulatory obligations due to poor price vs. performance of current technologies (products) offered in these markets.</p>	<p>KEY QUESTION 5.2.1</p> <p>What are the regulatory requirements for back up capability (or up-time) and/or exhaust noise and emissions for wireless teleco carriers in BAM?</p>
		<p>KEY QUESTION 5.2.2</p> <p>Do wireless teleco's meet these requirements?</p>
		<p>KEY QUESTION 5.2.3</p> <p>Are these requirements or penalties enforced?</p>
		<p>KEY QUESTION 5.2.4</p> <p>What penalties (costs) are imposed where enforcement measures exist but requirements are not met?</p>
		<p>KEY QUESTION 5.2.5</p> <p>What value would customers place on using Client's clean energy backup power solution to better comply with regulations (e.g. noise, emissions, etc.), if applicable?</p>
	<p>HYPOTHESIS 5.3</p> <p>Import duties for Client's clean energy backup power solution products in BAM will be prohibitively expensive, necessitating local assembly or production.</p>	<p>KEY QUESTION 5.3.1</p> <p>What are the import regulations for Clean energy power Systems in BAM?</p>
		<p>KEY QUESTION 5.3.2</p> <p>What tax rates (and tax breaks) would exist for new local production?</p>
		<p>KEY QUESTION 5.3.3</p> <p>How do manufacturing costs compare in rest of BAM with the existing production costs in Mexico?</p>
		<p>KEY QUESTION 5.3.4</p> <p>What capital and other costs would be sunk to set up local production?</p>
		<p>KEY QUESTION 5.3.5</p> <p>If local facilities duplicated production, what impact would the reduced economies of scale have on cost?</p>

	<p>HYPOTHESIS 5.4</p> <p>Subsidies or other regulatory benefits for “new” and/or “green” technologies will not improve customer value proposition enough to significantly impact sales.</p>	<p>KEY QUESTION 5.4.1</p> <p>What relevant “green energy” and “new technology” subsidies exist in BAM?</p>
		<p>KEY QUESTION 5.4.2</p> <p>What is the net financial benefit to the customer, of these incentives, if they exist?</p>

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Note to reader: there were other websites visited but in order to maintain the anonymity of the Client organization, these citations have been omitted.