DELFT UNIVERSITY OF TECHNOLOGY

MASTER THESIS

FACULTY: TECHNOLOGY, POLICY AND MANAGEMNET

Decentralized Sustainable Energy Systems For Domestic Lighting In Rural India: **An Explorative Study On Revenue Model Types And Components Employed By Indian Renewable Energy Companies**

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A thesis submitted in fulfillment of the requirements for a degree of masters of Science in
Management Of Technology

November 16,2015

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Acknowledgement

This master thesis course is one distinctive journey among others in my life. On reminiscing the several months spent in doing this research one thing that props up in mind is the arduous and bumpy journey. As always with any unique journey comes learning. The learning in this thesis was huge. Below I would like to thank some people who have contributed immensely towards this learning experience both directly and indirectly.

I would like to take this opportunity to whole-heartedly acknowledge the support and guidance of my committee. Firstly, I would like to thank Prof. C. van Beers for chairing the graduation committee and for his clear, concise and insightful comments on my thesis report. Secondly, I would also like to thank my co-supervisor Ing. Ester Blom for her constructive criticism on the subject of this thesis, and more so for keeping the doors open at any time of the day to discuss the problems that was confronted while performing the research. Lastly, I would like to extend my deepest gratitude to my supervisor Dr. Linda Kamp, who has supported me throughout my master thesis study with her copious patience, encouragement and guidance. Without her support this thesis wouldn't have been possible.

Next, I would also like to thank all the interviewees for their inputs and time. Without their practical inputs this thesis wouldn't have taken any shape.

I would also like to thank all my friends for being with me all along in good and bad times. Also, I would like to specially thank Goutami Rao for the discussions on this thesis and also helping me on several other fronts with regards to this thesis. Furthermore I would also like to thank my brother Naveen and sister in law Ruth for offering a place to stay during the final months of my thesis.

Finally, I would like to express my gratitude towards my parents who have stood by me all through this journey. Without whom my life would have no meaning. Special big thank you to my mother, she is the best thing that has and can ever happen. No words can explain my indebtedness towards both my parents for the love and support they have bestowed upon me.

Thanks
Pratheek Reddy

Executive Summary

Although researchers have acknowledged the issue of commercial viability previously, it is only recently that they have laid emphasis on addressing the relative importance of commercial viability to catalyze the dissemination of decentralized sustainable energy systems to rural consumers in developing countries. A business enterprise is said to be commercially viable if its revenues are > costs. Here in this thesis these business enterprises or promoters of efforts are called as renewable energy companies (REC's).

Moreover researchers have failed to acknowledge or address the role of revenues even after acknowledging the merits of a market driven approach as opposed to donor driven approach. Given such a high relevance of revenues in a market approach to operate successfully and a lack of focus on the same by researchers, in this thesis we will analyze the practical issue of commercial viability of Indian REC's through the lens of revenue model, while also addressing the literature gap on revenue drivers or revenue model components by exploring various relevant revenue drivers of commercially viable REC's. This study takes an exploratory case study approach to enlist all the relevant revenue driver or revenue model components that are relevant for REC's to attain commercial viability.

This thesis primarily consists of three subsequent phases: first phase: theoretical gap identification. Second phase: identification of types and components of a revenue model and third phase: building a revenue driver – commercial viability framework. The aim of the first phase was to narrow in on the literate gap and also present relevant background literature. The first phase yielded the literature gap on revenue model components in addressing the practical issue of commercial viability. The aim of the second phase was to identify revenue model types and components. The result of which was that two types of revenue models namely: ownership and service revenue models was discovered. Most importantly six potential revenue drivers were also discovered. They are: consumer trust, pricing strategy, willingness to pay, flexibility of payments, number of users and revenue sharing. These six revenue drivers were derived on the premise that they would increase revenues such that REC's attain commercial viability. This made up our initial conceptual model.

Next, the aim of the third phase was to build a framework on revenue drivers or revenue model components – commercial viability of Indian REC's. In order to do so firstly we analyzed cases where the initial conceptual model is leveraged into a more relevant context of Indian REC's. The case studies were based on SIMPA Networks, Onergy, Rural

Spark and MeraGao Power (MGP). All of these cases primarily are Indian companies exclusively catering to the Indian rural market otherwise also known as REC's or Indian REC's. The results of this section yielded us a relevant set of 12 revenue drivers i.e. six more in comparison to the initial set of 6 revenue drivers. They are consumer trust, supplier trust, pricing strategies, willingness to pay, flexibility of payments, number of users, revenue sharing, consumer financing, size of payments, service customization, after sales service/maintenance and discounts. Secondly, a cross case analysis was performed wherein findings from each case are pitched against each other to find the similarities and differences. The result of this section was firstly that, any sort of generalizations based on the type of revenue models was hard to come by and most importantly the type of revenue model only signified its affect on the source of financing and could play no role in explaining how and why commercial viability was being achieved. Moreover it also led to an inference that service revenue model poses more risk than ownership revenue model but however *commercial viability was achieved by adopting both types of revenue model, which was quite the contrary to the outcome of literature survey*. Secondly, list of revenue drivers was further narrowed to 10 from the previous list of 12. Basically willingness to pay was eliminated because it was already being considered in pricing strategies and number of users was also removed because it affected the commercial viability of REC's in terms of both costs and revenues whereas the others only impacted only revenues. The final set of relevant revenue drivers are: *consumer trust, supplier trust, pricing strategies, flexibility of payments, size of payments, revenue sharing, consumer financing, service customization, after sales service/maintenance and discounts.*

Lastly, a set of three factors was identified that actually contributed to the increase in revenues such that revenues were > costs. Or in other words served as a link between revenue drivers and commercial viability. They are namely: *rate of adoption, recoupment of costs (regular payments) and retention*. It is these afore mentioned revenue drivers that impact the three factors, which subsequently drive or increase revenues such that commercial viability can be attained. The ownership revenue model primarily derives its revenues from only the adoption factor, which subsequently brings in revenues to attain commercial viability. That said the adoption of DSE's by the rural consumers is contingent or dependent on revenue drivers like consumer financing and size of payments among others. The revenues of REC's employing service revenue model primarily depended on all the three factors like rate of adoption, recoupment of costs and retention. More specifically the revenue drivers should be conducive to rural customers such that they firstly adopt the product and/or service and most importantly make regular payments, which translates to revenues while retaining the existing customers. Moreover the retention

factor only applies to REC's that adopt a service revenue model with only a service platform like MGP unlike other REC's, which adopt a only a product platform like Onergy or both product and service platform like in the case of SIMPA and Rural spark.

In the backdrop of afore mentioned scientific implications several managerial implications can also be derived. Among many the key take away for incumbent managers and future potential entrants will be to look at each of the revenue drivers and adopt them carefully such that commercial viability can be attained contingent on the his/her appetite for risk and most of all focus less on the type of revenue model because that is not going to help achieve commercial viability.

Future research should be aimed at firstly developing a more elaborate revenue driver- commercial viability framework. After which each of the revenue driver's true affects on each of the factors should be quantitatively determined. This further helps to gain greater generalizability. That said the key limitation of this thesis is that it focuses only on one country i.e. India among other developing countries.

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Chapter 1: Introduction

1.1 Preface

In the past few decades renewable energy technologies (RET's) has gained importance due to rising awareness of consequentially catastrophic issues associated with traditional energy systems like coal power plants as the source of energy. The issue essentially being that of unsustainability and climate change. Previously, policy makers mainly tried to address the issue of unsustainability and climate change by taxing traditional energy systems and promoting the adoption of RET's by offering subsidies. Now, the quantum of this carbon tax levied on traditional energy systems to deter its usage is much debated and can be left to experts. Moreover, these initiatives only promoted projects at the utility scale. The viability of RET's hugely until today depends on subsidies and interest rates. Furthermore, renewables at the utility scale demands a grid infrastructure to transport the energy produced at a centralized location. To put it bluntly, a more sustainable source of energy is supplied to the population already having access to energy. This is more or less a top down way of looking at it, wherein the policy aims to push a certain technology into a market irrespective of its viability. Nonetheless, the upside to these utility policy initiatives is that the cost of RET's has come down drastically due to economies of scale, which wildly has benefited the industry as a whole.

In line with the reduction of costs, the other way of looking at the whole RET's saga can be bottom up. In other words wouldn't it make sense to look at a market where an obvious demand already exists for clean and safe energy? One can argue that rural market in developing countries may offer one such case of achieving viability because they lack access to clean and affordable energy. More specifically in the rural developing markets an apparent demand already exists. Nonetheless even today nearly half the populations of developing countries lack access to reliable, clean and affordable source of energy. These customers are essentially characterized with low-income levels, high aspirations for a better life, low literacy levels and lack of credit history.

The incumbent energy source used by the rural population is kerosene lanterns. Kerosene lanterns not only have adverse effects on the health and energy expenditure of rural populations but also on the states economy. Another alternative to kerosene lamps are RET's or otherwise also known as decentralized sustainable energy systems (DSE's). Interestingly even though the life cycle costs of DSE's are much lower than kerosene lanterns the later is still the predominant source of energy in rural parts of the developing countries. Researchers have found that the key deterrent for adoption of DSE's by the rural population is that it involves high upfront payments, which

simply is not affordable by this population. It is due to this combination of high upfront payments- lack of affordability and a very apparent demand for clean and affordable alternative energy that makes it an interesting space to do research in.

In the past the governments and NGO's have tried to provide access to clean and affordable energy for the rural population across the world, which has not yielded satisfactory results. That said the governments are not be blamed for their inaction in this market because the economics simply does not work out for them, in case of both traditional and renewable energy systems. In that case why cannot the NGO's (donor initiative) step in and fix the problem of energy access to all. This approach to energy access failed mainly due to fragmentation of efforts or more specifically due lack of, *commercial viability* of operations.

So here is a situation where private enterprises cannot thrive because the rural population simply cannot afford to pay for the costs of DSE systems and the efforts to allocate resources by the government and/or NGO's seems to be fragmented. More specifically the donor driven approach towards energy access to all has run its course due to inherent problems of this type of an approach. Now taking a step back, from a broader perspective, we can argue that history and experience teaches us time and again the importance of a market driven approach to solve problems effectively and efficiently. It is in this backdrop, in recent times an ingenious breed of entrepreneurs have set out to disseminate DSE's to the rural population under a market approach, while acknowledging the role of revenues in addressing the core practical issue of commercial viability.

Therefore in this thesis we intend to explore the concept of revenue model components or revenue drivers that help promoter's efforts achieve commercial viability. Unfortunately, there is not much literature on this concept to base our study on. Therefore we adopt the exploratory-case study approach.

1.2 Background

In this section firstly, we look into concepts like Bottom of the pyramid (BoP) in conjunction with energy, which serves as a base to our research because plenty of literature exists under the concept of BoP, which more or less engulfs the entire rural population of developing countries where they lack access to reliable, clean and affordable source of energy. Secondly, we look deeply into relevant literature, which provides insights into the emergence of these so-called Renewable energy companies (REC's) that are hopeful of addressing the energy access to the rural population entirely based on the market approach. Thirdly, we look into literature on financing. Lastly we will look at the relevance of revenue models in addressing the core practical issue of commercial viability of operations that was confronted previously

and a solution to which is being sort in the present. This section will also help us narrow in on the literature gap.

This section is primarily developed through desk research. The literature we look at does not particularly pertain to the Indian context. The literature pertaining to energy access-rural population-developing countries is used in order to build a better understanding of the problem at hand because there is not much literature exclusively for the Indian context. In general researchers mostly look at cases from developing countries as a whole instead of only India. In most of the articles cases from India always do exist.

1.2.1 Bottom of the pyramid (BoP)

C.K Prahalad popularized the phrase "bottom of the pyramid" in his book titled " The fortune at the base of the pyramid". The term Bottom of the pyramid (BoP) essentially refers to a socio-economic group of 4 billion people who live on income less than $2 a day (Interview & Prahalad, 2008). C.K Prahalad brought about this notion of making profit from BoP population instead of treating them as beneficiaries of a certain product or service for business enterprises. Nevertheless, over time this notion shows no periodic evidence that business enterprises can profit from them beyond certain high profile cases because they lack the purchasing power (Pitta, Guesalaga, & Marshall, 2008) (Garrette & Karnani, 2010).

In recent times researchers like (Simanis, 2009) have coined the term BoP 2.0 wherein the BoP population are co-creators of the BoP initiatives such that profitability can be attained under a market approach (Viswanathan & Sridharan, 2009) (Shrimali, Slaski, Thurber, & Zerriffi, 2011) (Bobinaite & Tarvydas, 2014). At a micro-level perspective in the BoP market, the debate has shifted from an entirely philanthropy or corporate social responsibility or donor approach to a market approach (Kolk & Buuse, 2012). In the following section we will look at these approaches in detail. Researchers like (Bobinaite & Tarvydas, 2014) further suggest that a more apt way to cater to the BoP market is to adopt a hybrid model. A hybrid model is a combination of a market approach with a social objective.

Apart from contentions regarding whether the BoP market is profitable or not, there also exists contentions regarding the levels of income of BoP population. In order to remove this ambiguity (Hammond, Kramer, Katz, t. Tran, & Walker, 2007) through an empirical research redefined the term "Bottom of the pyramid" to "Base of the pyramid". Base of the pyramid (BoP) refers to a socio-economic group of population who live on less than $3000 a year in terms of their local purchasing power. In reality both these terms are used interchangeably with a common abbreviation BoP.

In line with the concept of "Base of the pyramid", the definition is based on western standards. However it also states that it should be based on local purchasing power parity. Leveraging the concept of base of the pyramid

into the Indian context will more or less engulf the entire rural population, given that Indian per capita income is only $1500. In case of India, $3000/year purchasing power translates to 500 Rupees/day. This is an exorbitantly high spending in the Indian context or for that matter any other developing countries like Indonesia or parts of Africa. Given the anomalies that arise when we try to leverage the concept of BoP into the Indian context or other developing markets we adopt a more apt and *local socio-economic representation* known as the rural population (market) in developing countries. Since our research mainly focuses on India we look at definitions of the Indian rural population. According to IFMR research report rural population refers to approximately 700 million people of the Indian population, who spend $75/month and predominantly earn their income through farming (S.Bairiganjan et.al. 2010).

1.2.1.1 Indian rural population and energy

Mahatma Gandhi, founding father of India, in the 1950's once quoted " India begins and ends in her villages".

Indian population currently stands at 1.2 billion people with a growth rate of 1.58%. Unfortunately, even today India's fate still hinges around her villages, as it comprises of 80% of her population, which essentially thrives on populist policy initiatives and farming. It is estimated that three out of every four rural Indians live under poverty (Rao, Miller, Wang, & Byrne, 2009). Among the 700 million rural population, it is estimated that 78 million households in India do not have access to grid electricity (Chaurey & Kandpal, 2009b). Even though the rest of the population has access to the grid there is no electricity flowing through it.

Recent research shows that electrification of rural households not only increases productivity but also has tremendous impact on education, health and gender equality (Cabraal, Barnes, & Agarwal, 2005). Electrification of rural India not only helps eradicate poverty but also paves way for inclusive growth. Currently, the primary source of energy for rural Indians is subsidized kerosene. Some of the other sources of lighting used by rural Indians are wood, candles and cow dung, all of which have negative effects on health and state budgets. These primitive lighting sources may prove viable in the short run due to its economic benefits but however in the long run they have adverse socio-economic implications. It is estimated that losses caused due to primitive lighting sources are in the tune of $4 billion due to illness and lost working days (Laxmi, Parikh, Karmakar, & Dabrase, 2003). Furthermore, the losses to the Indian taxpayers are in the tune of $1.1 billion due to kerosene subsidies (Rao et al., 2009).

For a country like India whose majority of the population still resides in rural India, inclusive growth requires integration of the rural population into the mainstream population. At the crux of this integration process is the act of energy inclusion i.e. energy access to all. *Energy inclusion* can be realized

through electrification of rural India. Nevertheless, this task is easier said than done because it is estimated that India needs to build a coal plant every week for the next two decades to plug the energy gap (Reimagining India, 2013). This however is not sustainable. Traditional energy systems like coal power plants in the rural context are essentially characterized by challenges w.r.t. Scaling up of infrastructure, especially distribution networks like grid into less dense areas. Moreover they involve high capital and environmental costs.

Furthermore, research also shows that traditional energy systems are not commercially feasible in case of rural population of developing countries because the productivity gain in the short-term is low or negligible (Liming, 2009). More precisely in simple terms it is almost impossible to adopt traditional energy systems because of financial and organizational constraints in the rural context of developing countries (Liming, 2009). Here on referral to developing countries will include countries like India, Indonesia and China among others (Martinot, Chaurey, Lew, Moreira, & Wamukonya, 2002). Therefore a more practical solution to plug the energy gap is to adopt decentralized sustainable energy (DSE) systems for electrification of rural India. Decentralized sustainable energy systems like solar lanterns, solar home systems and micro-grid not only helps reduce carbon emissions but also overcome distribution challenges faced in traditional energy systems. Adoption of such energy systems helps replace primitive lighting fuels like kerosene and also make the concept of energy inclusion a reality. From a macro-perspective it also helps countries like India improve their energy security and also induce economic developments (Kumar, Kumar, Kaushik, Sharma, & Mishra, 2010). While the benefits of adopting DSE is more or less apparent from a socio-economic point of view achieving economic viability has been a challenge in the rural market due to high capital costs associated with these technologies.

The issue of economic viability of DSE's in rural India can be mainly attributed to lack of affordability due to high upfront costs (Reddy & Painuly, 2004) (Shrimali et al., 2011) (Rao et al., 2009). This population essentially derives income form agriculture. Income from agriculture is seasonal, meager and irregular. According to (Barnes & Floor, 1996) the rural population cannot meet the capital expenditures; let alone the cost of operation. Researchers like (Karekezi, Kimani, & Onguru, 2008) conducted a study where they concluded that the rural population was sensitive to high down payments and short maturities of loans. It leaves us to question, if the market cannot solve the problem of providing access to clean and affordable energy due to lack of affordability, why has the government not stepped in to address the issue of energy inclusion. Since DSE's are mostly local solutions in remote communities, policy makers cannot play an active role to make the prices affordable, apart from partnering with other private organizations or NGO. Partnering is essentially done through providing grants and subsidies to these organizations involved in dissemination of DSE's to rural parts of India. In the

next section we will delve deeper into the efforts made by these organizations to disseminate DSE's and challenges faced by them.

1.2.2 An overview on the emergence of Indian Renewable energy companies (REC's): Old Paradigm Vs. New Paradigm

In this section we will essentially discuss the saga of the efforts made by organizations to disseminate DSE's to rural India. To better understand the emergence of Indian REC's in this section, efforts are categorized into two phases based on the transformation of approaches. This demarcation is not based on empirically validated time periods. It is based on thinking frames i.e. the mental structures that force people to observe the same objective from different and diverse perspectives. The two phases are old paradigm and new paradigm. These phases underpin the paradigm shift in the DSE's dissemination initiatives, from NGO-donor driven to private-market driven business enterprises known as Renewable energy companies (REC's). The main objective of both the efforts: NGO's or REC's was/is to replace existing kerosene lanterns or lamps with DSE's in rural India.

1.2.2.1 Donor-driven approach: Old paradigm

The efforts to disseminate DSE's started in the early 1990's. These efforts were carried out by non-governmental organizations (NGO's) with only a social objective and not much emphasis on attaining viability of operations. This however later on will turn out to be the core reason for failure of efforts under the old paradigm (Chaurey & Kandpal, 2009a) (Shrimali et al., 2011). The main objective of the NGO's was to replace incumbent primitive lighting sources like kerosene lanterns with DSE's like solar lanterns and solar home systems. Rural population used kerosene lantern because it is economically feasible with low capital costs. However in reality the life cycle costs of kerosene lanterns is more than DSE's (Chaurey & Kandpal, 2009b). Most of these efforts either employed solar lanterns or solar home systems (SHS) due to its versatility to provide decentralized sustainable energy.

Now, In line with the old paradigm the funding or financing models they employ essentially characterize the NGO's efforts. NGO's belong to one end of the spectrum, wherein the traditional donor model is employed. From a macro or more broad perspective, this model refers to institutions from developed countries providing funding to aid energy inclusion in rural parts of India or other developing countries through bilateral or multilateral organizations (Bobinaite & Tarvydas, 2014) (Kolk & Buuse, 2012).

Old paradigm can be essentially characterized as a period which involved best technology fit, focus on supply of DSE's, analyzing the economic viability, technical demonstrations, donor money-gifts, government subsidies and programs-schemes (Martinot et al., 2002). These characteristics did not help in large scale diffusion of RET's but rather served as a footing. Efforts to

diffuse these technologies were in vein. The adoption rate was miniscule relative to the market size. Even though the dissemination of solar home systems started in the early 1990's the rate of diffusion of solar home systems in India stood at 363,399 as on December 2007 (Chaurey & Kandpal, 2009a), which is miniscule when compared to the off grid market size of 78 million households let alone the rest of the rural population (Chaurey & Kandpal, 2009b). Researchers mainly attribute the minuscule diffusion of RET's to lack of awareness, high capital cost, lack of distribution channels, lack of scalability, lack of financing and poor regulations among others (Shrimali et al., 2011) (Reddy & Painuly, 2004) (Velayudhan, 2003) (Ansari, Kharb, Luthra, Shimmi, & Chatterji, 2013) (Nieuwenhout et al., 2001). The same researchers also further conclude either explicitly or implicitly that these aforementioned shortcomings was mainly due to the donor finding model or donor driven approach (Nieuwenhout et al., 2001) (Shrimali et al., 2011)(Liming, 2009). *More specifically the common issues that arise are lack of financing, scale and commercial viability, which are consequences of a donor approach where the rural population is regarded as beneficiaries*.

Despite the shortcomings, the positive impact of these efforts resulted in increased awareness about the benefits of DSE's to the rural consumers and most importantly the issues confronted like financing, scale and commercial viability. Moreover these efforts served as a good enough infrastructural base for future entrants.

Table 1: Old paradigm vs. new paradigm (Martinot et al., 2002)

Old Paradigm ⟶	New Paradigm
Technology Fit	Market assessment
Equipment supply focus	Value added
Economic Viability	Financing and **revenue solutions**
Technical demonstrations	Demonstrations of innovative business models
Donor gifts and government subsidies	Building sustainable markets
Programs and Intentions	Experience and results

1.2.2.2 Market-driven approach: New paradigm

Before the transformation from donor-driven approach to market driven approach, the promoters did a lot of experimentation (Martinot et al., 2002). The new paradigm is essentially characterized by market assessment, value added by DSE's in comparison with kerosene lamps, financing solutions, **revenue solutions**, demonstration of innovative business models, addressing the issues faced in the old paradigm, focus was to build a sustainable market by taking into account the risks and Results (Martinot et al., 2002). The core rationale behind the rise of new paradigm was the belief that issues like: lack of financing, failing to achieve scale and lack of commercial viability can be solved if the efforts shifted from a donor to market approach. Table 1 shows

the essential characteristics of both the old and new paradigm. Upon introspective assessment, *lessons learnt on the importance of solving the issue of commercial viability to tackle almost all of the failures in the previous efforts may have led to this transition.*

According to (Kolk & Buuse, 2012) in a market driven approach private organizations deliver value to end users of electricity wherein they are fully responsible for installation, attracting financing and maintenance of the systems. However here financing can take from of both philanthropic and purely commercial sources. This will be dealt more in detail in the next section.

The new paradigm takes its grass roots in the early 2000's (Martinot et al., 2002). The fact that upon realization of the failure of donor approach gave rise to market approach is simply not convincing enough. There are possibly several other factors, which made may have led to this transition. Firstly, the costs of renewable technologies reduced drastically due to much supply and improvements in technology, which on the whole reduced its capital costs (Abolhosseini & Heshmati, 2014). Secondly, changing investment patterns (Martinot et al., 2002). Thirdly, *ingenuity on the part of entrepreneurs or promoters to combine existing complementary technologies, which enables them to emulate the pricing of DSE's with that of the rural households expenditure on kerosene in their revenue model*. Furthermore, at a macro-level after the global financial crisis in 2008, western central banks slashed interest rates to an all time low. This caused a credit spread between the western countries and emerging markets. The interest rates in the western countries were significantly lowers than most of the emerging countries. This meant that firms located in countries like India could now borrow or raise money for lower interest rates in the west. More specifically the cost of capital for a firm came down drastically and the benefits could be transferred to the end customer i.e. rural households. It is mainly due to these aforementioned reasons; promoters or entrepreneurs set up for-profit organizations on the belief that they can now capitalize on this rural market from the lessons learnt previously. In our thesis these business enterprises will be referred to as renewable energy companies. More specifically Indian renewable energy companies (REC's)

REC's vision is to replace incumbent kerosene lanterns with DSE's by providing energy access to the poor in a more sustainable manner. Some of the objectives of REC's are discussed below:

1. Energy Inclusion: REC's aim to provide energy access to poor rural Indian households who lack access to the grid. These households are low-income households, who were hitherto unreached by traditional initiatives by the government or NGO's to provide energy access to all by either extending existing grids or providing decentralized sustainable

solutions respectively. Hence, REC's aim is to create a commercially viable market based solution. A market system has the potential to offer freedom of choice for the poor and eliminate deprivation through broadening of choice, which consequently results in development of the poor. From the perspective of the REC's market system aids scaling of operations through development of necessary infrastructure by attracting financing.

2. Poverty Reduction: By providing energy access to the weaker sections of the Indian society, REC's address one of the most important problems faced by them: Lack of reliable sustainable and cheaper energy. Research shows that energy access not only increases household income but also improve the quality of life. Subsequently this section of the population can be integrated into the mainstream economy.

3. Women Empowerment: Women in the Indian rural society by and large stay at home. It is their responsibility to walk for miles to fetch the subsidized kerosene when their counterparts work in the fields. The time used to fetch the kerosene can otherwise be used for other productive income generating activities. Furthermore, kerosene causes health problems in women, which further affects the income generated.

4. Sustainability: The key differentiator of REC's from other utility companies is that they provide sustainable energy by alleviating poverty. Replacing primitive lighting sources like kerosene with RET's helps reduce green house emissions.

To conclude this rather insightful section on old vs. new paradigm gave us interesting insights about the context in which, the new renewable energy companies came into existence. *Moreover it helped us narrow in on the fact that achieving commercial viability and financing is the key for success in the renewables-rural market saga and most importantly it was a problem of the past (old paradigm) and the solution to which is being sought in the present (new paradigm)*.

1.2.3 An overview on financing of REC's

Upon closer scrutiny of the efforts concerned with old paradigm it becomes clear that the issue associated with financing comes up very frequently irrespective of the type of market (utility or rural). As (Reddy & Painuly, 2004) points out the issue of financing to be crucial for the diffusion of renewable technologies. Among many some of the relevant measures or solutions researchers provide for financing are financial incentives, international financial incentives from developed countries to developing countries, subsides from the local governments, financial instruments like carbon bonds or carbon financing and most importantly the role of Micro-finance institutions (Abolhosseini & Heshmati, 2014; Bobinaite & Tarvydas, 2014;

Hogarth, 2012; Liming, 2009; Mainali & Silveira, 2011). Most of the researchers refer to micro financing as one of the possibilities or the solution to address the issue of financing experienced in the rural market.

Financing can be looked at from the perspective of the rural consumer and the REC's. Rural consumers need financing because they cannot afford to pay for the DSE's system upfront (Chaurey & Kandpal, 2009b). That said the rural consumers do not have a credit history in obtain financing from traditional financing sources like commercial banks (Hermes & Lensink, 2011). Therefore in order to address this issue micro finance institutions (MFI's) were set up to provide credit access to the poor. However recently in India the MFI's were criticized for charging unreasonable interest rates, which resulted in many suicides of the farmers who constitute the Indian rural population. Researchers call this mission drift i.e. MFI's shifting focus from social objectives to only profit making objectives (Mersland & Strøm, 2010). The credibility of these MFI's has been questioned in recent times and most importantly has left the rural population perplexed. From the perspective of the REC's, they require financing to fund operations and most importantly scale in order to achieve economies of scale.

In order for the REC's to finance its operations it should demonstrate steady cash flows. The cash flows are nothing but payments by rural households to the REC's for value delivered. *Moreover researchers like (Liebreich & Michael, 2005) suggest that financing is very much tied to the cash flows a business enterprise (REC's) can generate for delivering value*. (Shrimali et al., 2011) puts its differently to say that the issues of financing can be dealt with if an REC is able to achieve financial sustainability. Financial sustainability refers to the fact that the REC generates enough steady and sustainable revenues to pay for costs. Cash flows are nothing but revenues a business enterprise appropriates for delivering value to its customers. More specifically we can say that REC's can attract financing only if they can demonstrate steady revenues that can cover for costs and make a profit (Liebreich & Michael, 2005; Shrimali et al., 2011).

Research on financing, which is relevant in the context of REC's have been included in the works of (Bobinaite & Tarvydas, 2014; Kolk & Buuse, 2012; Liming, 2009). After critically reading the articles we can broadly classify financing as philanthropic and commercial capital, which may be of better resonance in the context of REC's. The essential sources of philanthropic capital are foundations (Gates foundation) or grants. Philanthropic capital can essentially take two routes. Firstly, these capitals being used solely for social cause like energy inclusion without an objective to make a financial return. This sort of philanthropic capital has opportunity costs involved. Lets take the case of gates foundation, even though it is plush with cash it may be the case that more capital needs to be allocated for an epidemic outbreak or any other emergency social cause, which put energy inclusion on the

back foot. In that case the DSE dissemination effort depending on this sort of capital may essentially find it hard to finance its operations. Secondly, philanthropic capital can also take the route of financing social causes to make a financial return. The providers of such capital are known as social impact investors (SII). That said this sort of capital could only act as a catalyst. Moreover this sort of philanthropic capital is not available in excess to fund all of the efforts to essentially realize energy inclusion. Furthermore, we can argue that this sort of philanthropic capital will follow an investment, which yields greater return. The return is dependent on the revenues a business enterprise employs. This also implies that in order to attract philanthropic capital a business enterprise should present itself with reliable cash flows or revenues, which generates profits. Hereon or referral to philanthropic capital refers to the latter route i.e. social and financial objective combined.

The other source of financing is commercial capital. It is available mostly from banks and venture capital. The sole objective of commercial capital is to make a financial return. There exists no limit to this sort of capital, at least theoretically. Venture capital is an interesting source of commercial capital. It offers capital in the form of both debt and equity. Venture financing is primarily very useful in the growth phase of the business enterprise. The downside to venture capital is that it is usually expensive than commercial capital from banks. It is expensive because it accepts a lot more risk with regards to variability of revenues however looks into the commercial viability of the revenue model. Moreover financing is mostly done in the form of equity or debt convertible to equity, which can turn out to be expensive for the founders of a business enterprise because they are giving up equity at an early stage. Banks offer commercial capital essentially in form of debt as loans to business enterprises. They are risk averse unlike venture money. In order to finance they essentially look at a steady stream of cash flows. Cash flows are nothing but revenues a business enterprise collects form its customer for delivering a value (product or/and service).

Figure 1: Benefits of a commercially viable operation

The key take away from this section is the fact that financing is very much dependent on the revenues or cash flows the REC's are able to generate. As mentioned earlier some of the impediments for rapid diffusion were that of financing, scale and commercial viability. From this section we know that revenues help attract financing, which in turn will help achieve scale as shown in Figure 1. More precisely from a narrower lens we see that at the crux of the issues confronted in the old paradigm is revenues, which subsequently can solve the other burgeoning problems like financing and scale. Now these REC's that belong to the new paradigm should demonstrate revenues in order to successfully execute afore mentioned objectives in the previous section.

1.2.4 An overview on the relevance of revenue model concept in addressing the practical issue of commercial viability of efforts (Literature gap)

In the previous section we narrowed in on the ***core issue as revenues*** *that has been baffling promoters over the past couple of decades*. The practical issue of commercial viability circumvents the revenue aspect because by definition according to the Cambridge business dictionary commercial viability is the ability of a business, product or service to compete effectively and make a profit. Commercial viability essentially has two components namely revenues and costs. The revenue aspect deals with revenues or cash flows. The cost aspect deals with costs. Costs are mostly expense incurred by the REC's; they are operations costs, financing costs and fixed costs. *More precisely, commercial viability is the ability of an REC to generate revenues that cover all costs and make a profit while competing with kerosene lanterns without any subsidies*.

Below Table 2 shows one type of a decentralized sustainable energy solution i.e. solar lantern in comparison with kerosene lantern. It can be seen that even though the life cycle costs of kerosene lantern is higher than that of the solar lantern the rate of adoption is rather low because of high upfront costs of DSE's (Chaurey & Kandpal, 2009b). This holds true even for other decentralized sustainable technologies like solar home systems and off-grid systems, in fact these systems offer greater flexibility with applications.

Table 2: Comparison of kerosene and solar lantern (Chaurey & Kandpal, 2009b)

Characteristic	Kerosene lantern	Solar lantern
Capital cost	Low	High
Fuel	Needed	Nil
Replacement costs	Low	High
Lumen output	Low	4-5 times higher
Safety aspects	Fire and Health hazards	Safe
Life cycle costs	Higher	Lower

So based on the previous articles we can say that the main deterrent for rural households to adopt the DSE systems is for a fact the high upfront costs, which from the perspective of REC's affects revenues or cash flows. Nonetheless the rural customers can still afford to pay in increments for the DSE systems like they pay for kerosene fuel. *So in other words for REC's to appropriate revenues the DSE systems price should be made palatable to the rural consumer by emulating their expenditure on kerosene lamps*. That begs to question how are they doing it?

In recent times researchers have looked at this subject on attaining commercial viability (revenues > costs) of REC's through the lens of business model framework. However this is still a recent trend and literature is scarce. (Kolk & Buuse, 2012) looked at the viable business models for REC's across different developing countries. A business model essentially encompasses all the strategic activities undertaken by a business enterprise (Teece, 2010). They go on to demarcate business models based on the type of approach i.e. donor or market driven. They certainly do acknowledge for a fact that the shift from the donor driven approach towards a market driven approach has already taken place. *They conclude that market based models that operate with no subsidies rarely exist in theory and also in practice*. In other words commercially viable business models do not exist. Furthermore they also state that customer segmentation and/or socially oriented investors are key to attain viability. Even though this article gives us interesting insights into the practical issue of commercial viability through the lens of business model framework the findings are very broad and cannot be generalized because it consists of only four cases. *Moreover the article does not delve deeper to solve the issue of commercial viability either through the revenues aspect or the cost aspect but rather address the issue of commercial viability by suggesting measures such as customer segmentation*.

Another relevant article that has come close to acknowledging the revenues aspect directly on the issue of commercial viability is an article by (Chaurey & Kandpal, 2009b). This article looks at the viability of solar lanterns in the Indian rural context. Here in this article the authors look at the revenue aspect through the lens of type of revenue model. The two types of revenue model are ownership revenue model and service revenue model. Under the ownership revenue model the customer pays for the solar lantern upfront at the time of purchase. This translates to sales directly to the promoters. This type of revenue model was predominantly adopted in the old-donor driven paradigm. The other type or revenue model the author suggests is the rental model where the rural customers rent the lantern from a local village entrepreneur. Most importantly this article leads us to the relevance of the revenue model concept in addressing the practical issue of commercial viability. According to (Osterwalder & Pigneur, 2010; Osterwalder, 2004) revenue model is a concept, which captures the relationship between costs incurred to produce the product/service and revenues appropriated by

offering the same to its customers. Furthermore other researchers like (DaSilva & Trkman, 2013) (Richter, 2013) also signify that the concept of revenue model revolves around the cash flows or revenues a business enterprise generates. *These definitions of revenue model encompass the two important components of commercial viability namely revenues and costs*. **In other words the concept of revenue model will help look at the issue of commercial viability from a more structured approach**.

Moreover the article by (Chaurey & Kandpal, 2009b) gives an indication that adopting the rental revenue model over the ownership revenue model will help REC's achieve commercial viability because the prices of DSE's become more palatable for the rural consumers. The major drawback of this article is that it does not go into the details or components of these types of revenue models. More specifically it only gives an indication that one type of revenue model will yield higher revenues such that the REC's adopting one over the other can attain commercial viability. *This article fails to answer how and why adopting these types of revenue models will help attain commercial viability and most of all what are the components of a specific type of revenue model that make it attractive to the rural customers in order for them to adopt the DSE systems or for that matter increase revenues from the perspective of REC's.* After further scouring through the relevant literature to gain more insights into the revenue model components or revenue drivers that helped REC's increase its revenues there was none found that best resonated with the domain of this thesis. *Therefore in this thesis we intend to develop one such framework of revenue drivers or revenue model components that helps REC's attain commercial viability*.

To conclude this section and most importantly on the literature gap, the practical issue of commercial viability led to the issue of revenue models. That said while in search for relevant aspects or components of a revenue model that were applicable for commercial viability of REC's none was found through literature review. More specifically literature on revenue drivers or revenue model components was absent. Therefore apart from the practical problem of commercial viability of REC's in India we also intend to address the literature gap on revenue drivers in this thesis.

1.3 Statement of research problem

Given the relevance of revenues in addressing the issue of commercial viability, which in turn will address the issue of financing and scalability. In this thesis we intend to look at this revenues aspect through the lens of revenue model concept while addressing the literature gap on revenue drivers, which offers insights into how promoters or REC's can achieve commercial viability.

The core research question is as follows:

"How are Indian REC's achieving commercial viability of its operations through innovative revenue models"?

The core rationale for basing the main research questions exclusively on Indian REC's is essentially because it is also a developing country where majority of the population comes under the concept of base of the pyramid and access to energy is still scare as in the case of other developing countries. Studying the cases in India will offer greater generalizability to other developing countries as well because they face the same issues.

The answer to the core research question will be derived from the case analysis and cross case analysis. However, the precedent data required for the case analysis is obtained through a literature review. The term innovative is a subjective judgment based on the prior information gained through a literature review on revenue models. Here in this thesis only the revenue aspect of commercial viability will be looked at such that revenues are > costs.

In order to answer this core research question we will look into sub-questions that will lead us better answer the core question. The sub questions are as follows.

1. What are the different types of revenue model employed by Indian REC's?
   Why do REC's choose to employ one over the other?

Answering this research question will aid towards understanding the concept of revenue model better and also present an opportunity to compare the findings of this research to incumbent theory.

2. What revenue model is commercially viable in the Indian rural market and why?

Answering this question will yield us insights into the type of revenue model that is commercially viable because incumbent theory suggests that the ownership revenue model yields lower revenues and deters adoption of the DSE's by rural consumers. More specifically answering this question will yield us insights into what components constitutes each of the already commercially viable revenue model.

3. What are the revenue model components or revenue drivers that are deemed relevant by Indian REC's to achieve commercial viability?

Answering this question will yield us all the relevant revenue drivers or components that are apt for Indian REC's in order to attain commercial viability. Most importantly it will yield a representative framework of revenue model components - commercial viability of REC's.

In pursuit to find answers to these sub-questions we will firstly conduct a literature review that will be presented in chapter 2. It is based on this literature review an initial conceptual model or framework will be derived, which will be further leveraged or tested against the cases from India. It may be for a fact that the literature review may not yield all the relevant data that is required to answer the sub-questions, in such a case the case analysis and cross case analysis will provide a more concrete and apt data and interpretation. The case analysis and the cross case analysis will be presented in chapter 3 and 4 respectively.

1.4 Research aim and objectives

The aim of the research is to explore the innovative revenue models employed by Indian REC's. The objective of this research is essentially two fold: firstly, to contribute to the existing knowledge on *types of revenue models* employed by Indian REC's. Secondly, add to the knowledge gap on the *components* of a commercially viable revenue model of Indian REC's. We intend to make a valid contribution towards revenue model types and components or revenue drivers employed by incumbent Indian REC's.

1.5 Scope of study

In this section we will define the scope of the thesis. The scope is as follows:

- Types of market: We can essentially classify markets into 2 categories. Firstly, Utility market where energy is generated at a utility scale. In this market the renewable energy companies generates electricity at a centralized source to achieve economies of scale. The electricity generated from this source is essentially useful for end-users who already have the traditional grid infrastructure in place. The viability for producers is entirely dependent on policy and interest rates. The other market is that of the rural market where traditional grid infrastructure is lacking and it is believed that this market can be made commercially viable for renewable energy companies. In this thesis we look at the rural market, which may seem more interesting given that we are looking at revenue models.

- Products: We essentially concentrate on two different types of DSE technology namely: Solar home systems and Micro-grid systems.

- Region: The most apt regions for studying the rural markets that lack access to the grid are mostly developing countries. Some of the developing countries are India, Indonesia and most parts of Africa. Here in this thesis we mainly focus on India. The core rationale behind focusing exclusively on India is that of the sheer size of the rural market and the ingenious REC's that has come up recently to address the

problem of energy inclusion through focusing on attaining commercial viability.

- Cases: We look at essentially renewable energy companies, which are registered as for profit organizations and focus exclusively on the rural Indian market.

1.6 Relevance of study

The scientific relevance of this thesis is that it provides a new perspective on the issue of commercial viability of REC's by exploring the *relevant revenue model components or revenue drivers of REC's*. As discussed previously the issue of commercial viability has been looked at by researchers assuming that financing has to be addressed in order to solve the issue of commercial viability whereas they seem to have missed the *causality link between revenues and financing*. Therefore in this thesis we intend to narrow the gap between the incumbent theoretical knowledge and the practical issue of commercial viability by conducting a study on the relevant revenue drivers or revenue model components of REC's that help attain commercial viability. This will perhaps lead to the discovery of revenue model components or revenue drivers. Also, may lead to new insights regarding the types of revenue model.

The key contributions of this thesis to the scientific world will be a relevant list of revenue model components or revenue drivers that help REC's attain commercial viability i.e. revenues > costs. Note that this only offers a body of knowledge on the relevant revenue model components or revenue drivers to attain commercial viability. The list of revenue model components or drivers that will come out as a result of this thesis will only address the fact that when adopted will help REC's attain commercial viability such that its revenues are greater than costs to make a tidy profit.

One of the dimensions of scientific research is social cohesion or social relevance. This research mainly addresses the social problem of energy access to all or energy inclusion. In addressing the issue of relevant revenue drivers we intend to realize the act of energy inclusion because a commercially viable operation can further go on to achieve financing and subsequently scale. *More so it can catalyze the process of energy inclusion*.

The other dimension of scientific research is practical relevance. This study will equip incumbent managers and future entrants in the rural energy industry with a relevant list of revenue drivers that can be used to attain commercial viability.

1.7 Research approach

This study will be mainly qualitative and exploratory in nature because there exists a gap in the literature. An empirical research is preceded by literature review. The goal of this research is to characterize the incumbent innovative

revenue models of Indian renewable energy companies operating in the rural market. This study employs a multiple case analysis. The empirical part of the thesis consists of four case studies that will help us test the initial framework, which essentially consists of relevant revenue drivers or components or elements of a revenue model that will be derived through a literature survey. This approach will give us an in-depth and detailed examination of the case and related contextual factors.

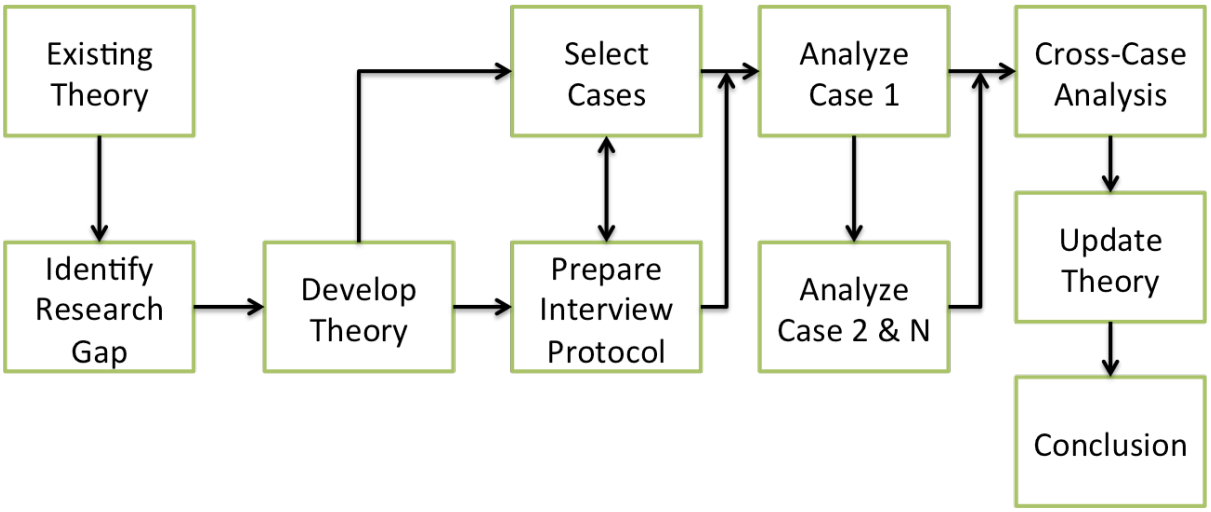

Figure 2: Case Study Method

Multiple case study approach not only helps us understand the contemporary phenomenon of interest but also helps with theory building. Furthermore, theory serves as a framework for generalizations (R.K Yin, 2003). The approach to this case study is essentially linear-analytic process, wherein the problem is identified after a relevant literature review. Followed, by addressing the literature gap on the back drop of existing literature. The identified gap in literature, serves as a foundation to further develop theory. In the next stage the theory is validated through a multiple case study approach. Below Figure 2 shows an overview of the case study approach.

The case analysis will be followed by cross-case analysis. This approach not only helps solve the issues related to observations and deductions but also that of generalizability and reliability (Lee, 1989).

The thesis can be divided into 3 phases. Namely, The theoretical gap identification phase, Identification of revenue model types and drivers phase, lastly, Testing phase. Below Figure 3 shows an overview of the research approach.

Phase 1: Theoretical Gap Identification Phase

The aim of this phase is to better aid us in narrowing down the literature gap and also to some extent look at the past efforts and current efforts. This phase is dealt more in detail in chapter 1. In this phase we essentially carry out a literature review on the concepts of barriers to diffusion, bottom of the

pyramid, financing and commercial viability in the context of DSE's and rural markets in developing countries or more specifically India. After critically reviewing the articles this helps us to narrow down towards the actual problem faced in this sector i.e. lack of commercial viability of efforts. While researching on the commercial viability, it becomes clear that the concept of revenue model can serve as a tool to look at commercial viability. It becomes apparent that researchers have tried to address the commercial viability issue by looking at the type of revenue model on the belief that a certain type of revenue model will help attain commercial viability. However the type of revenue model offers a vague solution to address the issue of commercial viability because the authors assume that one type of revenue model over the other will increase revenues. At the crux of this assumption lies for a fact that the rental revenue model will make the pricing more palatable for rural consumers as opposed to the ownership revenue model where customers are required to pay up front for the DSE system. The researchers make no attempt to look at what are the essential components of these two types of revenue model. Moreover the researches do not try to address the issue of commercial viability through the relevant revenue model components or revenue drivers that help attain commercial viability.

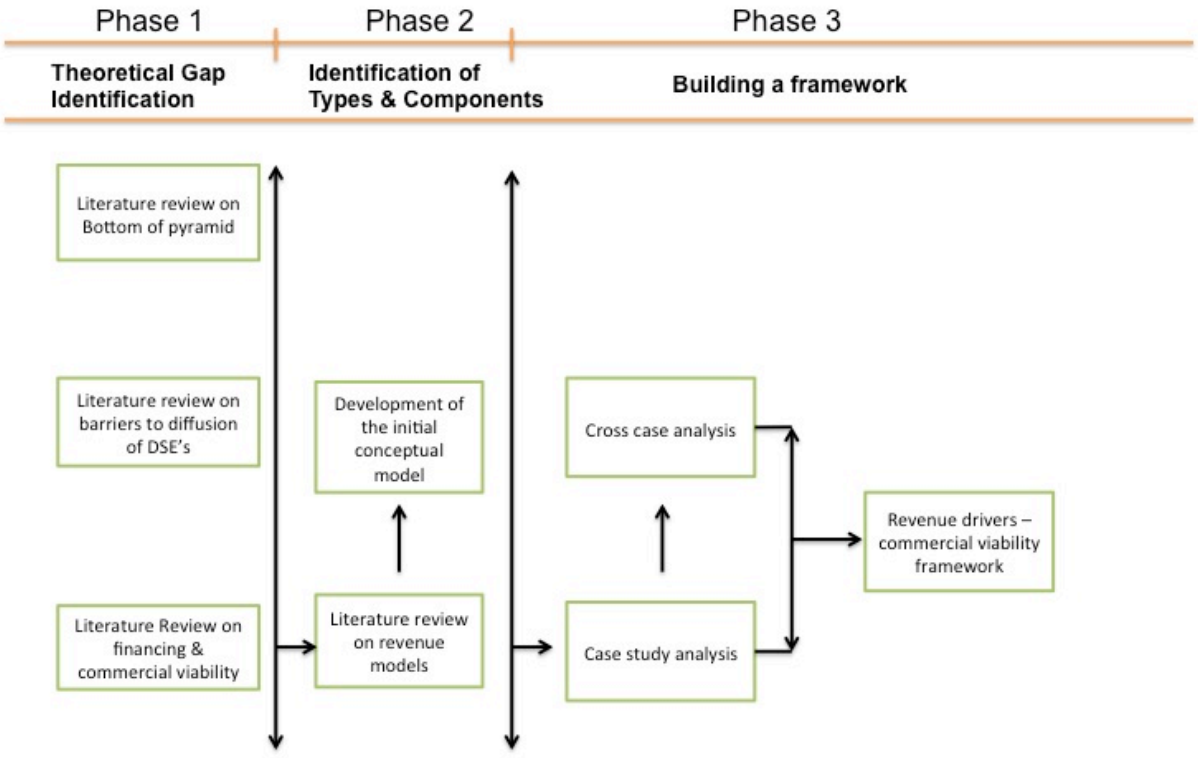

Figure 3: Overview of Research Approach

Phase 2: Identification of revenue model types and components

In this phase we essentially delve deeper into the concept of revenue model. The aim of this phase is to identify the revenue model types and components. This is dealt more in detail in chapter 2. The result of this phase will yield us an initial conceptual model of revenue model components.

Phase 3: Building a Framework: revenue drivers-commercial viability
In this phase we intend to leverage the initial conceptual model and possibly extend it to build a more relevant revenue model components-commercial viability framework. In this phase we perform a case analysis followed by a cross-case analysis.

The case analysis (chapter 3): The initial conceptual model is further leveraged into the context of each of the cases. This is done through interviewing the companies. The companies would give feedback and experiences they confront. This helps us to further enrich our conceptual model. Essentially in this phase the companies are asked questions related to "How" and "why" they do what they do. The questions surrounding the part of "How" will essentially look at how the company has adopted each of the identified revenue driver into its revenue model. The questions surrounding the part of "Why" will essentially look at why the company has adopted a particular component in their revenue model. Furthermore, the company is asked to give an indication on the relevance for each of the revenue drivers or components in its revenue model. These aforementioned actions will lead to an understanding where several other relevant revenue model components are identified.

Following the case analysis, cross case analysis is performed to increase the level of generalizability and most importantly elucidate all the relevant revenue drivers or revenue model components. This is presented in chapter 4. After gaining insights from the case analysis and cross case analysis a more apt revenue driver - commercial viability framework is achieved.

1.8 Organization of the thesis

We essentially organize the thesis into chapters. Figure 4 shows an overview of the organization of the thesis

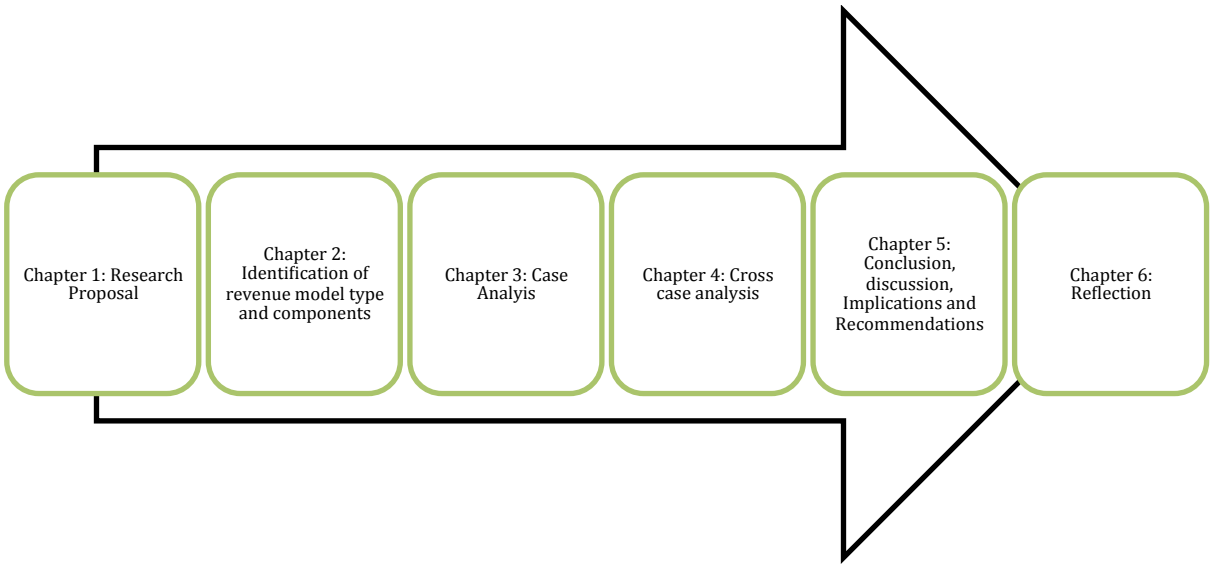

Figure 4: Overview of thesis organization

In chapter 1 we present the research proposal. In chapter 2 we delve deeper into the concept of revenue model. In chapter 3 we will perform the case analysis. In chapter 4 we will perform the cross-case analysis, which essentially yields us the similarities and differences between each of the cases. In chapter 5 we present the conclusion, discussion, implications and recommendations. Chapter 6 will mainly consist of reflections.

Chapter 2: Revenue Model: Types and Components

2.1 Preface

The previous chapter introduced all the relevant concepts of this thesis and most importantly gave insights into the practical issue of commercial viability, which when addressed helps other issues like financing and subsequently scale. Furthermore we also identified the literature gap to be revenue model components or revenue drivers that has not been looked at to address the issue of commercial viability confronted in the past efforts to diffuse DSE's and also the present. It gave an overview of the research question and research approach that will be employed in this work.

Against the backdrop of the previous chapter *this chapter presents an elaborate and detailed review on the concept of revenue model in terms of its theoretical background, types and components.*

The structure of this chapter is as follows: firstly, we will look at the theoretical background of the revenue model concept. Secondly, we will look at some of the definitions of the term revenue model. Thirdly, a literature review is carried out, which helps us identify the various types of revenue models and also the elements of a revenue model. Following which, we will present the conceptual model developed from the literature review. Lastly, the chapter summary is presented.

2.2 Theoretical background

Here in this section we will try to look at the theoretical background of revenue models.

2.2.1 Clarification on the ambiguity that exists between the terms revenue model and business model

Some researchers use the term business model and revenue model synonymously and others view revenue model as a component of a business model. Therefore it will be wise to clarify this ambiguity before going any further. In order to do so many Meta articles was looked at. In these articles researchers have tried to clarify the ambiguity.

According to Teece (2010) a business model describes a design or architecture of value creation, delivery and captures mechanisms. According to Giessen (2007), a business model essentially consists of an Industry model, revenue model and enterprise model. Industry model refers to innovating the value chain by moving into new strategic industries.

Enterprise model involves reconfiguring the network plays like external collaboration and partnerships. Figure 5 shows Giessen model. Revenue model refers to innovating on revenue stream by reconfiguring the pricing strategy. Below In Table 3 presents the so-called pillars of business model. According to (Osterwalder, 2004) conceptualization of the concept business model, revenue model is a component of the term business model. The same can be inferred from the work of (Richter, 2013)

Table 3: The business model conceptualization (Osterwalder, 2004)

Business model pillars	Description
Value proposition	It is the bundle of value and service that creates value for a customer and allows the company to earn revenues
Customer Interface	It consists of customer relationship, customer segments and distribution channels.
Infrastructure	It describes the architecture of a company's value creation.
Revenue model	Represents the relationship between cost and value proposition.

Amongst the articles reviewed all of are the view that revenue model as a component of a business model. Therefore in order to seek the theoretical grounding of the revenue model concept we should look at the theoretical grounding of business model.

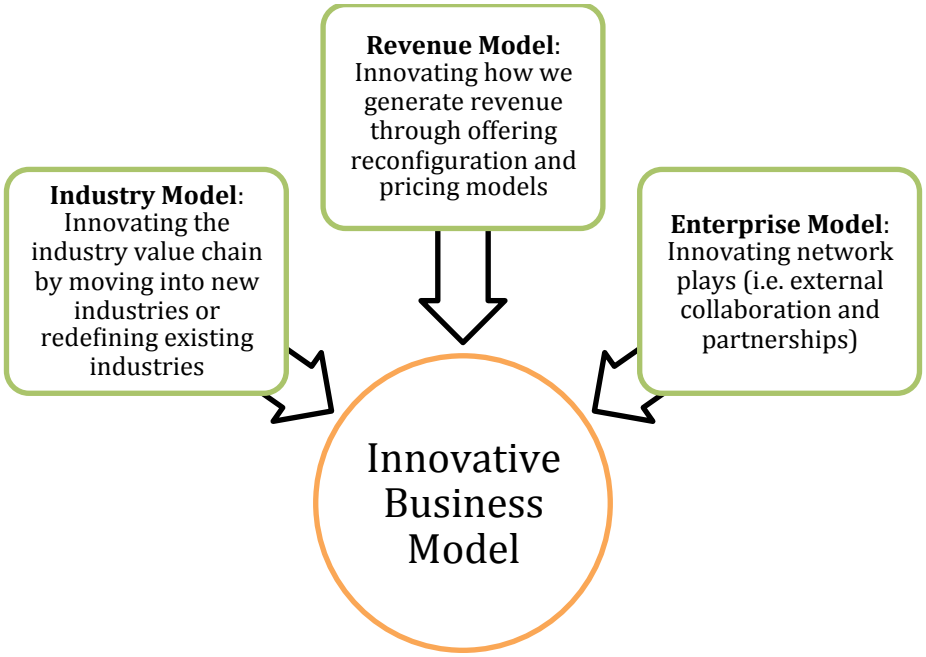

Figure 5: Framework of a business model (Giesen, Berman, Bell, & Blitz, 2007)

2.2.2 Theoretical grounding of business model (revenue model)

Before we look at the theoretical grounding of business model let us first look at the various definitions of a business model. According to Teece (2010), when a business enterprise is established, it either explicitly or implicitly employs a business model that describes a design or architecture of the value creation, delivery or captures mechanisms (Teece, 2010). According to (DaSilva & Trkman, 2013), a business model as a combination of resources and transactions that generate value for both customers and the company. (Chesbrough & Rosenbloom, 2002) define business model as the heuristic logic that connects technical potential with the realization of economic value. (Zott, Amit, & Massa, 2011) (Amit & Zott, 2001) (Morris, Schindehutte, & Allen, 2005) (Giesen et al., 2007) more or less concur that a business model entices value creation, delivery and capture. From the definition it becomes clear that all strategic activities undertaken by a firm can be viewed as components of a business model. It more or less can also serve as a framework to look into issues related to diffusion (Shrimali et al., 2011).

Business model lacks a theoretical grounding in economic theory. The absence takes root from the ubiquity of theoretical constructs that markets solve the problems (Teece, 2010). However in the real world business models are created to solve the problems (Teece, 2010). Economic theory assumes that if value is delivered at competitive market prices customers will always pay for it but this assumption may not entirely reflect the real world (Morris et al., 2005) (Teece, 2010). For example the Internet companies are perplexed because the customer expects that basic services should be free. Hence, in order to provide the free service companies should reinvent or innovate on their business model. In case of DSE's the rural customers cannot afford to pay the high upfront costs, therefore REC's should try innovate their business model in order to increase its customer base in order to attain commercial viability.

Business models also do not have a place in organizational, strategic and marketing studies. Teece states that business models are clearly an interdisciplinary study, which has been neglected (Teece, 2010). According to (C. Zott, Amit, & Massa, 2011) business models is mainly developing in silos according to the interests of the respective researchers. The interest areas identified are in the context of e-business, Strategic management, Innovation and technology management. Below we will discuss each of the areas briefly. The one simple explanation for this may be that the literature on Business models itself is fragmented and researchers are working towards structuring the literature on business model (Teece, 2010). Below we will look at the possible theoretical underpinning of business models from the perspective of strategy and innovation management researchers.

Business models for strategy: Value creation and value capture through activities

The main purpose of the concept of business model in the strategy literature is to explain: firstly, networked nature of value creation; secondly, the relationship between business model and firm performance and finally, the distinction between business model and other strategy concepts (Zott et al., 2011). Strategy researchers study value creation in the context of firm's activities (e.g., how a firm distinguishes itself from its competitors (Zott et al., 2011). The mechanisms through which the business model influences the outcome are competitive advantage, total value creation and distribution of bargaining power through business model and Schumpeterian innovation (Amit & Zott, 2001)(Zott et al., 2011).

Business model: Innovation and Technology Management

The purpose of a business model in technology and innovation management realm is to understand how technology is converted into market outcomes (Zott et al., 2011). In this realm the business model embodies organizational and financial architecture of the business. In this field of study the *technology is viewed as the enabler of the business model* rather than the causality running from business model to technology. The logic of a business model in this field encompasses, the firm's revenues and costs, its value proposition and mechanisms to capture the value (Zott et al., 2011). *In other words a business model can also be viewed as a vehicle for innovation but also as a subject of innovation*. The mechanism through which the business model delivers value is through connection of technology with customers and network plays i.e. partnerships (Zott et al., 2011).

2.3 Definition of revenue model

According to DaSilva (2013) revenue model can be defined as a specific mode in which a business model enables the generation of revenue. Revenue model is mainly associated with revenue sources their volume and distribution (DaSilva & Trkman, 2013). Revenue model represents the relationship between costs to produce the value proposition and the revenues that are generated by offering the value proposition to its customers (Richter, 2013) (Osterwalder, 2004).

2.4 Literature review

Literature explicitly on the concept of revenue models is scarce. It can be noticed that the use of revenue models in literature is predominantly in the cloud-computing industry. Even though, cloud computing is essentially a different industry in relation to renewable energy industry. They can be characterized as relatively new disruptive technologies because they enable reconstruction of the existing value chain. As mentioned by Teece (2010) disruptive technologies need novel and innovative business model, which also implies a need for an innovative revenue model. For Instance the adoption of solar home systems eliminates the need for transmission infrastructure, which is a necessity in the case of traditional fossil fuel energy

systems. The same holds good in the case of cloud computing, the need for infrastructure like servers is completely eliminated from the customers perspective.

Technologies like cloud computing and DSE's not only helps in delivering value to customer's in novel ways but also helps include customers who were excluded from the traditional systems. Traditionally, software had to be licensed out to the customer, which involved the customer buying the license to use the software by making an upfront payment. In case of cloud computing the same value i.e. software can be delivered over the Internet and the customer can access it as and when he or she needs the software. In other words the same value can be delivered to the customer in a radically different way. This type of new value delivery mechanisms makes way for a new value capture mechanism i.e. Revenue model. Now, for example Oracle can offer its ERP software to smaller enterprises via the cloud for a fraction of the traditional price. Likewise, even in the case of SHS, renewable energy companies can deliver the same value i.e. energy for a fraction of the traditional price paid upfront, which opens up possibilities to serve underserved or new markets like that of rural India.

There certainly exist similarities between the cloud computing technology and renewable energy technology, they are as follows: firstly, both technologies are characterized by high capital costs from the perspective of the owner. Secondly, both technologies enable the owner to serve underserved and new markets. Thirdly, both these technologies pave way for innovative revenue models, which may bring in access to new/larger markets. Lastly, the marginal costs of operation are relatively low.

We seek to borrow the fundamentals i.e. types and elements of a revenue model form cloud computing industry. We intend to leverage the findings into the renewable energy industry also. The research articles in the realm of revenue model are still at an infancy stage, wherein researchers are still trying to build the concept and delineate its elements. In sum the literature on revenue model is still in its structural phase. Hence, to build a conceptual model we gather data from all types of research articles on revenue model, primarily through desk research.

2.4.1 Revenue model

In this section we will look at the various articles, which will not only help us to better understand the concept of a revenue model but also gives a gist on the various revenue drivers.

The article by (Popp, 2011) tries to model revenue streams of software companies. The author looks at SAP, Microsoft and Google. In this article the author tries to solve the causality relationship between the business model and revenue stream. Author defines revenue model as how a company is

compensated for each of the business pattern provided. A revenue model comprises of one of more revenue streams. The authors conclude that revenue models can be used to fund other complementary business patterns; this may result in creating a competitive advantage e.g. lower pricing. From this article we can say that revenue model may comprise of several revenue streams i.e. a company can offer several solutions branching out from its core competency.

(Chai, Potdar, & Chang, 2007) conducted a survey of all the revenue models employed today by several social software systems. The authors concluded that some of the most prevalent revenue streams in the social software systems are advertising, premium memberships, affiliate programs, donations and merchandize sale. They claim the success of these systems is mainly due to *revenue sharing*. Revenue sharing can be defined as the sharing of revenue earned the supplier with the customer. This is essentially done to encourage customer help the supplier to generate more revenue.

The article by (Enders, Hungenberg, Denker, & Mauch, 2008) examines two major German social networking sites in order to answer the question of how social networking sites generate revenue through advertising, subscription and transaction models and how do they create value. The generation of revenue through various mechanisms like advertising, subscription and transaction can be dubbed as revenue appropriation mechanism. The authors argue that the key revenue drivers are: (1) the *number of users*, (2) *willingness to pay of customers* and (3) *the trust of customers*. In this article the authors show how each of these revenue drivers impact the revenue model employed by the firm. The article centers on how willingness to pay of a customer can be used to envisage an appropriate revenue stream. The authors classify willingness to pay as low, zero and high. Based on the willingness to pay of a customer the authors suggest the appropriate revenue mechanism. The article proposes the usage of advertising revenue stream if the willingness to pay is zero and there exists a large customer base. If the willingness to pay is high then subscription revenue stream is most apt. This article helps us conceptualize willingness to pay, the number of users and trust as the components of a revenue model.

The article by (Ojala, 2012) investigates the different revenue models and the reasons for using particular revenue models. The author delves deeper into software as service industry (SaaS), which is enabled by the cloud computing technology. The author characterizes this as a service revenue model, where the product i.e. software is delivered as a service. The author further classifies service revenue model as pay-per-use or pay-per-month. Under Pay-per-use or pay-per-month the customer pays for the service when they are needed. The author argues that SaaS models offer *flexible* and *attractive pricing* for its customers. However the features like flexibility and attractive pricing lowers the switching costs of the SaaS existing customers. This is beneficial to the customer. Nevertheless, SaaS model provides steady and predictable source

of revenue for the providers. Some of the traditional revenue streams identified by the authors are revenue generated through renting and licensing. The author concludes by stating that clients of SaaS providers are rather conservative and prefer renting or licensing as opposed to pay-per-use or pay-per-month. We can conclude that *flexibility of payments* and *pricing strategy* are important concepts to be considered when considering a service revenue model. To gain a more concrete understanding of pricing strategies we will further look into another article by Ojala, 2014.

Another article by (Ojala, 2013) gives a detailed description on various revenue models like pay-per-use, renting and licensing. The authors define pay-per-use as a revenue appropriation mechanism in which the customer is periodically charged according to units consumed. This mechanism helps increase the base of the customers who might not have financial recourses to buy a traditional software license. In other words customers with lower willingness to pay become potential customer. In the renting revenue appropriation mechanism the customer pays a negotiated subscription fee to use the software license for a limited time. This mechanism also helps increase the customer base but not as much as pay-per-use mechanism. Under the licensing revenue appropriation mechanism the customers buys the product outright. The licensing revenue model is apt only when the customer's willingness to pay is high. Each of the above mentioned revenue models have its advantages and disadvantages.
Below Table 4 shows an overview of the advantages and disadvantages of various revenue models.

Table 4: Comparison of software revenue models from the perspective of (Ojala, 2013)

Model	Advantages	Disadvantages
Pay per use	• Increases the customer base	• Carries risk of not recouping the development costs • Requires maintaining records of usage
Renting	• Offers flexible pricing strategies • Increases the customer base • Does not require maintaining records of usage	• Increases the risk of not recouping the development costs
Licensing	• Development costs can be recouped quickly	• Customer base will relatively decrease due to unaffordability

The article by (Chaurey & Kandpal, 2009b) analyzes several dissemination models including rental and fee-for service for centralized solar charging stations for solar lanterns available in India. The authors believe that the main reason for the miniscule diffusion of solar lanterns can be mainly attributed to the failure of Ownership revenue model. Under the ownership revenue model the customer pays the price of a solar lantern upfront. The reason for the failure of Ownership revenue model is mainly due to high capital costs for the customer. As an alternative to Ownership revenue model the authors propose fee-for-service or rental revenue model to catalyze the pace of dissemination. Table 5 shows the different types of revenue model in comparison to characteristics like initial cost burden, O&M cost, flexibility, recharging of battery and safety. Even though this article looks at revenue model of a solar lantern as opposed to SHS, it is still relevant for this thesis because it offers insights into two essentially disparate revenue models.

Table 5: Comparison of Ownership and rental revenue model (Chaurey & Kandpal, 2009b)

Characteristic	Ownership revenue model	Fee-for-service/rental revenue model
Initial cost burden	User owns the lantern by paying full cost	User does not own the lantern, rather rents it when required
Maintenance cost	User pays for the maintenance costs	User bears no cost of maintenance
Flexibility of use	The user can use the lantern at any time and any purpose	Flexibility of use reduces
Recharging of battery	User has to recharge the battery	The user need not recharge the lantern
Safety	User is responsible for safety	User is not responsible for safety.

The articles presented above each have its own contribution towards the development of a conceptual model. However, the researchers do not bother to elucidate the concept of revenue model in detail nor its components. To reduce complexity in the future work on revenue model we would like to make clarifications with the types of revenue models and revenue models itself.

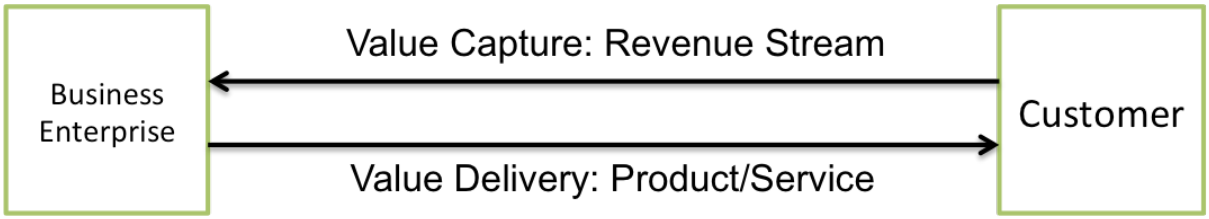

Figure 6: Schematic diagram showing value delivery and capture

There exists ambiguity with respect to types of revenue model and revenue appropriation mechanism. The type of revenue model varies from pay-per-use, renting as revenue models ownership and service revenue model. Revenue models like pay-per-use or pay-per-month or subscription can be dubbed into a much broader term known as the service revenue model. By definition the term service revenue model refers to value delivered periodically. In other words the customer pays for the value delivered by the supplier in increments as opposed to paying for it upfront as in the case of ownership revenue model. These increments can vary based on the revenue appropriation mechanism employed under the service revenue model like pay per day or pay per month. Again, Ownership revenue model can be used in a broader sense to encompass other revenue models like lease. Here the revenue appropriation mechanism is the upfront payments.

The revenue drivers or components or elements that were identified after literature review on revenue models are: Consumer trust, Pricing strategies, Flexibility of payments, Willingness to pay, Number of users, Revenue sharing and Size of payments.

2.5 Conceptual model

In this section we aim to look deeper into the initial conceptual model that can be built following the literature review on revenue models. Figure 7 shows an overview of all the identified revenue drivers after literature review on revenue models. The *components identified are consumer trust, pricing strategies, flexibility of payments, willingness to pay, number of users, and revenue sharing*. Here in this section we try to look deeper into each of these concepts like consumer trust and pricing strategies among others. Moreover it may be the case that the theory of each of these components may not match with the cases but however it will give a basis of understanding, which may prove to be useful during the interview. This section is a result of literature review.

2.5.1 Consumer trust

Consumer trust is grounded in the commitment-trust theory of relationship marketing (Morgan & Hunt, 1994). According to (Spekman, 1988) trust is the cornerstone of strategic partnership between seller and buyer. It is believed that trust is a multi-disciplinary concept, which incorporates ideas from marketing, economics, psychology, strategy and decision sciences. According to (Morgan & Hunt, 1994) trust exists when one party has confidence in another party's reliability and integrity. The concept of trust seems to be positively correlated to shared value and communication. Shared value can be defined as both the supplier and consumer have common beliefs. Communication can be defined as sharing of important and meaningful information. A consequence of trust is commitment. Commitment is defined as an enduring desire to maintain the valued relationship (Mukherjee & Nath, 2003)

According to (Humphrey & Schmitz, 1998) in a real world the issue of trust arises due to economic transactions. An inherent characteristic of an economic transaction is perceived risk. This is particularly relevant in the case of REC's because the perceived risk increases due to fear and anxiety associated with the DSE and/or the renewable energy company's reliability. In this case they simply may choose not to adopt the DSE's. Hence, building trust is a very important revenue driver for a renewable energy company's revenue model.

2.5.2 Pricing strategies

Lessons from the old paradigm teach us that pricing plays a very important role in adoption of DSE systems by the rural consumers. The pricing strategy that can be implicitly derived from the work of (Chaurey & Kandpal, 2009b)is that prices should be made palatable for the rural customers. In pursuit to find more information regarding pricing strategies (Ojala, 2014) has suggested a pricing model based on five dimensions known as the SBIFT model. The authors claim that pricing should be based on the dimensions of scope, base, influence, formula and temporal rights. This model however is much too elaborate but however this can serve as a basis to further instigate the conversation with the interviewee.

2.5.3 Flexibility of payments

According to (Ojala, 2012) the flexibility of payments revenue model component or revenue driver will increase the customer base because the customers will not feel the weight of obligation to make a payment. It may be relevant for the REC's because the option of flexibility of may relieve the rural consumers from any kind of obligatory regular payments.

2.5.4 Willingness to pay (WTP)

The maximum amount an individual is willing to pay (WTP) for product/services is a common measure in economics, of the value of the product/service to the individual (Shogren, Shin, Hayes, & Kliebenstein, 1994).

Semee Yoon et al., 2014 conducted a field experiment on the willingness to pay for solar lanterns. They concluded that the current business model of trail period and postponement of payment to increase diffusion of solar lantern was ineffective. Some of the key points they make in their research are that the willingness to pay for a solar lantern is low. To add to this finding the article by (Mobarak, Dwivedi, Bailis, Hildemann, & Miller, 2012) concludes that the demand itself is low for modern cooking stoves. Even though both these articles look at different technologies, they are useful to classify that the willingness to pay for these green renewable technologies is low. Hence they call for a reconfiguration of the traditional revenue models to better suit the low WTP of the customers. Considering the low willingness to pay of the rural consumers in an REC's revenue model may offer a better case of adoption by the rural consumers.

The article by (Johannes and Semee, 2014), conduct a survey in Uttar Pradesh, India to evaluate the awareness and willingness to pay for the solar home system. They concluded that awareness of SHS is high among households with high income and education levels. With regards to willingness to pay the authors conclude that there certainly exists a discrepancy between the customers WTP and the market price. In other words there is a gap between market price and willingness to pay. They also delineate the predictors of willingness to pay as follows: grid electricity, income, *kerosene expenditures* and education. The key take away from this article for REC's is the fact that the price of DSE's should be comparable to that of the kerosene expenditures.

2.5.5 Number of users

According to (Enders et al., 2008) number of users is a key revenue driver in the advertising revenue model. Even though the advertising revenue model may not be relevant for REC's the component number of users may prove useful because most certainly more the number of users more will be the revenues.

2.5.6 Revenue sharing

According to (Chai et al., 2007) Revenue sharing can be defined as the sharing of revenue earned by the supplier with the customer. Considering that the rural market is characterized by low income, revenue sharing may prompt adoption of DSE's.

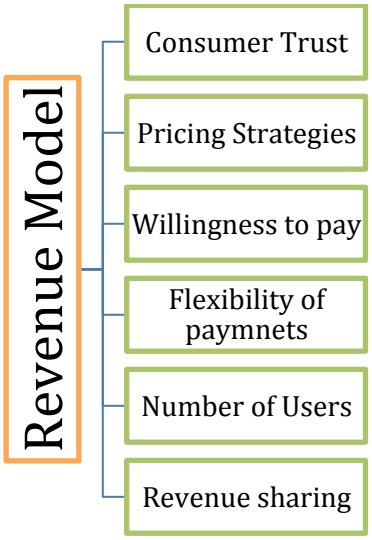

Figure 7: Revenue model components or revenue drivers conceptual model

2.6 Chapter summary

Revenue model of a company or business enterprise constitutes one or more revenue streams. The supplier generates revenue through value delivery to its customers. The value can either take the form of product or/and service. The

exchange of value for a payment by a customer can be termed as a revenue stream. The method used to collect payment from the customer by the supplier can be termed as revenue appropriation mechanism. Revenue drivers mainly govern the logic behind the adoption of a certain revenue model as opposed to the other. In other words variability in each of the revenue drivers, gives rise to a specific revenue appropriation mechanism and revenue model.

We identified several types of revenue model. However, due to the fragmentation in the definitions of revenue model we essentially identified two revenues model i.e. service and ownership revenue model. Furthermore, to avoid confusion we grouped concepts like pay-per-use, pay-per-month, rental and leasing into a macro term known as revenue appropriation mechanism. In literature these terms are defined as revenue model, nonetheless we will view them as revenue appropriation mechanisms. The differentiation of revenue models and revenue appropriation mechanisms helps us to simplify the case analysis and prevents ambiguity while analyzing the each of the cases.

Furthermore, The literature gives us six revenue model components or revenue drivers irrespective of the type of revenue model. As derived earlier in the previous chapter the concept of revenue model is best suited to look at the commercial viability issue. However what we can notice is that there was not much of relevant literature specifically to look at revenue drivers that are relevant for REC's in order to achieve commercial viability. Nonetheless the revenue model components elucidated above are all relevant in increasing revenues. *Since these components and types of revenue model already gives us a clue on its impact on revenues it wouldn't be a bad idea to test these against the cases to obtain a more representative framework on revenue drivers-commercial viability of REC's.*

As a note these afore mentioned revenue model components are only indicative of its relevance in increasing revenues by making it appealing to the customer such that he/she readily adopts it if the need exists. The relative importance of each of the revenue drivers will not be addressed in this thesis because we are primarily interested to know more about whether or not these revenue drivers are relevant in the context of REC's attaining commercial viability and more so the relevant notions of each of the revenue drivers.

The literature suggests that the ownership revenue model is bound to not achieve commercial viability and service revenue model is the way forward for the REC's. On the whole six components or elements or revenue drivers were identified. *They are consumer trust, pricing strategies, flexibility of payments, willingness to pay, number of users, and revenue sharing*. This will be validated and possibly extended in the case analysis next.

Chapter 3: Case Study

3.1 Preface

In the previous chapter we firstly, looked into different types of revenue models employed across various sectors, especially from the cloud-computing sector. It became clear that these several types of revenue model could be grouped into essentially two macro level revenue models known as service and ownership revenue model given the fact that they were just a spin on words. Secondly, elements or components or revenue drivers of a revenue model was identified, which is our initial conceptual model. Here in this chapter we try to leverage the initial conceptual model developed in the previous chapter onto four cases.

A case study approach was adopted to test and possibly extend the conceptual model derived from literature review. The structure of this chapter is as follows: case analysis of SIMPA networks, Onergy, Rural spark and MeraGao Power (MGP). Before we present the case analysis of each chapter we will firstly look at the methodology adopted in this thesis.

3.2 Methodology

Given for a fact that researchers in the past have not looked at the addressing the issue of commercial viability by studying revenue model components or revenue drivers begs for a qualitative-explorative-case study approach. The rationale behind adopting the case study approach is as follows: firstly, Since the theory and conceptual model with regards to the components of a revenue model is derived from across various other industries like e-commerce, cloud-computing and social networking industry, the case study approach helps with further testing of the conceptual model derived in the earlier chapter. Secondly, it also aids in extensions or modifications to the conceptual model, which is more apt for the scope of this study. The case study will be an in-depth analysis of each of the chosen cases. Below the thought process for the case study is presented.

3.2.1 Selection process

This section essentially elucidates the selection process of Industry, Market, country, technology and cases.

The industry we choose to look at was Renewable energy sector because even after so much of research and development both with respect to technology and business, its market potential are still being questioned. On one hand, the optimists say that there is a future given its potential to contribute towards reducing global warming and the pessimists say that there is no future for green energy at least in the short-term. The pessimism is

mainly due to the fact that unit economics of green energy simply cannot compete with that of traditional fossil fuel energy systems, without government subsidies. Even the optimists may be a bit too over optimistic currently, because this positive trend in renewables gaining traction can be mainly attributed to fiscal and monetary stimulus, which has been adopted by western state governments, due to the economic recession in 2008. Coupling of monetary stimulus, which has contributed to a fall in interest rates in the western world and fiscal stimulus, which comprises of favorable policies towards the renewable energy sectors may be a possible reason for this traction. This however may not be viable in the long run as interest rates are bound to go up as the economy picks up, which leads to further questioning of the viability of renewables in the utility energy market.

That said there are these new breeds of entrepreneurs who are poised to prove the commercial viability of renewables in rural energy markets through innovative revenue models. One such country with a large untapped rural market is India, which is said to offer the necessary demographic dividend for business to thrive. India is a country with plenty of sunshine all year round therefore the viability of solar DSE's is a no brainer. This leads us to question who are these entrepreneurs i.e. the companies they represent or REC's?

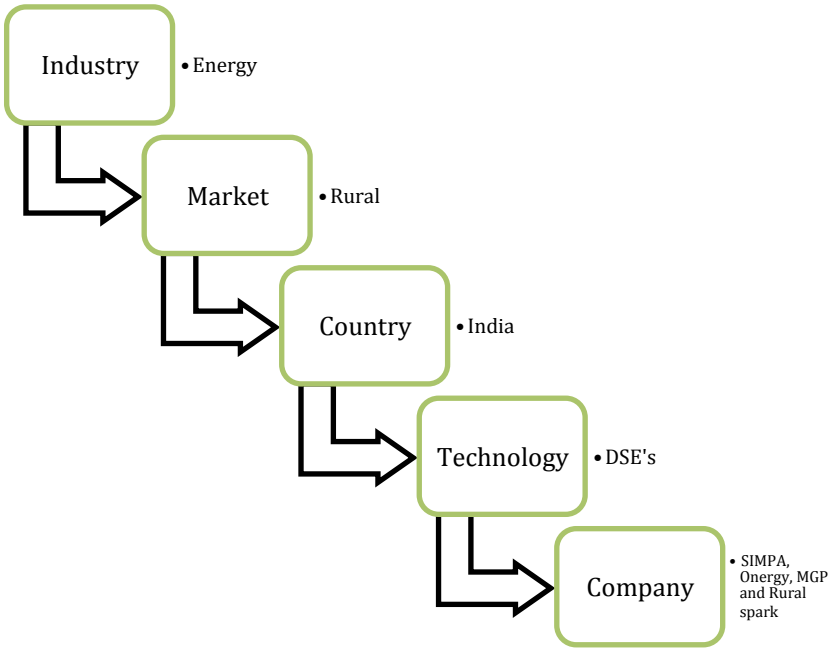

Figure 8: Process of selection

The selection of companies was quite an arduous task because there exists no directory of REC's who operate in the Indian rural market. However, through Google search we found quite a few companies who were operating in this sector. The key words, which were used, are innovative, rural market, renewable sector and India. The search yielded us a list of almost 30 companies operating in the renewable energy sector. The list of companies are shown in the in the appendix.

These companies do not necessarily fit into the scope of our thesis. Companies like SELCO and Onergy among others sell an array of products like solar home systems, solar lanterns and solar TV among others to the rural market. The list also comprises of REC's who do not cater to the rural market exclusively. The list also comprises of companies like Azure power and Orb energy, which provides solar energy solutions and they serve the utility, commercial and rural markets. Some of the companies like Gram power provide only components. In order to narrow down on the list of companies within the scope of our thesis, we adopted the following selection criteria.

The selection criteria to narrow down to a considerable amount of REC's for an in-depth case analysis are as follows:

- The company should be market based. They should be registered as for-profit companies. In other words the REC's should have a revenue stream in place for operations.
- The REC's should exclusively cater only to the rural market segment.
- The primary product of offering should be DSE's. Most of the REC's offer an array of products like solar lanterns, solar TV and solar fridges. These can be deemed as derivatives of solar home systems.
- The companies should be representative of the two types of revenue model with innovative revenue models designed such that commercial viability can be attained.

Table 6: List of cases chosen for case study

Cases	Location	Customers	Revenue model	Products
SIMPA	Bangalore	Rural market	Service revenue model	Solar home systems (SHS)
Onergy	Kolkata	Rural market and Institutions	Ownership revenue model	Array of solar related DSE products
Rural Spark	New Delhi	Institutions	Ownership revenue model	Solar home systems (SHS)
MGP	Uttar-Pradesh	Rural market	Service revenue model	Micro-grids

As mentioned earlier we are looking only into the rural market as we deem it to be the only market where commercial viability of the DSE solutions can be established without subsidies. After carefully researching about each of the identified companies on the web and news articles. We narrowed in on SIMPA networks, Onergy, Rural spark, MeraGao power, Thrive energy,

Gramoorja, Teri and D.Light design. All of these are Indian companies apart from Rural spark and D. light design.

Given the willingness of these companies to participate in our research the list or cases was further narrowed down to SIMPA, Onergy, MeraGao power (MGP) and Rural spark. Below Table 6 shows an overview of all the cases with respect to its customers, revenue model and products.

3.2.2 Data collection

In this section we discuss about the data collection process. Firstly a general description regarding the interview will be presented. Followed by a description of the detailed interview process.

3.2.2.1 General information

After the selection process of technology, market and cases, for further case analysis we need to conduct interviews and gather data. Initially the companies were contacted through e-mail. The email consisted of a copy of the research proposal. The goal of the research was explicitly mentioned. SIMPA was contacted in December 2014. The insights gained initially proved very useful to develop the thesis in general. The interviews were conducted with the top-management or founders of each company. Interviews were essentially conducted through Viber or VoiP calls. Language of communication was essentially done in English. The interviews were conducted in the month of May and June 2015. The duration of each interview was about an hour long. The interview contained both open-ended questions and closed questions.

3.2.2.2 Interview process

The goal of this research is two fold: firstly to validate the revenue drivers against the cases and also seek to identify and modify or extend the conceptual model in order to build a revenue driver – commercial viability framework. In this backdrop a questionnaire was designed. The interview questions were mostly open ended. This strategy gives us insights into the rationale behind the concept revenue model. The interview process can be divided in two parts, namely: introduction and questionnaire. Please refer to the appendix for the questionnaire.

Introduction: The interview process started off with by introduction of each the interviewer and the interviewee. After introduction the interviewee was made aware of the goal of the thesis.

Questionnaire: After introduction, the interviewee was asked questions from the questionnaire. Figure 9 shows an overview of each category of questions pose to the interviewee and also indicates the depth of questioning as we move towards the base of the pyramid. Refer to appendix below for the questionnaire. The questionnaire can be divided into the following categories:

- Company: The interviewee was firstly, asked about the company and product. Secondly, was asked to describe about the problem they intend to solve with their business. Thirdly, questions regarding the market they serve and why they serve the market was asked. All of the responses in the introduction were used as information with regards to the company's profile. This also helped develop a rapport with the interviewee.

- New Paradigm Vs. Old Paradigm: In this category, questions were asked to validate the concept of new paradigm and old paradigm found while performing the literature review. The type of question was open-ended; this would give an indication to further cross validate the practical problems that was delineated previously. *At this point the most important question of all on whether if the company is commercially viable or not is asked to the interviewee*.

- Business Model: Questions regarding the company's business model was asked. Before asking about the company's business model, clarification was made regarding the concept of business model and revenue model because practitioners mostly confuse these two concepts to be synonymous. Explicitly questions regarding the value offering, delivery and capture was asked. The responses to these categories more or less serve as a precedent to make better judgments about the companies strategies to serve the rural market and also aid in understanding its revenue model.

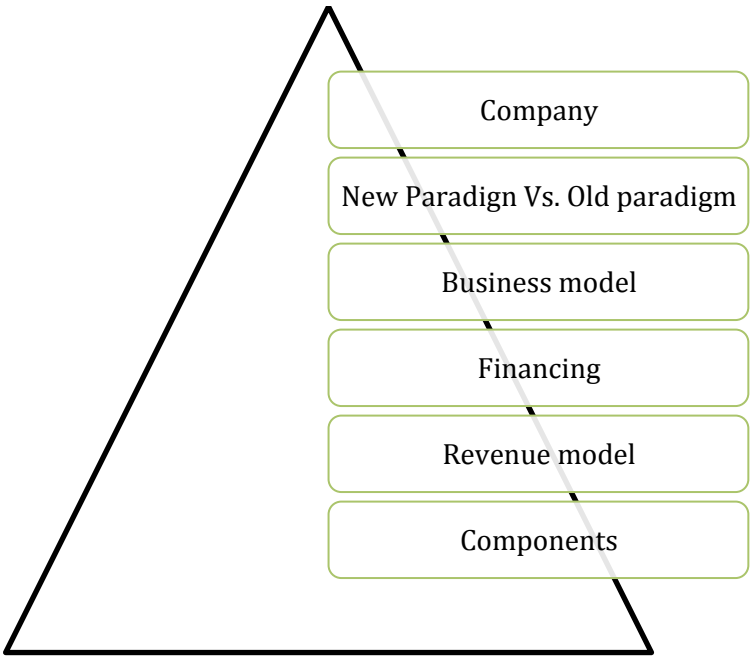

Figure 9: Questionnaire Categories

- Financing: Interviewee was posed with questions regarding the financing structure of the company. Questions regarding financing were open-ended. In order to attract financing companies must meet certain criteria. The criteria entirely depends on the source of financing the company wants to attract. The source of financing is tied specifically to the nature of cash flows i.e. revenues a company generates. The response not only helps us to bridge the concept of financing and revenue but also solve causality relationship between financing and revenues.

- Revenue Model: After questions regarding financing was posed and the causality relationship between financing and revenue was established. An open-ended question was asked about the revenue model of the company. Followed by the response on revenue model, the interviewee was asked why they had adopted the revenue model mentioned by them and also how they achieved commercial viability. The responses from this category of questions firstly, help conceptualize the relationship between value delivery and capture. Secondly serves as a bridge to the next category of questions on revenue drivers or components or elements.

- Components: At this stage the interviewee was intimated that this is the core of the thesis. In this category the questions can be divided into non-aided and aided part. In the non-aided phase an open-ended questions regarding what drives the revenues of the company was asked. The response from this phase givens an indication regarding some of the revenue drivers deemed important by the company.

  In the aided phase the interviewee was asked about the pre-specified revenue drivers obtained from the literature review. Initially all the revenue drivers were explained to the interviewee with the little knowledge gained from the literature review. After which, the interviewee was asked to indicate the relevance of each of the revenue drivers in their revenue model. For each of the revenue driver the interviewee was asked how and why is this relevant to the company's revenue model and its role in catalyzing revenues that are greater than costs. Following which the interviewee was again asked to think of any other revenue driver, which is relevant to his/her company's revenue model. This process not only helps us to validate our conceptual model but also offers opportunity to extend the conceptual model further to better suit the scope of the thesis. Moreover after each company gave their responses and in case of extensions the company was contacted again to ask for their opinion a specific component of a revenue model.

This marks the end of the interview process.

3.3 Case 1: SIMPA Networks

In this section we present the case of SIMPA Networks. Data for this section was essentially gathered from various sources. Firstly, the interview conducted with Mrs. Priya Shah, who works in the strategy department. Secondly, SIMPA's official website and Lastly, the founders working article.

The case analysis of SIMPA essentially constitutes its company profile, revenue model and revenue model components.

3.3.1 SIMPA's company profile

SIMPA networks were founded in the year 2011 in Bangalore, India. It is primarily a venture-backed company. Its operations are primarily based in Uttar-Pradesh, India. SIMPA networks offer state of the art solar home systems with an innovative business model, which circumvents the market failure. According to SIMPA the market has failed to provide access to clean and affordable energy in rural India. Hence, its mission is to make modern energy simple, affordable and accessible by everyone. SIMPA intends to make their product "radically affordable" to the 1.6 billion, base of the Pyramid (BoP) customers who lack access to the grid across the world. SIMPA estimates this market to as a $2 billion market/year. The team at SIMPA consists of nearly 12 employees.

SIMPA intends to replace the incumbent kerosene lamps with a more socio-economically viable solar home system. The price of the solar home system is around $300. They cater to customers whose income ranges from $1500 to $3500 a year.

3.3.2 SIMPA's revenue model

In this section we look at the revenue model of SIMPA and its characteristics.
SIMPA employs a solar-as-a service revenue model through solar home systems (SHS). SIMPA employs a service revenue model. The customers of SIMPA are primarily Indian rural households. Below the characteristics of SIMPA's service revenue model are briefly discussed. Figure 10 shows an overview of SIMPA's revenue model.

- The rural customer firstly registers with SIMPA for its solar home system (SHS) product. Upon an initial small down payment of say 10% to 20% of the price of the SHS, which translates to nearly $30 to $60. The local village level entrepreneurs (VLE) team installs the SHS. These so-called village level entrepreneurs essentially consist of a team of personnel trained by SIMPA to specifically carry out tasks like sales, distribution and maintenance.
- Even after installation the system still remains locked, which means the customer still cannot use the SHS. The SHS product unlocks only after the customer tops-up or recharges from SIMPA's locally available

recharge shops. A recharge essentially refers to a pre-paid amount a customer pays in-order to avail the energy service from the SHS product.

- After recharging the customer receives a code to his/her registered mobile number. Upon entering this code into SIMPA's SHS product, the system unlocks. The recharge amount varies form $1-to $10. Each recharge allows the customer to use the energy generated from the SHS until the recharged amount is used up.
- Once the recharge or prepaid amount or top-up is used up, the SHS system is disabled temporarily until the customer makes a new recharge.
- Once the total amount of the customers recharge reaches the price of the SHS quoted by SIMPA, the SHS product unlocks permanently. In other words the customer now owns the SHS system and starts receiving the energy for free. SIMPA quotes "*Our product lasts for almost 10 years*".

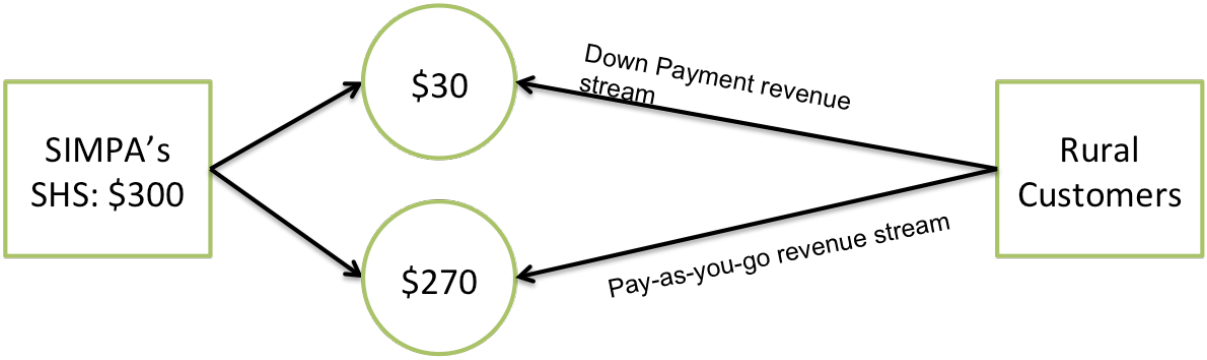

Figure 10: SIMPA's Service revenue model

SIMPA claims that a typical customer completes these iterative top-ups in nearly 3 years. For the customer to own the SHS completely, he or she pays up for the difference price. The difference price is the price of the SHS product ($300) minus the down payment ($30 to $60) the customer has already made at the time of installation. In order to re-coup the difference price, SIMPA uses this rather unique revenue appropriation mechanism known as pay-as-you go. The term pay-as-you-go refers to the act of collecting revenues as and when the customer uses the value delivered. In this case the value delivered is energy. SIMPA's service revenue model essentially employs two revenue appropriation mechanisms, namely: down payment and pay-as-you-go.

SIMPA's service revenue model resembles a home mortgage or a car loan. In the case of home mortgage, customer cannot afford to pay for the home upfront hence a bank steps in to provide the finance for the home built by a builder. The loan is provided by the bank against the current value of the home and most importantly on the ability of the borrower (customer) to pay back the loan. In order for SIMPA to derive revenues from its customers, SIMPA takes on the role of the bank. The difference price of the SHS product is nothing but a loan provided by SIMPA to its rural customers. The customer

pays up this difference price over a period of time. The majority of SIMPA's revenues are a function of the revenues appropriated through its banking operations or the repayment of the loan provided by SIMPA. Through this revenue appropriation mechanism, SIMPA addresses the core issue of lack of financing and affordability.

SIMPA quotes "*Our service revenue model not only appeals to our customers but also has room for a decent profit margin*". This implies that SIMPA's service revenue model strikes the notion of being commercially viable and affordable to its rural customers at the same time.

Now, we take a step back and ask ourselves where is SIMPA getting the money to pay for the SHS product and operations. SIMPA gets the money to fund its product and operations through financing. Over time SIMPA's has attracted financing from angel investors and social impact investors in the form of equity and debt. Social impact investors are investors who invest in organizations with an intention to make a financial return with a social objective. The financing they provide is also referred to as philanthropic capital. SIMPA quotes "*In the early days we had to depend on grants and private money. Over time as we started to demonstrate profitable revenues philanthropic capital has come in handy, this capital is not free, the rates are only slightly lower than Indian market rates be it debt or equity*". This philanthropic capital was raised from the western parts of the world, where interest rates are quite low as compared to Indian interest rates. This implies that SIMPA has essentially made use of philanthropic capital to fund its equipment and operations up until this stage.

SIMPA goes on to say philanthropic capital is only a catalyst because it helped initially with product development and operations. SIMPA quotes "*In order for us to scale and scale quickly we need large sums of capital in the form of debt financing, especially bank loans*". Furthermore SIMPA also quotes " *That said attracting mainstream commercial financing like bank loans is only possible once we are able to show good track record of reliable revenues for 2-3 years*".

We can conclude that SIMPA's operations are commercially viable and it intends to gain access to commercial capital in order to scale in the future. However, gaining access to commercial capital is a function of showing a good track record of revenues. A good track record of revenues for SIMPA means, pay-as-you-go revenue appropriation mechanism should work for SIMPA i.e. its customers should pay up the price of SHS product in increments. Nevertheless, it has attracted philanthropic capital from social impact investors based on its commercially viable service revenue model and rate of adoption of its SHS product. It can be comfortably stated that its only time SIMPA receives commercial capital because of its already successful commercial capital.

3.3.3 SIMPA's revenue model components

In this section we will delve deeper into the relevance of each of the revenue model components identified earlier, in the context of SIMPA's service revenue model and possibly also extend the conceptual model. SIMPA's take on each of the components are the following:

Trust: Consumer Trust and Supplier Trust

SIMPA regards trust as a very relevant component in its service revenue model, with direct implication on adoption of its product by its customer. However they look at trust in both ways customer and supplier trust as opposed to only one way i.e. the customer trust. It is obvious that once the product is adopted, revenues follow under both the pay-as-you-go and down payment revenue appropriation mechanism. For that adoption to take place the customers should trust SIMPA, which implies that SIMPA has to build customer trust. SIMPA builds customer trust through local partners.

The other trust is the supplier trusts i.e. SIMPA trusting its customers that they will make regular payments. There exists risk to SIMPA's pay as you go revenue stream. There is no risk with the down payment revenue stream, whereas in the pay-as-you-go revenue stream there is a risk of default. Risk of default refers to the fact that the customer fails to make subsequent recharges. It is here where trust comes into play.

SIMPA looks at trust in two ways: SIMPA trusting its customers (Supplier trust) and customers trusting them (Consumer trust). Firstly, with regards to SIMPA trusting its customers, SIMPA essentially relies on VLE to make a judgment about the customer's capacity to pay for the SHS. Furthermore, they also reduce the risk of total loss by asking the customer to make a down payment. Secondly, with regards to consumer trust. SIMPA quotes "*It is very important that our customers trust us because we take a down payment from them for the system*".

In SIMPA's service revenue model, the aspect of trust has a positive effect on the rate of adoption by the rural households, however it comes at the cost of SIMPA taking on the risk associated with the cash flows or revenues from the pay-as-you-go revenue stream by trusting its customers. SIMPA quotes "*Its inevitable, we have to take on this risk of us trusting the customer, it has paid off so far. We hope it does in the future as well*".

Pricing strategies

SIMPA deems pricing strategies as very relevant to its service revenue model. SIMPA quotes "*It affects the adoption of our product by our customers*". SIMPA's pricing strategy essentially revolves around the willingness to pay of the rural households. SIMPA quotes "*If the rural market deems our product to be expensive they simply wouldn't adopt it. Where is the question of revenues*?" Hence, SIMPA makes its product affordable through its service revenue model, which includes a pricing strategy that is not only palatable to

the rural market but also the difference price is recouped, which further brings down the risk associated with the cash flows.

SIMPA quotes "*It is very essential that we recoup the difference price; we believe that can be done through a flexible pricing strategy*". SIMPA's flexible pricing strategy is owed to the fact that the customer can recharge any amount at any time. This was essentially designed to emulate the rural consumers kerosene expenditure. It is nothing but the pay-as-you-go concept. Furthermore, SIMPA also quotes "*we do not base the price of our product on competition*".

To conclude, SIMPA believes the aspect of pricing strategy affects not only adoption but also repayment of the difference price, both of which contribute to revenues indirectly and directly respectively.

Willingness to pay

SIMPA considers the element of willingness to pay to be very relevant in its service revenue model. They deem it to be the core rationale behind adopting the service revenue model. SIMPA quotes "*Our customers willingness to pay is low, however not zero*". This implies that the rural customers desire the energy services but lack the affordability.

Revenues are solely dependent on the customer's willingness to pay. SIMPA quotes "*The low willingness to pay of our customers is reflected in the flexible pricing strategy we adopt*".

Flexibility of payments

SIMPA considers flexibility of payments as very relevant to its service revenue model. They believe it to have a direct relationship with adoption of its product and repayment of the difference price.

SIMPA incorporates flexibility of payments through its pay-as-you-go pricing strategy or revenue appropriation mechanism. Wherein the customer pays for the service as and when consumed. The customer buys energy on per unit basis at his or her convenience. This strategy eliminates the fear of periodic payments, which in the past is said to have deterred adoption of SHS by rural customers. Furthermore, flexibility of payments also takes into account the seasonal income of the rural consumer. Seasonality of income is due the fact that the rural community essentially derives its income from farming. Considering these reasons SIMPA believes it may prompt the rural consumers to adopt the SHS product and also increases the chances of recoupment of difference price.

Nevertheless, offering a feature like that of flexibility of payments comes with the burden of transaction costs. Transaction cost can be defined as the cost incurred while making an economic exchange. The transaction costs is

primarily the cost of the net meter technology, which enables monitoring of usage. Net meters are necessary to facilitate the pay-as-you-go revenue appropriation mechanism. It primarily consists of a hardware component and a software component, both of which add to costs of SHS product. The net meter enables SIMPA to look at how much energy has been consumed by its customers. SIMPA's proprietary net meters technology enable them to monitor the system via the cloud. SIMPA quotes "*We don't look at it as costs because it encourages adoption and most importantly repayment of the difference price. Moreover, in the future this component will be achieve scalability*"

To conclude the flexibility of payments has a positive effect on adoption and repayment. However comes at a cost. Given that SIMPA's service revenue model is already a commercially viable model these costs shouldn't be a problem.

Number of users

SIMPA considers number of users as very relevant to its service revenue model. We can argue that more the number of users more the revenues through increased sales and cost reduction due to economies of scale. This holds true for SIMPA as well.

That said, SIMPA quotes "*Achieving scale is a good, however we have to keep in mind that it also increases our operational costs because more VLE teams need to be trained, that said since we have an automated revenue appropriation mechanism we are confident we can tame the scalability issue*". This implies that it SIMPA to should keep an eye on the operational efficiency and also simultaneously the risk associated with its pay as you go revenue stream.

To conclude, SIMPA's service revenue model benefits from a large number of users. However the risk with these cash flows should always be monitored. SIMPA acknowledges this by hiring a chief financial officer, whose primary job is to keep a check on the risk of theses cash flows. Furthermore, SIMPA's ability to attract commercial capital in the future rests on how well it balance the act of scale and risk associated with cash flows.

Revenue Sharing

SIMPA deems revenue sharing not relevant to its revenue model.

Size of payments

SIMPA deems size of payments very relevant to its service revenue model. SIMPA believes that smaller the size of payments the more attractive the value proposition looks to the rural customer because it takes into account the low-income levels of the rural consumer. SIMPA quotes "*The smallest size of payments we offer is $1. We intend to emulate the operational*

expenditure of the rural customer on kerosene lamps". This is again incorporated in SIMPA's pre-paid solution.

To conclude, this component has a positive effect on adoption and repayment. Maybe at a large scale, too many small payments in combination of temporal flexibility (Flexibility of payments) may increase monitoring costs.

Service customization

SIMPA deems service customization as very relevant to its service revenue model. Service customization is offered through size of payments and flexibility of payments. This can be termed as a service platform. At the product level customization is offered w.r.t to the wattage requirements by the customers. SIMPA believes that its revenues and rate of adoption are very much dependent on the degree of customization offered.

After sales maintenance

SIMPA deems after sales maintenance as very relevant to its service revenue model. SIMPA quotes " *It is in our interest to provide the after sales maintenance, otherwise the customer may simply fail to top-up or recharge, this has implications on or revenues also*". Hence, it has a positive effect on adoption and maintenance.

3.3.4 SIMPA's case summary

In order to make SIMPA's service revenue model is commercially viable in the rural market it turns itself into a bank. The service revenue model employed by SIMPA has attracted philanthropic capital. This type of philanthropic capital has a social objective coupled with financial return. SIMPA believe that their service revenue model circumvents the issue with financing and adoption. In the future SIMPA is confident that once they have a good track record of recharge or top-up payments from their customers, they can easily access commercial capital from banks. Currently we can say that SIMPA has proved that it can serve the rural market profitably. However, they also do acknowledge the fact that it is impossible to serve the poorest of the poor, they believe it has to be left to the government.

The initial conceptual model fit pretty well in the case of SIMPA apart from revenue sharing and supplier trust. The component consumer trust was renamed to a broader term trust because SIMPA looks at trust comprising of supplier trust and consumer trust. The most relevant components of SIMPA's service revenue model are: consumer trust, supplier trust, pricing strategies, willingness to pay, flexibility of payments, number of users, size of payments, service customization and after sales maintenance. Figure 11 shows an overview of all the relevant components of SIMPA's revenue model. Moreover the purple coloring indicates additional components identified from analyzing the case of SIMPA.

It becomes clear that commercial viability of SIMPA's service revenue model essentially hinges on factors like rate of adoption and successful repayment of the difference price or recoupment of costs, which further translates to revenues. Each of the above-mentioned components has a direct effect to either both or one of these factors. The components like trust, pricing strategies, willingness to pay and service customization has positive effects only on adoption. Components such as Flexibility of payments, size of payments and after-sales service has positive effects on both adoption and repayment. Furthermore, the component number of users may have positive or negative effects directly on the commercial viability of SIMPA's service revenue model, which will be essentially decided on moderator like the operational efficiency.

One such interaction between a revenue model component and the factors affecting commercial viability is as follows: The component consumer trust helps with the appropriation of down payment revenue stream because the customers trust SIMPA, which is built through communication. The pay as you go revenue appropriation mechanism symbolizes that SIMPA trusts its customers, which results in adoption of its SHS product and therefore increases revenues. Furthermore it can be noted that these components are not responsible for increase in revenues they impact the essential factors like adoption and repayment in a positive way such that revenues > costs (commercial viability). It is these two factors namely adoption and repayment that influence the commercial viability and not the revenue model components themselves. *It is these revenue model components or revenue drivers that aids in adoption and possibly effective repayments, which impacts revenues such that commercial viability can be attained in case of SIMPA*.

Another interesting pattern is that of Intra-component linkages come to light in SIMPA's service revenue model. For ex. Willingness to pay aspect is considered in the pricing strategy component. The other linkage is the relationship between pricing strategies and flexibility of payments and size of payments.

Furthermore we see that the type of revenue model i.e. service revenue model employed by SIMPA has impacted its financing because even though they are commercially viable they still have not attracted purely commercial capital from banks. SIMPA needs to show a good track record of payments, which is essentially the repayment factor over 2 to 3 years without defaults to attract financing from banks. Nonetheless SIMPA has already attracted both philanthropic and commercial capital from social impact investors and venture money.

To conclude there is certainly a linkage between the commercial viability and revenue model components. Let us look at some more cases to check if this interaction still holds true.

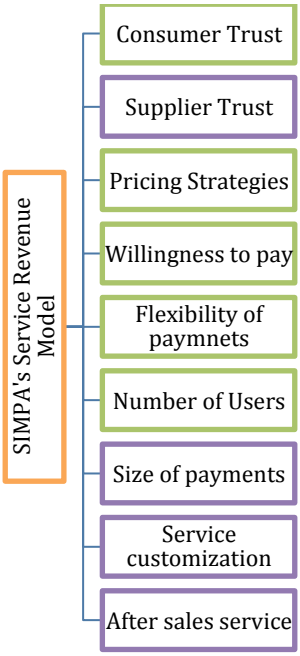

Figure 11: Overview of SIMPA's components

3.4 Case 2: Rural Spark (RS)

In this section we present the case of rural spark. Data was essentially gathered through interviews and RS official website. The interviewee was Mr. Marcel Van Heist, who is one of the co-founder of Rural Spark.

3.4.1 Rural spark company profile

The company was founded in the year 2012 in the Netherlands known as Rural spark B.V. In 2013 a 100% affiliate of rural spark B.V known as Rural Spark Energy India Pvt. Ltd was set up. In India the company is based in Delhi. Rural spark is backed by private and venture money. They have received funding to the tune of $850,000. They do not rely on any kind of aid or subsidies to carry out their business. They offer state of the art solar home systems known as rural spark energy kit. The company primarily consists of 9 personnel including the founder and employees.

Rural spark envisions, designs and implements the smarty distributed energy networks of tomorrow. They intend to leapfrog the old, expensive and resource intensive grids and build networks of the future. Rural sparks intention starts from rural India where 400 million people have no access to sustainable energy.

Product Description: It is essential to look into RS product because it's an interesting combination of a SHS with other complimentary technologies,

which enable RS to address the issue of affordability by the rural households. The product of RS is known as RS Energy Kit. RS energy kit is a high quality energy solution where customers become local energy suppliers who sell the energy to their fellow neighbor's by becoming entrepreneurs. The product essentially comprises of storage units they call cubes, a router, solar panel and lamps. The router technology acts as an enabler of pre-paid solution, wherein the customer pays a small amount of money for the product to be activated. The product costs nearly $260 (15,800 Indian Rupees). Figure 12 shows rural sparks energy kit.

Figure 12: RS Energy kits components: Router and cubes

3.4.2 Rural spark revenue model

RS quotes "*We position ourselves as a commodity or product deliverer*". Rural Spark employs an Ownership revenue model, which includes a service and retail platform. Service platform of RS extends services of its product and know-how of the rural energy market down the value chain. The retail platform of RS sells directly to its customers. RS has made a conscious decision to employ ownership revenues model instead of service revenue model even though their product enables them to take the route of service revenue model. The rationale behind this is that they intend to reduce the risk associated with their revenues i.e. cash flows. Hence we can say that RS is more of a rural energy solutions company. This is further reflected in the customers of RS. The customers of rural spark are for-profit or not-for-profit organizations with cash pile to pay upfront for the product. Hereon we will refer to RS's customers like Vayam as clients in order to avoid confusion. These organizations further build a business based, which essentially employs a service revenue model. Below we will briefly present the characteristics of RS ownership revenue model. Figure 13 shows rural sparks revenue model.

- The customers pay for the product outright. Lately, RS has signed a MoU (Memorandum of understanding) with Vayam renewable to

supply 10,000 units. In this context Vayam renewable will pay for the 10,000 energy kits upfront. However the relationship of RS and Vayam renewable does not terminate after the sale is done. Both Vayam and RS work together to help Vayam set up the RS's energy kits in rural India.

- Vayam renewables now employs a service revenue model. Vayam renewables is a for-profit organization with a social objective. The customers of Vayam are the local village entrepreneurs (LVE). Vayam sets its own price for the Energy Kit. The local village entrepreneur makes a small deposit (small fraction of the cost of the energy kit) with Vayam. In exchange Vayam equips the local village entrepreneur with the energy kit for monthly installments. The router technology in the energy kit enables RS to track the usage of the system. If the entrepreneur fails to make a monthly payment the energy kit is disabled. The monthly payment is done through a pre-paid system wherein the local village entrepreneur buys the credit balance before hand through his/her registered mobile number. The number is registered with RS because in case of any issues with the energy kit, it is RS that does the replacement.

- Now the local village entrepreneur sells the energy produced from the RS energy kit to his fellow villagers, wherein he/she again employs a service revenue model. Here he/she adopts a rental revenue appropriation mechanism. A rental revenue appropriation mechanism refers to the fact that energy, which is stored in the cubes, is rented out to fellow villagers in exchange for a daily payment. Cubes or modular battery packs are traded, which can power lights and other appliances. This translates to revenues for the local village entrepreneur.

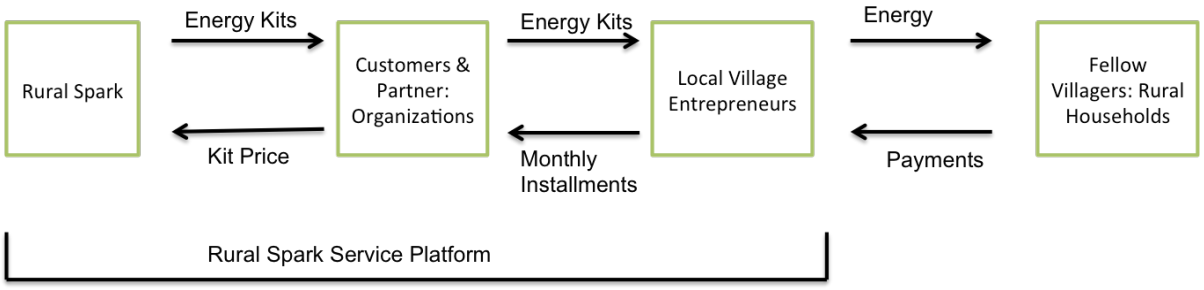

Figure 13: Overview of Rural Spark's revenue model

We can argue that the commercial viability of RS ownership revenue model essentially hinges on its clients paying for the energy kits upfront and also most importantly its clients service revenue model, which further depends on the revenues generated by the LVE. In other words the commercial viability of RS ownership revenue model depends on the commercial viability of the service revenue model employed by both its clients like Vayam and VLE.

Hence, RS quotes "*It is due to this dependencies we adopt the retail and service platform*". This implies that commercial viability of RS ownership revenue model is a function of commercial viability of service revenue models employed at both the VLE and client level, which is facilitated through strong partnerships at both levels. Collectively RS clients like Vayam and VLE can be termed as middlemen.

RS partnering with its customers with deep pockets helps transfer the risk of recoupment of development costs or price of energy kits. In other words there is no risk involved with RS upfront payment revenue stream. However its client takes on the risk of appropriating the price of energy kits form VLE because it has made the full upfront payment to RS.

RS ownership revenue model however comes at a cost. The cost is in terms of transaction costs. Transaction costs are costs incurred in making an economic exchange. Here at a macro-level the transaction costs is essentially due to involvement of the middlemen. Even if each of them roughly made a margin of 20%, the costs to the end rural customer would increase by nearly 40%. Nonetheless, RS claims that the rural households still save nearly 30% to 45% of their money otherwise spent on kerosene lamps. This implies that the energy from RS energy kit is nearly a third cheaper than energy from kerosene lamps.

Now, we can take a step back and ask, why is it that RS themselves are not taking the route of service revenue model. RS strategy to include the middlemen is essentially two fold: firstly, they believe that payment systems like mobile payments are currently underdeveloped or they do not want to go around collecting revenues physically. Secondly, They believe that work is cut out for them and they can concentrate on product development and R&D. However, they also quote that "*not like we do not want to adopt the service revenue model ourselves but we would rather wait for the market to evolve further and also wait for technical improvements in banking solutions like the mobile banking*". In this case the middlemen will now help with the distribution and sales of Energy Kits.

RS has attracted both philanthropic and commercial capital in both equity and debt. The sources of financing are social impact investors, venture capital and grants. RS quotes "*In our early stages both the grants and social impact investors came in handy*". This implies that philanthropic capital has acted as a catalyst. RS attracts commercial capital from village capital, which is primarily a venture capital firm. RS quotes " *we get paid upfront for our product and service, this may be the primary reason for us receiving commercial capital*". This implies that even though RS is relatively new company without track record of revenues over a period of time to show, it has been able to gain access to commercial capital because there is no risk involved with its upfront payment revenue appropriation mechanism. RS

expects to breakeven (revenue covering all costs) by July 2017. However its ownership revenue model is currently commercially viable.

RS addresses the issue of commercial viability by adopting an ownership revenue model coupled with strong partnerships, which employ energy as a service revenue model. Given the low risk associated with RS cash flows (upfront payments), RS has been able to attract both commercial and philanthropic capital.

3.4.3 Rural spark revenue model components

In this section we will look into the relevant components of RS ownership revenue model. The components are as follows:

Consumer Trust

RS deems consumer trust as very relevant to its ownership revenue model. However, it does not impact their revenues directly. RS quotes "*since we have a strong partnership with Vayam, it is in our best interest that we help Vayam with its revenues also, which is dependent on the revenues made at the LVE level, which again is dependent on rural consumers for its revenues*". RS also quotes "*we do not leave the aspect of building consumer trust to the LVE, we do it ourselves*".

To conclude even though building consumer trust has no direct impact on RS revenues, they do have an impact on its clients service revenue model, the viability of which is greatly affects RS future revenues through repeat sales. Furthermore, RS take on the responsibility of building consumer trust with the local village entrepreneurs.

Pricing Strategies

RS deems pricing strategy to be very relevant in its current ownership revenue model. They believe that their product should be price competitive with other competitor's products, especially the cheap-low quality Chinese products. RS quotes "*While pricing our product we have to price our product such that it is conducive to our client and local village entrepreneur to make enough revenues to cover costs and make a tidy profit for his/her investment in the energy kit*". This assertion implies that education regarding the pricing is crucial. In other words RS helps its middlemen with pricing also.

RS quotes " *With regards to pricing we have learnt from the previous efforts that to diffuse DSE systems in this market segment there is always a trade off between quality and price*". The aim of RS was to make the product as cheap as possible. In pursuit of the best product for an affordable price, RS choose the modular design. They incorporated the modular design in their routers and battery cubes, wherein several batteries and lamps can be charged all at once.

To conclude, RS believes that for the adoption of its energy kits by VLE and the monthly service fee paid by VLE to its clients, it has to offer its client a relevant product keeping in mind the lack of affordability of the rural households, such that VLE can employ a service revenue model. In other words it is the commercial viability of the pricing strategy employed by VLE i.e. rental revenue appropriation mechanism, which has a positive effect on adoption of RS energy kits.

Willingness to pay

RS deems the aspect of willingness to pay as not so relevant in its current ownership revenue model because they believe that once the viability of their product is experienced by local village entrepreneurs in one community then automatically the entrepreneurs from neighboring communities willingness to pay increases. This being said they also quote "*it was important to consider the fact that the willingness to pay of the rural households is low while designing our product*".

Flexibility of payments

RS deems flexibility of payments as very relevant to their ownership revenue model. Flexibility of payment at the outset seems irrelevant to RS's ownership revenue model because they receive full price of the kit upfront, however in fact the revenues of the local village entrepreneur is important to RS's customers like Vayam, in order for them to recoup their upfront investment on the kits.

The aspect of flexibility of payments is most relevant to the middlemen as opposed to RS directly. RS incorporates flexibility of payments by offering a product design, which can accommodate the pre-paid solution. They believe that prepaid solution solves the issue of seasonal and irregular income of rural households thereby catalyzing the adoption rate of the services provided by the local village entrepreneur. RS quotes " *It is at the will of the local village entrepreneur if he chooses to top up his account weekly or monthly or half yearly, we provide this service but the revenues goes to Vayam*".

To conclude flexibility of payments has a direct effect on the service revenue model of Vayam (client). Nonetheless, RS provides this service, which is paid for in the form of upfront payment. This aspect has a positive effect on adoption of RS energy kits. Furthermore, it also enables the recoupment of the price paid by Vayam.

Number of users

RS believes that Number of users is not relevant at this point in time, but however in the future it will be when they themselves take the service revenue model route. However it may be of interest to the local village entrepreneur.

Revenue Sharing

Currently RS deems revenue sharing as not relevant in their ownership revenue model because they do don't deal directly with the rural households. However, they believe revenue sharing is very relevant in their future service revenue model.

They intend to implement the aspect of revenue sharing in the future service revenue model in two stages. Firstly, They envision a community wherein it is not necessary for all the rural households to adopt their product to realize the concept of energy for all, in a particular community. Instead a few of the rural households can adopt, RS's Energy Kit and trade the surplus energy with their fellow neighbor's. This promises timely payments by the rural households because they generate extra income by trading the surplus energy. RS quotes "*Our current technology enables us to incorporate the revenue sharing aspect, this aspect also incentivizes rural households to adopt our product*". In the second stage, they intend to further the concept of revenue sharing by enabling surplus energy sharing between communities and also between rural India and urban India.

To conclude the aspect of revenue sharing has a positive impact on adoption.

Size of payments

RS deems the aspect of size of payment very relevant to its current ownership revenue model. As in the case of flexibility of payments, RS enables this aspect of size of payments with the help of pre paid solution. It is again relevant because of the irregular income of the rural households. This however has no direct implications on the current ownership revenue model of RS. Nevertheless has a direct implication on the service revenue model of the middlemen, especially at the LVE level.

Service Customization

RS deems the aspect of service customization to be relevant to its ownership revenue model. RS quote " *we offer service customization not in terms of product but in terms of partnerships*". In other words even after the payment is made upfront from RS clients, RS still offers services like payment management, marketing for RS's partners like Vayam and 24/7 helpline. All of this is incorporated into RS's service platform.

Aftersales Service

RS deems after sales service to be very relevant in its ownership revenue model. RS quotes " *Because of the service revenue model employed by the local village entrepreneur in case of any problem with out product we replace our product and also help the local entrepreneur scale his/her business operations*". This is again incorporated into RS's service platform. RS quotes "*we do not offer maintenance*".

3.4.4 Rural spark case summary

RS believes to have made its ownership revenue model commercially viable by forming strong partnerships with its clients and local village level entrepreneurs (LVE), whose commercial viability is a function of their service revenue model. Its unique ownership revenue model, which has eliminated the risk associated with cash flows, has paid off well with respect to attracting both commercial and philanthropic capital. In the future RS considers the option of moving towards the service revenue model, which is subject to improvements in mobile payment system.

Below Figure 14 shows the relevant components in RS ownership revenue model, they are: consumer trust, pricing strategies, flexibility of payments, revenue sharing, size of payments, service customization and after sales service. RS believes that both the willing to pay and number of users are not relevant to their ownership revenue model. Moreover the purple coloring indicates additional components identified from analyzing the case of RS. That said even tough willingness to pay is not relevant it is however considered while designing its energy kit, such that it takes into account the low willingness to pay of the rural consumers. This has an impact on the revenues at the LVE level. From a broader perspective willingness to pay aspect is relevant to the service revenue model.

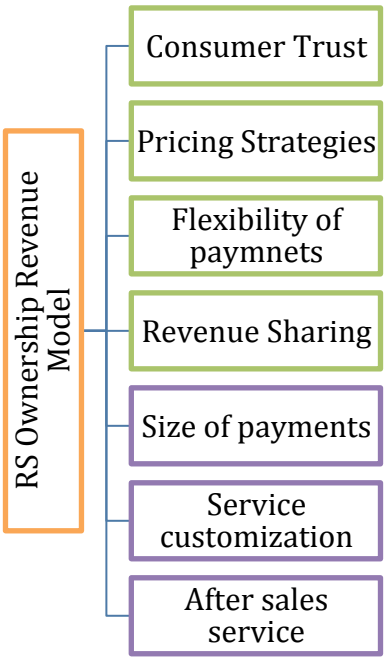

Figure 14: Overview of RS revenue model components

It is clear that the revenues of RS ownership revenue model essentially hinges indirectly on factors like rate of adoption, regular payments from LVE to Vayam and regular payments from rural consumers to LVE. Here the rate of adoption refers to both at the LVE and rural consumer level. It is the viability of the service revenue model, which makes possible for RS to adopt the ownership revenue model. The component consumer trust has a direct

positive impact on LVE revenues. Pricing strategies has a direct relationship with rate of adoption. Flexibility of payments has a direct relationship with rate of adoption and also on the service fee paid by LVE. The component revenue sharing in the future would have an implication on rate of adoption. Size of payments would have a direct implication on the service fee. Service customization has a direct implication on RS revenue through greater sales.

3.5 Case 3: ONergy

In this section we will present the case of Onergy. Data was gathered primarily through interviewing. The interviewee was Mr. Vinay Jaju who is a co-founder and COO of Onergy.

3.5.1 Onergy company profile

ONergy was established in the year 2009. The company is located in Kolkata, India. ONergy was a spin-off from an NGO "SwitchON" whose aim was to spread knowledge on climate change. In the mid-2009 Onergy registered itself as for profit organization to develop an ecosystem for uptake of complete energy solutions for rural India but also address the gap within distribution and financing. ONergy specializes in providing DSE products to rural India. The solar products offered by Onergy are solar home systems, solar lanterns, solar irrigation system, solar micro grid and solar power plants. They sell solar home systems as home electrification kits in various configurations as per the customer requirements. It operates mainly in markets like Bengal, Odisha and Jharkhand where the states have failed to provide electricity. Onergy reinforces the fact that the stalled development in rural India is mainly attributable to lack of energy. Onergy intends to leverage its technical prowess into the rural market because of the sheer market size. Over the years Onergy has received wide recognition for its work, it has won many awards and also enjoys strong national and international partnerships.

The customers of Onergy are mainly rural households and Institutions. Onergy caters to rural households whose income is as low as $ 1000 per year, with no assets. The Institutional customers are government institutions and corporate social responsibility initiatives by large for profit companies, whose aim is to provide rural India with energy. Onergy takes up the projects offered by these Institutions by leveraging its core competencies with respect to technology and market.

3.5.2 Onergy revenue model

Onergy primarily derives its revenues from essentially two sources the rural households and Institutions, each contributing nearly 50% of the total revenue. Onergy employs an Ownership revenue model. In this revenue model the customer pays for the solar home system upfront. Bearing in mind that the rural customers cannot afford to pay for the huge upfront costs, the ownership model is supplemented with strong partnerships with micro financing institutions. Micro-financing institutions are institutions, which provide

micro-credit to rural households. Below Figure 15 shows an overview of Onergy's revenue model.

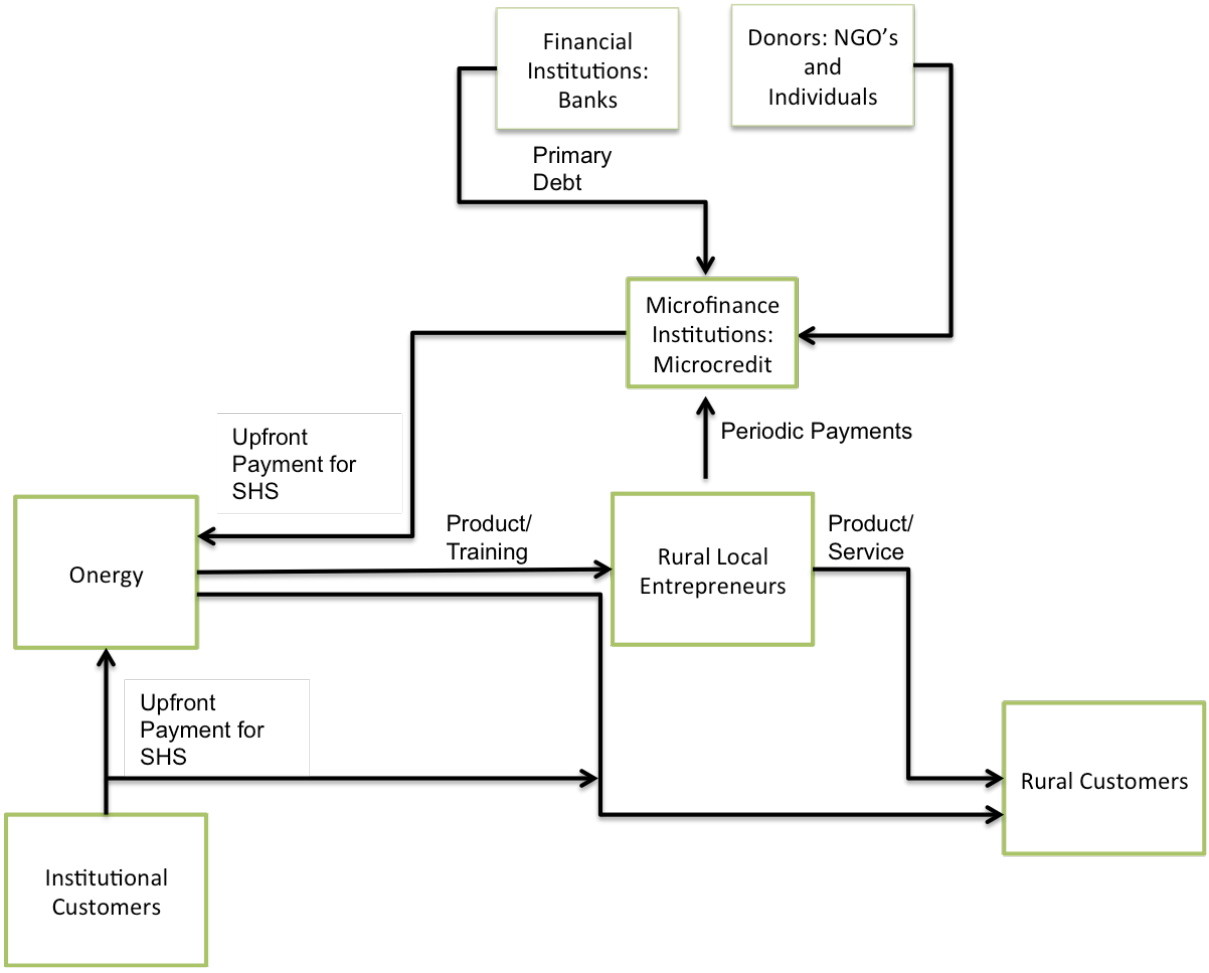

Figure 15: Overview of Onergy's revenue model

Rural Households: Under the ownership-revenue model, rural households pay for the DSE products upfront. This leaves us to question how the rural households can afford to pay for the DSE products. Onergy solves this problem by maintaining strong relationships with microfinance institutions (MFI). MFI's primary function is to provide micro credit to less credit worthy individuals, who do not have any assets or fixed income. The MFI's finance the DSE products by using the same as an asset or mortgage. In exchange for the financing provided by the MFI's, they receive regular monthly payments by the rural households.

Institutions: Onergy also derives its revenues from government institutions, CSR initiatives and NGO's. In this case Onergy provides solutions for these initiatives, whose common aim is to provide electricity to rural India by creating employment. The same ownership revenue model is employed in the case of Institutions too. However these institutions pay upfront for the DSE products purchased without the assistance MFI's.

Onergy lays testament to the fact that the market has shifted from a donor driven paradigm to market paradigm. Onergy quotes "*with our proven*

ownership revenue model we are now profitable without any subsidies". This implies that Onergy's rather straightforward Ownership revenue model coupled with strong partnerships, especially with MFI's is a commercially viable revenue model. It is this commercially viable revenue model that has enabled Onergy to attract financing from angel investors and social impact investors. To add to this Onergy also has funding from one of India's largest banks. This implies that Onergy has financing not only in the form of philanthropic capital but also commercial capital from banks. Furthermore, Onergy quotes "*we are now in talks with a Dutch social impact investor to raise money for our growth*". The fact that Onergy has attracted financing from Axis bank mainly can be attributed to the fact that its revenues are forthright or in simple terms the risk associated with the recoupment of costs is essentially eliminated.

Interestingly Onergy also quotes "*there is no silver bullet in terms of any best DSE technology to serve this market, hence our large array of DSE products, we have products that satisfy both our rural household and Institutional customers* ". This implies that Onergy positions itself as a retailer or a product company in the marketplace.

3.5.3 Onergy's revenue model components

Consumer Trust

Onergy deems consumer trust as a very relevant component in its ownership revenue model. They believe that trust needs to be established between them and the customers to further facilitate sales. Onergy quotes "*over the years we have slowly built trust with both our customers, namely: rural households and Institutions through mostly word of mouth by providing products with high quality*". This more or less implies that it is branding which is key to our sales and henceforth Onergy's revenues. Furthermore, Onergy also builds consumer trust by setting up local offices wherein they employ local people or entrepreneurs who can vouch for their product in his/her own community.

Pricing strategies

Pricing strategy is deemed very relevant to the success of Onergy's revenue model. They believe that it is very essential to achieve a more palatable price to the rural households because they simply cannot afford it. This is achieved through partnerships with MFI's. Onergy quotes "*The financing provided by the MFI's to our rural customers is very essential in breaking up the cost our customers have to bear into smaller chunks of payment*".

The pricing strategy is more or less in line with the bargaining power and volume of the DSE products ordered, in the case of Institutional customers. Since Onergy positions itself as a retailer, the prices have to be competitive in order to sell more of its products. Onergy quotes " *It is very essential that we strike the right balance between price and quality because our customers*

are very price sensitive and also demand quality. The price sensitivity is essentially due to the fact that they lack affordability and moreover compare our products to cheap products from china".

Willingness to pay

Onergy deems willingness to pay as not so relevant to its ownership revenue model. However they do acknowledge that the willingness to pay is low and the rural households lack the affordability. Onergy quotes "*It may be of no relevance to our sales directly, nonetheless in our revenue model, the MFI's take care of this*". This implies that the sales or adoption of Onergy's DSE products is essentially tied to the fact that its partner, the MFI takes aspect of low willingness to pay of its customers.

Number of users

Onergy deems number of users as not so relevant in its ownership revenue model from a strategic viewpoint. Onergy quotes "*of course the more users the more our sales*". Onergy takes the market penetration route. The market penetration route refers to setting up shop in a specific region and making sure that the entire population in the region adopts the product. In other words scalability or larger dissemination of Onergy's product is achieved through a decentralized strategy as opposed to centralized strategy.

Achieving rapid adoption shouldn't be a problem to Onergy because it can essentially sell its DSE products to the rural consumers all across India by simply partnering up with different MFI's in each region of the country. Onergy quotes "*it is not as easy as it looks, the ground reality is different*".

Flexibility of payments

Onergy deems flexibility of payments to be not relevant to its ownership revenue model.

Revenue Sharing

Onergy deems the aspect of revenue sharing as not relevant to its ownership revenue model.

Size of payments

Onergy believes size of payments as very relevant to its ownership revenue model. The fact being that the price of DSE products is high for the rural households, Onergy reduces the size of payments under its ownership revenue model by maintaining strong relationship with MFI's. Onergy's success of Ownership revenue model can be mainly attributed to reduction in payment size through partnering with MFI's.

Service customization

Onergy deems service customization very relevant in its ownership revenue model. They believe that every customer has different needs. Therefore

Onergy offers an array of DSE products. In the case of Onergy it is rather better to call the aspect of service customization as product customization.

Customer's financing

Onergy deems customer financing as very relevant to its revenue model. Onergy maintains strong relationships with MFI's to finance its customers. The MFI's provide financing to its customers by using SHS as a mortgage, in exchange for regular periodic payments. The risk of recouping of costs of SHS is eliminated.

After sales maintenance

Onergy deems after sales service as key to its ownership revenue model. In other words essential to the sales and subsequently its revenues. Locally personnel provide the after sales service. The quality of after sales service impacts the relationship between the customer and MFI. Hence, for increased adoption Onergy believes after sales service is a very essential in order to maintain good faith with its partners.

3.5.4 Onergy case summary

Onergy is an energy solutions provider company or a retailer of DSE products. The commercial viability of Onergy's ownership revenue model can be mainly attributed to its strong partnership with MFI's. Its rather predictable revenue stream is awarded with philanthropic and commercial capital financing. The financing from Axis bank speaks volume about its longing for a predictable revenue stream with least risk.

In addition to our conceptual model, Onergy deems consumer financing, service customization and after sales maintenance as relevant to its ownership revenue model. Figure 16 shows all the components Onergy deems relevant in its ownership revenue model, they are: Consumer trust, pricing strategies, number of users, size of payments, service customization, customers financing and after sales maintenance. Moreover the purple coloring indicates additional components identified from analyzing the case of Onergy.

It is clear that Onergy's revenues hinges on sales of its products. The sales are dependent on the rate of adoption. We notice that all of Onergy's relevant revenue model components directly or indirectly affect adoption of the DSE products.

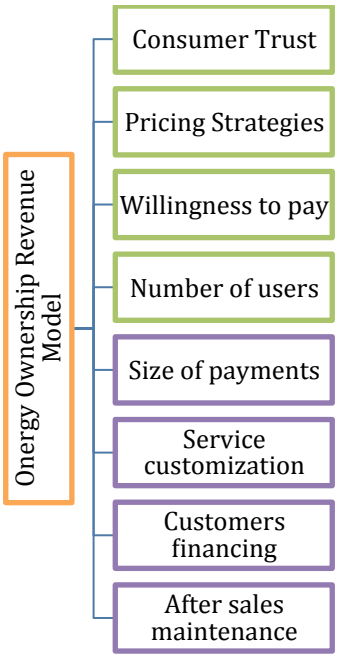

Figure 16: Onergy Revenue model components

3.6 Case 4: MeraGao Power (MGP)

In this section we present the MGP case. Data was primarily gathered through interviewing. The interviewee was Mr. Nikhil Jaisinghani, who is the co-founder of MGP.

3.6.1 MGP's company profile

MeraGao Power (MGP) was founded in the year 2010. It is an Indian company. It is primarily an equity-funded organization. They build, own and operate micro-grids in Uttar-Pradesh, India. The services offered by MGP are high quality, dependable lighting and mobile charging to its customers. Their typical customers are poor rural village farmers residing in hamlets, who earn less than $1/day. A hamlet is a settlement with few people, usually less than 100 people. By the end of 2012, MGP had nearly installed 100 micro grids with 3000 customers. The micro-grid for a hamlet approximately costs $900 and can be constructed in a single day. This nearly works out to $30/customer. The team at MGP consists of 3 co-founders. The team envisions a future where incumbent kerosene lamps are replaced with clean energy.

3.6.2 MGP's revenue model

MGP quotes " *Ownership revenue model is not very interesting to us* ". MGP employs a service revenue model through a Micro-grid system. MGP quotes "The success of our service revenue model lies in making the economics of energy as attractive to achieve higher penetration". Since it is a micro-grid system, MGP positions itself as any other large-scale energy utility companies but of course these large companies are not willing to supply energy to these hamlets through traditional infrastructure. The energy generated through these micro-grids systems are sold to these villagers residing in hamlets in exchange for regular payments. MGP's customers do not own any product.

The rationale for MGP to take the service revenue model route is " *In our revenue model we keep our customers for a long time, whereas if did we adopt the ownership revenue model we would loose contact with our customer after the sale is done*". Some of the characteristics of MGP's revenue model are discussed below.

- MGP picks up a district. Many districts make a state or province. In a certain district they set up office and look at electrifying hamlets. Currently they are in the Sitapur district in Uttar-Pradesh, India. They look at electrifying nearly 500 hamlets in this district. MGP claims that most of the off-grid population resides in North-India. They believe that serving this population essentially requires an innovative revenue model because of low affordability. Hence they believe that through their service revenue model they can make adoption of clean energy, attractive to this population.

- After setting up the Micro-grid in a hamlet the customers then sign up for energy. After signing up, the households are provided with the necessary grid infrastructure, which can power appliances. At the time of signing up the households are charged a fee of $2, which in MGP's balance sheet is registered as three weeks of advance payment.

- MGP quotes "*it was important that we first looked at how much our customers spent on kerosene each week before embarking on this journey*". They estimate that a typical village customer spends nearly $1/ week on subsidized kerosene. Keeping this in mind MGP decided that it would only charge $0.5/week for its energy. MGP believes this incentivizes the villagers to adopt their service. This translates into $0.5/ week/household revenue for MGP. This can also be referred to as pay per week revenue appropriation mechanism. MGP quotes "*At this price we are commercially viable and also afford to grow organically and attract financing*".

- MGP does not use any payment technologies like mobile payment. They do it the old fashion way mainly adopted from the micro-finance industry. They collect revenues through a specially formed group known as the Joint Liability Group. This model enables MGP to not only become operationally efficient but also ensures timely and regular payments by the subscribers.

MGP's revenue model can be deemed as a pure service revenue model, wherein the value i.e. energy is delivered purely as a service and the customer pays no upfront costs and maintenance costs. Another interesting fact about MGP is the way they look at the rural market as a whole in terms of market segmentation. They believe that the rural energy market can be divided into three categories, namely: Rural towns, villages and hamlets. MGP quotes " *We leave the market for rural towns to our competitors like*

SIMPA and ORB energy. We would like to essentially concentrate on the hamlet market, wherein we believe the best way to serve energy to this population commercially, is by adopting a micro-grid system instead of SHS".

Through this service revenue model MGP's pay back period is nearly 2.5 years/installation. Given this attractive pay back time and margins they are able to attract both debt and equity financing from social impact investors. Social impact investing refers to investments made into organizations with the intention to observe social benefits alongside financial return. However they claim that this has not been as easy as it seemed, especially in the beginning because investors required MGP to show transactions with customers to investors. This almost led to bankruptcy in the year 2012. This scenario further reinforces just how important a commercially viable revenue model was to attractive financing.

MGP quotes "*we cannot say with certainty that service revenue model is the most attractive to the investors over ownership revenue model. With our service revenue model we can achieve the most penetration with less geographic coverage. Whereas, in ownership revenue model the penetration is very low and the coverage is high. We believe service revenue model has the most impact on society because penetration is higher. Furthermore, It is also not like the margins are low in the service revenue model. The attractiveness of either of the revenue model depends on the level of risk an investor is willing to take. REC's who adopt ownership revenue model normally attract financing from Bank, who are normally risk averse. In our purely service revenue model it is very hard to attract financing from the banks as yet, may be 5 years from now i.e. only if are able to show good track record of payments. However due to a decent risk-reward of a service revenue model financing sources like venture capitalists and social impact investors are interested*".

In addition to this MGP also adds, " *If we are able to add scale by being operationally efficient, it this type of criteria, which is most conducive to attract investors with commercial capital. We have proven a commercially viable service revenue model and now we are working on scale*". This implies that in order to attract commercial capital service revenue model should be able to demonstrate a good track record of revenues.

3.6.3 MGP's revenue model components

Now we will discuss about some of the components of MGP's revenue model.

Supplier Trust

MGP looks at consumer trust in two ways. One is MGP trusting the customer, they deem is very relevant to its revenue model and the other is the customer trusting MGP, which they deem as not so relevant. Hence, we dub this as supplier trust instead of consumer trust because it is more representative in

the case of MGP. With regards to MGP trusting the customer: MGP quotes " *Our customers are not dependable, nonetheless we intend to make them dependable. This aspect is very important for us because our entire revenues stands on us trusting them*". With regards to customer trusting MGP for its services, MGP quotes " *We do not essentially need this because we employ a pure service revenue model, wherein we only charge the customer for the energy consumed at a pre-defined weekly price. We eliminate this aspect by offering a flat price on a weekly basis, In other words the customer has nothing to lose*".

Pricing Strategies

MGP deems pricing strategies to be very relevant to its service revenue model. Their pricing strategy centers on the low price and better quality. MGP quotes " *If the price is high the market will cancel out and most importantly price should be cheaper than kerosene*". This translates to the fact that price should be kept low at a considerably better quality of service. In sum MGP quotes "*our pricing strategy is a function of our customers willingness to pay*"

Willingness to pay

MGP deems willingness to pay as a part of its pricing strategy; hence it is also very relevant to its service revenue model.

Flexibility of payments

MGP deems the aspect of flexibility of payments as not relevant to its service revenue model. MGP quotes " *the only type of flexibility we offer is that of offering discounts or cancelling payments when our energy service was poor due to bad weather conditions*". They believe that offering too much flexibility with respect to payments often makes the revenue collection by hand often impossible at scale and to achieve scale it is very essential that we are disciplined. Offering flexibility of payments hinders discipline. Hence MGP charges a flat fee for efficiency purposes.

Number of users

MGP deems the number of users is relevant to its revenue model. In the context of MGP's business operations the number of users is the penetration they can achieve in a hamlet. This helps them to achieve economies of scale. However, on the contrary, since it is a labor driven organization, as the operations expand and the geographic outreach broadens, if weak penetration levels persists in hamlets, this may hinder the operational efficiency and consequently increase costs. Hence the success of MGP's service revenue model lies essentially in striking the right balance between scale and operational efficiency. In other words scaling too quickly can hinder revenues by increasing costs.

Revenue Sharing

MGP claims that revenue sharing aspect is not relevant to its revenue model.

Size of payments

MGP deems size of payments as very relevant to its service revenue model. They claim to have incorporated this aspect of size of payments into their service revenue model by considering the willingness to pay of its customers to be low. The result of which is that size of payments should be small and more frequent. Hence, the flat rate of $0.5/week was decided. Nevertheless, MGP quotes "*large payments-less frequently will be optimal for us because we can save on revenue collection costs. At least for now implementing this is far fetched*".

Consumer Financing

MGP quotes " *the perks of adopting a service revenue model is that we do not need to worry about consumer financing because our price is well within the income bracket of poor*".

Service Customization

MGP deems service customization as not so relevant to its service revenue model. They say that they offer standard solutions. MGP quotes "*We would love to incorporate this aspect into our revenue model, however the reality is that in order to incorporate this aspect in our revenue model we would need to invest in net meters in each of the households and usage monitoring, this increases the cost to our customers, given the price sensitivity of our customers, we don't think it's a good idea. However may be sometime in the future if relevant technological innovations bring down costs drastically then we will definitely consider it* ". This implies that even though micro-grids help achieve lower costs there is a trade off with regards to service customization in relation to other DSE systems like SHS.

In line with service customization, if MGP plans to adopt net meters then they can also incorporate revenue model components like flexibility of payments and size of payments. This may lead to greater adoption.

Aftersales Service

MGP deems after sales service to be very relevant to its revenue model. MGP quotes "*In our rather pure service revenue model, where the customer does not own anything, aftersales service is not an aspect that needs to be considered, it comes with the service revenue model*". This translates to the fact that revenues are dependent on a constant quality oriented service. In case of any breakdown or problems with the service a 24/7-call center is available at the customers disposal.

Discounts

Another extra aspect MGP deems important to its service revenue model is discounts. They believe it to be very relevant to its revenue model. MGP quotes *"We offer discounts as a flexibility in order to retain our customers*

during bad weather conditions". This implies that for MGP's service revenue model to be a success, it is very essential to keep the customer for the future.

3.6.4 MGP's case summary

MGP can be called as an energy service provider. The commercial viability of MGP' service revenue model essentially hinges on operational efficiency of its operations and the number of users in a particular community. MGP's revenue model has faced issues in the past to attract financing essentially due to lack of a good track record or reliable revenues. However in recent times they have had financing in the form of both equity and debt from social impact investors. In the near future they hope to attract commercial financing from banks, for which they need to have a good track record of revenues.

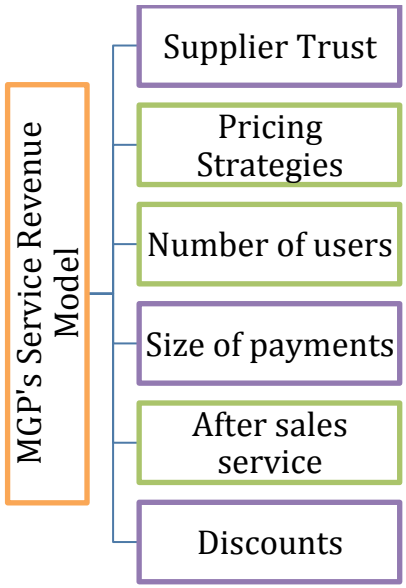

Figure 17: Overview of MGP's service revenue model components

Figure 17 shows some of the relevant components of MGP's service revenue model. They are: Supplier trust, pricing strategy, number of users, size of payments, after sales service and discounts. Moreover the purple coloring indicates additional components identified from analyzing the case of MGP. Some of the additions to the initial conceptual model are discounts, size of payments. Also, it required a slight modification with the aspect of consumer trust to supplier trust. Another interesting addition was discounts, which was deemed as relevant because it impact retention of rural customers.

The important factors that impacted commercial viability was rate of adoption and prompt regular payments for the service provided. Almost all the components had an impact on the rate of adoption. Components like size of payments, after sales service and discounts plays an important role in prompt regular payments by rural households.

3.7 Chapter summary

This chapter essentially looked at the various cases. The cases were SIMPA, Onergy, Rural Spark and MeraGao Power (MGP). The REC's essentially adopted two different types of revenue models i.e. the service revenue model or the ownership revenue model. SIMPA and MGP adopted a service revenue model whereas rural spark and Onergy adopted an ownership revenue model. Nonetheless each of the cases had different revenue appropriation mechanisms like pay as you go, pay per week, down payment and upfront payment. Among the four cases investigated majority of cases adopted a service revenue model either directly like SIMPA and MGP or indirectly like rural spark. The rationale behind adopting the service or ownership revenue model was mainly based on the risk the entrepreneur or founder or REC was willing to take on because from the cases it becomes evident that even the ownership revenue model should try to emulate the service revenue model where the DSE's prices are made more palatable to rural customers. *More specifically irrespective of the type of revenue model the payments should be made palatable by offering an REC's product and/or service, which nearly emulates the kerosene expenditure*. The *risk* at the juncture of deciding on the type of revenue model to employ is essentially governed by the trade off between adoption of the REC's product and/or service by the rural customers vs. the recoupment of costs. In other words the REC's take on the risk of recoupment of costs by employing the service revenue model but however there is a higher probability that the rate of adoption increases and whereas employing an ownership revenue model helps eliminate the risk of recoupment of costs but however may result in lower rate of adoption as compared to the service revenue model.

In line with the different types of revenue model, even though both MGP and SIMPA employed the service revenue model the characteristics of their revenue model was found to be completely different apart from the fact that value i.e. energy was being delivered periodically. The basis for this anomaly can be mainly attributed to the fact that MGP offers only a service platform whereas SIMPA offers a product platform complemented with a service platform. Now, in the case of REC's employing ownership revenue model like Onergy and Rural spark yet again the characteristics seemed to differ significantly too. Again the basis for this anomaly can be mainly attributed by the fact that Rural spark employs both a product and service platform whereas Onergy only employs a product platform.

Both the ownership and service revenue model were used to achieve commercial viability. In other words both type of revenue models help the REC's to derive revenues that are greater than costs. A service revenue model refers to the fact that rural customers pay for the product and/or service he/she avails periodically. On the other hand an ownership revenue model involves the customers paying for the product upfront. Given that the rural customers lack the affordability it is rather counter intuitive that REC's are

commercially viable employing the ownership revenue model. Looking into the case of rural spark and Onergy it becomes clear that partnerships are required in order to reach and make it affordable to the rural customers. Interestingly both rural spark and Onergy take different routes to make their products affordable yet at the same time profitable. Rural spark offers both product and service platform to its partners or clients who further go on to employ a service revenue model all along the value chain to reach to the rural customers. Onergy offers only a product platform and essentially takes the route of consumer financing by maintaining strong partnerships with Micro finance institutions (MFI's) to reach the rural consumers. In sum the commercial viability of the ownership revenue model essentially hinges on making the payments palatable for the rural customer through partnerships either with clients who are willing to adopt the service revenue model along the value chain or with the MFI's. The service revenue model achieves commercial viability through adopting a more palatable payment structure like in the case of SIMPA and MGP directly.

The initial conceptual model seems to be a very good fit with the cases. Most importantly it needs to be extended to fit the case of REC's revenue model. Some of the other new factors found in the case analysis are *size of payments, service customization, after sales service, revenue sharing and discounts*. Component like consumer trust was relevant to most of the cases however some of the cases looked at it both ways i.e. consumer trust wherein the customers trust the REC's product and/or service and supplier trust wherein the REC's need to trust the customers for payments. Now, essentially there is two ways of looking at trust and they are consumer trust and supplier trust. The component after sales service/after sales maintenance is used interchangeably depending on the context. The basis for the context is the type of platform i.e. product and/or service. For instance, since Onergy only offers a product platform a more relevant component may be after sales maintenance instead of after sales service. We also can notice that one component more or less can signify the type of revenue model. The consumer-financing component explains the ownership revenue model and its absence signifies an REC employing a service revenue model either directly or indirectly. Even though RS employs an ownership revenue model it does not have consumer-financing component because it is indirectly dependent on service revenue model.

Figure 18 shows an overview of all the revenue model components irrespective of the type of revenue model that are relevant for an REC to achieve commercial viability. The color purple is indicative of the fact that these components or revenue drivers were identified while carrying out the case analysis. *In sum the various components of a commercially viable revenue model are consumer trust and/or supplier trust, Pricing strategies, Willingness to pay, flexibility of payments, number of users, revenue sharing, size of payments, consumer financing, after sales service/maintenance,*

discounts and service customization. Overall there are 12 revenue model components identified in the case study.

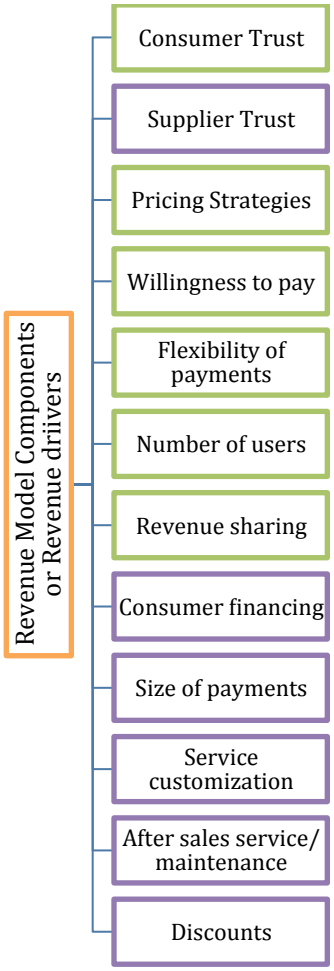

Figure 18: Overview of revenue model components

In this chapter on case analysis it can be concluded that each of the REC interviewed helped us not only to further our understanding on the type of revenue model but also the revenue model components or revenue drivers they adopt in order to achieve commercial viability. Interestingly it turns out that the type of revenue model i.e. either the service or ownership is entirely based on the discretion of the entrepreneur or founder or REC, which of course is governed by the risk appetite. Furthermore the chapter also reveals that the answer to solving commercial viability issue lies only partly with the type of revenue model but rather mostly with the revenue model components because irrespective of the type of revenue model the price of the DSE technology is made palatable to the rural customers.

Chapter 4: Cross-Case Analysis

4.1 Preface

In the previous chapter we looked at the case analysis. This yielded us insights into the types of revenue model employed and most importantly resulted in 12 revenue model components.

The purpose of this chapter is to compare the results obtained from the four cases analyzed above. This will help with deductions and difficulties related with generalizability of results (Enders et al., 2008). In this chapter we look across all the different cases to find the similarities and differences. This helps us to generalize our findings and subsequently also contribute to the knowledge on revenue models.

4.2 Revenue model: types and components analysis

In this section we will try to compare the components of the different cases employing both the service or ownership revenue model. For each component we will firstly discuss about its relevance for a specific type of revenue model followed by analysis of on how each of these components interacts with the revenue aspect of commercial viability.

4.2.1 Trust: consumer trust & supplier trust

The Figure 19 below shows a plot of relevance of the consumer trust component with respect to the ownership revenue model (ORM) and service revenue model (SRM). Figure 20 shows a plot of relevance of the supplier trust component with respect to the ORM and SRM. It is clear that REC's employing service revenue model look at trust in both ways with more emphasis on supplier trust whereas REC's employing ownership revenue model deems only consumer trust to be relevant to their revenue model.

Between the REC's that deem Consumer trust component to be relevant to its revenue model (SIMPA, Onergy and Rural Spark), consumer trust was essentially built through either communication and/or branding. Moreover partnerships with local partners were deemed essential in order to build consumer trust. The consumer trust component was deemed relevant by REC's that employed both ownership and service revenue model. Furthermore, among the REC's investigated the suppliers trust component was mainly deemed relevant by REC's employing a service revenue model.

It is obvious that any business enterprise would like to build consumer trust and eliminate the supplier trust (i.e. the business enterprise trusting its customers on the fact that they will make payments in the future) because there is a chance or probability that the customer may default on payments.

This turns out to be a risk on revenues for REC's employing service revenue model. Among the cases investigated that employ a service revenue model like SIMPA and MGP, this risk associated with the revenues has impacted its ability to attract financing from banks.

In service revenue model whose value delivery is purely through a service platform like MGP the aspect of consumer trust can be eliminated. However the act of trying to eliminate the costs of building consumer trust may add to another type of costs in the form of risk because the supplier like MGP needs to trust its customers that they will not default on payments. In the case of SIMPA, which offers a product platform supplemented with the service platform both consumer trust and supplier trust is essential. Consumer trust is essential because they take a down payment from the customers and SIMPA needs to trust its customers for regular payments.

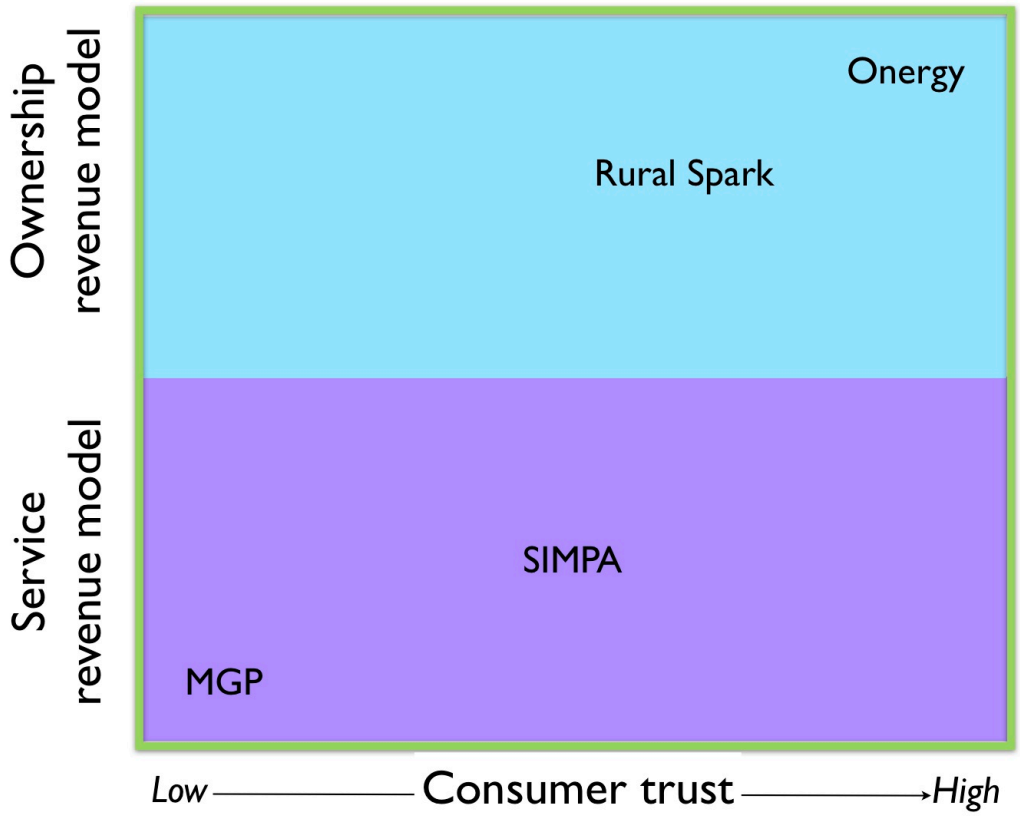

Figure 19: Consumer Trust vs. ORM & SRM

Nonetheless, REC's like Onergy and Rural Spark, which employ an ownership revenue model transfer the risk of supplier trust to other parties or partners in order to build a commercially viable business. Onergy transfers it to its partner MFI's and Rural Spark transfers it to its clients like Vayam. *In other words if we were to consider the entire eco-system in which the REC's employing the ORM operate we can comfortably say that both consumer Trust and supplier Trust are very relevant in order to cater to the rural population but due to the risk associated with supplier trust REC's may simply choose to transfer it to other parties*. Furthermore, in the ownership revenue model, even though the

REC's deem consumer trust to be essential for the adoption of their product in order to appropriate revenues they add to costs. As mentioned earlier the costs are essentially in the form of middlemen or adding sales and distribution teams for every region.

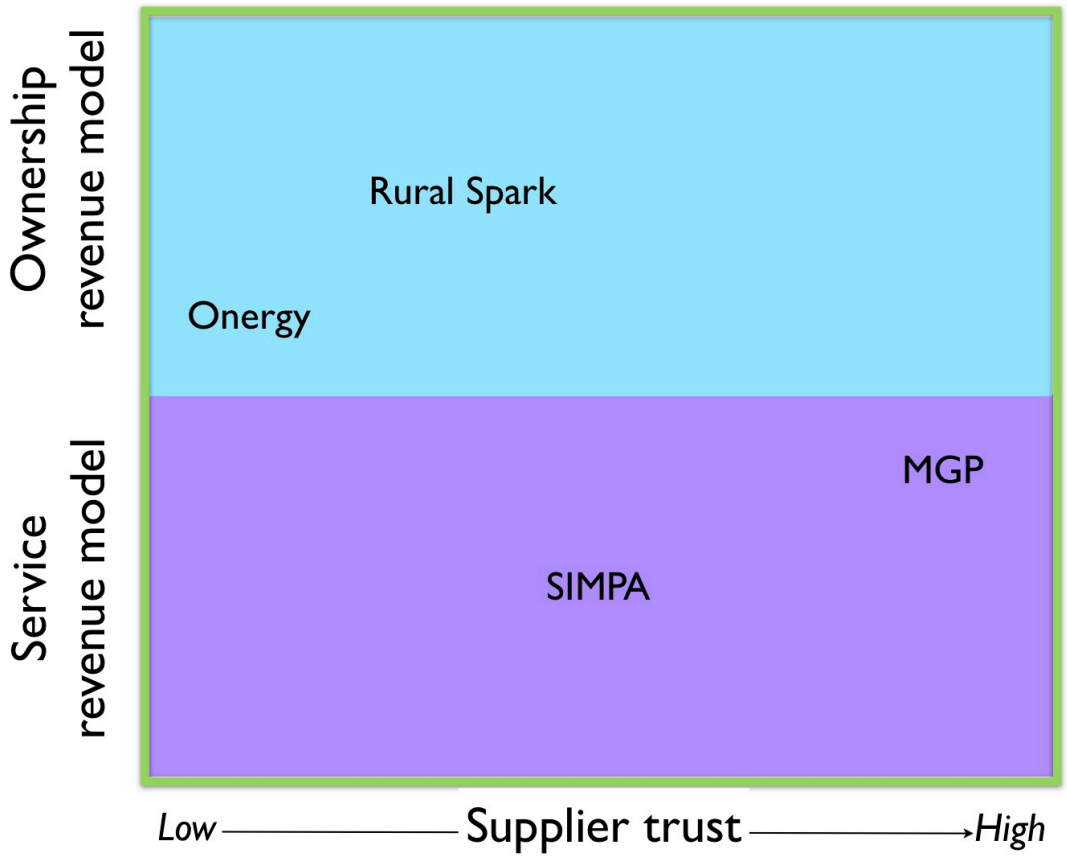

Figure 20: Supplier Trust vs. ORM & SRM

The one set of generalization that can be derived for REC's employing service revenue model is that both consumer trust and supplier trust are relevant for REC's that employ a product platform like SIMPA and whereas the consumer trust component is not relevant for REC's employing a service revenue model with only a service platform like MGP.

In the ownership revenue model consumer trust translates to adoption, which affects the commercial viability of the REC directly through revenues. In the case of service revenue model consumer trust translates into adoption of a product and supplier trust translates into adoption of a service and recoupment of costs, which affects the commercial viability.

4.2.2 Pricing strategies

The common theme with pricing strategies across all the cases can be concisely put into two dimensions: firstly, the *basis of price* and secondly, the *flexibility of prices*. The dimension of basis of price or base price refers to the type of information that dominates the pricing. At one extreme are the competitors where the REC bases its price on competitors and the other

there is the willingness to pay (WTP) where the price is solely based on what the rural customers are willing to pay for the product or/and service rendered. The other dimension is the flexibility of prices offered by the REC's. The flexibility of prices can range from low to high.

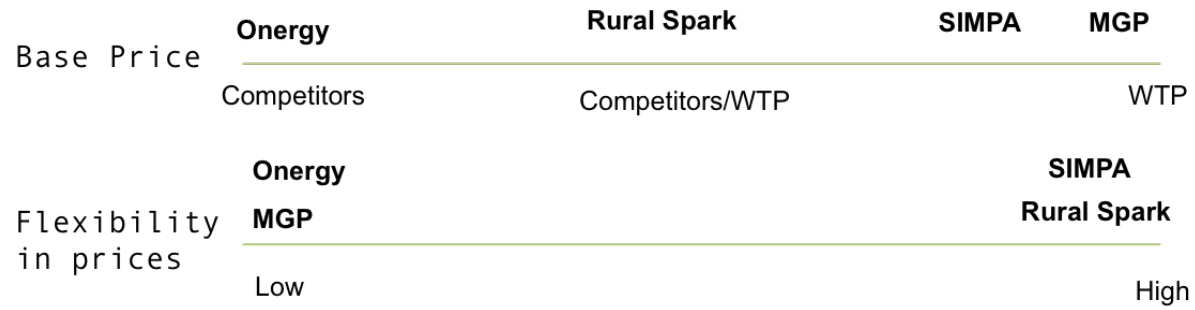

Figure 21: Pricing strategies plot

It becomes clear that cases employing service revenue model directly (SIMPA and MGP) or indirectly (Rural Spark) consider the low willingness to pay of the Indian rural customers while pricing its product and/or service. On the other hand we can also notice that an ownership revenue model like Onergy, which has no dependencies on service revenue model bases its price purely on competitors price whereas in the case of rural spark which indirectly depends on the service revenue model its pricing takes care of both competitors and willingness to pay of its rural customers. We can infer that a service revenue model does require prices to reflect the willingness to pay of its customers.

With respect to flexibility of prices we cannot infer anything in general based on the type of revenue model. We can see that MGP and Onergy both offer low flexibility in prices. They believe that it keeps its costs down. On the other hand we see that SIMPA and Rural spark offer highly flexible pricing. They believe that the increase in revenues through adoption and regular payments will outweigh the costs of incorporating flexibility of payments. The core rationale for offering flexibility of prices is to mimic the rural households irregular income streams.

The pricing strategy in the ownership revenue model affects the rate of adoption through competitive pricing and in the service revenue model it firstly affects the adoption of product and/or service and subsequently the revenues associated with recoupment of costs.

4.2.3 Flexibility of payments and size of payments

Flexibility of payments is the answer to the flexibility in prices, which was elucidated as a dimension of the pricing strategies employed by REC's. The flexibility of payments refers to the fact that the rural customers can pay the price of the product and/or service at his/her convenience. The size of payments refers to the quantum of payments the rural customer needs to make. Figure 22 shows the flexibility of payments against each of the cases

investigated. Figure 23 shows the size of payments against each of the cases investigated.

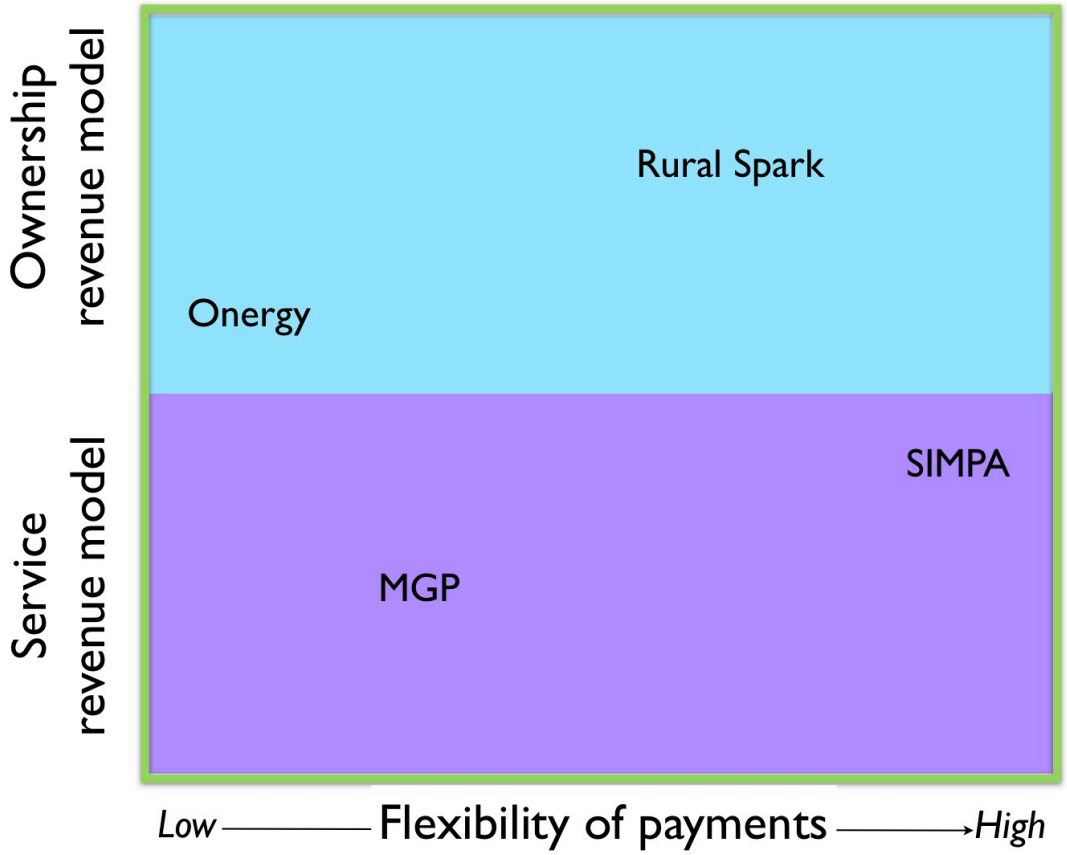

Figure 22: Flexibility of payments vs. ORM & SRM

Interestingly we can notice that all of the four cases deem size of payments as relevant irrespective of the type of revenue model whilst the preferred being small size of payments. Its relevancy is in the act of making the size of payments small. In the ownership revenue model the size of payments is made small essentially in two ways: firstly, partnering with MFI's, which pay for the product up front in exchange for small monthly payments from the rural customers. It basically emulates any other bank loan. Secondly, partnering with clients who in turn adopt a service revenue model.

On the other hand flexibility of payments is left up to the discretion of the REC irrespective of the revenue model they employ. In case of the Rural spark even though they employ an ownership revenue model they deem flexibility of payments as important because its clients revenues hinges on offering the flexibility of payments. This is contrary to Onergy because they deem flexibility of payments to be irrelevant to its ownership revenue model. Now, in the case of the service revenue model incorporating flexibility of payments solely revolves around the trade off the REC is willing to make in terms of increase in costs and rate of adoption.

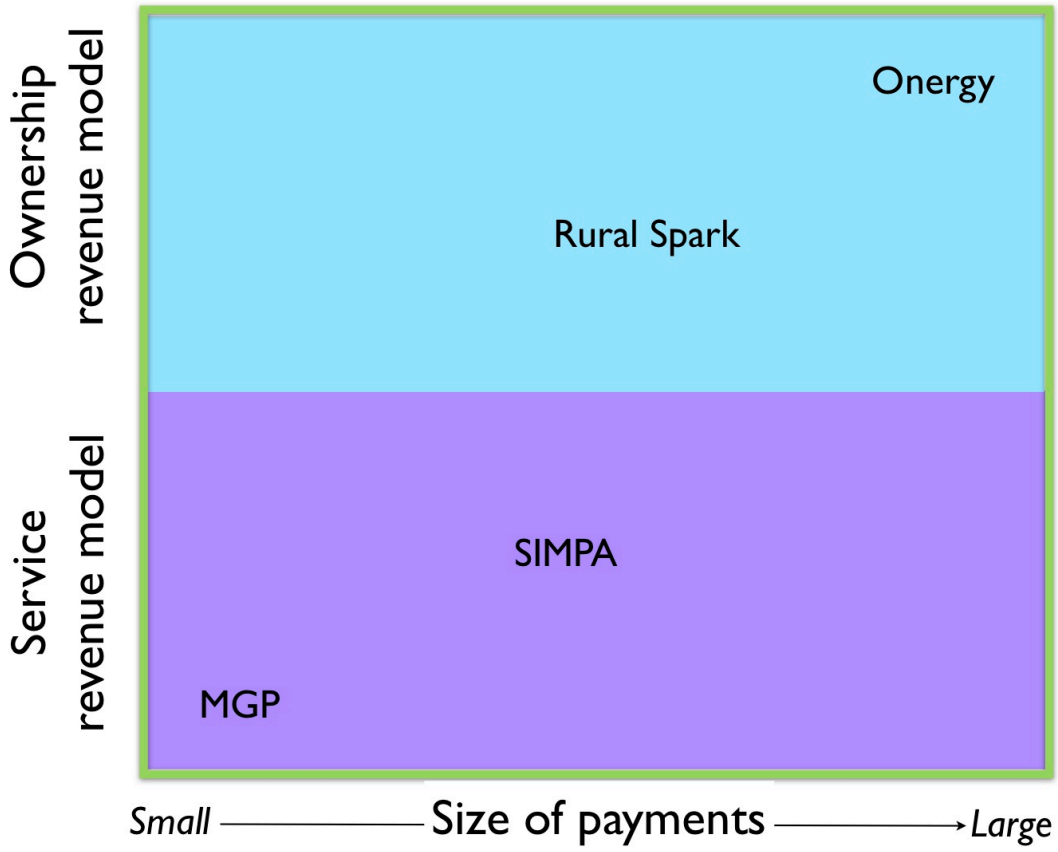

Figure 23: Size of payments vs. ORM & SRM

In line with the increase in costs, it is mainly due to the technology costs and monitoring costs. We can collectively call this as transaction cost. This may affect the commercial viability of a service revenue model. REC's like MGP that adopt a service revenue model in a very price sensitive market (Rural hamlets) may simply chose not to adopt the flexibility of payments to keep the price as low as possible.

In sum both the size of payments and flexibility of payments affects the rate of adoption and recoupment of costs in the service revenue model. The size of payments affects the rate of adoption in the ownership revenue model. Also, there is a trade off between incorporating flexibility of payments in terms of transaction costs and revenues appropriated through it. *The smaller the size of payments complemented with higher flexibility of payments greater will be the adoption and higher chances with recoupment of costs or payments*.

4.2.4 Number of users

It is interesting how the REC's look at number of users in their revenue model. Almost all the REC's apart from rural spark deem number of users as a relevant component of their revenue model if not very relevant. However, it may be relevant to them indirectly because more the users more the sales for its clients, which will bring back reorders for rural spark.

Number of users comes as a package of both benefits and challenge. The benefit being more the number of users more will be the revenues, which leads to commercial viability of both the types of revenue model. The challenge arises due the fact that more number of users will lead to increase in the costs of customer acquisition in ownership revenue model and managing risks associated with payments in the service revenue model.

In general the ownership revenue model may offer a better case to increase dissemination all across India i.e. it has a wider reach. In other words Onergy and Rural spark can simply tie up with already existing MFI's and clients like Vayam all across India, which leads to faster dissemination. This may offer a case for commercial viability of the ownership revenue model. On the other hand in the service revenue model it may be hard for REC's to have a wider reach like the ones employing ownership revenue model. That said it might offer a case of greater penetration by covering all the rural households in a community.

In the rural market irrespective of the type of revenue model employed the number of users component can be viewed as a separate element, which affects the commercial viability directly through both costs and revenues. *It cannot be viewed as one of the components of a revenue model because it has no affect on either the adoption or payments rather affects commercial viability separately through other factors like operational efficiency and risk management*.

4.2.5 Revenue sharing

As yet revenue sharing has not been incorporated by any of the REC's. That said rural spark believes that incorporating this aspect in the future will lead to greater adoption and higher chances of recoupment of costs or payments without default. Hence the component revenue sharing cannot be ruled out as yet.

The revenue sharing component when adopted by the REC's may lure more customers to adopt the DSE system irrespective of the type of revenue model and. Furthermore, it may also incentivize customers to make regular payments in case of the service revenue model.

4.2.6 Service customization

With regards to the component of service customization all the REC's deem it to be very or at least relevant to their revenue model apart from MGP. Irrespective of the type of revenue model employed by the REC's service customization is essential for adoption of its product platform. Nevertheless, in the case of MGP, which offers only the service platform deem service customization as irrelevant because they believe it will increase the costs, which may subsequently hinder adoption of its services.

Now, can we generalize that service customization is not relevant for REC's that offer only a service platform? It may be hard because another REC employing a service platform may choose to offer service customization to lure more customers who are willing to bear the extra costs. The only generalization that can be drawn is that irrespective of the type of revenue model employed by REC's adopting service customization is left up to the discretion of the REC given the sensitivity of price increase of its customers.

The component service customization influences the revenues only through adoption in the case of both ownership and service revenue model.

4.2.7 After sales service

All of the REC's deem after sales service as very relevant to their revenue models. In the case of REC's employing service revenue model after sales service impacts their payments due from the customer. In the case of Ownership revenue model aftersales service impacts their reputation in the market place thereby in the long run subsequently affecting the adoption of its product.

In sum after sales service is important to both the type of revenue models. Furthermore, it has an impact on both the rate of adoption and recoupment of costs or payments due.

4.2.8 Consumer financing

Interestingly employing a service revenue model can eliminate the much-debated part of consumer financing and the challenges associated with it. That said Onergy has proven its commercial viability of its ownership revenue model by incorporating the consumer-financing component. The success can be mainly attributed to the strong partnership Onergy maintains with the MFI's. So we can say that if REC's choose not to employ service revenue model either directly (SIMPA/MGP) or indirectly (Rural spark) and would rather adopt the ownership revenue model then the consumer financing component is essential. In the ownership revenue model the consumer financing impacts the adoption of the REC's products by the rural consumers.

4.2.9 Discounts

The discounts component is very relevant to only MGP, which employs a service revenue model delivered entirely through a service platform. It has an effect on the *retention* of the incumbent customers and also subsequently the payments.

4.3 Chapter Summary

In this chapter we looked at the data obtained from the case study in the previous chapter. The main aim of this chapter was to check for any similarities and differences between the four cases investigated. Some of the observations made are as follows.

At the level of type of revenue model one can argue that even though REC's like Onergy and Rural spark adopt an ownership revenue model directly their ownership revenue model characteristics are similar to that of a service revenue model. Both Onergy and Rural spark offer the service of making the payments *palatable* through *partnerships* such that the rural households can afford to pay for the DSE's.

We also can notice that one component more or less can signify the type of revenue model. The consumer-financing component explains the ownership revenue model and its absence signifies a service revenue model. Even though Rural Spark employs an ownership revenue model it does not have consumer-financing component because it is indirectly dependent on service revenue model. In other words we see that some components are necessary for commercial viability of either the ownership or service revenue model like that of consumer financing and supplier trust respectively.

Below Figure 24 shows the new revised set of revenue model components. The previous chapter offered 12 revenue model components that were found relevant in the context of DSE systems-rural India. After careful cross case analysis it became evident that two components namely: willingness to pay and number of users did not fit well in the context of revenue drivers. The rationale for eliminating the willingness to pay component was that in cases like Onergy it was not relevant and most importantly even though other REC's considered it relevant they considered the willingness to pay component in their pricing strategy. In other words between the REC's investigated the notion of their pricing strategy always consisted the willingness to pay component. The rationale for eliminating the number of users component from the list of revenue model components was due to the fact that the number of users component shows quite an obvious lineage towards revenues and most importantly its interaction with commercial viability is both positive (revenues) and negative (costs). The fact being that all the other revenue model components identified affected commercial viability of the REC's through factors like adoption or rate of adoption, payments and retention and that was not the case with number of users. *The final list of all the relevant revenue model components yielded us 10 revenue model components rather than 12 and they are: consumer trust, supplier trust, pricing strategies, flexibility of payments, size of payments, revenue sharing, consumer financing, service customization, after sales service/maintenance and discounts*.

Figure 24 shows an overview of all the 10 revenue model components identified in the case study and the factors they affect, which further affects the revenue aspect of the commercial viability. On more discussion on how these drivers affect the factors please look at this chapter in detail. The factors identified were not a result of the aided case study but rather it became evident during analyzing the data. Moreover these factors serve as

a link to revenue model components and commercial viability. More specifically it is these factors that result in revenues and the afore mentioned revenue drivers merely facilitate or help REC's realize these factors such that revenues are > costs.

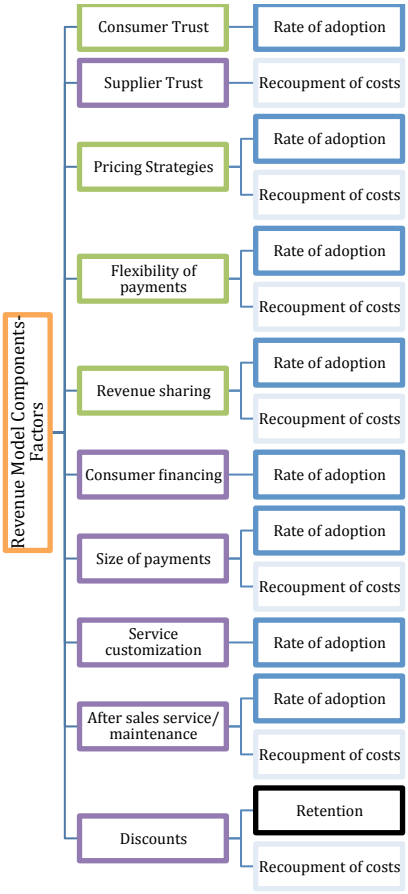

Figure 24: Overview of revenue model components-factors

On the whole three factors was identified, which was seen to affect the revenues of the REC's. *The three factors are rate of adoption, payments and retention*. In case of the Ownership revenue model the components were designed such that it only affected the rate of adoption. On the other hand the REC's adopting the service revenue model either directly (SIMPA/MGP) or indirectly (rural spark) designed its components such that it affected both rate of adoption and payments. Only in the case of MGP's service revenue model it was found that its components affected rate of adoption, payments and retention.

The components that affected the rate of adoption or adoption are consumer trust, pricing strategy, flexibility of payments, size of payments, service customization, after sales service/maintenance and consumer financing. The components that affect the payments or recoupment of costs in the service revenue model are supplier trust, pricing strategies, flexibility of payments, size of payments, after sales service, revenue sharing and discounts. The components that affect the retention factor are discounts.

Another interesting observation that can be made is that in the case of a service revenue model that consists of only the service platform like MGP the factor retention is applicable. *In other words we can say that REC's employing product and service (SIMPA and Rural spark) or only product platform (Onergy) does not require them to account for the retention factor to achieve commercial viability*.

Chapter 5: Conclusion, Discussion, Implications and Recommendations

5.1 Preface

The aim of this research was to understand the innovative revenue models employed by Indian Renewable energy companies (REC's). The aim of this research was accomplished by pursuing essentially two research objectives. Firstly, the various types of revenue model and secondly, characterize the revenue model components. Both these research objectives were dealt with the hindsight of commercial viability phenomenon, which in the past has baffled promoters. This research adopted a three-phase study to accomplish the objectives. The previous chapters presented all the three phases dealt with in detail. The first chapter dealt with the first phase of theoretical gap identification wherein we narrowed down on that the revenue drivers was the missing link in addressing the issue of commercial viability. The significance of second chapter is essentially two fold: firstly, dealt with the theoretical underpinning of the concept revenue model and the conclusion was that it has variegated backgrounds mainly from the strategy and innovation management literature. Secondly, It also dealt with the contention of the term revenue model and business model being used synonymously and the conclusion of which was that revenue model is a component of a business model. Wherein a business model is a framework to look into all the strategic activities a business enterprise takes on whereas a revenue model is one such component of a business model that deals with the revenue aspect. Thirdly, dealt with the second phase of Identification of the different types and components or revenue drivers of a revenue model. The literature found on the concept of revenue model was very scarce but nonetheless yielded a not so representative conceptual model that encompasses the revenue model components. The third, fourth and fifth chapter dealt with building a relevant framework of revenue drivers – commercial viability against the four cases that was carefully chosen to represent the domain of this thesis. Firstly, It was interesting that the initial conceptual model had a very good fit with the cases and most importantly the model was also extended. All in all after careful analysis the final set was revenue model components was presented in chapter 5 i.e. the cross case analysis.

This chapter begins by presenting the conclusion of this research where answers to all the sub-research questions will be answered subsequently followed by the answer to the core research question. A discussion section where several other things that are not related to answering the research question but were rather interesting facts to be noted will be discussed will

follow the conclusion section. After which a section each on the practical and theoretical implication of this research will be dealt. Lastly, The academic recommendation will be presented, which are a result of the core thesis work and also the discussion section of this chapter.

5.2 Conclusion

The objective of this research is to characterize the types of revenue models and revenue model components or revenue drivers for REC's operating in rural India. In order to meet this objective a core research question was formulated. To better answer the core research question several sub-questions was formulated. The conclusion of this research is presented below in this section. Each question is answered below. The answer to each of the questions consist of firstly the answer derived from literature followed by the answers derived from the case analysis and cross case analysis.

5.2.1 Sub-questions

What are the different types of revenue models employed by Indian REC's?
Why do REC's choose to employ one over the other?

Incumbent Literature: Given that the literature on revenue model of REC's is scarce, we looked at various other revenue models from other similar industries like cloud computing. The incumbent literature suggests that revenue model can take various forms. The different types of revenue models that were derived from the literatures are: Pay per month or day or use, subscription, leasing, licensing and rental. That said upon greater scrutiny of the literature the afore-mentioned types of revenue model can be deemed as a micro level revenue model. A better case would be that these types of micro level revenue models could be termed as revenue appropriation mechanisms. Furthermore in order to gain generalizability each of these revenue models was classified under the macro terms known as service and ownership revenue model. In simple words the term service and ownership revenue model are the umbrella terms, of afore mentioned different types of revenue model. In the service revenue model the value i.e. energy is delivered periodically. In the ownership revenue model the value is delivered upfront to the customer. Furthermore In literature it is believed that adopting the service revenue model in relation to ownership revenue model would increase the customer base because the product and/or service becomes cheaper and more specifically removes any obligation on the part of rural consumer to make a large payment upfront.

Case Study: The types of revenue models adopted by the Indian REC's was more or less in line with existing theory on the different types of revenue models. Moreover the classification of the various different types of revenue models like pay per use, pay per day, pay-per-month, subscription and leasing into revenue appropriation mechanisms came in handy. The REC's

investigated in the case study essentially employed either the *Ownership revenue model* or *Service revenue model* in order to appropriate revenues. Both SIMPA and MGP employed a service revenue model whereas both Onergy and Rural Spark employed ownership revenue model. That said interestingly even though each of the cases complied with the previous definition of the service or ownership revenue model the characteristics were totally different.

Moreover, the revenue appropriation mechanism employed by SIMPA was pay as you go. The revenue appropriation mechanism employed by MGP was pay per week. Both pay per week and pay as you go were part of the service revenue model. The pay as you go offers more flexibility than pay per week to the rural customer.

After carefully looking into the cases it becomes evident that the rationale for choosing the service revenue model over the ownership revenue model or Vice-versa is two fold: firstly, the risk appetite of the entrepreneur or REC. The REC's that seek for lower risk go for the ownership revenue model. The REC's that seek for a higher risk adopt the service revenue model because they believe that the upside in adopting the service revenue model far outweighs the risk they take on. Secondly, the choice of type of revenue model has until now impacted financing. The REC's that adopt ownership revenue model has already obtained commercial capital from venture capitalists (Rural Spark & Onergy) and Banks (Onergy). On the other hand the REC's like MGP and SIMPA that adopted the service revenue model has had quite a struggle with financing and until date they have been denied access to commercial capital due to the risk associated with its cash flows or revenues. So at the current stage it is clear that risk appetite and financing govern the choice of revenue model type.

What revenue model is commercially viable in the Indian rural market and why?

Literature: Literature suggests that Ownership revenue model lacks commercial viability because the Indian rural customers lack the affordability to pay the high upfront costs associated with the DSE systems. Researchers like (Chaurey & Kandpal, 2009b) explicitly went on to argue that REC's should look at employing service revenue model to increase the rate of diffusion, which subsequently leads to increase in revenues and therefore paves way for commercial viability.

Case Study: In the four cases investigated it was rather surprising to see that irrespective of the type of revenue model i.e. service or ownership, commercial viability was achieved. The core rationale for commercial viability of REC's employing Ownership revenue model lies in the partnerships with either clients who go on to adopt a service revenue model or with Micro-finance institutions (MFI's) who offer financing solutions that again emulate

the characteristics of a service revenue model. On the other hand REC's that employ the service revenue model also has achieved commercial viability of its operations. It can be comfortably stated that irrespective of the type of revenue model the commercial viability does not hinge around the type of revenue model but rather around the fact, how best can these REC's emulate the rural households expenditure on kerosene lamps. Now each of the REC's choose different routes to realize the act of emulating pricing of their DSE systems they offer in either solely as products (Onergy) or products and service (Rural spark and SIMPA) or solely service (MGP).

Since the type of revenue model cannot alone explain the commercial viability phenomenon in the next sub-question we will delve deeper into the revenue model components.

What are the revenue model components or revenue drivers that are deemed relevant by Indian REC's to achieve commercial viability?

Literature: As mentioned earlier the literature is scarce on the concept of revenue model and almost absent in the rural-renewable domain. After scouring through the cloud computing literature extensively there seemed to be very few articles. From these very few articles the initial conceptual model of revenue model components was derived. For a business enterprise to be commercially viable the revenues it generates should be greater than the costs. So the commercial viability phenomenon has two components the revenues component and the cost component. The revenue model concept helps us visualize the commercial viability phenomenon. In other words the concept of revenue model is used as a lens or tool to look into the mysterious world of commercial viability. So what exactly is a revenue model? A revenue model is one such component of a business model that deals exclusively with the revenues aspect of a business enterprise.

The revenue model components that were identified in our literature review are: *Consumer trust, Pricing strategies, flexibility of payments, willingness to pay, number of users and revenue sharing*.

Case Study: After carefully cross analyzing each of the four cases investigated. A final list of 10 revenue model components were found. The initial conceptual model provided a very good fit apart from the fact that it needed to be extended. The final list of revenue model components or revenue drivers are as follows: *consumer trust, supplier trust, pricing strategies, flexibility of payments, size of payments, revenue sharing, consumer financing, service customization, after sales service/maintenance and discounts.* The REC's adopt these revenue model components or revenue drivers in order to increase its revenues. In order to gain a better understanding about these components across the four cases investigated please refer to chapter 5.

5.2.2 Core research question

How are Indian REC's achieving commercial viability of its operations through innovative revenue models?

In order to answer this core research question we employed an explorative approach. Given the explorative nature of this research we firstly tried to understand the exact problem at hand by looking back in time and derived that commercial viability of an REC was the basis of all most all problems confronted in previous efforts. We essentially choose to look at the commercial viability through the lens of revenue model, which more or less encompasses the phenomenon of commercial viability. This research has been in pursuit to add to the knowledge on revenue models and more specifically plug the literature gap on relevant revenue drivers that help REC's attain commercial viability. In this journey several interesting things were found.

Figure 25 shows the framework on revenue drivers – commercial viability of Indian REC's. At first the framework may look complex where in fact it is rather simple. The framework can be explained from a macro perspective and a micro perspective. The macro perspective gives a gist of the framework whereas the micro perspective goes into detail.

The figure can be viewed as three disparate columns. We read from left to right. The first column signifies the rationale behind each of the revenue drivers. The revenue drivers or revenue model components are depicted in the middle. The last column represents the three essential factors that actually translate to revenues for each type of revenue model. Below lets us look at each of the rows on the basis of the 10 different revenue drivers.

5.2.2.1 Macro-perspective

Firstly, let us try to answer this core research question rather simple before we delve deeper into analyzing each of the revenue drivers. After careful analysis of the four cases it was seen that essentially 10 revenue drivers contributed towards increase in revenues such that REC's attained commercial viability irrespective of the type of revenue model. In the case of ownership revenue model each of the revenue drivers was incorporated by the REC's in the hope or belief to lure customers and thereby increase the *rate of adoption,* which helped REC's attain revenues > costs. Now in the case of service revenue model with a product and service platform like SIMPA the components were employed such that *it not only increases the rate of adoption but also increase the probability or chance that the rural customer makes regular payments*. Furthermore in the case of MGP, which employs a service revenue model with only a service platform the revenue model components were based on the *factors like rate of adoption, regular payments and retention of customers*, which affects commercial viability. *All in all we can say that it is not the type of revenue model that would impact the commercial viability of an REC through increase in revenues but rather it*

is the impact of these components or revenue drivers on factors like rate of adoption, payments and retention that impact the commercial viability of an REC.

Another important variable that affects the commercial viability of REC's is the number of users. It is rather intuitive that higher the number of users higher will be the revenue. However this assertion holds true only for REC's employing ownership revenue model wherein they sell directly to its clients or rural customers. On the other hand REC's employing service revenue model treated increase in number of users with caution. The rationale for this is that costs go up relatively to revenues as the number of users increases.

5.2.2.2 Micro perspective

Below are all the relevant revenue drivers that helped Indian REC's achieve commercial viability.

Consumer trust: Consumer trust refers to the rural consumers trusting the REC's product and/or service. Therefore in order for the rural consumer to trust the REC's product and/or service the REC's should build the consumer trust. Among the cases investigated consumer trust was built essentially through either communication and/or branding. Note that the consumer trust revenue driver does not by itself translate to revenues for REC's. The higher levels of consumer trust translates to increase in the rate of adoption, which subsequently leads to increase in revenues such that commercial viability can be attained.

The consumer trust revenue driver is only relevant for REC's that adopt a product platform as one of its value proposition to the rural consumers irrespective of the type of revenue model. The levels may differ based on the type of revenue model. The REC's that employ ownership revenue model (ORM) requires higher levels of consumer trust compared to service revenue model because the customers pay for the value delivered upfront.

Pricing Strategies: The REC's adopt pricing strategies such that the pricing structure is more palatable to the consumers. *Mostly pricing strategies affect two factors i.e. rate of adoption and payments*. The rate of adoption factor translates to revenues in an ownership revenue model and both rate of adoption and payments translates to revenues for REC's employing a service revenue model.

In order to make the pricing structure more conducive for the rural customers such that it leads to adoption, REC's essentially base their prices of its products and/or services either on the willingness to pay of its customers and/or competitors. Moreover the pricing strategies like making prices more palatable to its customers by bringing it in line with the willingness to pay prevents defaults of payments, which in turn may affect the revenues of a service revenue model.

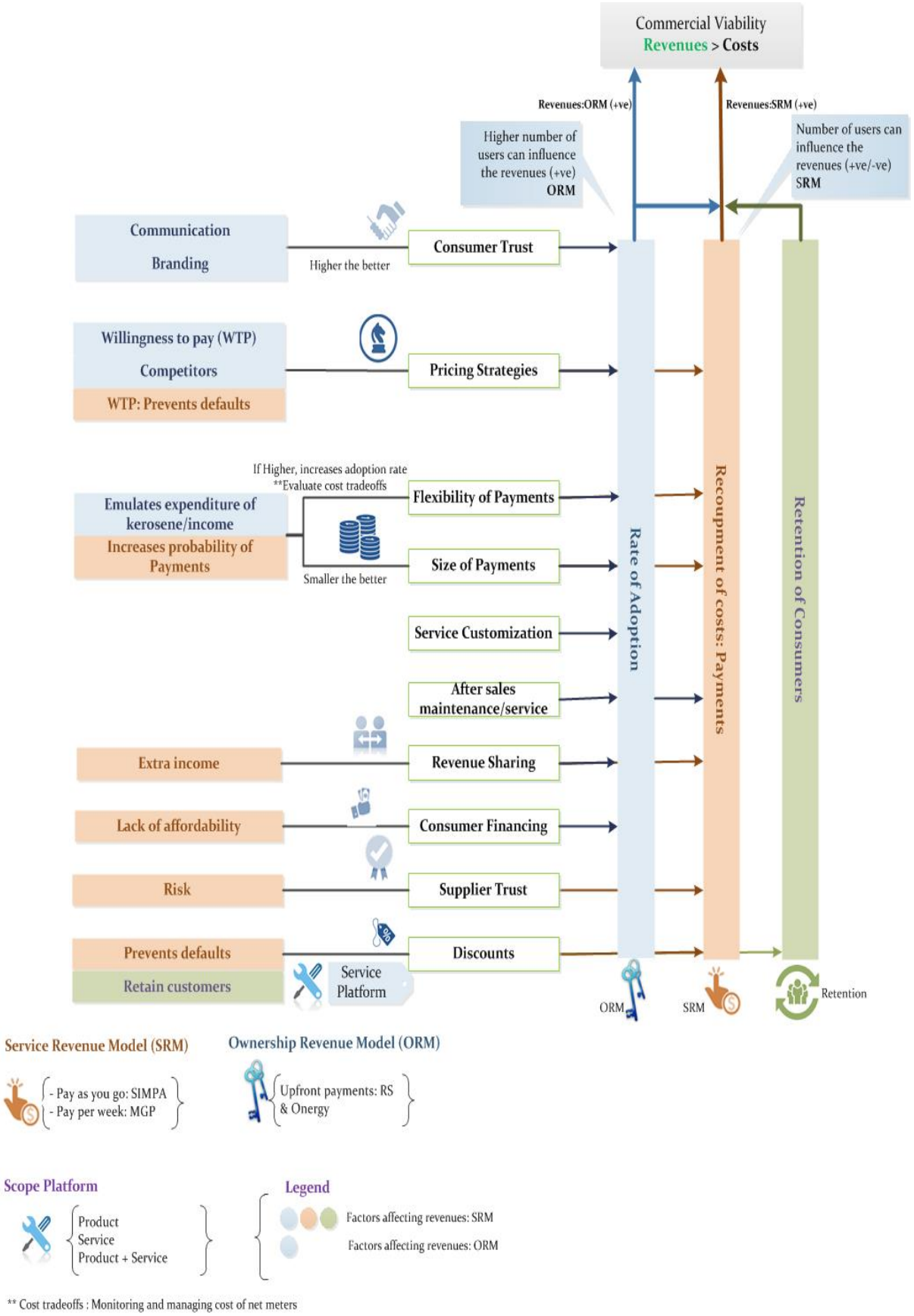

Figure 25: Revenue drivers - Commercial viability framework of Indian REC's

Flexibility of payments: Primarily the flexibility of payments revenue driver affects both the rate of adoption and payment factors, which translate to revenues such that commercial viability of REC's is attained. The flexibility of payments revenue driver affects adoption because it is designed to emulate the rural consumers expenditure on kerosene and most importantly the rural consumers irregular income. The higher the flexibility of payments more will be the rate of adoption because it removes any kind of obligation on the part of rural consumer. Moreover higher the level of flexibility of payments increases the probability that the rural consumer will make payments. However the downside to higher flexibility of payments is that costs go up, which may subsequently affect the revenues. In order to implement the flexibility of payments revenue driver complementary technologies like net meters are required. Adding to the costs of net meters are the costs of monitoring and managing the usage of rural consumers.

Size of payments: Size of payments affects both the adoption and payment factors. Among all the REC's investigated the size of payments emulates the income of rural consumers and their expenditure on kerosene. *It was seen that smaller size of payments increases the likelihood of adoption, therefore more revenues*. Moreover smaller the size of payments higher will be the probability that the rural consumer will make payments.

More so it can be argued that the best combination is to make the size of payments as small as possible and offer higher flexibility.

Service customization: REC's deemed the service customization revenue driver to be relevant because it increased the rate of adoption. The core rationale for offering service customization is to cater to the variegated needs of the rural consumer or for that matter even clients. Higher levels of service customization would lead to higher rates of adoption of an REC's product.

After sales service/maintenance: After sales service/maintenance mainly aids in adoption of REC's product and/or service. The reason for this is that in the past efforts the promoters fooled rural customers by offering sub standard DSE systems that did not last for long. Now that has left them perplexed as to whether to buy the new system or not. Furthermore the after sales service also helps with recoupment of costs or payments for REC's employing a service revenue model. Higher levels of satisfactory, timely service by REC's may help with higher levels of adoption and higher chances that the rural customer will make regular payments.

Revenue sharing: Revenue sharing is an interesting revenue driver because this revenue driver incentivizes the rural consumer to adopt an REC's product and/or service. The rationale behind incentivizing is that he/she may earn extra income by sharing the energy generated by the DSE's with the

neighbors or the community. Moreover it also increases the probability that the rural consumer may make regular payments.

Consumer financing: The consumer financing addresses the issue of lack of affordability of the rural consumers. This revenue driver is however only relevant to REC's employing the ownership revenue model with does indirect dependence on service revenue model. The consumer financing revenue driver affects the adoption of an REC's product by the rural consumer. In order to provide consumer financing REC's should maintain strong relationships or *partnerships* with micro financing institutions.

Supplier trust: The supplier trust is a revenue model component that impacts the payments factor that contribute to revenues of a REC employing a service revenue model. It can be essentially viewed, as the risk an REC is willing to take in order to appropriate revenues under the service revenue model. A higher level of supplier trust do not necessarily translate to regular payments or more specifically increase in the probability of the payments.

Discounts: Discount is a very relevant revenue driver for REC's employing a service revenue model with only a service platform. This is essential because it may prevent defaults of payments by the customers when the service may not be good during bad weather. Discounts primarily affect the retention and payments factor.

5.3 Discussion

In this section we will delve into the several other things that are not covered in the research objective but rather was a consequence of this research. Here we will open a discussion about the result of this thesis.

5.3.1 Understanding the rural market and type of DSE technology

It can be seen that each of the cases caters to the Indian rural market. Nevertheless, they cater to different income levels in the rural consumer market and most importantly they are not necessarily in business with the poorest of the poor, which is the off-grid population. SIMPA and Onergy acknowledge that they cannot cater to the poorest of the poor. However MGP prides itself in catering to this market.

Keeping in mind the different types of customers each of the REC's cater to, we can classify the market into three categories namely: Rural towns, rural villages and rural hamlets. Rural town households refer to the rural India, which are close to the cities. Figure 26 shows a crude conceptualization of the types of rural market. The rural villages refer to rural India, which are father away from the cities and the towns. Rural hamlets are the households, which are father away from the rural villages, and it is these communities that lack access to the grid. SIMPA and Onergy serve a market whose annual income

is more or less in the range of $1000 to $3500. We can classify this income base into the rural towns and villages. Also, by no means are these markets off-grid maybe they are characterized with intermittent power outages. The market MGP caters to can be dubbed as the truly off grid market, which are the rural hamlets.

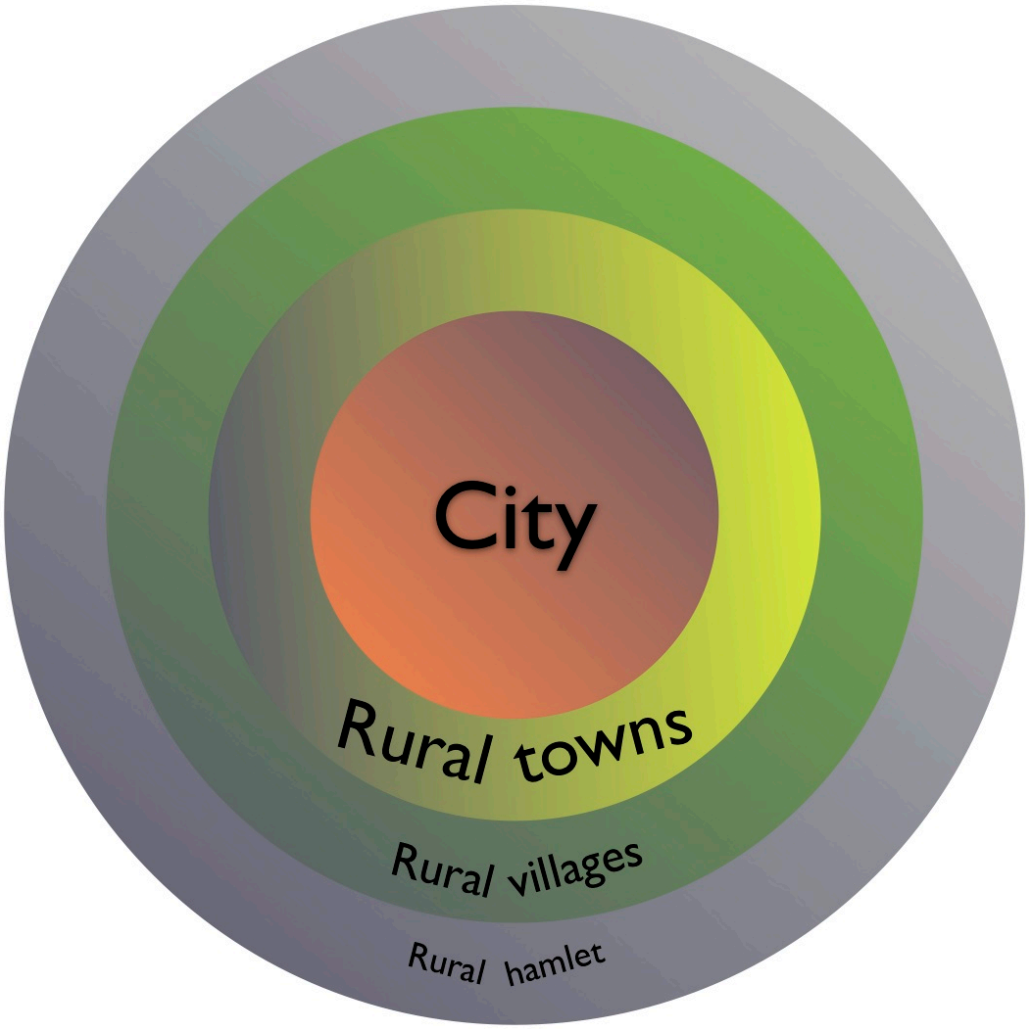

Figure 26: Visual conceptualization of the types of rural market

Owing to these different sub-markets in the Indian rural markets each of the cases use different technologies and approaches to deliver the value. MGP employs micro-grids as they deem it best fit to serve the rural hamlet market. Other REC's like SIMPA and rural spark employ a solar home system. Onergy offers an array of DSE's technologies to the rural village and towns market.

From afore mentioned types of rural market and the type of DSE technology employed, can we say that a certain type of DSE technology is best suited for a particular type of rural market to stay commercially viable. To a certain extent we can say that yes it does matter. The reasoning being that the SIMPA's solar home system (SHS) may not be viable in the rural hamlet market because it is still not affordable. The smallest payment required for SIMPA's SHS is $1 whereas MGP's is only $0.5.

Since this was an unexpected outcome of this thesis further research is required to look into the linkage between the types of rural market - type of DSE technology - Commercial viability.

5.3.2 Service revenue model Vs. Ownership revenue model

A service revenue model involves regular payments by the rural customers for availing the product or service, which delivers energy. The REC's employing them directly is MGP and SIMPA. Nevertheless the value delivery systems are different because SIMPA offers a product platform, which is supplemented by a service platform whereas MGP offers only a service platform. Below Figure 27 shows an overview of the platforms.

On the other hand an ownership revenue model involves the customers paying for the product upfront. Given that the rural customers lack the affordability it is rather counter intuitive that REC's are commercially viable employing the ownership revenue model. Looking into the case of rural spark and Onergy it becomes clear that partnerships are required in order to *reach* and make it's offering affordable to the rural customers. Interestingly both rural spark and Onergy take different routes to make the their products affordable yet at the same time profitable. Rural spark offers both product and service platform to its partners or clients who further go on to employ a service revenue model all along the value chain to reach to the rural customers. Onergy offers only a product platform and essentially takes the route of consumer financing by maintaining strong partnerships with MFI's to reach the rural consumers. Here below we will look at some of the benefits and challenges of both service and ownership revenue model.

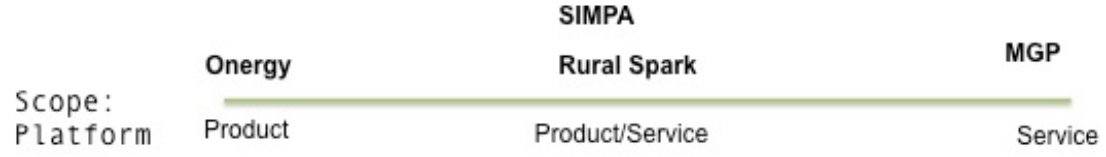

Figure 27: Cases and Platforms

Firstly, service revenue model is fraught with challenges initially with regards to financing but not adoption. Secondly, with regards to *service revenue model penetration is high but scalability is slow, however not limited*. All in all it could be the case that the rate of diffusion is higher than ownership revenue model over the long run. Nevertheless, this statement requires an empirical testing some time in the future.

With regards to ownership revenue model, scalability can be obtained fairly quickly in the rural market due to unmet demand. However once this demand is satisfied the REC's adopting ownership revenue model may have to look at other markets. *We can question the sustainability of revenues or cash flows of the ownership revenue model after the demand is met*. Given the low affordability of the Indian rural population, especially due to high upfront capital costs, the *success of the ownership revenue model can also be attributed to wealth effect*. Wealth effect can be defined as the change in spending that accompanies a change in perceived wealth. In India, this type of wealth effect can be mainly seen in rural towns and villages due to increase in land or property prices. The phenomena can be mainly attributed to expansion of metropolitan cities and industrialization of cities. If this ownership revenue model is sustainable or not, only time has to answer.

Now, Interestingly in the case of rural spark that employs a ownership revenue model and its indirect dependence on the service revenue model further augmented by the entrepreneurship model gives them the ability to utilize all the benefits associated with them respectively. Its adoption of the ownership revenue model helps them mitigate the risk associated with recoupment of costs. Due to the lower risk attached to its cash flows or revenues it can easily attract commercial capital. This would help them to scale. Now in the case of Onergy it can also scale very quickly however with lower penetration. In the case of rural spark it can achieve scale with higher penetration given the fact that its clients adopt a service revenue model augmented by the entrepreneurship model. The local village entrepreneur who adopts rural sparks client's services will further adopt a rental model, which involves renting out lamps to the poorest of the poor who cannot afford the rural sparks solar home system. In sum the combination of various types of revenue models and other models like entrepreneur model employed by rural spark may be the ideal case to reach not only the poorest i.e. hamlets but also other markets like rural villages and towns. In other words we can say that in adopting such an approach the social objective is not lost while in pursuit of commercial viability or profits.

5.3.3 Revenue model: type & components - risk and financing

The old paradigm efforts essentially failed because it lacked commercial viability and financing. Initially we said that it was obvious that if the REC's could achieve commercial viability i.e. Revenues > Costs, attracting financing would not be an issue. Nevertheless after the case analysis it became clear that the assumptions made could only partly solve the issue associated with financing. Hereon the referral to the term financing refers to commercial capital. Another strikingly important factor related to attracting financing was the risk factor in association with commercial viability.

From a macro level the type of revenue model signifies the risk associated with the cash flows i.e. revenues that impact financing. The REC's that employ service revenue model either directly or indirectly have failed to attract commercial capital from banks whereas the REC that employ an ownership revenue model (Onergy) has already attracted commercial capital from the banks. The interviewee from SIMPA quotes "*Given the size of the Indian market we are after only commercial capital can help us achieve that goal*". Other REC's like rural spark and MGP also more or less concur with this statement.

The core rationale behind the lack luster appeal of service revenue model's ability to attract commercial capital is mainly due to the excess risk associated with the cash flows. The risk being that the rural customers may simply fail to make regular payments for the product and/or Service already offered to them. REC's has adopted novel revenue drivers or components to make sure that the rural customers make regular payments and thereby reduce risk of its cash flows. For instance if we take the case of SIMPA we see that it offers the most flexibility of payments and relatively smallest payments (pay as you go) between other REC's. In doing so SIMPA reduces the risk of default of payments but however it also increases costs. Here there is a higher probability that the rural customer will make regular payments than the case where flexibility of payments is nil or the size of payments in large. Interestingly, MGP has another approach where they aim to maintain the size of payments to be the smallest and offer low flexibility of payments (pay per week). Given that SIMPA adopts a pay as you go and MGP adopts a pay per week revenue appropriation mechanism it is rather intuitive that pay as you go offers a better case for lower risk of an REC's revenues. It may be the case that further *quantitative longitudinal research into the pay as go and pay per week revenue appropriation mechanisms may offer interesting insights into the trade offs with respect to revenue-costs-risk*. The costs can take the form of managing and monitoring payments or in other words the transaction costs.

That said both the REC's that employ a service revenue model more or less go on to say that if they are able to demonstrate reliable cash flows over a period of 3 to 5 years they can attract commercial capital. Again this needs to be validated in the future.

5.3.4 Transaction costs and competition

At the time of interviewing and after careful analysis of data it becomes quite evident that REC's are taking a treacherous path in order to realize the act of energy inclusion of all. Nevertheless this is coming at a great cost to the REC's. Previously we dubbed this costs as transaction costs. Transaction costs are costs that are incurred while making an economic exchange. A more apt definition of transaction costs that better suit the context can be as follows: the costs incurred in order to facilitate an economic exchange.

It can be noted that the REC's incur large sums of transaction costs in order to *reach* and *address the lack of affordability*. REC's like rural spark that employ an ownership revenue model and indirectly depend on the service revenue model and the entrepreneur model to achieve commercial viability do incur excessive transaction costs to reach its customers in terms of middlemen. These middlemen add up to almost an extra 40% in transaction costs because each of them makes a margin. This is also the case with SIMPA, MGP and Onergy where their middlemen add to costs because they need to be trained and maintained in order to carry out tasks like sales, maintenance and distribution. *In all probability we can say that rural spark incurs the highest transaction costs to reach its customers among others*. This however requires further testing. In order to address the lack of affordability REC's like SIMPA and MGP both adopt the revenue model components such as flexibility of payments and size of payments. In order to execute SIMPA's pay as you revenue appropriation mechanism SIMPA requires net meters to manage and monitor the rural customers usage, which translates into transaction costs.

Nonetheless the REC's also do openly acknowledge the fact that there exists a trade off between transaction costs and making price palatable for the rural consumers. In other words *operational inefficiencies are part of the larger picture of energy inclusion through a market based approach*. Nonetheless free market economics teaches us that competitive markets solve inefficiencies. This leads us to ask the question, why is that even though there exists such large sums of inefficiencies in terms of transaction costs competition has not stepped in to bring these costs down? One of the co-founder of rural spark quotes "*It will be hard to factor in competition from other REC's in a particular community and stay commercially viable* ".

To conclude transaction costs (operational inefficiencies) are inevitable to serve the rural population. REC's are already commercially viable but however commercial viability may be threatened in face of competition.

5.3.5 Market development approach

Market development approach refers to the fact that both the supplier and the customer cooperate to build a market that is viable for both. This definition also more or less concocts with the bop 2.0 strategy wherein the local customers are a part of the bop initiatives (Viswanathan & Sridharan, 2009) (Kolk & Buuse, 2012). Below Figure 28 shows an overview of the market development approach taken by REC's.

All the REC's investigated tend more towards a market development approach where they create new value chains to not only reach the rural customers but also at the same time stay profitable or commercially viable. This conclusion is based on the fact that most of the REC's investigated have build their own network of *local partners* to realize its objective of providing

clean and cheap energy and yet at the same time stay commercially viable. Rural spark works with local Village level entrepreneurs and its clients like vayam to reach the rural consumers. SIMPA works with local partners for sales, distribution and maintenance of its product. MGP works closely with local partners for collection of revenues and maintenance. Onergy also takes on a market development strategy because they too offer product maintenance and distribution through local partnerships. The key take away from this discussion is the fact that local partners are very essential in order to reach and effectively serve the rural consumers. Figure 28 shows a conceptualization of the market development approach taken on by Indian REC's.

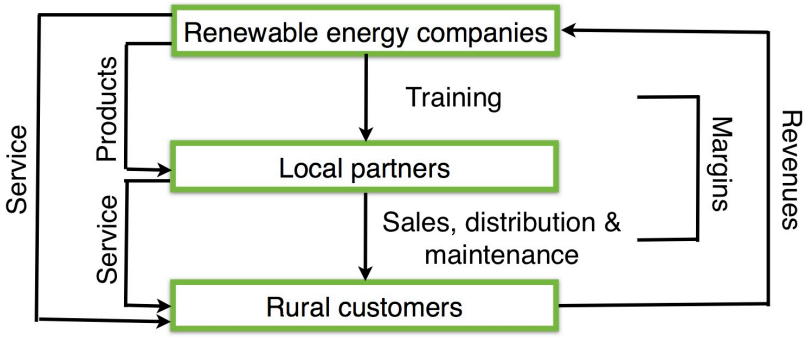

Figure 28: Overview of Market development approach

In line with the market development approach it becomes quite evident that in order to appropriate revenues from the Indian rural population the REC's need to build their own distribution, sales and most importantly train the local personnel through building strong local partnerships. If partnerships are key to derive revenues from the bop market then our derivation of the fact that a revenue model is a component of a business model may not hold true in the scope of this thesis. For instance if we take (Giesen et al., 2007) framework of a business model then from that we know that the business model primarily consists of three components namely: industry model, revenue model and enterprise model. Now the component revenue model cannot solely explain the generation of revenues because generation of revenues requires both the industry model innovation i.e. innovating the value chain and enterprise model that involves collaboration and partnerships. Therefore form this we can infer that in the bop market the revenue model alone cannot explain for revenues and moreover the concept of business model is apt to study revenues.

5.4 Practical implications

The finding of this study has the following implications on the REC practitioners and also most importantly the future entrants. The implications are as follows:

i. The first and foremost practical implication that can be derived form the study is a final set of revenue model components or revenue drivers that an existing manager or for that matter any future entrant should take note off while designing their revenue model. Moreover managers should take note of the fact that these revenue drivers were designed to emulate the expenditure on kerosene by rural households. That said among the cases investigated the REC's tried to emulate the expenditure as closely as possible bearing in mind the risks and costs that are a part of certain components like flexibility of payments and supplier trust.

ii. Furthermore managers who employ an ownership revenue model should also take note of the fact that catalyzing the rate of adoption of their product and/or services is the only way they can increase revenues to attain commercial viability. The catalyzing process is mainly influenced by revenue drivers like consumer financing and size of payments among others. On the other hand REC's employing an ownership revenue model should take note of the fact that the recoupment of costs or payments factor essentially contribute to revenues.

iii. Among all the identified revenue model components special managerial attentions are to be paid to flexibility of payments and size of payments. The variability of these revenue model components seems to have a large impact on factors like rate of adoption and size of payments. It may be tempting to adopt a strategy such that the flexibility of payments is the highest and the size of payments are the smallest in order to attract more rural customers and increase the probability of regular payments. More specifically a revenue appropriation mechanism like the pay as you go may seem attractive. The downside to such a revenue appropriation mechanism is that with scale the costs of managing and monitoring a revenue appropriation mechanism may push costs up to unsustainable levels and may hinder commercial viability. Furthermore for managers who adopt service revenue model a tab on risk associated with its cash flows should always be looked at.

iv. In the beginning from a theoretical stand point we said that if managers could achieve commercial viability then financing will follow suit and scalability can be achieved fairly quickly. In practice also this holds true but however comes with challenges. Especially for REC's that employ a service revenue model because the transaction costs and more importantly risk associated with payments are fairly high. If the managers try to scale quickly without any risk analysis of its payments from his/her rural customers portfolio, then it may eat into the

revenues. Therefore managers should be careful while planning growth of his/her company.

v. Moreover the result of this study also signifies that the source of financing has lineage towards the type of revenues model. *It can be noted that managers who employ a service revenue model should try and maintain a good track record of payments for at least 3-5 years to attract financing from banks*. On the other hand the managers who employ an ownership revenue model access to commercial capital has been fairly easy. The new entrants should take note of this afore mentioned assertion.

vi. The case of MGP (service revenue model * only service platform) and the complex model employed by rural spark (Ownership revenue model * Service revenue model * Entrepreneurship model) may offer a case for other managers to look at their revenue models in order to cater to the off-grid rural population where most of the managers predominantly believe that it is hard to attain commercial viability in this part of the off-grid market.

vii. Under the notion of the fact that the rural consumer market can be segmented into rural towns, rural villages and rural hamlets have implications for Managers. They should also take note of the fact that the type of DSE technology matters in order to achieve commercial viability. For instance the solar home systems may not be the right fit for the rural hamlet market because the unit economics may simply be too expensive for the off-grid rural consumers to afford.

viii. Another important implication that can be drawn from the results of this thesis is that a local partner is essential to attain commercial viability because they help the REC's to essentially reach the rural consumers.

ix. The founder of Onergy during the interview quoted that "*There is no silver bullet in appropriating revenues in our market*". The view of this thesis is also the same wherein it is hard to say what works best. That said the result of this thesis i.e. the revenue drivers-commercial viability framework should guide the future entrepreneur or incumbent managers such that they can attain commercial viability.

5.5 Theoretical implications

The finding of this study essentially contributes to the renewable energy in developing countries literature. More specifically it hopes to have made a dent in realizing the concept of energy inclusion or energy access to all under a market based approach through studying some relevant revenue drivers that will help REC's achieve revenues > costs such that it can attract financing and subsequently scale. Previously, literature contributed towards the realization of energy inclusion by studying and offering insightful business models and theories that could encompass the micro draw backs associated

with slow diffusion of DSE's and studying the barriers and strategies. However all of this study was done based on the mental framework of a donor approach wherein the approach itself had major macro level problems such as commercial viability and financing. Since the aspect of revenues had such a burgeoning impact on solving the issues associated with the old paradigm efforts the concept of revenue model was used as a tool or framework to study the commercial viability of incumbent REC's that essentially adopted a market approach. The main result of this thesis is a revenue drivers-commercial viability framework.

The findings of this study add to the literature on all the fronts mentioned below:

i. On the belief that viability cannot be attained with the ownership revenue model: This study is of the view that commercial viability can be achieved irrespective of the type of revenue model. In other words both the service and ownership revenue model is commercially viable in the Indian rural market. Furthermore the study also advocates that it is not the type of revenue model that solely determines the commercial viability of an REC but rather it is the revenue model components that serve as a framework to mimic the expenditure on kerosene by rural consumers. The REC's that employ an ownership revenue model achieve this through key *partnerships* with clients and MFI's. In doing so they get to keep the perks associated with ownership revenue model of low risk and also at the same time enjoy revenues > costs.

ii. Clarification on the debate of whether or not revenue model is a component of a business model or they are the same: When trying to study the different types and components of a revenue model in the rural India market context it becomes clear that the concept revenue model more or less encompasses all of the components of a business model. (Giesen et al., 2007) points out that there are three components to a business model and namely: Industry model, revenue model and enterprise model. The industry model refers to value chains. The revenue model refers to revenue appropriation. The enterprise model refers to building essential partnerships. Now, In order to appropriate revenues the REC's adopt both the Industry and Enterprise model. Moreover the argument from renowned researches like (Osterwalder, 2004; Teece, 2010) and several others who say that revenue model is a component of a business model may not be applicable to the Indian rural market or more to say the Bop market because it requires key local partners and construction of value chains. In sum this study is of the view that in order to study the Indian rural market population a rather more apt case would be that the term revenue model and business model can be used synonymously and most of all the concept

of revenue model cannot be viewed in isolation as a component of a business model.

iii. On the claim by (Kolk & Buuse, 2012) about the inevitability of social impact investors: The results of this study purports (Kolk & Buuse, 2012) claim on the fact that social impact investors are required by these REC's in order to attain viability of its operations. *It can be noticed that all the REC's investigated had attracted capital from social impact investors and they felt that this source of investors acts as a catalyst in the early stages of business*. Moreover this study by (Kolk & Buuse, 2012) also elucidates that truly market based solutions cannot be viable in the off grid market. However to our surprise it was found that MGP had attained commercial viability in the off grid market i.e. the rural hamlet market. This means to say that commercial viability can be attained by REC's operating even in the off-grid market.

iv. Much debated theoretical grounding of revenue model or its parent business model in economic theory: Incumbent literature suggests that there is not concrete theoretical grounding of the concept business model in economics. Teece argues that the absence takes roots due the fact that all theoretical constructs in economic theory assume that markets solve the problems but however in the real world business models are created to solve the problems. The view of the study strongly purports the view of (Teece, 2010; Zott et al., 2011) on the absence of theoretical grounding of the concept of business model in economic theory. In other words it was a case of market failure. Nevertheless, a new breed of entrepreneurs has found ingenious ways to innovate their revenue model such that it solves not only the problem of energy inclusion but also at the same time commercial viability.

5.6 Academic recommendation

This section on academic recommendations will essentially present suggestions for further research. The recommendations will be mainly confined to the results obtained by this research.

Firstly, It would be wise to further extend the revenue model components in order to obtain greater generalizability. Given that this research only looks into four case studies in a specific country denies much of a chance to obtain generalizability. So in order to obtain greater generalizability of the revenue model components or revenue drivers more cases should be studied across several other developing countries like Indonesia and china. Furthermore, It would be even better to have companies form all over the African continent. In doing so will further enrich the list of all the relevant revenue model components or revenue drivers in order for REC's to attain commercial viability.

After which quantitative research should be conducted in order to make the theory on revenue drivers more robust. More over in order to better reflect the reality the study should try a longitudinal approach to keep a tab of how the revenue model components evolve or change over time. All of afore mentioned suggestions can be done against the research questions posed earlier in this study.

Furthermore, the impact of each of the revenue model components on the factors like rate of adoption, payments and retention that influence the commercial viability through the revenue aspect should be studied quantitatively by building hypothesis. Quantitative study offers a better case for sound generalizability because it makes use of statistics. Ex. Does smaller payments translate into faster rate of adoption or do smaller payments translate into higher probability of payments. *Statements or hypothesis like this should be built for each of the components against each of the factors in order to check if these factors do really impact commercial viability*. The most interesting and highly relevant future recommendation will be to test: "*How much of each component or at what level of each revenue model component the risk is lowest for the maximum revenues*?"

More recommendations can be derived from the discussion sections as well. Please refer to the discussion section for further recommendations and inspiration.

Chapter 6: Reflection

6.1 Preface

This chapter will essentially consist of some of the reflections from a personal level while conducting the research. In pursuit to better understand the innovative revenue models employed by Indian REC's some various other matters were found, which offers interesting insights for researcher in the realm of renewables and Bop.

This chapter firstly presents a brief discussion about reflections on research methodology followed by the assessment of research quality and lastly, research limitation.

6.2 Reflections on research process

Firstly, Given the choice of topic on revenue model and most importantly the case study approach further augmented by the fact that it is an exploratory research can be more or less characterized as running around in circles. The research approach followed a three-phase approach of theoretical gap identification, identification of types and components of revenue model and testing and extension. The first two phases was essentially carried out through a literature survey. That said the literature survey initially did not yield much results and most importantly in the beginning days of the research it seemed that the objective could not be obtained. Given such a situation it became very much necessary to first contact at least one company or case to see if all was going in the right direction. Nonetheless, after the first case study on SIMPA, the first two phases was revisited and corrections were made. The interviews following SIMPA with Onergy, rural spark and MGP resulted in very rich data. Given that the data was so rich making sense and extracting the most out of the data proved to be very challenging.

Second, with respect to the execution of the case study several challenges were faced while performing the interview. The interviews lasted one hour on an average. This time proved to be short given that each of the interviewee had to be briefed about the research and most importantly on what each concept or terminology meant. Even though this took quite some time the upside to this was that the interviewee and I stayed on the same page. The limitation with time and lack of concrete theory on revenue model limited our research in focusing only on identification of relevant revenue model components.

Thirdly, it was a challenging task to contact companies given the fact that I did not have any personal contacts with the companies I intended to contact initially. All of the four cases in this research came from personal cold calling and cold emailing for a long period of time. It would have been great

if other REC's like Gram Oorja, thrive energy and OMC power cooperated for this research because it would have added more weight to our findings.

Fourth, It was to our dismay that literature failed to make a good and concrete link between the concept of Bop and below poverty line in developing countries.

Fifthly, in hindsight it would have been better if we choose to only investigate only the service revenue model across several different countries. In that way the research would have become a lot less complicated than otherwise to deal with both types of revenue model.

Lastly, it was found that during the interviews the concept of revenue model was most often mistaken for business model. The case being that in the real world they are used synonymously. This was challenging because the entire case regarding revenue models vs. business models had to be explained to interviewee.

To conclude on a personal note it would have been better to deal with the research focusing on one aspect rather than simply mustering too many aspects. That said since it was an explorative research trying to narrow down on one thing proved to be very hard especially when incumbent literature makes no attempt to look the concept of revenue model. Furthermore, the data that was obtained was very dense and rich with no proper orientation to it. Triangulating all of that was quite a task. Last but not least, may be it would have been wise to pick cases that the supervisors have already established contacts with rather than hunt yourself because it saves time.

6.3 Assessment of research quality

According to (Robert K Yin, 2009) the main criteria for assessment of quality of empirical research are construct validity, external validity, internal validity and reliability. Below the outcome of this thesis will be evaluate based on the afore mentioned criteria very briefly:

6.3.1 Construct validity

Construct validity refers to the degree to which the operational measures of the concepts being studied are accurate. In this research construct validity was mainly taken care of by literature review further augmented by gathering data from multiple case studies and sources.

While coding the data obtained from case studies, it was noted that it did not tally much with preconceived notions obtained from literature review. At the most only notions on consumer trust and the fact that willingness to pay of rural consumer was low are the only few aspects that tallied with previous literature. Furthermore notions on revenue drivers like flexibility of payments and revenues also seemed to resonate well in the domain of this thesis

because the incumbent theory and case study data shows that these components leads to increase in revenues. Moreover revenue drivers – factors – commercial viability framework was never before operationalized or conceptualized by researches in different scopes of research. That said given the exploratory nature of this research construct validity was hard to achieve. To conclude construct validity cannot be completely guaranteed. Most of all additional research building on this research is required.

6.3.2 Internal validity

Internal validity refers to the confidence one can claim into the cause and effect relationships. Given the exploratory nature of this thesis internal validity may be hard to achieve. However efforts were made to increase the internal validity by performing cross case analysis (Christie, 2000).

6.3.3 External validity

External validity refers to the fact that the outcome of this thesis can be generalized beyond the immediate case study. External validity was addressed by taking up four cases in order to make the initial conceptual model more relevant in the context of Indian REC's. According to (Robert K Yin, 2009) this type of multiple case study approach helps improve generalizability. That said this begs to question, to what level can the outcome on revenue model components or revenue drivers can be generalized.

In the case study analysis careful attention was paid to the fact that these cases were only doing business in the Indian rural market and was registered as for profit organizations. Attention was paid to include cases such that each of them is nonconforming based on the type of revenue model and the type of technology in the same industry. This however reduced the chances of achieving high internal validity but however increased chances to increase the external validity. Therefore the list of relevant revenue drivers to attain commercial viability can be generalized across almost all type of DSE technologies like solar off grid and solar home systems.

In relation to previous work by (Chaurey & Kandpal, 2009b), which tries to address the issue of commercial viability through suggesting one type of revenue model over the other may not truly make the cut. The findings of our study show that type of revenue model cannot truly indicate a firm's commercial viability. For instance Onergy's ownership revenue model by itself is not commercially viable but rather what makes its commercially viable is for a fact that they have incorporated the consumer financing revenue drivers among others to make the payments more palatable. Moreover it was hard to draw similarities or differences based on the type of revenue model. Therefore drawing generalizations of the basis of type of revenue model may not be apt in addressing the issue of commercial viability.

That said the primary outcome of this research on the list of relevant revenue drivers or revenue model components that help Indian REC's attain commercial viability can be generalized into other developing markets as well. We can find no reason that will prevent from generalizing the revenue drivers into other regions like the rural population of developing counties. The rural consumers across all the developing countries need an affordable and cleaner source of energy like DSE's (Martinot et al., 2002). If these revenue model components induce the rural consumers to adopt DSE's in India how would it be different in other developing countries where the rural populations face the same needs. Moreover electricity is a commodity where it is necessary for every day life. The revenue model components derived addresses essentially the rural customers characteristics like lack of affordability and emulating the kerosene expenditure that has influenced adoption of DSE's until now. There is no reason to believe that the rural consumer in another developing country like Indonesia or parts of Africa has different priorities in relation to Indian consumers. Of course the affordability level in Africa may be lower than India then only tweaking of one or more of these components are required and the notion of what these components can do, will be the same. For ex. In case of African, in order for rural consumers to adopt the REC's services may be the flexibility of payments should be higher and size of payments should be lower. The fact is that components like flexibility of payments and size of payments still do matter but maybe the variability of these components should be tweaked. Nevertheless this is still only an argument and has not been derived through empirical studies across various contexts. Therefore in the future attempts should be made to make these revenue drivers more robust by developing the framework for other developing countries too.

6.4 Research limitation

This sub-section tries to elucidate some of the limitations of this research.

This study only lays emphasis on the 4 cases that might not be representative enough of the whole world to build substantial theory. Moreover it is country specific. Therefore the generalizability of this study is certainly restricted. Nonetheless further iterative research should be carried out across all rural markets in the developing world by including a lot more cases.

Furthermore, all the cases chosen for this research are relatively new companies where they themselves are yet to validate the data provided by them. This limitation can be overcome by a longitudinal study. SIMPA was founded in 2011. Rural spark was founded in the year 2012. Onergy was founded in the year 2009. Lastly MGP was founded in the year 2010.

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Appendix

A1: The initial list of companies

Below is the initial list of companies that was derived from Google search that could were prospective cases to base our case study on.

Table 7: Initial list of renewable energy companies from Google search.

Sl no.	Company	Rationale for elimination or inclusion for case study analysis
1.	Selco	Not for profit organization hence excluded
2.	Simpa	For profit organization caters exclusively to the rural market hence included
3.	Orb energy into all markets	For profit but however into all markets
4.	Rural spark	For profit organization caters exclusively to the rural market hence included
5.	Teri (not for profit)	Not for profit organization hence excluded
6.	Onergie	For profit organization caters exclusively to the rural market hence included
7.	Azure power-into all markets	For profit but however into all markets
8.	Meragao power (MGP)	For profit organization caters exclusively to the rural market hence included
9.	Dlight design	For profit organization. However acts more like a supplier. Therefore excluded
10.	Aurore India	For profit but however into all markets
11.	D.E.S.I power	Not relevant
12.	Gram power	Not relevant
13.	Nature tech infrastructure	Not relevant
14.	Thrive solar energy	For profit organization. Intent to include.
15.	Green Light planet	Not relevant
16.	Gram oorja	For profit organization caters exclusively to the rural

		market hence intent to include.
17.	Solar town	Not relevant
18.	Aspiration energy- all markets	For profit but however into all markets
19.	Claro	Not relevant
20.	Ecolibrium	For profit but however into all markets
21.	SunBorne energy	Hard to retrieve information
22.	Trilig energy-	For profit organization caters exclusively to the rural market hence intent to include.
23.	Sunkalp energy- all markets	For profit but however into all markets
24.	Renew power	For profit but however into all markets
25.	Green mela	Not relevant
26.	Greenwood energy	Not relevant
27.	Lumos	Not relevant
28.	LEDprince	Not relevant
29.	Reconnect energy	Not relevant
30.	Tessol	Technology not relevant
31.	OMC power	For profit organization caters exclusively to the rural market and commercial markets hence intent to include.
32.	Loop solar	Relatively very new company founded in 2014 therefore not included

A2: Questionnaire

1. What position do you hold in the company?
2. What market segment does your company cater to (Rural market or BoP)? If possible please specify the household income also?
3. Which type of DSE's do you sell?
4. Broadly, can we say that your companies founding was based on the premise that the shift from a NGO donor driven paradigm to a more market-based paradigm? Can you roughly say when the shift took place?
5. Do you receive any tax incentives or interest rate subsidies? If yes please can you mention the scheme?
6. What are the sources of financing your company has taken on? Like loans from banks or venture money?
7. Would you agree the Holy Grail for your company is to obtain financing from institutional banks?
8. What is that your company has done to obtain financing from the banks, when your cash flows are subject to high risk? In other words how has your company gained credibility with the banks
9. To obtain financing for your company do you think revenues are relevant? YES or NO
10. Can I say that to become successful i.e. commercially viable and achieve scalability. W.r.t financing and revenue the causality runs from revenue to financing. In other words can we say achieving sustainable revenue (no blips, steady revenue) through revenue model innovation would attract more financing due to decrease in perceived risk?
11. **Is your company commercially viable**?
12. Would you say high capital costs of SHS deters buyers? Yes or no
13. What would you classify your customers Willingness to pay as (*low or zero or high*)? Low being the customers want your product but cannot afford it and high being the customers want the product and also can afford to pay for your product upfront
14. Can you please specify which revenue model your company has adopted and WHY? *Ownership revenue model or Service revenue model*
15. What are some of the revenue appropriation mechanisms that you employ?
16. Why is it that you have chosen to adopt the ownership revenue model instead of service revenue model or vice versa, when this market is essentially characterized by low affordability, in other

words the households have very low income to pay for your product upfront?

- For REC's employing ownership revenue model ?Was it a conscious decision because of the risk of recouping the capital from the poor

17. Below are some of the components of a revenue model, in your ownership revenue model can you please rate **how** relevant are these revenue drivers or components on a scale of 1 to 5.
    - 1= Not relevant
    - 2= Slightly relevant
    - 3= Moderately relevant
    - 4= Very relevant
    - 5 = Extremely Relevant

    And also briefly mention **HOW & WHY** you incorporated these components into your revenue model?

Revenue drivers	Score on a scale of 1-5	How? & What?	Why
Consumer Trust		How you build consumer trust:	Why was it necessary to build trust:
Pricing strategies		1. What kind of a pricing strategy did you develop? Tiered pricing or flat rates or unit rates: 2. Is your pricing strategy based on Willing ness to pay or your competitors price:	Why did you adopt the pricing strategy you mentioned earlier?
Willingness to pay		How did you incorporate the low willingness to pay of your customers?	
Flexibility of payments		How did you incorporate flexibility of	Why do you think flexibility of payments is

	payments:	important in your revenue model:
Number of users		
Revenue sharing	1. Does your revenue model incorporate revenue sharing? 2. If yes, how did you incorporate it into your revenue model?	Why do you think revenue sharing is important or not important?
Size of payments	How have you incorporated this in your revenue model?	Why do you think it is important?

18. Can you think of any other revenue drives, which is essential to your revenue model?

A3: Case data

The case data that was obtained was elaborate therefore only the data on revenue drivers is made available.

Table 8: Answers from the interviewee regarding the relevant revenue drivers

Components	SIMPA	MGP	Rural Spark	Onergy
Consumer Trust	Moderately Relevant	Not Relevant	Very Relevant	Very Relevant
Suppliers Trust	Very Relevant	Very Relevant	Not Relevant	Not relevant
Pricing Strategies	Very Relevant	Very Relevant	Very Relevant	Very Relevant
Willingness to pay	Relevant	Not Relevant	Moderately Relevant	Slightly Relevant
Flexibility of payments	Very Relevant	Not relevant	Very Relevant	Not Relevant
Number of users	Relevant	Moderately Relevant	Not relevant	Slightly Relevant
Size of payments	Very Relevant	Very Relevant	Very Relevant	Very Relevant
Service customization	Very Relevant	Not Relevant	Moderately Relevant	Very Relevant
After sales maintenance/service	Very Relevant	Very Relevant	Very Relevant	Very Relevant
Discounts	Not Relevant	Very Relevant	Not Relevant	Not Relevant
Revenue Sharing	Not relevant	Not relevant	Currently: Not relevant Future: Very Relevant	Very Relevant
Consumer financing	Not relevant	Not relevant	Not relevant	Not Relevant

A4: Key differences between cases

Characteristics	SIMPA	MGP	Rural Spark	Onergy
Type of DSE	Solar home system	Micro-grid systems	Solar home system	Array of DSE's
Customers	Rural towns and villages	Rural hamlets	Rural towns, villages and hamlets	Rural towns and villages
Platform	Product and service platform	Service Platform	Product and service platform	Product Platform
Partnerships	None	None	Clients	Micro finance institutions
Ownership	Customer owns the product after repayment of the loan	Customer does not own anything	Clients own the product.	Customer owns the product
Local village entrepreneurs	Required	Required	Required	Not Required
Revenue streams	Pay as you go and down payments	Pay per week	Upfront payments for the products	Up front payments for the product
Financing source	Social impact investors and grants	Social impact investors and grants	Social impact investors and grants	Social impact investors and commercial capital
Access to commercial capital	After 2-3 years of reliable revenues	After 5 years of reliable revenues	Already available	Access available