

STRATEGIC MARKET APPROACH FOR ENTERING THE INDIAN SOLAR WATER PUMP MARKET.

Plan the marketing strategy for solar off-grid applications

LAHTI UNIVERSITY OF APPLIED
SCIENCES
Master Programme in International Business
Management
Master's Thesis
01.12.2011
Khalil Almanasreh

Lahti University of Applied Sciences
Master Programme in International Business Management

ALMANASREH, KHALIL SULIMAN: Strategic market approach for entering
the Indian solar water pump market.

Master's Thesis, 101 pages, 6 Appendixes

01.12.2011

ABSTRACT

This study examines the strategic market approach for investing in solar water pumps market (SWP) in India, and Punjab state as a business case. The main research question is: What is an appropriate strategic market approach to invest in solar water pump market in India? The study focuses on the marketing strategy and strategic planning to enter the Indian market.

The thesis follows the qualitative study design where the data was collected by observing the market and interviewing main stakeholders and possible customers of SWP.

The theoretical framework discusses the corporate strategy theory and its link with marketing strategy and strategic planning for companies. The theory provides the required tools which will be used in the study; those tools are essential to analyze, formulate and plan the business marketing strategy. Marketing strategy takes its place as the most crucial element in developing the business strategy, and as a result of strategic planning.

The market is attractive and the government related agencies announced a national mission to increase investments in solar off-grid applications where SWP is one of them. Besides, the Indian government aims to exploit the country's abundant solar power, sustain irrigation and reduce dependence on fossil fuels.

The target segments are the users of diesel pumps and the users of electric pumps with diesel pumps as a backup. The price of the final product is benchmarked by the Ministry of New and Renewable energy (MNRE). However, the solar companies can strategically develop a lease agreement with those who can't afford the system's initial cost or involve international organizations to finance such projects. The Marketing mix principle is mix and match the system design for individual farm. The recommended entry mode invests directly to the market through Wholly Owned Subsidiary.

Key words: Marketing Strategy, Renewable Energy, Solar Water Pump, Off-Grid applications, Solar Power System Providers, Solar Companies.

CONTENT

1	INTRODUCTION	8
1.1	Background	8
1.2	Research objectives, questions and limitation	11
1.3	Research approach	13
1.4	Suggested business case	14
1.5	Technology reliability and feasibility	16
1.6	Research structure	20
2	THEORETICAL FRAMEWORK OF MARKETING STRATEGY	22
2.1	Corporate strategy formulation	22
2.2	Marketing strategy and Statement of objectives	24
2.2.1	Situation analysis	25
2.2.2	Threats and opportunities analysis	26
2.2.3	Marketing goals and objectives	27
2.2.4	Developing the marketing strategy	27
2.2.5	Marketing mix	29
2.2.6	Marketing control	32
2.2.7	Action programs	33
2.2.8	Contingency plan	33
2.3	Business model	34
3	RESEARCH METHODS AND CONTEXT	35
3.1	Research design and approach	36
3.2	Phases and structure of the research	38
3.3	Data collection	39
3.4	Data analysis and interpretation	40
3.5	Research ethics	42
4	DEVELOPING THE STRATEGIC MARKET APPROACH	43
4.1	Current market situation	44
4.2	Marketing objectives	46
4.3	Recommended primary activities	48
4.4	External environment analysis	49
4.5	Stakeholders mapping	70
4.6	Threats and opportunities	73
4.7	Segmentation of Indian farmers	74

		3
4.8	Marketing mix	81
4.9	Entry mode	90
4.10	Proposing the possible business model	95
5	CONCLUSIONS	97
5.1	Recommendations for market strategy and business model	100
6	REFERENCES	102
7	APPENDICES	118

LIST OF FIGURES

Figure 1: Map of Punjab and its districts	15
Figure 2: Working principle of solar water pump system and its components	17
Figure 3: Comparison of Life Cycle Cost LCC and Operating Life OL of DP and SWP.....	19
Figure 4: Research Structure.....	21
Figure 5: Environmental scan tools	24
Figure 6 : Targeting Market concentration.....	28
Figure 7: Pricing decision factors	30
Figure 8 : Stages of the research process	36
Figure 9: Research deductive and inductive approaches	38
Figure 10: Indian Energy Basket	44
Figure 11: Main internal resources to approach the Indian market.....	47
Figure 12: Diesel pump in the field.....	58
Figure 13: Electric pump run on diesel as a backup.....	58
Figure 14: SWP in the field backed up by electricity.....	60
Figure 15: An electric pump motor run on solar energy	61
Figure 16: Project arrangement	63
Figure 17: Project financing procedure.....	65
Figure 18: Demand and supply of PV modules	67
Figure 19: Porter`s five forces of the industry	70
Figure 20: Business stakeholders` grid	72
Figure 21: Farmers willingness to buy the product	81
Figure 22: Source of information	88
Figure 23: Entry modes control and risk trade off	92
Figure 24: Expected adoption curve of SWP	96

LIST OF TABLES

Table 1: Cost comparison between Diesel, electric and SWP of 900 Wp	19
Table 2: Cost comparison between diesel, electric and SWP of 1800 Wp	20
Table 3: Strategy development process	23
Table 4: Current Status and JNNSM phases	45
Table 5: Market objectives linked to JNNSM phases	48
Table 6: PESTLE structure	50
Table 7: Indian main macroeconomics indicators	54
Table 8: Indian demographic figures	56
Table 9: Existing product features	60
Table 10: Threats and opportunities	73
Table 11: Sizes of land holding in India and Punjab state	76
Table 12: Famers' attitude toward the product	79
Table 13: Product mix	83
Table 14: Lease agreement installments	86
Table 15: JV advantages and disadvantages	93
Table 16: WOS advantages and disadvantages	94
Table 17: Estimated cost and profit margin	97

LIST OF ABBREVIATIONS

AC	Alternative Current
B2B	Business to Business
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CFA	Central Financial Assistant
DC	Direct Current
DP	Diesel Pump
EP	Electrical Pump
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ha	Hectare
hp	Horse Power
INR	Indian Rupee
IREDA	Indian Renewable Energy Development Agency
JNNSM	Jawaharlal Nehru National Solar Mission
JV	Joint Venture
kW	Kilo Watt
kWh	Kilo Watt Hour
MNRE	Ministry of New and Renewable Energy
MS	Marketing Strategy
MW	Mega Watt
NABARD	National Bank for Agriculture and Rural Development
NGO	Non-governmental Organization
PA	Project Administrators
PAC	Project Appraisal Committee
PEDA	Punjab Energy Development Agency
PEDA	Punjab Energy Development Agency
	Politic, Economic, Society, Technology, Laws,
PESTLE	Environment
PR	Public Relation
PV	Photovoltaic
R & D	Research and Development

RE	Renewable energy
SNA	State Nodal Agency
SPV	Solar Photovoltaic
SSP	Solar Power System Provider
SWOT	Strengths, Weaknesses, Opportunities, Threats
SWP	Solar Water Pump
USD	United States Dollar
W	Watt
WOS	Wholly Owned Subsidiary
Wp	Watt peak

1 INTRODUCTION

The thesis investigates the strategic market approach to invest in solar water pump market in Punjab state as a business case and India as a target market. The background of the study represents the reason behind carrying out this study. The objectives and the research question show the study perspective. The research methodology provides the design of this study. The research limitation identifies the boundaries of the research. The theoretical framework discusses the related theories to the empirical part and introduces the tools which we should use to answer the research questions.

1.1 Background

Finland is one of the leading countries in technology and innovation. New technologies require a new marketing strategy and business model. The challenge arises when firms plan to enter new foreign markets. Therefore, countries create programs to serve those firms which aim to invest abroad usually those programs produce only desk researches. For example, since the 1950s, the Ministry of Foreign Affairs of Finland has created policies and services in order to support companies to enter new markets [formin.finland.fi, 2010]. Also, Finnish companies formed an association called Finpro in order to assist small and medium enterprises to grow globally.

In September 2010, Finpro's President, Kari Häyrynen underlined that, *"People's needs, legislation, business models and technologies are developing at an ever increasing rate, and the growing influence of consumers is increasingly fracturing business globally. It is essential that companies view the world in a new way so that they can seize the emerging business opportunities"* Thus, Finnish companies must be aware of the customer's needs. Technologies and business models are fast

developing globally and companies should be adaptive to those changes in order to grab the business opportunities.

India is one of the attractive foreign markets, particularly its energy sector, because of the following reasons; India tries to adopt new technologies, exploit its abundant renewable resources, attempt to fuel its economic growth and satisfy people's growing demand for energy. Companies' core strength in renewable energy has an opportunity to invest in the Indian energy market. Finland has competitive edge in clean technologies which is needed in Indian markets [ibrnews.org, 2010].

The big reason behind choosing India as a target market is the Indian government's high interest in developing the country's renewable energy sector. It has one of the world's largest programs in solar energy [direc2010.gov.in, 2010]. This study focuses on the solar water pumps (SWPs) as a practical solutions to promote sustainable power source for irrigation and farming in India, and reduce the country's dependence in fossil fuel and decrease its energy deficit. The research is also needed for Finnish renewable energy companies to enter new markets, plan their marketing strategy and business model to be able to grab the emerging business opportunities.

Farming is rooted in Indian culture and agriculture is the backbone of the Indian economy. Mahatma Gandhi has said a century ago "*India lives in villages and agriculture is the soul of Indian economy*". Agriculture contributes up to 17.5% of GDP. It hires more than 50% of the labor force. It is considered the largest economic sector in the country. In spite of this, it is the third GDP contributor after services and industry [pteducation.com, 2010]. Agriculture covers more than 60% of the whole country area [Parvaiz., new-ag.info, 2011]. Farming depends on irrigation which relies on pumping water from wells, ponds, and rivers. The irrigation land in India is about 1.5 times size of Finland. Punjab state is one of the most irrigated states and has the highest number of tube wells in whole India.

The need for water at the right time to irrigate crops has forced farmers to use either electric pump (EP) in case the farm is connected to a grid or diesel pump (DP) if the farm is far away from the grid. That creates three problems. First, using EPs has increased the demand for electricity. Second, the price of diesel raised the running cost of the DPs. Third, the using of DPs and EPs generate a huge amount of emissions and pollution.

The farmers' electricity charges in Punjab are much cheaper than the diesel but unreliability of electricity influences irrigation and farming. The EP connected to the grid became a burden rather than solution because of the following facts. The demand for electricity is growing exponentially; as a result of fast economic and population growth, "India's power supply-demand gap has averaged between 8% and 10% over the last decade where electricity access exists" [direc2010.gov.in, 2010]. The gap will continue in future. "India's each percentage increase in GDP needs 1.5% increase in power generation. So, GDP growth of 7.5-8% needs increase in power generation by 11.5-12% [karnbanker.com, n.d]. "Irrigation water pumping is the second most important commercial energy in Indian agriculture after land preparation" [Purohit et al., hwwi.org, 2005]. In addition, the current power sources depend heavily on fossil fuels, mainly coal, which has a high cost financially and environmentally.

Solar water pump (SWP) is the best solution to reduce the country's electricity demand (if the farm is connected to the electric grid) sustaining Indian farming and reducing the country's emissions. Also, the SWP is the best choice to replace the DPs. It is a good practice of implementing sustainable technology not only in crops irrigation but also for any other purpose it can be used for, such as household usage, filling pools, water fountain and garden watering.

The SWP is a sustainable technology which combines sun and water; it is a perfect match of life fact. **Water is the most needed, when the sun shining is the strongest.** The SWP market is enormous and it can reduce the Indian energy demand if adopted widely. The market potential comprises 21 million irrigation pumps out of which over 9 million run on diesel and 12 million are on the

electricity grid. [pvgroup.org, 2009] the market so far adopted only 7045 solar water pumps because:

- The affordability of the current market segment is low
- The market mix of the local companies doesn't satisfy the different farmers' needs
- Farmers' negative perceptions of the product because the existing product is not suitable for deep wells and the system capacity is getting lower over time.

Based on the background and previous research, the author determined this research is crucial for foreign companies which are looking for international opportunities in SWP in India. The research will assist them to unpack the business opportunity in the Indian RE market and change how the SWP market is currently working. On the other hand, the research aims to identify an appropriate market strategy to speed up the adoption rate of SWP among Indian farmers.

The core of this study will plan the appropriate marketing strategy and propose a business model for solar power companies to enter the Indian market. The product is SWP. The target market is the users of irrigation pumps. The researcher will use solar power system provider SSP to describe the solar companies designing the solar projects.

1.2 Research objectives, questions and limitation

Main Objective:

- Plan the strategic market approaches for solar companies to invest in the Indian solar water pump market.

Sub-Objectives:

- To analyze the current market situation
- To understand the process to invest in solar off-grid applications
- To find the right market segments of the business
- To propose the possible marketing mix offerings
- To recommend the right entry mode

Main research question

- What is an appropriate strategic market approach for foreign companies to enter the solar water pump market in India?

Sub- questions

- What is the appropriate strategy to promote using the SWP among Indian Farmers?
- How can the marketing strategy be linked to the business general strategy with respect to the SWP businesses?
- What are the elements of marketing strategy?
- How do firms plan their marketing strategy?

Research discussions

- How can the solar water pump system replace electric and diesel pumps?
- What is the market demand for SWP?
- What are the factors influence the demand of the SWP?
- What are the possible marketing mix offerings?
- How is the market organized between competitors?
- Who are the possible stakeholders of the business?

Limitations

The research will be limited to Punjab state of India. The state was chosen because Punjab is the main agricultural state in India. It will be impossible to carry out a research that covers the whole India and population. The limitation was implemented to choose an area that depends mainly on farming and using tube wells for irrigation. In addition, we can't interview all target farmers in Punjab state.

The sample will cover users of electric and diesel pumps. Also, early adopters of the SWP will be included in the sample. The farmers will be categorized according to the pump type and the farm size. Thus, the information will be

generalized and reliable. We will try to interview solar power companies especially the companies which sell solar off-grid applications.

The study will plan the marketing strategy for solar companies, identify key stakeholders and propose a possible business model. The Solar off-grid applications in this research are street lights, solar lantern, solar water pumping and standalone solar home lightening.

Despite the focus on Punjab state, the research methodology, analysis and results are applicable in other Indian states. There will be a brief description for the mechanical and technical structure of the SWP.

1.3 Research approach

This study follows the qualitative design which is suitable to study business and management. Qualitative design allows investigating business issues in depth. Also, it is an appropriate for answering the research questions which they are about describing and explaining the business and the market. Statistics are used to show patterns and relationships among variables.

Qualitative design research gives the researcher more flexibility in terms of survey questions; it allows interacting and asking new questions during interviews. Deductive method is applied in the theoretical framework where theory leads to information and inductive method is applied in the empirical part where information leads to recommendations.

Research information are collected from secondary sources such as academic books, studies in international business, reports of Indian energy resources, and related authorized websites. Primary data is collected by interviewing business stakeholders such as farmers, solar power companies, government authorities, and financing agencies.

1.4 Suggested business case

Punjab state derived its name from Persian. Panj means five and an aab means river. Because of the five rivers and fertile soil the agriculture is the dominant sector in the state [punjabonline.com, 2011]. The state has a remarkable history especially in the Indian green revolution. It is well known as “The Food basket and Granary of India” [newglobalindian.com, 2011]. It is located in the northern west of India. Chandigarh is the capital of Punjab and Haryana state as well. It is a bit hard to distinguish between Punjab and Haryana especially in farming and agriculture. The capital is the only planned city in whole India. It is clear the level of urbanization there than any other city in India.

The presumption was suggesting Punjab as a business case but during the field trip, researcher found out the similarity between Punjab and Haryana state. Furthermore, both states share the same capital and many governmental institutions. The researcher will focus in Punjab and indicate Haryana state when is needed. Consequently, solar company can approach both states as business cases then can plan the long term strategy to cover most parts of India.

The state of Punjab covers an area of 50 362 km². The population is more than 24 million, above 70% of them involved in agriculture. [punjabgovt.nic.in, 2011] in spite of, the size of the state represents only 1.5% of India. The state contributes 23% of the wheat, 14% of the cotton and 10% of the rice of the whole country's production. The per capita income is one of the highest in India. [whereincity.com, 2011] the state has 20 districts divided to blocks. The map shows the state and its districts. The interviewed farmers are from the southern districts Rupnagar, Fatehgarh, Patiala, Sangrur and Mansa.



Figure 1: Map of Punjab and its districts

[Punjab-state.com, 2011]

The state enjoys the sunshine at least 330 days a year with good insolation level. This energy can be utilized for electric use. The state main power sources are through conventional thermal and hydro power generation. The using of coal is not only costly but also is pollutant. *“The State is endowed with vast potential of solar energy estimated at 4-7 kWh/m² of solar insolation levels”* [usea.org, 2008]

Since 1960 the government of India has used new technologies in state of Punjab. The state was able to jump ahead of other states and be the hero of the green revolution. Digging wells and pumping water were and still the major source of irrigation in the state. More than 84% of the state land is under cultivation [Sidhu., global.ucsb.edu, 2005] almost every farmer uses a water pump either electric or diesel. *In 1984-85, more diesel pump sets per lakh (=10⁵) hectare of gross cropped area and per lakh operational holdings were installed in Punjab than in any other state in India.* [Kohli et al., people.ucsc.edu, 1995]

The early adopters of SWP were in Punjab state. In 2000/2001 the MNRE of India subsidized the first project of installing SWP in Punjab. During the project 500

pumps powered either by 900 watts and 1800 watts arrays were installed. “*Government statistic in 1997-1998 shows there are more than 975 000 tube wells out of which 750 000 had electric pumps and 125 000 were powered by diesel generators*” [enviroscope.iges.or.jp, 2004]. However, how can this market be approached not only in Punjab state but also in whole India? And how solar companies can plan their marketing strategy?

1.5 Technology reliability and feasibility

The sun power can be transformed from one type of energy to another. For instance, the sun radiation can be trapped or collected to solar panels to produce electricity. The electricity power strength depends on size, quality, and technological level of the solar panel. Also, the sun availability is essential to produce electricity. So, at nights and the days when there is no sun light, the electricity will not be produced. However, battery storage for the electricity power can be solution for times when there is no sun light that will increase the cost of using this energy. On other hand, the need for water is less in cloudy days. [aurore.in, 2002].

The two major types of PV technologies are Crystalline Silicon and Thin Film. The silicon based technology is more efficient but more expensive. The thin film is promising technology and much cheaper but less efficient. However, the less efficiency of Thin film doesn't mean less performance but it require more panels to produce the same amount of electricity as silicon based technologies [aurore.in, 2002].

In India, the most used solar panel sizes are 35 Watt peak (Wp) and 75 Wp. The PV module is the assembly of PV panels. They can range from few watts to more than 150 watts. Connecting the PV modules make the PV array. [aurore.in, 2002] Those vocabularies will be used during the research for different purposes.

SWP depends on the same logic of using solar panel to produce electricity. Solar panel or the photovoltaic absorbs the sunlight, that effect produces a flow of electrons. “Electrons are excited by particles of light and find the attached electrical circuit the easiest path to travel from one side of the solar cell to the other. Photovoltaic or solar electric cells convert sunlight directly into electricity. This electricity is collected by the wiring in the module, and then supplied directly to alternative current (AC) power pump or to the direct current (DC) pump controller and motor, which, in turn, pumps water whenever the sun shines” [kyocerasolar.com, 2002]. The following figure shows the basic SWP structure.

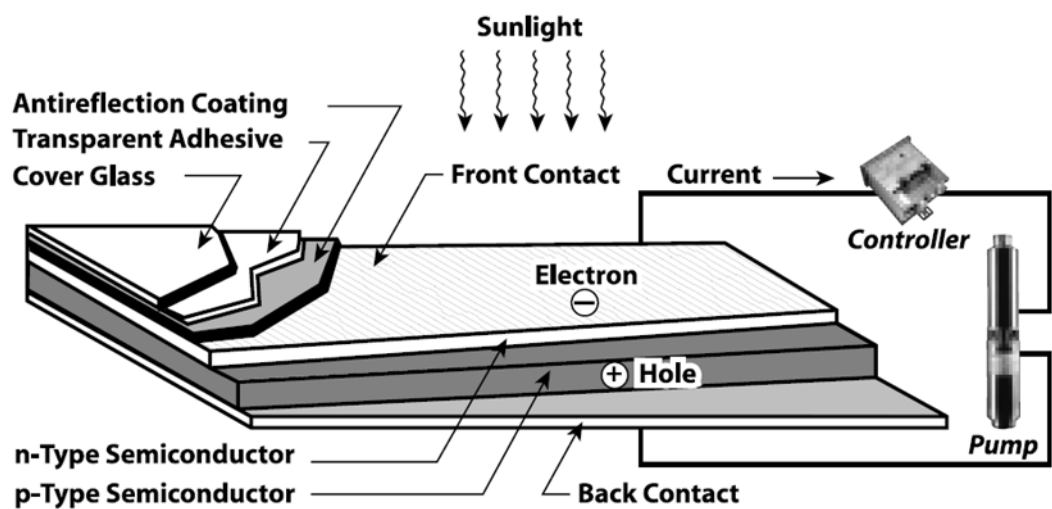


Figure 2: Working principle of solar water pump system and its components

[kyocerasolar.com, 2002]

The system is usually used without battery storages for electricity. As seen in the above figure, the pump is connected directly to the PV array, which leads to maximum use of electricity. But, what can be done if sun is not shining and we need water, there are many solutions. First, the system can pump water to storage tank where it can be used later for irrigation. Second, the pump of solar systems can be powered by grid electricity in case the pump is designed for that, and you are connected to grid. Third, there is a SWP designed to use diesel as a backup.

Sizing is the process to find the optimal pump size in order to satisfy the water demand. The SWP is classified by the PV array capacity. The available systems in many countries vary from 300 Wp to more than 5 kWp. The ones widely used in

India are the 900 Wp and the 1800 Wp. designing the right pump size involves collecting data about:

- “The water demand of site. Water demand can be measured by size of the land and type of crops.
- The depth of water source or water head such as river or well
- The hydraulic load (m^4) by multiplying overhead with required amount of water in m^3 .
- Estimate the PV array size by using the following equations:
 $W = mgh$, where W is energy in Joule, m is the mass of the water in kilograms, g is the constant of gravity (9.81 m/s^2), and h is the head in meters. Then power in watts can be found by $P = \frac{W}{t}$, where t is the time in seconds”. [Bjarnegard et al., palangthai.org, 2011]

Feasibility and Reliability: Many studies have been published in different times show the reliability and feasibility of SWP. Introducing them will give an idea about how the product is feasible even when the price of oil was only 11 USD. Recently, the prices of the solar cells and the new system technologies make the solar applications more attractive than before:

- In 1998 when the barrel of oil price was as low as 11 USD, a study was conducted by Sandia National Lab in Mexico of 3 different sized solar pumping systems (106 Wp, 848 Wp, 1530 Wp) which showed that all had lower life-cycle costs than diesel-powered pumps. The SWP versus DP had paybacks of 2 years, 2.5 years and 15 years respectively when replacing gas or diesel pumps. [self.org, 2008: p 7]
- After 2006, the barrel of oil was an average 58.30 USD. The study is quite interesting because an Indian made DP type Kia and Kirloskar available in the Namibian market were compared with certain type of SWP such as Lorenz PS (Germany brand), Grundfos SQ Flex (Danish Brand). The power of solar arrays range from small 300 Wp to 5600 Wp. The study

matched the power level with different water over head from 100 m to up 230 m. The idea is to find the best combination between the power and water table in order to identify the optimal pump size with optimal overhead. The typical years to breakeven of a single case (Grundfos SQ 1400 Wp) is a bit more than 2 years. As shown in the figure, the breakeven point and the cost behavior over time. The price of the Grundfos SQ pump was close to €9000. [self.org, 2008: p 7] The study pointed out “for every 10% increase in fuel costs, there is a 5% reduction in the years to breakeven. So, a SWP that broke even in 2.5 years in 2006 now breaks even in 1.75 years”. [self.org, 2008: p 7]

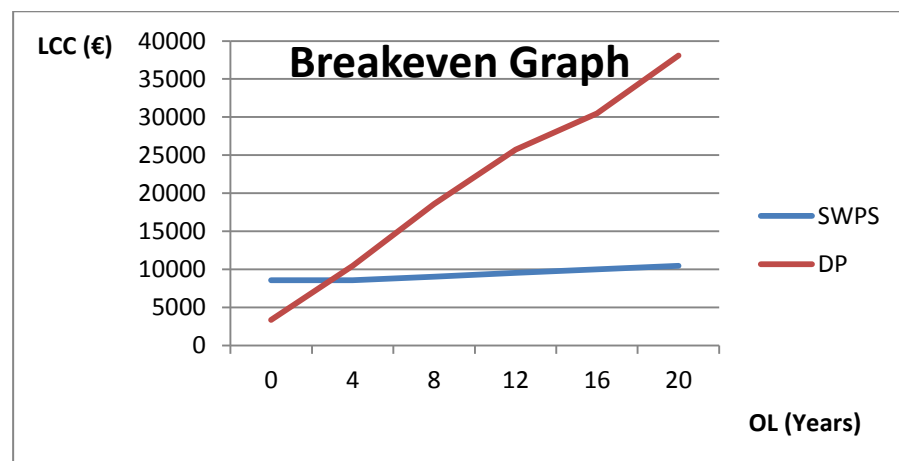


Figure 3: Comparison of Life Cycle Cost LCC and Operating Life OL of DP and SWP

Adapted from [self.org, 2008: p 7].

- The latest study has compared the diesel and the electric pump used in India with 900 W and 1800 W SWP. The following tables show the cost per kWh in each case. [Raghavan et al., cstep.in, 2010: p 77] (€1= 64 INR)

Table 1: Cost comparison between Diesel, electric and SWP of 900 Wp

Pump set	Capital Cost (€)	Operating Cost / Year (€)	Net Present cost (€)	Cost per kWh (€)
SWP	4057	23	4590	0.13
Electric	468	34	1243	0.035
Diesel at € 0.65	390	321	6337	0.18
Diesel at €0.78	390	377	7368	0.21

[Raghavan et al., cstep.in, 2010: p 77]

Table 2: Cost comparison between diesel, electric and SWP of 1800 Wp

Pump set(€)	Capital Cost(€)	Operating Cost / Year(€)	Net Present cost(€)	Cost per kWh(€)
SWP	8739	25	9307	0.11
Electric	468	49.5	1594	0.02
Diesel at € 0.65	390	711	13434	0.17
Diesel at € 0.78	390	840	15810	0.20

[Raghavan et al., cstep.in, 2010: p 77]

“In terms of saving in diesel approximately 185 billion kg and 470 billion kg of CO² yearly can be saved by changing only 50% of the existing 9 million diesel pump sets in India” [Raghavan et al., cstep.in, 2010: p 77].

End-user` s perceptions

The perceptions of SWP are gathered through the interviews. The main concerns of customers are:

- The efficiency and strength of the system to satisfy the water demand.
- The high initial cost.
- The SWP ability to pump water from more than 10 m water table.
- The backup if needed in cloudy days or at night.
- The product after sales services and maintenance.

Nowadays, these perceptions can be changed easily because there are efficient SWPs which can satisfy different water demands. The cost of solar panels is decreasing. That will lead to lowering the initial costs. The SWP developers were able to pump water from more than 200 m water overhead. [self.org, 2008] the storage tank is widely used in India and it can be utilized for backing up using the SWP.

1.6 Research structure

The structure of this research will follow the stages of the study. There will be five chapters. The first chapter covers introduction, background of the study,

objectives, research questions, limitation, and research design. An introduction of the business case is included in this chapter, in this case Punjab state/ India. There is a brief description of the technology that includes a listing of main previous studies related with feasibility and reliability of the SWP.

The second chapter discusses the theoretical framework of the study. Theories relate with corporate strategy and marketing strategy will be introduced. The tools to approach the research main question will be according to the theoretical framework. Furthermore, the business model and entry mode theories will be discussed briefly.

The third chapter describes the research approach and methods which were applied to collect and analyze data. The fourth chapter argues and discusses the empirical part of the study. The data is collected from selected farmers, main stakeholders, and local people. The main aim of the empirical part is to segment the market into main categories finds the patterns of buying behavior and uncovers the possible stakeholders. The last chapter will be the research conclusion, recommendations. The following figure illustrates the research structure and its main sections.

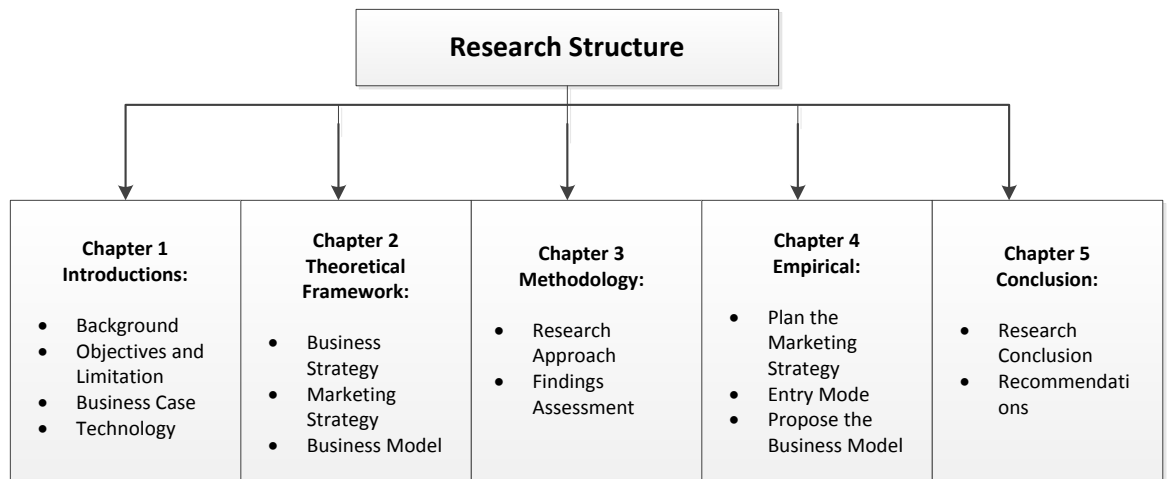


Figure 4: Research Structure

2 THEORETICAL FRAMEWORK OF MARKETING STRATEGY

The research is about planning a strategic market approach for foreign solar power companies to invest in solar water pump market in India. The process to develop the suitable marketing strategy plan has to be based on the company overall or general strategy. Consequently, In order to create your own marketing strategy (MS) you need first to link it to the business overall strategy.

Formulation of the business overall strategy required certain stages and tools which also are needed to plan the MS. The theoretical framework discusses the corporate strategy and its relation with planning the business marketing strategy. The difference among corporate strategy levels will be ignored because of the focus on the marketing strategy. So, corporate strategy and business strategy will be considered at the same strategy level.

2.1 Corporate strategy formulation

“Strategy without tactics is the slowest route to victory. Tactics without strategy is the noise before defeat” [Kaplan et al., 2008: p 10].

Strategy was used to describe military operations. It came from Greek word strategos. The simple meaning of the word is “what the general do” [Fifield., ftp.monash.edu.au, 2007] However, adapting the concept for businesses usage redefined the term for wider and more comprehensive meaning. It can be described shortly as the long-term direction of an organization [Johnson et al., 2008: p 2]. Also, Strategy can be defined as the steering wheel of the business toward its goals and objectives.

Designing the process of strategy development carefully will drive the business toward its goals and objective. The process contains three stages. The company has to clarify mission, values, and vision then conduct business environmental

strategic analysis. The process closes by formulation the strategy. The following table shows each phase with its analysis tool [Kaplan et al., 2008].

Table 3: Strategy development process

Strategy Development Process	Representative Tools
Clarify Mission, Values, and Vision Why are we in business?	Mission, values, vision
Conduct Strategic Analysis What key issues affect our strategy?	Environmental scan (PESTLE) Internal analysis (Value chain analysis) Competitive scan (SWOT)
Formulate the Strategy How can we best compete?	Strategy methodologies (Choose the strategy approach)

Adapted from [Kaplan et al., 2008: p 38]

The strategy development process shows the phases which are needed to build a strategy. The marketing strategy is the core of this study but we can't study MS unless we investigate the overall company strategy formulation. Before framing the strategy, the business must start by answering a core question why are we in business? The answer is the company statements of mission and it should involve the customers of the business [Kaplan, R.S. et al., 2008]. Values are related to the business behavior toward its customers. Vision sets the goals of the business for mid to long term. [Kaplan et al., 2008]

The market base of mission statement defines the goals and **objectives** of the company. The mission should reflect the marketing objectives of the company. Values are the guide of business; usually display the company action toward their stakeholders and their customers. Both mission statement and values are stable for longer time than vision. [Kaplan et al., 2008] the vision statement should reflect the marketing orientation of the company.

The PESTLE stage provides the context for corporate strategy. The analysis tools for market and the business environment consist of market scanning. In this study, India is the target market. An external analysis should be conducted in order to generate new strategy for new market. A **Political, Economic, Social,**

Technological, **L**egal and **E**nvironmental (PESTLE) framework is an effective tool to understand the market macro environment. Furthermore, Michael porter's five forces are used to analyze the industry and the competitiveness level where the business is operating and marketing its products and services.

The internal analysis assists us to understand the company capabilities and performance. The value chain analysis is a tool to conduct an internal analysis. It shows the company steps to deliver products or services. [Kaplan et al., 2008]. The summary of internal and external environmental analysis can be done by using the SWOT table (**S**trengths, **W**eaknesses, **O**pportunities, and **T**hreads). SWOT is a powerful tool to map out all factors that influence on the company strategy and marketing strategy. The following figure illustrates the environmental scan structure.

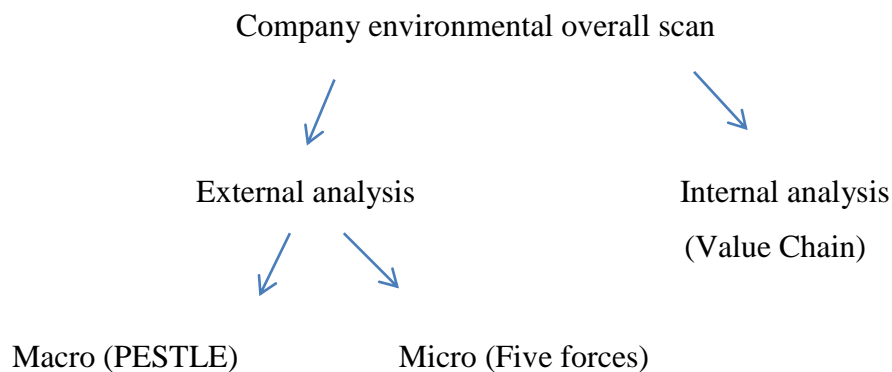


Figure 5: Environmental scan tools

The last stage deals with closing the loop and formulation the overall business strategy. It starts by choosing the strategy approach that suits the company's mission, values and vision. The approach to do so must be according to the external and internal environmental analysis. [Kaplan et al., 2008]

2.2 Marketing strategy and Statement of objectives

Marketing strategy (MS) is *“the marketing logic by which the business unit hopes to achieve its marketing objectives”* [Kotler et al., 2004: p59].

Marketing strategy is a part of the corporate strategy and the importance of the MS compared to the overall business strategy is getting more with the company size getting smaller. Mission statement should be a market oriented. [Kotler et al, 2004: p 59] Also, it has to be turned to a list of objectives and goals. For instance, business objective is to enter new market then the MS should match the business objective. “The mission leads to objectives those are business objectives and marketing objectives. Based on the marketing objectives the organization must develop the MS”. [Kotler et al., 2004: p 60].

Companies must plan their marketing strategies according to the company overall strategy. The plan elements are derived from the process of developing the corporate strategy. Further steps have been added to fit into the marketing strategy:

- Current market or situation analysis
- Threats and opportunities analysis
- Marketing goals and objectives
- Develop marketing strategies
- Action programs
- Marketing control
- Contingency plan

Adapted from [Kotler et al., 2004: p 60] and [Marshall et al., 2010: p 35]

2.2.1 Situation analysis

The situation analysis investigates the current market environmental situation. The analysis tools are PESTLE, competitive scan and firm capabilities and resources. The tools can be described as follow:

- External Environment Factors: at this level the analysis focuses on (PESTLE) aspects of the target market. A competitive scan is required to map out your competitors. The industry competition can be analyzed by introducing the forces which they control the market. [Marshall et al, 2010: p 44] Those forces are:

- ✓ Threats of new entrants
- ✓ Rivalry among existing firms
- ✓ Threats of substitute products
- ✓ Bargaining power of buyers
- ✓ Bargaining power of suppliers

“The stakeholder power such as governmental agencies, interest groups and local communities can be a strong force to attract or increase number of players in certain industry especially when the industry is related to sustainable and clean technologies.” [Marshall et al., 2010: p 44]:

- Internal Environmental Factors: include the value chain analysis and company capabilities. In this research, there is no a case company to conduct internal analysis. So, The value chain will be as description and recommendations for only the primary activities:
 - ✓ Inbound activities: sourcing raw material.
 - ✓ Operations: the process to produce the final products
 - ✓ Outbound logistics: distribution the final product.
 - ✓ Marketing: communication with the market place.
 - ✓ Services: customers service before and after.

2.2.2 Threats and opportunities analysis

Threats and opportunities are external origin factors. They are important to understand the market environment. Studying the market will introduce the threats and the opportunities. Both have major effect on the marketing strategy. Threats and opportunities are derived from PESTLE framework and Porter`s forces, they are needed to plan the long term marketing strategy and develop the company general strategy.

The solar company approaching this market should analyze their internal capabilities through the value chain analysis. That will continue the SWOT table

by adding the internal origin factors Weaknesses and Strengths. The researcher will try to describe the minimum level of technology and capabilities which required for competing in this market.

2.2.3 Marketing goals and objectives

The company should set goals and objectives for the MS. Objectives must be related with the company overall strategy but represent a different level. For instance, our goals are selling certain amount of this product and get market share of 10%. This level of objectives is concerning only the marketers. It is a must to have them in order to measure the marketing plan performance. The overall strategy objectives can be enhancing the company marketing growth or the company will increase its market share. According to project management tools, the goals and objectives should follow the SMART rule which stand for:

- Specific: they should be precise
- Measurable: they are quantifiable
- Achievable: they are possible
- Realistic: they are real
- Time-Framed: they are within a time limit

2.2.4 Developing the marketing strategy

The purpose of marketing strategy is to achieve the marketing goals and objectives. Also, marketing strategy enables the business to respond to threats and opportunities. [Kotler et al., 2008: p 59] The elements of the marketing strategy are market segmentation, target marketing and competitive positioning and product – market strategies [Marshall et al., 2010: p 35]

Users of SWP are mainly farmers. The main usage for the SWP is irrigation, animal husbandry and household drinking. The research limitation is the irrigation usage. Farming is a business in nature and behavior. Consequently, the market

segmentation criteria and variables of business to business (B2B) will be used in general.

“Market segmentation is the process to divide a market into smaller markets based on common characteristics” [Marshall et al., 2010: p 238]. Segmenting the market is essential to satisfy the customers’ needs and wants. There are many criteria for dividing the market into smaller groups. The groups must share some common features. The most famous criteria for B2B market segmentation include geographic, demographic, psychographic and behavioral. Each criterion consists of certain variables. For example, geographical variables are the target country, region within the target country, population density and climate. We will apply each criterion and variable in more detail in the empirical part of this study and try to introduce the most profitable group. Market segmentation is useful and important for marketing strategy only if the segment is:

- Measureable: size, purchasing power
- Accessible: reached and served
- Substantial: large and profitable
- Differentiable: respond differently to different marketing mix

The fundamental principle of market segmentation is how this market segment is different than the whole market and how it can respond to a company’s different marketing mix.

“Target marketing is the process to evaluate market segments and choose the most promising one” [Marshall et al., 2010: p 256]. The following figure illustrates the four possible approaches. They start from targeting broadly to targeting narrowly.



Figure 6 : Targeting Market concentration

[Kotler et al., 2004: p 252]

The target marketing approaches give the company two advantages. First, the company decides which approaches to adopt with taking into account the firm capabilities and competitors. Second, the adopted approach allows the company to establish profitable relationship with SWP users and achieve its objectives.

“Positioning the product is the way the product is defined by consumers” [Kotler et al., 2004: p 259]. The company must find the ways and tools to deliver the product and differentiate it from other competitors. It can be done by using the marketing mix. The company must choose a positioning strategy that can create a competitive advantage. Positioning the product against other competitors in terms of quality, price and value are the necessities for the company marketing strategy. The company can differentiate their product by many ways such as price, innovation, product, personnel and convenience leaderships. [Marshall et al., 2010: p263]

2.2.5 Marketing mix

“Marketing mix is one of the important topics of marketing. The idea of this term is generated back in 1948 by James Culliton, he said marketing decision should be the result of something like receipt. The idea of recipe was further refined by Neil Borden and coined the term ‘Marketing Mix’. In 1960's E. Jerome McCarthy elaborates the term in more details by classifying the term into 4Ps concept are product, price, place and promotion”. [sic][soopertutorials.com, 2009]

The marketing mix planning must bring a value for customers and satisfy their need. When marketing mix planned efficiently the company will achieve its marketing goals and objective. Recently, the 4Ps extended to be 7Ps as a result of the modern complicated world and the high competition between companies. The extra 3Ps are People, Physical evidence, and processes. Those are essential when the product without service can't satisfy the customer needs and expectation. Besides, service with product combination has a big influence on the customer buying decision. [sales-and-marketing-for-you.com, 2011]

Product: The SWP is the main product. Service is the activities and benefits offered by the solar companies in this field. “Product is the tangible item that offered by the firm to acquisition, use or consumption that might satisfy the need or want. While, the service is the intangible activities, benefits and satisfactions offered by firm but there is no ownership of anything” [Kotler et al., 2004: p 276].

In terms of products classification based on consumer’s purpose of buying, “the industrial products bought by individual and organization for further processing or for use in conducting a business” [Kotler et al., 2004: p 343]. Also, industrial products are divided into three groups:

- Materials and parts: raw material in terms of farm it will be seeds, fertilizers etc.
- Capital item: industrial product that aid production and operation, include installations. In this case, the SWP and the installation services.
- Supplies and services: operating supplies such as fertilizer and services include maintenance and repair. [Kotler et al., 2004: p 343]

Usually, price and services are the major marketing factors; branding and advertising are less important especially in the farming sector of India.

Price is the amount of money the consumer is willing to sacrifice in order to get certain product and service. “It is the most flexible element of the marketing mix” [Kotler et al., 2004: p 345] price can be changed quickly compare to product features.

The decision of the company to choose among price approaches will depend on internal and external factories. The following figure illustrates those factors in the:

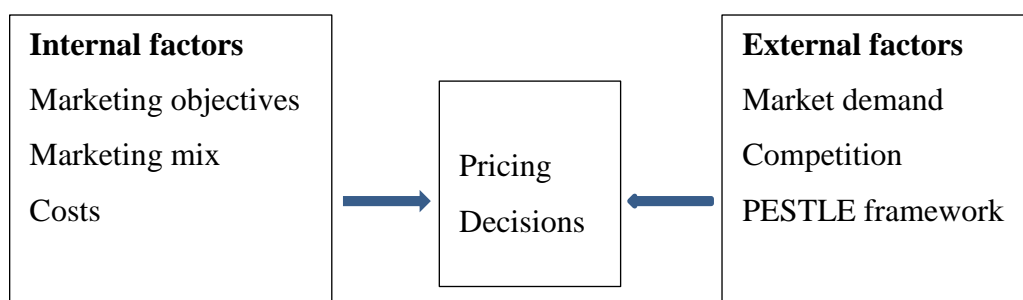


Figure 7: Pricing decision factors

Adapted from [Kotler et al., 2004: p 348]

Place is related to the product channel of distribution from the firm to costumers. The location of distribution channel and the ways to reach your customers are crucial for business. However, in marketing the industrial product for farmers, the location becomes less important. The key factor here is how to reach your market segments and use your distribution channel effectively. The channels of distribution rely on the company strategic goals and entry mode to the target market. The solar company might sell to consumer directly or through agent. For instance, a solar water pump company can choose between sell direct to customers or indirect through middleman. [Marshall et al., 2010: p 415]

The direct and indirect channels are set according to the goals and objectives of the company where the form of the entry mode is the key determinant. For instance, a solar company decides to own a subsidiary in India. That will lead to more flexibility to choose the distribution channel than exporting to an agent. Chapter four will discuss that deeply.

Promotion is the process to communicate with customers [Marshall et al., 2010: p 464]. Promotion is an interesting element of marketing mix. Company's promotion decision relies on the promotion mix. That mix includes advertising, sales promotion, public relation (PR), personal selling and direct marketing. As mentioned earlier, price and service are the major factors influence the buying decision of industrial products. Branding and advertising can play a minor rule in the selling process. Therefore, the PR promotion occurs when a firm builds good relation with publicity and stakeholders. For example, the business should keep a good relation and reputation with the farmer community and government related authorities. Personal selling and direct marketing can be the heart of the promotion mix of SWP in Indian market. Because of simple reason, in India, people are so close to each other and share many personal experiences.

People include every person or persons related to your business. Employees are very important in the extended marketing mix. Employees should be trained and offer a good service.

Physical evidence refers to whatever your customers can see before purchasing. It is connected with customer's experience of doing business with you. Any confusing or misunderstanding of customer want or need lead to bad experience. The atmosphere created by the firm to offer service or selling a product should be carefully designed and reflect a good value for customers. [sales-and-marketing-for-you.com, 2011]

Process is the ways to deliver the product services to end-users. This is essential when the product is an industrial and customers expect high service when they buy the product. The service for customers includes delivery of the product installation services, maintenance, user manual and customer relationship etc.

Any one of those processes influence the MS and sales. A good service leads to better image and growing sales. Customers of industrial product invest relatively high initial capital. So, they expect to get a high standard service and enjoy doing business with your company. [sales-and-marketing-for-you.com, 2011]

2.2.6 Marketing control

Marketing control comes after the planning of the company MS. The firms require measuring the MS performance and achievement. Marketing control is “the process of measuring and evaluation the outcomes of the marketing strategy and taking the corrective action to ensure that objectives and goals are achieved” [Kotler et al., 2004: p 62] this step of planning the marketing strategy is so important because of the following:

- Marketing control measure early enough whether the market strategy in the right tracks or not.
- Marketing control suggest the correction action that include adjusting the market segment, marketing mix, or even the company objective.

- It is effective to measure the gap between the expected and actual happening in the market place. [Kotler et al., 2004: p 62]

Therefore, the marketing control can suggest the correction actions which need to be done to MS and keep it in the track. For instance, the market segment might need to be extended or shrunk. The marketing mix needs a new recipe or the company objectives can't be achieved. All these could be the outcomes of marketing control. [Kotler et al., 2004: p 62].

2.2.7 Action programs

Action programs concern how the firm implements the marketing strategy to the marketplace, how much it will cost and who will be responsible of each action. It is necessary for marketing strategy in order to be successful in the market place. An action program is developed by the company. The marketing control related with correction action and contingency plan. The action programs create the tactics, budget and responsibilities for applying the MS in the real world. [Marshall et al., 2010: p 48]

2.2.8 Contingency plan

This is the final step of the marketing planning. the contingency plan should be exist and implement when is needed. The risks should be classified as the probability of happening during the implementation of marketing strategy. There should be a plan for a worst case, best case, and expected case performance against the forecasts. [Marshall et al., 2010: p 49] Consequently, when expect the best case performance of your marketing strategy the company should apply the best case plan.

2.3 Business model

“Many successful innovations do not rely simply upon new science or technology, but the reorganization of all the elements of business into new combinations. Here innovators are creating whole new business models, bringing customers, producers and suppliers together in new ways, with or without new technologies” [Johnson et al., 2008: p 329].

Business model can be a result of product innovation or process innovation. In practice both innovations are dependent on each other, for example, a new product requires new processes to make and sell the new technology. [Johnson et al., 2008: p 329]. There is no real distinguishing among SWPs in the market. This is the case for all solar off-grid applications. The real difference will occur more in the processes of designing, selling and service the products. However, the SWP must be designed in a way to compete with other pumping system. If there is a company with new technologies related with the system design, pump efficiency, or even the wiring quality that will add more competitive advantage to this company, but the new technology must be observed by customers otherwise the company will be considered as others.

The business model canvas is a practical way to plan and sketch out your business model. The researcher found it a useful practical tool to use for introducing the business model for solar power system providers. The business model canvas comprise of 9 blocks. Each block covers certain process of the business element. [Osterwalder et al, 2010] Some of the blocks will be introduced in the marketing strategy planning:

- A customer segment is the heart of the business model. It is a part of marketing segmentation.
- Customer relationship is also a part of managing the market segment.
- A value proposition is in terms of product and service. It is a part of marketing mix.
- Channels of distributions are also part of marketing mix.
- Key resources comprise all resources to execute the business model. The resources can be financial, intellectual or human.

- Key activities to make the business model works such as designing and making the product, new solution for each customers and networking with other companies.
- Key partnerships are essential to decrease risk and achieve business objectives by creating alliances, cooperate with competitors, and managing suppliers.
- Revenue streams are how the business generates revenue. The stream can be either a transaction cost that means one payment from the customer or recurring revenue that means ongoing payment by customers to get new values or customer support.
- Cost structure related to a cost driven or a value driven. Cost driven is where business focuses on cost minimizing than value creation.

Another important issue which should be addressed for the managers of solar companies is the innovation diffusion or the adoption curve. Knowing the stage of the product diffusion is essential for developing the marketing strategy and its business model. Here, the pace of diffusion can be predict by using the S- curve/ the height shows the extent of diffusion and the shape shows the speed of adoption. The empirical part of this research will estimate only the cost and revenue structure of business model and the diffusion curve of SWP.

3 RESEARCH METHODS AND CONTEXT

“A research project is a systematic process which consists of defining, designing, doing and describing an investigation into a research problem”. [Maylor and

Blackman, 2005: p 5] This research is investigating the suitable strategic market approach for investing in SWP for irrigation in India. The study focuses more on describing and analyzing the market in forms of words, pictures and objects that will lead to better understanding of the research problem. In this manner, the qualitative design suits more the purpose of this research. However, the quantitative method will be used to connect some results and to link relation among survey responses.

Another research model is a case study design where both designs are combined to investigate the case from different perspectives. The case study will not be considered because it is defined by the boundaries of data collection in terms of what you collect data about rather than research method or techniques of how you will collect data [Maylor et al., 2005: p 242]. For this type of research we don't know the boundaries of the data collection before we complete the research and the data leads to an answer of the research questions. The following figure shows the research processes

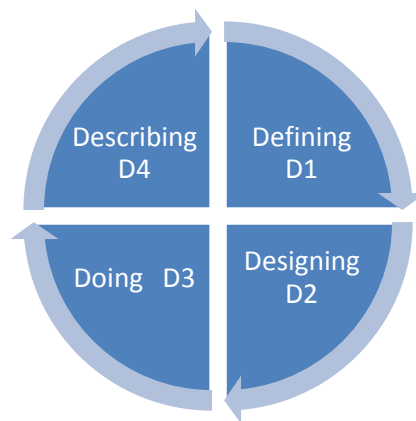


Figure 8 : Stages of the research process

[Maylor et al., 2005: p 1]

3.1 Research design and approach

"All research ultimately has a qualitative grounding" [Campbell, 1974.] as cited in [Howe., nepc.colorado.edu, 1988: p 12]

Qualitative research is more convenient of researching in business and management issues. [Maylor et al., 2005: p 139] Also, qualitative design investigates business research in deeper and wider angle than quantitative research, because qualitative approaches must have:

- A focus on natural settings of life. The data should be collected from farmers and people in the field with limited previous assumption about their need and behavior that is important to determine and understand the farmers and stakeholders, data will lead to assumption and then theories.
- An interest in meanings, perspectives and understandings of the end-users and stakeholders of Indian solar water pump market.
- An emphasis on process is the key issue of choosing the qualitative research design, the idea not only to sell SWP to farmers but to understand the process from developing the product, going to the market, managing the stakeholders and building a customer relationship. The research will unpack the how entering and selling of SWP should be happening in India.

There are two research approaches. First, deductive research approach starts from theory to hypothesis then observation and confirmation. So, theory leads to the data which should be collected. Deductive approach is used in the theoretical framework of this research as a guide for the research data collection and set the first part of the customer's questionnaire.

The second is inductive approach where information leads to theory. It is the opposite of deductive approach. It starts from specific observation then finding patterns to hypothesis end up with general conclusion and recommendations. The inductive method is used in the field research. Both approaches are used as a process to prove the findings [Trochim., socialresearchmethods.net, 2006]. The following figure illustrates the process:

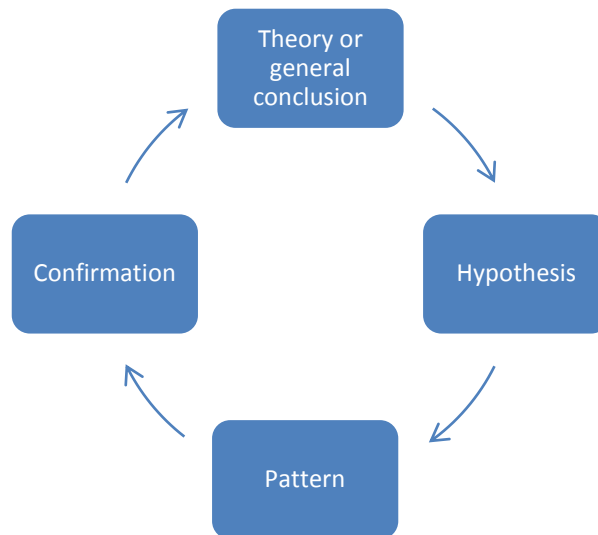


Figure 9: Research deductive and inductive approaches

3.2 Phases and structure of the research

The research was completed in four phases. Phase one was during a research project where the researcher with other colleagues produced a desk research of certain target markets. India was one of them. Phase one relied only on secondary data collection from official websites and academic books. Second phase concerns the theoretical framework of this research. This phase also relied on secondary data such as academic literature of strategy and marketing, academic journals, and official websites. The aim of this phase is to draw the theories of the business strategy and the marketing strategy. Phase three has started at the same time of phase two but the aim is the field research preparation and primary data collection. In this phase the primary data was collected before visiting the target market and during the field research trip. The researcher prepared structured survey for the potential customers of the SWP. The survey distributed by professional research company in Punjab. The company contact info and profile is in the references, list of interview and meeting. The reasons piloting the survey before the filed visit summarized by:

- The researcher gets better and deep understanding of the field before the actual trip.
- The market research company comments the survey before launching.

- The survey can be amendments and adjusted in case there is unclearness or unrelated questions before the last survey distributed.
- The market research company brought a unique ability and access to farmers that added a deeper understanding of farmer's behavior and how things work in India.

Another set of semi structured questions were prepared for each stakeholder of the research. The semi structured questions were of course different from each other. The set depend on the function of the stakeholder. For example, the interview question of MNRE is different than IREDA. The questions purpose to understand each stakeholder potential distribution in the market of SWP. During the third phase the analysis and the interpretation of the secondary and primary data was implemented. The fourth phase is the conclusion and recommendations of this research. During this phase, an overall revision and amendments were applied.

3.3 Data collection

The collected data in this research are secondary and primary data. The secondary data are used for writing the study background and theoretical framework. The secondary data was analyzed and linked to the research main problem. Also, the researcher has adapted and argued some theories and models to be more fitting for the research investigation.

The primary data of this research was collected in Finland and India using semi structure interview. The semi-structured interview seeks further clarifications and meanings. Moreover, the researcher explores the area of the research further with the respondent and other stakeholders. There were no presumptions during data collection that allow the researcher to report and analyze the data fairly.

In Finland, The data was obtained from:

- FCG Finnish Consulting Group Ltd
- Naps Systems Oy (Solar Company)

In addition to interviewing the business potential customers, the interviewees in India were as follow:

Government Agencies

- Ministry of New and Renewable Energy (MNRE)
- India Renewable Energy Development Agency (IREDA)
- National Bank for Agriculture & Rural Development (NABARD)
- Punjab Energy Development Agency (PEDA)

Market Entry Stakeholders

- Invest India
- KMAFICS- India
- Finpro

Companies

- Saur Oorja Solutions LTD
- Chandigarh Marketing Research Solutions
- Maya Engineering Works

3.4 Data analysis and interpretation

Before adopting the analysis approach of qualitative data, managing the data is an important step to ensure data traceability and reliability. The researcher recorded most interviews and classified them according to time, organization and respondent [Maylor et al., 2005: p 345].

In the qualitative research, the quality of findings must be assessed differently than quantitative assessments. The terms reliability and validity are used differently in qualitative research. “The quality of a study in each paradigm should be judged by its own paradigm's terms” [Golafshani., nova.edu, 2003: p 601]. For example, while the terms Reliability and Validity are essential criterion for quality in quantitative paradigms, “in qualitative paradigms the terms Credibility, Neutrality or Confirmability, Consistency or Dependability and Applicability or Transferability are to be the essential criteria” [Golafshani., nova.edu, 2003: p 601]. Consequently, in qualitative research the assessment criteria are:

- Credibility represents internal validity in quantitative studies. Credibility concerns of the results of qualitative research are credible or believable from the perspective of the participant in the research. The research is credible because:
 - a) The researcher collected primary data using different methods. Direct participation, field interviews, social networking.
 - b) The primary data is documented and recorded. The data are traceable.
 - c) Peer reviews and supervision of the work by research supervisor.

- Transferability represents external validity: refers to the degree to which the results of qualitative research can be generalized or transferred to other contexts or settings. There is a full description of the research setting and participants. Potential customers were chosen for the business case area, in this case Punjab. The sample was chosen to represent the study field. Stakeholders were chosen according to direct relation with farming, irrigation and RE sector.

- Dependability is equal to reliability in quantitative research. The research data and methods are documented. The same conclusion can be reached when the same research settings are followed. The researcher described and reported all changes in the design of this research. [researchconnections.org, 2011]

- Confirmability means that the research results are confirmed by others. The research was viewed by other colleagues. Also, the results defense is a must in order to enhance the research quality. [researchconnections.org, 2011]

There are two approaches to analyze data. The unstructured analysis where meaning and themes emerge from data. This approach can maximize creativity but is not suitable for a deadline research project. The structured analysis of

qualitative data is the approach to compare findings to conceptual framework that already developed in the theoretical framework of this research [Maylor et al., 2005: p 351] Therefore, the structure analysis is adopted in analyzing the research data.

3.5 Research ethics

The researcher would like to state principle issues were managed carefully in writing up this report. The researcher completed the report with respect to:

- Maintaining privacy: all comments and data are sourced and identified where did come from. All interviewed people gave the permission for their name to be published with this research. [Maylor et al., 2005: p 284]
- All collected data is represented fairly even when the finding didn't fit with the prior expectations. [Maylor et al., 2005: p 284]

4 DEVELOPING THE STRATEGIC MARKET APPROACH

India is not only a huge country but also a sub-continent of 28 states and 7 union territories [harshitsinghal.com, 2011]. The market of any product becomes huge if the marketers plan an appropriate marketing strategy for the Indian market. The RE market in India is very attractive to foreign investors and product manufacturers. The author tried to draw practical lines for businesses which are considering entering the Indian market. The MS is developed for solar companies specialized in off-grid applications. The target market and the business case area have been visited. Stockholders and potential customers have been interviewed. Stakeholders were divided to five categories according to the role of their institution. Each category has a different set of semi structured questions:

1. Governmental legal stakeholders.
2. Governmental financing agency.
3. Entry mode stakeholders.
4. Solar companies.
5. Stakeholder of promoting and assisting Finnish companies.

The empirical part follows the same logic of the theoretical framework of this research. Therefore, this part will propose a marketing strategy for foreign companies. The business model will be linked to the marketing strategy elements. However, the cost and revenue will be addressed with the technology diffusion. The author will recommend an appropriate entry mode form based on previous studies and field research. The marketing analysis tools are applied to the Indian solar market and they are linked to the global industry when is needed.

4.1 Current market situation

The reasons behind introducing the current energy consumption situation and the irrigation patterns in India are:

- Introduce the market and the need for sustainable technologies.
- Evaluate the size of current business opportunity for SWPs.
- Explore the government initiatives in solar energy market.
- Identify the future trend and the expected growth of market.

RE energy mix counts only 8% of the total energy basket. Coal contribution is 53%. Oil and gas contribution is only 12%. The fossil fuels depletion creates a real challenge for the Indian government. So, the country reevaluate its energy sources by promoting the RE sector. The pie chart below shows the Indian energy sources and its share of the total energy basket [Meisen., geni.org, 2006]:

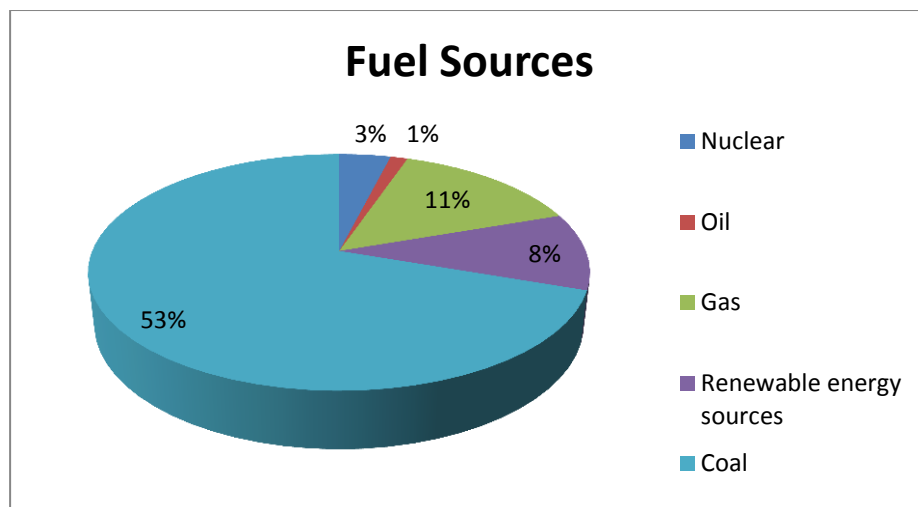


Figure 10: Indian Energy Basket

Adapted from [Meisen., geni.org, 2006]

The key drivers of the RE market are as follow [Meisen Peter., geni.org, 2006]:

- An annual increase in the demand-supply gap of energy.
- A large unexploited potential of RE.
- The need to diversify the India's energy basket.
- Concern for the environment and pollution.
- Stakeholder pressure on the high emission industries.

Although, the annual global sun radiation in India varies from 1600 to 2200 kWh/m². Which is comparable with radiation received in the tropical and sub-tropical regions, India generates only 0.2% (9.8 MW) of energy from solar. [Fellow et al, cognizance.org, n.d] The initial cost of solar systems is the major obstacle to promote solar applications. It is much more expensive than using coal. The people awareness of sustainable technologies is limited. Caring about environment among local Indian is not an important issue yet. So, the government tries by launching new initiatives and programs to spread and support using those technologies.

Recently, government of India set ambitious targets to transfer India into global leadership in solar energy. In order to do that, government of India on 11th January 2010 unveiled the Jawaharlal Nehru National Solar Mission (JNNSM) [Minister Speech, mnre.gov.in, 2010]. The Solar Mission has three key components- the large grid connected plants, the smaller grid connected plants and the off-grid components.

In this research, the scope is only the off-grid application and SWP is the core product. The mission will last for 12 years. This period divided to three phases 2010-2013, 2013-2017 and 2017-2022. Each phase will promote certain target for off-grid application reaching 200 MW, 1000 MW, 2000 MW respectively [JNNSM, mnre.gov.in, 2010]. The following table summarizes the JNNSM off-grid targets and the market current status

Table 4: Current Status and JNNSM phases

Off-grid applications	Current status	Phase 1	Phase 2	Phase 3
	2.92 MW	200 MW	1000 MW	2000 MW

[Raghavan V et al., cstep.in, 2010: p 12]:

The market potential of SWP is estimated at 21 million pumps distributed cross India. However, an interview with the head solar program in MNRE pointed out, we should distinguish between the potential and the demand of SWP. So, the demand is determinant by identifying the current market driver, where the product is needed and who is willing to buy it.

Two factors encourage using electric and diesel water pump in India. First, the ground water is the base for irrigation and drinking water. So, the need for lifting water is essential. Second, the green revolution in the mid-1960s made agriculture more dependent on machineries in order to increase production and decrease the cost per farm. [Sharma et al, agricoop.nic.in, n.d]. Therefore, understanding farming and irrigation processes in India and Punjab state are fundamental for developing a market strategy not only for SWP but also for off-grid applications in general.

The current key drivers of SWP in India can be summarized as [pvgroup.org, 2009]:

- 70% of the population is involved in agriculture
- Farmers depend on ground water and rainfall to satisfy crop`s need
- Government subsidies for irrigation pump around 6-8 USD billion
- Electric consumption of irrigation pump estimated around 10-15% of total national consumption
- The need to change the current pump sets because they are less efficient than those in other parts of the world
- SWP is the best substitute of existing 9 million diesel pumps in India.
- The government concerns of reduce emission and adopt sustainable technologies [pvgroup.org, 2009]

4.2 Marketing objectives

The marketing objectives have to be linked to the company`s mission statement. The JNNSM can be the guide for the foreign companies to develop a list of marketing goals and objectives. Linking the market goals and objective with JNNSM phases will allow the company to get advantage of each phase and the SMART rule will be applied on setting those objectives.

The following requirements are crucial to be available for foreign companies before entering the Indian solar off-grid market. The requirements are based on meeting local solar companies and stakeholders in India:

- Experienced solar company has installed off-grid projects such as home lighting, solar pumping and solar street lightning. Experience is needed when the company applies as a channel partner for MNRE.
- The company core competitive is know-how.
- The company has financial and human resources to invest abroad.
- The company goal is to create a reputable brand of off-grid applications in India.

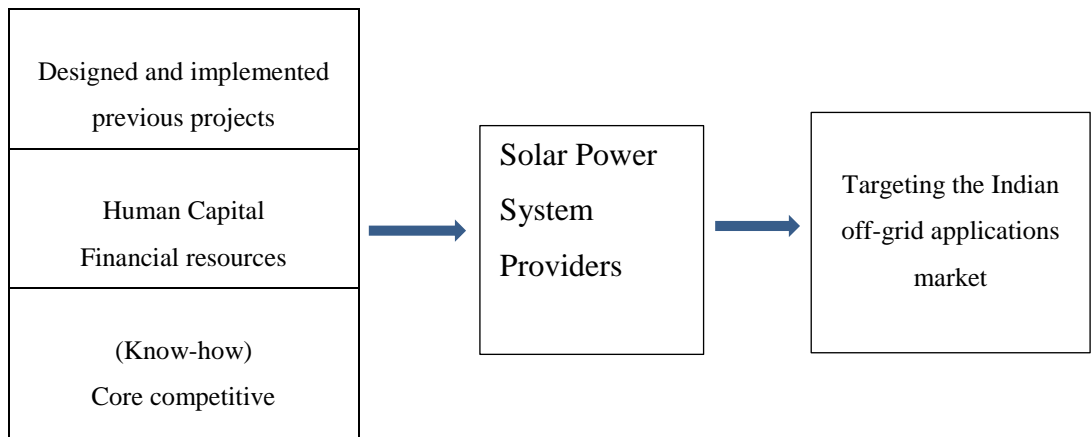


Figure 11: Main internal resources to approach the Indian market

The suggested marketing goals are based on the field research. The company marketing strategic goals are:

- Enter the Indian market by end of 2012
- Apply for SWP projects in India. Punjab will be the first station then neighboring states such as Haryana, Uttar Pradesh and Rajasthan
- The Target will be installing up to 1000 pump in the first phase. From 2014 to 2017, the company will double the installed pump to 2000 and start providing other off-grid applications. In the third phase, where the JNNSM aims to increase the capacity of off-grid application to 2000 MW, targeting the level of 4000 pumps can be achieved smoothly

The following table shows how the marketing objectives can be created and measured. The estimated value is based on 900 Wp and 1800 Wp pump divided equally. For instance, when the target is 1000 pump should be installed by end of 2014. The estimation value is 500 units of the 900 Wp pump and 500 units of 1800 Wp pump. 210 INR per Wp (€3.281) is the priced used in the calculations which is the benchmarked price used to estimate the government subsidy and soft loan for SWP users.

Table 5: Market objectives linked to JNNSM phases

Year	JNNSM (MW)	The targets (units of pump)	Estimated value (€)
2012- 2014	200	Up to 1000	4 429 687
2014- 2017	1000	At least 2000	8 859 374
2017- 2022	2000	At least 4000	17 718 748
Total		7000	31 007 812

4.3 Recommended primary activities

The primary activities are essential in the company internal value chain. So, the recommended primary activities are based in the field research and the MNRE regulations on the project channel partners. The need to recommend the primary activities is to create value for users of SWP and change the customer perception of the SWP.

The inbound logistics: The company major strength is the capability to develop the optimal solar system to satisfy the farmers pumping needs and match their irrigation requirements. The solar module quality and the system designing are critical to build a competitive pump. So, the experts and the solar cells are the only imported components from their suppliers in Europe.

The outbound activities: The Company outsources the pumps, inverters, switches and wires from local Indian companies. I was able to meet a pump producer company. The company showed a high interest to work with European company. Pumps companies are widely available in India. The standard and specification of these components can be produced in India easily.

Operations: the final product has to be assembled in India. Experts and technician must come from the mother company. Outbound logistics depend on the entry mode choice but the researcher proposes a possible location for the company branch. Chandigarh is a good location and close to the target states (Punjab and Haryana).

Marketing and sales are set during the project. The company is responsible for evaluating the best areas to execute the project with coordination with the state nodal agencies (SNA) such as PEDDA. The company responsibilities are targeting the most promising market segments, introducing the product and the scheme through local newspaper and other promotion tools. **Service** is an important part of final product. Three major services are essential to change the farmers' perceptions of the product. Those are customizing the installation for each farm, repairing availability and training customer to use the system.

4.4 External environment analysis

External environmental scan is divided into two sections. First, the PESTLE framework presents the macro environment factors where the company will operate. Second, the Porters five forces discuss the micro environment factors. The following table illustrates the structure of PESTLE with regard to SWP.

Table 6: PESTLE structure

Political Conditions	Political stability, trade restrictions and tariff, RE policy and agriculture policy
Economic Conditions	Macroeconomic indicators and investment environment
Social Conditions	Demographic profile and labor force
Technological conditions	Innovation and standardization of Indian solar industry and market existing technology of SWP
Legal framework	Tax structure and incentives and governmental procedures to apply for off grid projects
Environmental factors	Fukushima nuclear disaster and SWP projects under CDM

Political conditions: “Economic growth and political stability are deeply interconnected. On the one hand, the uncertainty associated with an unstable political environment may reduce investment and the speed of economic development. On the other hand, poor economic performance may lead to government collapse and political unrest” [Alesina et al., ssc.upenn.edu, 1992].

India is the world`s largest democracy in terms of the population. However, this is not the reason behind the high growth of Gross Domestic Product (GDP) and the increase in attracting foreign investments. For example, Vietnam and China are not democratic countries. On the contrary, both governments economic reform brought to the country a long term political stability despite the single party rule. When looking into the political conditions of where solar companies are operating and formulating their MS, five issues should be addressed: political structure, political stability, trade restrictions and tariff, RE policy and agriculture policy.

Political structure: the Indian modern political system is only 61 years old. Since the current constitution has come in force in 1949 [india.gov.in, 2011]. India has adopted the form of the parliamentary federal government. It is a mix of British parliamentary system and American federal flavor. However, the national government has greater power than states. All states must follow the national government policies and regulation.

The elected parliament represents the legislative branch. It consists of two houses Council of States (Rajya Sabha) and the House of the People (Lok Sabha) [india.gov.in, 2011]. Since 2007, the executive branch has been represented by President Pratibha Devisingh, vice president and the Prime Minister Manmohan Singh with his cabinet members. The judicial branch is the Supreme Court where the chief justice and 25 associates are appointed by president and stay in office until age of 65 dissimilar the parliament where election held every 5 years [asianinfo.org, 2011].

The norm of the government for last two decades is a coalition government at the center as well as in the individual states. But that didn't influence on the economic reform even when government change or coalition collapse. Simply, because the economic liberalization is set as a national priority so even communist parties agree on it. [globaledge.msu.edu, 2011]

Political stability, Based on the index of political instability, the Indian political regime is moderate at risk with score 4.6 out of 10, where 10 is the highest at risk. However, the index reflects only the social unrest and doesn't provide any forecasting of the future. This is why Libya in 2007 was classified more stable than India and Tunisia was as stable as India. [Economist Intelligence Unit, viewswire.eiu.com, 2007].

The reality showed that political stability is not only how the political regime practices power and how many years stays in power but also it is interrelated with the economic growth and the people participation in decision making. The major threats of political stability in India are divided to external and internal risks.

Externally, the uncertainty of the Indo-Pakistani relation disturbs the economy and increase stress in both countries. Fortunately, both governments are working on rebuilding a good relation especially after Mumbai attacks in 2008. Internally, issues such as the Kashmir case where many strikes and even violence between the government and the resistant groups who fight for the independence of the state from India. Also, the ongoing Maoist (Naxalite) insurgency – named as the

single biggest threat to internal security and the Hindu Muslim relation in certain areas. [Export Development Canada, edc.ca, 2011]

Trade restriction and tariff: India is a member of World Trade Organization since 1st of January 1995 [World Trade organization, wto.org, 2002] India membership in such organization allows increasing international trade and economic reform. “Recognizing the important linkages between trade and economic growth, the Government has simplified the tariff, eliminated quantitative restrictions on imports, and reduced export restrictions. It plans to further simplify and reduce the tariff”. [World Trade Organization, wto.org, 2002] India also is member of many free bilateral and regional trade treaties.

Finland and India signed agreements in many fields such as Agreement on Economic Cooperation between India and Finland that was signed on 26.03.2010. The agreement emphasizes the following: “identify new business possibilities and also to identify and remove hurdles which could hamper mutual economic cooperation between the two countries”. The two sides also decided to set up three joint working groups in the areas of innovation, clean technology and waste management and skill development and training” [Ministry of Commerce and Industry, commerce.nic.in, 2010]. Another important agreement is the Revised Double Taxation Agreement (DTA) and protocol which will be applied in Finland from January 2011 and in India from April 1st, 2011. The aim of this agreement is to avoid double taxation. “The treaty reduces the withholding tax rate on dividends, royalty and fees for technical services from 15 to 10 percent in order to boost trade” and “the facility of tax sparing credits for companies has been removed” [BNA International, taxtreatiesanalysis.com, 2010].

Agricultural Policy: “Agriculture occupies a prominent position in Indian policy-making not only because of its contribution to GDP but also because of the large proportion of the population that is dependent on the sector for its livelihood”. “Indian agriculture policy is aimed essentially at improving food self-sufficiency and alleviating hunger through food distribution. Aside from investing in agricultural infrastructure, the government supports agriculture through measures

including minimum support prices for the major agricultural crops, farm input subsidies and preferential credit schemes. At the same time, subsidies on farm inputs including fertilizers, electrical power and irrigation water have led to inefficient use of inputs and indirectly subsidies income” [European Commission, ec.europa.eu, 2007]. The government supports and promotes all sustainable development projects in agricultural sector.

Renewable energy Policy: “The objective of the JNNSM is to create a policy and regulatory environment which provides a predictable incentive structure that enables rapid and large-scale capital investment in solar energy applications and encourages technical innovation and lowering of costs”. [mepcoeng.ac.in, 2011] The RE policy is already developed in India. So, foreign investors can plan their strategy on solid and strong base instead of working without directions.

Economic conditions: “India today is not an emerging economy. It has fully emerged, and it is in full bloom” [Kallasvuo, Olli-Pekka, Nokia’s CEO, ibef.org, 2011]. India is already emerged to world developed economy and become a major player. The economic conditions are grouped to the India macroeconomic indicators, and the investment environment.

India is ranked globally as the 10th GDP and 4th GDP Purchasing power parity [worldbank.org, 2010]. Its GDP has reached the level of a trillion euros by year 2009/2010. It is growing on average by 8% annually. The economy will continue grow at the same rate in the future as a result of market liberalization, growing size of the middle class and adopting the new technologies for production.

The growing amount of foreign direct investment is shown in the table below (FDI) and it is expected to keep growing. That reflects the growing attractiveness of India as destinations for foreign investments. Global and American depository receipts indicate an increasing number of foreign companies listed in the Indian capital markets. Exchange rate is managed float and €1 buys 64 INR in average during 2011. The Indian rupee symbol is ₹ and it is adopted recently.

India's GDP growth has facilitated the world economy to recover from the latest financial crisis. Besides, the economic growth rate is more than what witness in developed economies. The following table shows the major macro-economic indicators for last three years and the expected coming year. The table units are in billions and the amount has been converted from USD to Euro by using 24.08.2011 exchange rate. (EUR/USD = 1.44)

Table 7: Indian main macroeconomics indicators

Macroeconomics Indicators (€ billion)	2008-09	2009-10	2010-11e	2011-12f
GDP at current prices	842.9	958.8	1200.3	1405.6
GDP growth%	6.8	8	8.5	8.2
Inflation rate%	8.3	10.2	9.7	9.4
Gross Fiscal Deficit (% of GDP)	6	6.7	5.1	4.6
External Debt to GDP%	20.5	18	17.3	
Exchange Rate (INR/Euro, avg.)	65.1	67.1	63.2	63.46
Foreign Investment Inflows	16.7	48.7	43.0	
FDI	26.25	26.25	21.11	
GDRs/ADRs	0.833	2.292	1.458	
Compare with world indicators	2009e	2010e	2011e	2012
Global GDP	-0.5	5.1	4.3	4.5
Advanced Economies	-3.4	3	2.2	2.6
Emerging and developing Economies	2.8	7.4	6.6	6.4

[EXIM Bank, eximbankindia.in, 2011]

The negative side of economic growth is inflation. As shown in the above table, inflation has touched a level of 9%. The government tries to control inflation by increasing the interest rate. The recent level of interest rate is 8% (July 2010). Furthermore, India is classified as a low income country around €930 GDP per capita [worldbank.org, 2010]. Punjab and Haryana are the highest per capita states and the highest income for farmers. Therefore, affordability of farmers is higher than other states.

The investment environment: Corruption and bureaucracy are the main challenge for foreign and local investors. According to the corruption perception index 2010, India was ranked 87 out of 178 (score 3.3 out of 10). [transparency.org, 2010] The judiciary branch especially the higher levels are considered fair. Both the government and the Supreme Court took certain procedures to limit corruption particularly after recent movement which was called “India Against Corruption”. Also, bureaucracy has delayed many investments to continue forward. Many surveys and reports have categorized India as the worst bureaucratic country. From my own experience in the field research, foreigners enjoy better access to the governmental agencies than locals. Foreigners mainly who come from western countries don’t face the same bureaucracy as locals.

The social conditions: the social and cultural heritage of Indian people is rooted to 5000 years back. In India, the official languages of the central government are English as a business language and Hindi as an official language inside the union. Across states and regions in India, there are another 19 national languages. There are 8 major religions. Hindus accounts for 83% of population. Muslim is the second largest at about 12%, Christian 2.6% and Sikh about 2% most of them in Punjab state. [Ernst & Young, investindia.gov.in, 2010] Consequently, the culture across the country is highly diverse. The caste system or (Jati in local language) is considered as one of the unique Indian social hierarchy system [nos.org, 2011]. Caste system means “a person is considered a member of the caste into which he or she is born and remains within that caste until death” [Cooke, raceandhistory.com, 1999]. The system encouraged the economic cooperation and product and service exchange between different castes in old times [nos.org, 2011], but it still plays a role in India`s modern life.

There were no barriers or obstacles to meet any of the research stakeholders or even government officials. Some tips are worked out to meet officials. Firstly, try to contact them by email or phone; don’t expect a high rate of responses to your mails. You have to go there without an appointment and insist to get one. You have to show how important this meeting is to you. Usually you will get it at the

same day but it will cost you to wait for couples of hours. For getting an appointment with business men, they might come late by hours but be there on time just in case. Another issues should be addressed here are the Indian demographic profile and the labor structure.

Demographic profile: India is rich with human capital. The country was able to move a large population from burden on the economy to productive labors. The important demographic figures with respect to the research purposes are summarized in the following table:

Table 8: Indian demographic figures

Demographic figures	
Population	1.16 billion (29% urban. 71% rural)
Population growth rate	1.5%
People without electricity	403 million, almost 34%
People at age 15-64	64%
Labor force	523 million only 10% skilled workers

[Ernst & Young, investindia.gov.in, 2010]

As seen in the table, there is a huge electricity deficit. More than 403 million people live without access to the grid electricity that is where off-grid applications get its strength as a competitive product. The country has the second largest number of labor force after China. However, most of them are unskilled workers especially in the RE sector. One of the solar companies the researcher interviewed in New Delhi states the following: “There is a big lack in trained educated workers in solar industry. It is a serious challenge” [Mr. Varshnei, Saur Oorja Solutions LTD, 2011]. So, the solar firms must be aware of that and send their own experts to train the local staffs, and supervise the installations and operating process.

Punjab state official language is Punjabi. English is the business language and the official language of the state government. Also, Punjabi exists in Haryana state and part of Delhi [lisindia.net, 2011]. Most of the farmers speak Punjabi. The level of farmer’s education is primary schooling with poor English skills. So, the

foreigner must coordinate with local partner or translator in order to communicate effectively with land holders. The researcher was able to gather the primary data and communicate with farmers by working closely with a local market research company called Chandigarh Marketing Research Solutions.

Technological conditions: “Nowadays in fact, no firm can afford to persist with the outdated technologies” [nos.org, 2011]. The last 50 years carried big socio-economic changes to the people of India. Adoption of the new technologies in production has allowed the country to promote economic growth and has become the preferred destination for research and development R & D laboratory exclusively in the Information Technology (IT). The technological conditions are gathered in two issues for the purpose of this research, the innovation and standardization of solar industry in India and the existing technology of SWP.

The innovation and standardization of solar industry in India: as mentioned earlier, the green revolution in India has influenced on farmers and agriculture in many ways. Using the new technologies such as agriculture machinery became necessities in order to increase yields production. [Fitzgerald-Moore et al, people.ucalgary.ca, 1996] Punjab state was the early adopter of these technologies. So, the state can be the best place to promote latest technologies.

Irrigation was and still the way to increase farm productivity in India. So, tube well digging has grown very fast. Therefore, farmers shift from using centrifugal pumps to submersible pumps. [Fitzgerald-Moore et al, people.ucalgary.ca, 1996] However, **the current existing electric and diesel pump sets are less efficient than the one in Europe or even other developing countries.** Consequently, the existing electric and diesel pumps must be upgraded for more modern and efficient pumps. The following two photos are recently taken from the fields in Punjab. The photos show the current used DP. Also, the photos illustrate the way those pumps have been installed.



Figure 12: Diesel pump in the field



Figure 13: Electric pump run on diesel as a backup

The MNRE not only formulates RE policies and regulations but also sets the industry standards and encourages innovations. With respect to the solar industry, there is a solar energy center (SEC) in the Ministry which promotes R & D and tests solar systems. “The test is available for both submersible and surface types, with variable suction head 1-7 m and total head up to 10 m, the performance of SWP is evaluated in terms of throughput, PV array power, and wire to water

efficiency” [MNRE website, 2010]. There is a summary of the MNRE guidelines of off-grid application in the appendix 5 of this research. The appendix contains in more details the off-grid applications standards, test, models and technical requirements.

Furthermore, The MNRE “could provide 100% central financial assistant CFA for undertaking pilot and demonstration projects through manufacturers and other organizations for demonstrating new and innovative applications of solar systems” [JNNSM, mnre.gov.in, 2010]

The existing technology of SWP: the total number of installed SWP in India by end of 2010 has reached 7495 [MNRE website, 2010]. In Punjab state, there are 1800 solar pumps. The existing technology is “Solar PV cells made of fine sheets of silicon wafers, cut to the required shape. The technology is mainly based on mono crystalline silicon and polycrystalline.” [india-opportunities.es, 2011]. The current technology components are:

- PV array of 900, 1800 Wp power a motor pump of 1 hp, 2 hp respectively.
- Interface electronics
- Connecting cables & switches
- Support structure & tracking system
- Pipes, etc.

The system features are [tn.gov.in, 2010]:

- “Available in different capacity ranges right from 600 watts to 3000 watts.
- Available in different types, floating type, ground-mounted, submersible type, etc.
- Lifts water to a total head of 30 feet maximum (suction and delivery)
- A standalone system, producing and consuming energy on the same spot, thus totally avoiding loss of energy in transmission” [Tamil Nadu Energy Development Agency, tn.gov.in, 2011].

The commonly used SWPs in India are the 900 Wp and 1800 Wp pump. The 900Wp or 1 hp pump can pump up to 75 000 liters a day of up to 10 m water table. This amount of water can irrigate max a land size of 5 acres or 2 hectares. The 1800 Wp or 2 hp pump can pump up to 140 000 liters a day of up to 10 m water table. This amount of water can irrigate up to 10 acres or 4.5 hectares. The following table shows the specification of the existing products for irrigation purposes and the daily average pumping:

Table 9: Existing product features

Type	Capacity (Wp)	Water table (m)	Pump (liters/day)
DC Surface	900	10	75 000
	1800	10	140 000
AC Submersible	1800	50	50 000

[Tamil Nadu Energy Development Agency, tn.gov.in, 2011].

The following photos were taken from the field for installed SWPs. The photos show the current technology installation and how the grid electricity is used as a backup.



Figure 14: SWP in the field backed up by electricity



Figure 15: An electric pump motor run on solar energy

Although Rajasthan state receives the highest solar radiation, Punjab is a good destination for launching solar power projects because the state has the required sun radiations to empower the solar applications and the state has its own policy to support solar projects. However, Mr. P.C. Bains seiner manager in PEDDA stated during the interview with the researcher the main constraints of SWP as:

- High initial cost of the system
- Low subsidy
- Environmental condition during winter
- Is not suitable for deep wells
- The system is good for small farmers from 3-5 acres of land but the system doesn't fit farmers who own more than 5 acres.

Legal framework: the legal issues are the most significant factor of investing in RE. In India, the laws and regulation encourage investing in RE technologies. The Electricity Act 2003 and National Electricity Policy 2005 regulate generation, transmission and selling electricity from RE sources. The legal framework favors using RE sources based on optimal utilization. In addition to, the Electricity Act 2003 in the national level, there is an individual state own policy and regulations. In case of conflicts the national regulations will be the applicable one. [Prakash, ebookbrowse.com, 2010]

The good news for investors in off-grid applications including SWP is that there is no need for license or special permissions to use or buy such systems. This is a good advantage compared to the connected grid systems. “It is more complicated with stations of 1 MW power plants, because the power has to be sold to the grid company then to customers that consumes a lot of time and paper work. Meanwhile, investing in off-grid applications is easier and faster because the sale occurs direct from the company to the end-users” [Mr. Varshnei., Saur Oorja Solutions LTD, 2011]. The legal framework is divided into tax structure and incentives and the government procedures to apply for off-grid projects.

Tax structure and incentives: the Indian tax system consists of direct taxes such as income tax, wealth tax and corporate tax. The direct taxes are levied by the central government. The indirect taxes are service tax and value added tax VAT. The indirect taxes are levied by both the central and the state government. Recently the government has proposed a new tax named the Good and Services tax to replace most of indirect taxes and levied also by both [Ernst & Young, investindia.gov.in, 2010].

Fortunately, investing in renewable resources includes solar applications. It has many incentives and benefits such as “tax holiday for up to 10 years and 80% accelerated depreciation, exemptions from excise duties, low import tariffs on some raw materials and components, soft loans from Indian renewable energy development agency (IREDA), capital subsidies and training programs”. [JNNSM, mnre.gov.in, 2010] The capital subsidy is up to 30% of system cost. The Ministry already benchmarked the price of SWP without battery by max 210 INR per Wp. For instance, SWP of capacity 1800 Wp, the subsidy will be $30\% \times 210 \times 1800 = 113400$ INR (€1772).

MNRE subsidizes both irrigation and house hold drinking pumps. Also, there is a soft loan at rate of 5% interest. The loan covers up to 50% of the initial cost minus the subsidy provided. [JNNSM, mnre.gov.in, 2010]

The government processes to apply for off-grid projects: off-grid applications projects include the SWP must be evaluated and examined by Project Appraisal Committee (PAC) in the MNRE. The committee sets certain arrangements for the channel partners in order to ease and speed up the scheme implementation. The following chart tries to illustrate the process as described in the guidelines published by MNRE:

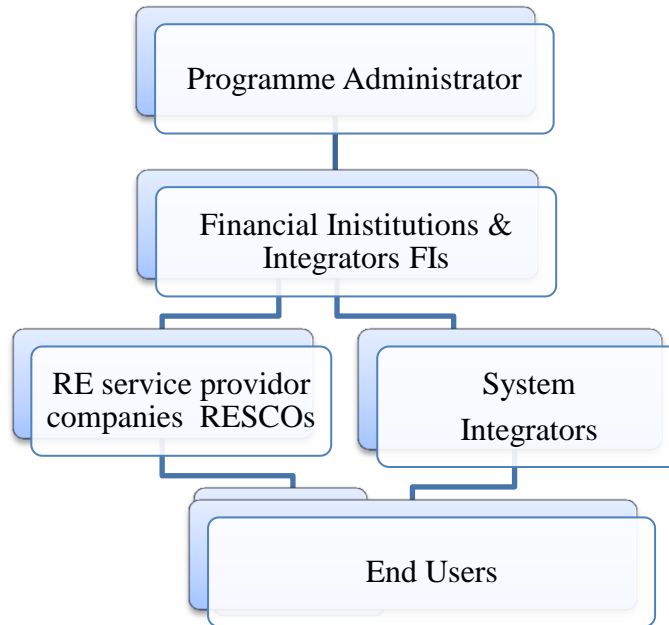


Figure 16: Project arrangement

Programme Administrators (PA) can be both national and state government. Also, Non-governmental agencies (NGOs) can be a PA in case they organize and finance project. The duties of PA organize and implement the project. Also they can access the capital subsidy from MNRE. [JNNSM, mnre.gov.in, 2010]

Financial Institutions & Integrators (FIs) are both financing the off-grid projects. The difference between the financial institution and the financial integrators is:

- The financial institutions fund customers in rural and urban areas
- The financial integrators develop new financial instruments from different sources of financing such as carbon finance and other government assistance and they are linked to manufacturers and service providers.

RE service provider companies (RESCOs) are solar companies which install and operate RE systems. RESCOs deliver services for customers. [JNNSM, mnre.gov.in, 2010]

System integrators are companies which provide RE systems & services to clients but these companies can design, supply, integrate and install solar power systems. Also, they are responsible of operating and maintenance of the provided systems.

Funding Pattern based on the MNRE website for year 2011 under title of Guidelines for off-grid and decentralized solar application, a summary of the guideline available in appendix 5 [JNNSM, mnre.gov.in, 2010]:

- “Funding under the scheme would be in project mode, i.e. there must be a project report which would, inter alia, include client details, technical & financial details, operating and maintenance (O&M) and monitoring arrangements.
- The total project cost shall be funded through a mix of debt and incentives where the promoters' equity contribution would be at least 20% (unless otherwise specified). Techno economic specifications for a minimum cut-off level for the requirement of the project mode would be specified by MNRE.
- MNRE would provide financial support through a combination of 30% subsidy and/or 5% interest bearing loans.
- For the year 2010-11, the benchmarked price for photovoltaic systems with battery back-up support is considered as INR 300 /Wp. In case of the systems, which do not use storage battery such as the SWP, the installed PV system cost is considered as a maximum of INR 210 /Wp” [JNNSM, mnre.gov.in, 2010]. The Funding procedure can be illustrate by the following figure :

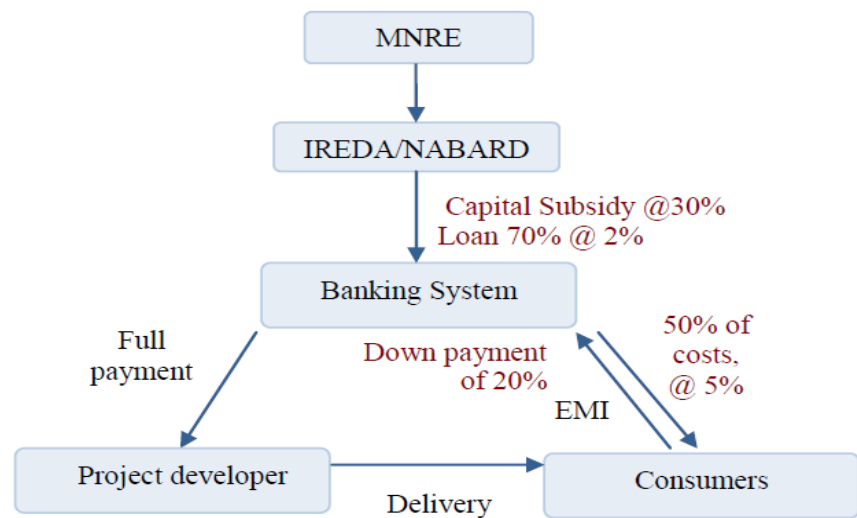


Figure 17: Project financing procedure

[Raghavan et al, cstep.in, 2010: p 67]

Environmental factors represent an important part in this study. For the last three decades a huge pressure has been implemented on national governments and institutions to promote sustainable technologies. Recently, after Fukushima nuclear disaster in Japan a huge change has occurred in the world and the market of clean technologies. For example, all Germany's nuclear power plants will be shut down by year 2022 and the country will move to use only clean technologies in generating energy. In India a growing fear among people and authorities of nuclear disaster similar to Fukushima has forced authorities to rethink of the country nuclear plants safety measurements [bbc.co.uk, 2011]. An interview with Finpro consultants agreed on this point and he added: "This is the time for investing in the Indian RE market."

Another important issue, SWP is a sustainable technology supported and promoted by the Indian government. The environmental factors support the using SWP because it cuts the emission that is produced by using the diesel and the electric pump. "The SWP is viable under the Clean Development Mechanism (CDM) because it directly displaces the greenhouse gas emissions and sustains rural development. The substitution of diesel pumps in India could be made viable

by a relatively limited subsidy with the maximum mitigation volume is more than 214 million tons of CO₂ for diesel pump only” [Purohit et al, hwwi.org, 2005].

The micro environmental factors of the solar cell industry will be evaluated by using Porter’s five forces. The analysis will identify the attractiveness or unattractiveness of the solar industry in India. The researcher will apply the framework to global PV industry and link it to Indian market when is needed.

Bargaining power of Suppliers: Low

The power of suppliers and buyers are interrelated. During 2004 till end of 2006, the solar panels demand soared and suppliers were controlling the market of the poly silicon, the main material of solar panels. Years later, the financial crisis has reduced the demand, as a result of the uncertainty of global economy and the cut of projects financing globally. Bill Stewart, president of Solar Craft, a California installer described the industry lately “After years when installers had to badger manufacturers to ensure that they would receive enough panels, the situation has reversed”. The oversupply drove the prices of solar panels down. “The price of solar panels has fallen by 25% in six months during 2008/2009” [Resch, enn.com, 2009].

The Naps Systems sales director stated: “We have suppliers in Sweden and Estonia also we can get suppliers in Taiwan. There is no supply problem at the moment” [Sales Director of Naps Systems, 2011]. As seen in the following graph the demand is expected to stay under the supply for the coming two years. The demand side is controlled by three factors: the economic growth in emerging countries, the price level of fossil fuels and the governments’ commitments across the globe toward RE projects. Recently, the demand starts climbing again because the world hopes of economic recovery. The high level of oil prices has forced customers to seek alternative energy sources (more than \$100 a barrel)

PV MODULE DEMAND/ SUPPLY SUMMARY (MW)

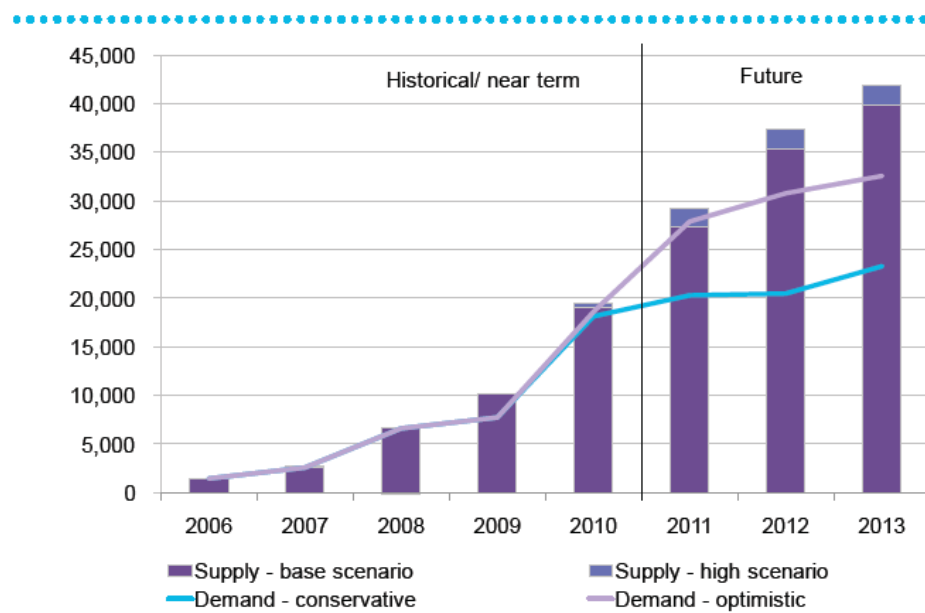


Figure 18: Demand and supply of PV modules

[Konrad, easy-solar-quote.co.uk, 2011]

With regard to other components of SWP such as invertors, pumps, wires and switches, all are available and there is no supply problem. Accordingly, the power of supplier is low as long as the demand of solar panels is less than the supply.

Bargaining power of buyers: Moderate

The direct buyers of solar power plants usually are not the end-user. Government agencies or electricity companies are the buyers then to the end-users. However, the buyers of solar off-grid applications are the end-users. Nevertheless, the related authorities set the standards when there is a subsidy or governmental loans. So, the power of buyers can be evaluated by two issues:

- Fragmented off-grid application end-users. For example, the buyers of SWPs are farmers with different preferences and needs.
- The government standardization of solar projects powers the buyers. Also, the process of project assessing includes negotiations of prices and quality.

Thus, the power of buyers in case of the off-grid application is moderate but not high.

Threats of substitutes: moderate

Any source of energy is considered as a substitute of solar power. For instance, the irrigation pumps can be powered by wind, diesel or electricity. Price and efficiency are the main determinant of the customer's choice. The first substitute is diesel. Diesel is expensive, July 2011, during the field research trip to India; the price of one liter of diesel with INR 6.08 subsidy was almost INR 42 that it is equal to €0.65 and €0.73 without subsidy [firstpost.com, 2011]. This is so expensive when you compare the income in India to the one in Europe. DP is noisy, pollutant and less efficient over longer time. Second, the electricity prices is extremely low because the extensive subsidies to farmers 'electricity but it is unreliable and forced farmers to use a diesel pump as a backup. Third, wind energy is still more expensive than solar in powering pumps. The wind energy requires certain source of wind which is not available in Punjab and Haryana states. Forth, there can be a real differentiation among the providers of the solar pumps. It can be according to the quality of solar panels, the pump efficiency and the system overall performance. Thus, the threats come from EPs and other SWPs in the market. The substitute's threat is moderate.

Threats of new entrants: Low

The threat of new entrants to Indian solar off-grid market is low but increasing over time. The entry barriers face the foreign solar companies are:

- The India complicated regulations as it is seen by Finnish companies.
- The law enforcement of patent protection laws make many companies fears their technology to be copied. "The product or design of product will be copied and reproduced by using different label to same markets. The traditional copyrights, labels and trademarks can be problematic to control".[Mr. Kurvi, Project Manager in FCG, 2011]
- Many foreign companies and even promoters of Finnish companies abroad look at Indian market as a complicated and tough market to enter. The market was described as " India is tricky and extremely tough market to enter" [Mr. Kurvi, Project Manager in FCG, 2011]

For new entrant inside India:

- “The technology in the Solar PV industry is changing quite rapidly with innovations and R&D where is limited for local companies to compete” [karmayog.org, 2011].
- “Some components and raw materials require deep technological expertise and extensive production experience in order to produce a competitive product” [sustainablebusiness.com, 2011]. Those limit the new entrants from the local environment.

However, the expected growth of solar industry and the rising demand for solar products will put Indian solar market under the spot light. The Indian solar national mission estimated value of €13 billion will indeed attract many new entrants to the market.

Rivalry among existing firms: Moderate

The solar market is growing globally as well in India. The Competitive rivalry among the solar module manufacturers is globally moderate because there is no a real differentiation among the solar panel. However, the differentiation occurs when solar companies create new applications or develop the existing ones. The key global competitors are from US, China, Germany and Japan. There is no Indian big player in this Industry so far but the market opportunities will make such player. The competitive among the Indian solar companies which specialized in off-grid applications is low when you compare the existing player with the market size and growth. “That’s true there are many solar companies in India but competition is still low because of the market size. Changing products and target certain customers are the keys to reduce competition” [Mr. Varshnei, Saur Oorja Solutions LTD, 2011]. The following are the registered providers list of SWP in MNRE:

Photon Energy Systems

1. Udhaya Semiconductors Ltd
2. Central Electronics Ltd.

3. Surya Jyothi Devices Pvt.
4. Tata BP Solar India Ltd.
5. Rajasthan Electronics & Instruments
6. Titan Consultants & Services Ltd.
7. Premier Solar Systems (P) Ltd.
8. Bharat Heavy Electricals Ltd.

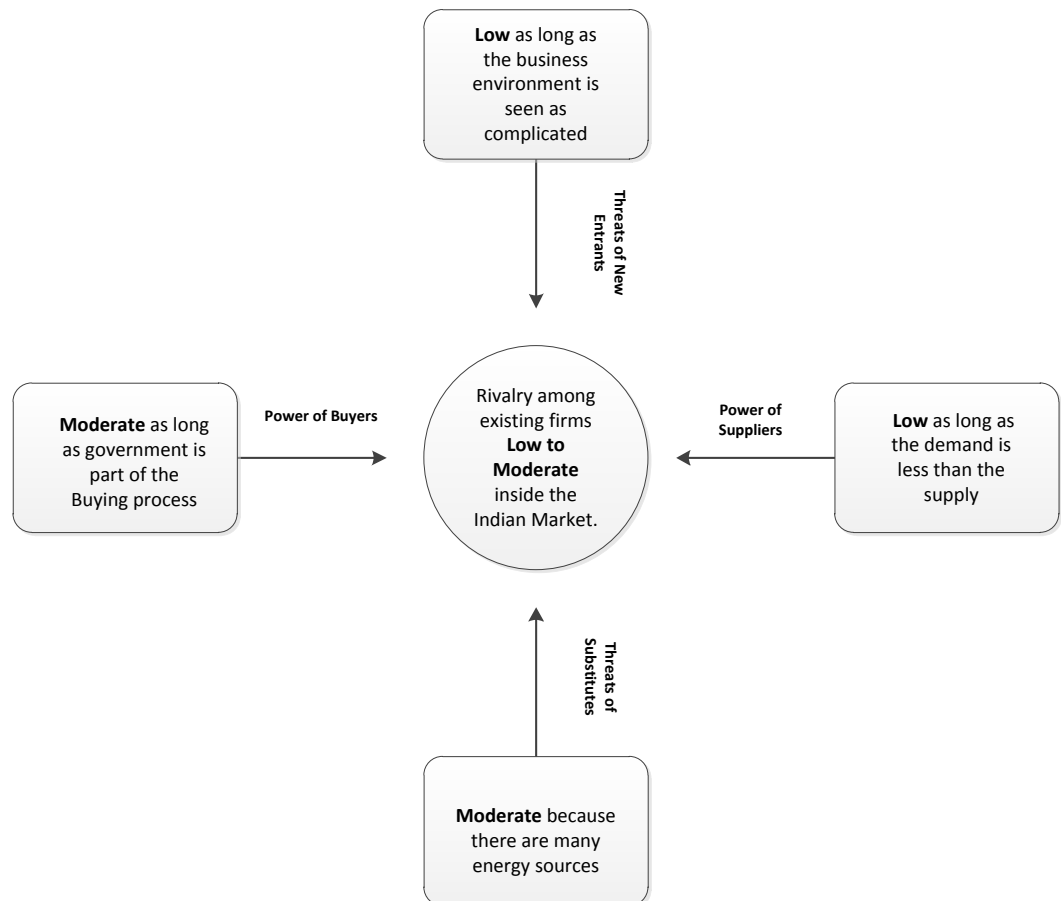


Figure 19: Porter`s five forces of the industry

4.5 Stakeholders mapping

“One of the first steps in almost any intervention which affects the use of natural resources is the identification of those individuals and groups who hold some kind of "stake" or interest in the resource” [Stakeholder Group, fao.org, 2011].

The business stakeholders are considered an effective force to evaluate industry attractiveness. Here, the solar off-grid applications include the SWP have mostly the same organizations, financing agencies and competitors. The only difference is the interest groups are more related with farmers and agriculture such as, the state irrigation authorities and the farmers associations.

For any company there might be hundreds of stakeholders but managing the key ones is more important. So, the stakeholders can be grouped into two types. Primary stakeholders are “those with a direct interest in the resource, either because they depend on it for their livelihoods or they are directly involved in its exploitation in some way” [Stakeholder Group, fao.org, 2011]. Secondary stakeholders are “those with indirect interest with the managing or exploiting the resources” [Stakeholder Group, fao.org, 2011].

The primary stakeholders are identified based on the assumption that a foreign company tries to enter the Indian solar energy market. The difference compare to local company will be the entry mode stakeholders which the foreign company will get in touch for certain period of time. The stakeholders can be divided according to their relation with SSP and they can be listed as:

- Ministry of New and Renewable Energy (MNRE) is the governmental institution of organizing and financing renewable energy programs. Main duties are: policies and programs formulation, implementation of laws and regulation, launch researches, technology development, and manufacturing. The department of photovoltaic program at the Ministry is the most important stakeholder for SSP.
- State Nodal Agencies (SNA) is the state level authorities to implement MNRE schemes and get access to capital subsidies. For instance, the investors in Punjab state will deal with the Punjab Energy Development Agency (PEDA) as a state nodal agency.
- India Renewable Energy Development Agency (IREDA) is a government financing company of RE projects. IREDA provide soft loans for end-users to buy off-grid applications after coordination with MNRE. Also,

IREDA assesses the project financially and release the fund to the distribution channels, such as National Bank of Agriculture and Rural Development (NABARD).

- Market entry stakeholders such as Ministry of Commerce & Industry, Chamber of Commerce and Industry and state governments. Those can be approached by one institution called Invest India. Also, the institutions which promote the national companies in India. For example, Finpro for Finnish firms.
- End-users are the customers of the business.
- Competitors and media.

The following figure shows the influence of each stakeholder and this influence can be measured by $\text{Power} \times \text{Interest}$. The position of the bubble symbolizes the influence of the stakeholder on the business. The size of the bubble represents the amount of effort put in. Also, the figure shows how the company should manage these stakeholders. For instance, MNRE has the highest power and interest so the firm must manage it closely and pay the highest effort to satisfy it. [David Campbell, accaglobal.com, 2008]

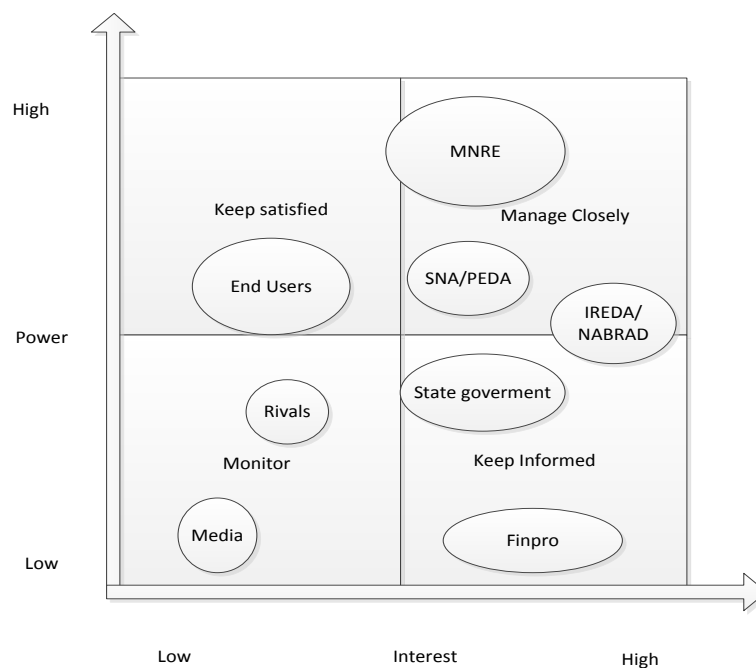


Figure 20: Business stakeholders' grid

Adapted from [Campbell, accaglobal.com, 2008]

4.6 Threats and opportunities

The table of threats and opportunities is created according to PESTLE framework and Porter`s five forces,. The SSP can add the internal origin factors of strengths and weaknesses to complete the SWOT matrix. As seen in the following table:

Table 10: Threats and opportunities

External Factor	Opportunities	Threats
Political	<ul style="list-style-type: none"> -A good degree of political stability -Member of WTO and signed agreements with Finland. There is a high cooperation level between India and Finland in Cleantech. - Investing in agriculture infrastructure is national priority. -Availability of national plan for Investing in Solar applications (JNNSM) 	<ul style="list-style-type: none"> -External factors affect political stability. -Complicated Tariffs structure. -Conflicts between the states government`s priorities and national government. -Shifting of concerns away from RE to other national challenges.
Economic	<ul style="list-style-type: none"> -Growing economy combined with energy deficit. -Increase prices of diesel and electricity is not reliable in most parts of India. -Punjab, Haryana are the highest farmer`s income. -Solar panels show a price declining pattern. -Subsidizing farmer`s electricity led to financial loss and there are some states rethinking of cutting electricity subsidies. 	<ul style="list-style-type: none"> -High inflation and Interest rate. -Availability of fund for financing the MNRE programs. -A new financial crisis might influence on the government JNNSM.
Social	<ul style="list-style-type: none"> -English is one of the official languages. -2nd largest population in the world. -Cheap labor force. -71% are rural population. -Foreigners get a better access to government authorities than locals. 	<ul style="list-style-type: none"> -Cultural diversity and different local languages. -Availability of skilled workers in solar industry. -Corruption and bureaucracy effect business.
Technological	<ul style="list-style-type: none"> -MNRE set the industry standards and support innovation. -Pumping water for irrigation is a necessity. There are at least 9 million DPs and 12 million EPs. 	<ul style="list-style-type: none"> -Approve new technologies. -The initial cost of SWP. -Formalize farmers with new technologies.

	<ul style="list-style-type: none"> -The current existing pumps are less efficient than the ones in Europe or other developing countries. -The existing technology of SWP depends only on monocrystalline silicon. The widely used products are the 900 Wp and 1800 Wp. 	
Environmental	<ul style="list-style-type: none"> Stakeholders pressure to promote using environmental technologies. -The increasing concerns of nuclear disaster. -SWP in India is eligible for CDM. 	<ul style="list-style-type: none"> -Competition of other RE. -Farmers lack knowledge of sustainable technologies.
Legal	<ul style="list-style-type: none"> -Legal framework encourages the RE usage. -No need for license or permission to use SWP. -The chance to get a tax holiday and 80% accelerated depreciation on SWP projects. -Existing subsidies and soft loans. 	<ul style="list-style-type: none"> -Complicated rules and regulations. -Registering as a channel partners. -There is a possibility to implement new regulations. -The restriction on importing components of the solar systems.

4.7 Segmentation of Indian farmers

The Indian market of off-grid applications is arranged as a project. Solar power system providers (SSP) should know their customers and design the project to satisfy their needs. The SWP market is more complicated than other off-grid application because many variables have to be considered to segment the farmers such as the land size, the water table, the irrigation method and the source of energy to power the existing pump.

The head program of the solar division in MNRE emphasized moving from potential to demand. When, the SSP target the right market segment with the proper product the demand will be created. Previous projects were designed only for marginal and small farmers. So, small numbers of farmers adopted the new technology simply because:

- Affordability of this size of land holders is very low.

- The local solar companies didn't consider the cross customers' different needs and the product was not design to fill their needs.

The SSPs have to plan the project and the product to suit a bigger number of farmers and meet their different affordability levels that will not occur unless the solar companies know the market segments. Here, the researcher will segment the farmers based on matching between previous studies and the field research interviews.

The system developers can enhance the existing technology or invest in new technologies in order to target all possible market segments. SSP can develop a pump to fit different land holders and different needs. The principle used in these projects is “mix and match”. The product mix and combination should be customized to match the possible target segments. For example, source water of 50 meters with a land size of 5 acres might be matched with the 1800 Wp pump. However, the same land size with a water table of 8 meters can be matched with 900 Wp pump. The challenge is designing a project with certain product capacity to target the most promising segment. The product boundary is 5 kWp.

The farmers can be segmented by the size of land holding, location, the crops planted, the type of pump used and the level of technology used in agriculture. Regarding, the size of land holding, the researcher will use the agriculture statistics of India. The Ministry of agriculture classifies farmers according to their land holding to five groups as follow (1 ha = 2.47 acres):

- Marginal farmers who own less than 1 hectare (ha).
- Small land holders who own 1-2 ha.
- Semi-medium 2-4 ha.
- Medium 4-10 ha.
- Large, more than 10 ha.

Based on statistical numbers published by Indian Ministry of Agriculture, the distribution of farm holding in India and Punjab is as follows:

Table 11: Sizes of land holding in India and Punjab state

Category	India 90/91		Punjab State 90/91		Punjab state 00/01	
	Percent	Number (×1000)	Percent	Number (×1000)	Percent	Number (×1000)
Marginal <1	59.4	63 342	26.5	296.1	12.34	123
Small 1-2	18.8	20 048	18.2	204	17.35	173
Semi-medium 2-4	13.7	13 969	25.9	289	32.9	328
Medium 4-10	7.1	7571	23.4	261.5	30.19	301
Large > 10	1.6	1706	6.0	67.2	7.2	72

Adapted from [Tiwana et al, moef.nic.in, 2007: p50] and [Sharma et al, agricoop.nic.in: p 128].

As seen in the table, India is an agriculture land of marginal and small operational land holding. More than 79% of farms holdings are marginal or small. In Punjab, the marginal and small land holders are less than the national average. Both comprise only 30% of the total land holders. The reason behind that, most of the marginal farmers are leasing out their land or even sell it because farming this size of land is insufficient for generating enough income to cover the farming cost [Tiwana et al, moef.nic.in, 2007: p50]. As a result, marginal farmers can't afford the product.

The large farms holders are 7.2%. Their affordability is higher than other groups but this land size requires a big pump size which it might exceed the product boundary. As a result, the small, semi-medium and medium land holders are more likely to be the right segments.

Since the green revolution in India and Punjab, the productivity per hectare has increased by using more modern farming technologies such as tractors, water pumps, and new irrigation method. Agriculture in Punjab is the most mechanized in India [Sharma et al, agricoop.nic.in: p128] the diffusion of new technologies early 1970s spread to neighboring states Haryana and Uttar Pradesh. In 1992, “the data shows that the percentage growth of tractors, pump sets and threshers has been higher in the marginal and small farm holding categories” [Sharma et al, agricoop.nic.in: p164].

In terms of cross farmer differences, the researcher was able to pilot highly structured interview questions for farmers. They represent the different farm holdings and they are located in different districts of Punjab. The interviewees were as follow:

- EP users
- DP users
- EP and DP users
- SWP users

The buying decision of industrial product is complicated and the degree of customer involvement is high. All interviewed farmers consider using a water pump is a necessity because:

- The government water supply is not sufficient.
- Pumping is the only source of water.

The buying criteria of pump sets are based in many factors. However, the researcher assumed the following criteria in order to understand based on what criteria the farmers make their buying decision of the pump set:

- The type of the pump
- The price
- The strength and quality
- The environment effect
- Other reasons

Most farmers agreed on the quality and strength of the pump set as the main criteria when they make their choices. The price wasn't the most important indicator as assumed. However, marginal and small land holders showed more concerning in choosing both criteria price and quality. The rest of the farmers are willing to pay higher price in order to get a better quality and stronger pump.

The users of electric pump stated that the electricity grid is reliable but electricity prices are getting more expensive yearly in spite of heavy subsidy. The users of

EPs have showed less interest toward SWP because the cost of running the electrical pump is still low. For example, 5 kW (7 hp) electric pump users pay INR 30 000 initial cost and INR 22 900 for electricity plus INR 2000 for maintenance yearly. The simple payback period (SPP) considering only the yearly running cost and the initial price will make it clear why the EP users are not ready yet to switch using SWP. It is worth noting the electric motor burn outs aren't considered in the calculation.

$$SPP = \frac{€5906 - €468}{€389} = 13.9 \text{ years. (€1/ 64 INR)}$$

Thus, the EP users will switch to use the SWP unless the cost of running the EP increased by removing the government subsidies on farmers electricity. Then, EP users must recognize the SWP as a strong and reliable system.

The diesel pump users are more willing to shift simply because the payback period is much shorter. The interviewed diesel pump users consider electricity unreliable. The cost of running the diesel pump is expensive. For instance, the initial cost of the 5 kW pump is INR 30 000 and the running cost is INR 700 (€11) daily plus 2000 INR for maintenance yearly. If we assumed only three months a year, the pump is in full use. The simple payback period without considering the diesel motor burn outs

$$SPP = \frac{€5906 - €468}{€1020} = 5.2 \text{ years.}$$

Thus, the DP users are willing to use the SWP.

Users of both electric and diesel pumps as a backup are also a promising segment. During the interviews, users of both have described the electricity as unreliable and the cost of running both motors is expensive. They also suffer from the motor burn outs because of regular electricity cuts. The running cost of both pumps is still less than the users of DPs. However, they showed an interest toward the SWP.

Regarding the irrigation method, the field research has shown that, there is no relation between the irrigation method and the type of pump used when other variable are constant. The important issue is lifting water. In this author's opinion,

users of drip irrigation system can be the niche market of SWP. The SWP is best suitable to use with drip system but solar companies has to promote that among farmers. [The Schumacher Centre, practicalaction.org, 2011]

The depth of the water source or the water table has a big influence on the choice of the pump. The interviewed farmers whose water table is deeper than 30 feet or 9 meters were more hesitant about replacing their exiting pump with SWP. the unwilling to use SWP for tube wells deeper than 10 meters is as a result of users perceptions and early adopter challenges with the new product. The latest SWP technologies are suitable for deeper than 50 m water table.

Related to the crops, in Punjab the main crops are wheat 44%, rice 33% and cotton 6% and the rest for vegetable fruits and pulses. The major two cropping season in the year are autumn (Kharif, from July to October) and spring (Rabi, from October to March). Based on the field research, crop types and plantation session do not have an influence on the pump choice. However, the farmers who need more water in sunny days are of course happy to use SWP compare to crops requiring more water in early stage of plantation.

The farmer stated attitude toward the product is classified according to size of land holding, pump set in use and the running cost. (The capacity of the pumps was converted to watts by using $1 \text{ hp}=740 \text{ W}$):

Table 12: Famers' attitude toward the product

Operational land size (Acres)	Type of pump	The Running cost	Attitude toward the SWP

6	DP 5.5 kW	€11 daily	Maintenance and running cost is extremely low
10	Both DP and EP 5 kW	Up to €30 monthly	Maintenance and running cost is affordable
2	EP 1500 W	€130 yearly	Reliable, economic and environmental
7	EP 5.5 kW	€ 130 yearly	It is suitable to my field and water demand
20	EP 14.8 kW	€1008 yearly	Unreliable for deep well and big farms
13	EP 1250 W	€230 yearly	Unreliable
12	EP 1500W	€240 yearly	Not strong
8	EP and DP 5.5 kW	The diesel cost reach €430 monthly when in use	Reliable and cost-effective. the problem SWP lose power in very deep wells
10	EP and DP 5 kW	€ 338 cost of diesel monthly	Reliable and cost-effective but it is not suitable for deep wells
13	DP 9 kW	€2 hourly and more than 500 € monthly when in use	Reliable and running cost is low

The user of diesel pump showed an urgent need for cheaper source of energy. Also, they are willing to replace their existing pump with the SWP. As you can see in the above table, the attitude toward using the SWP changed according to the cost of energy used. Users of diesel pump are the most promising segment with regard to the water table up to 10 meters and area of land less than 10 ha. Another promising segment is the user of both electric and diesel pump sets. Those farmers attitude toward the product is positive. They consider the SWP reliable but they have some worries about using it in the deep wells. EP users have described the SWP as an unreliable and weak pump. Consequently, users of DP and both EP and DP are potential customers. The market segments are clearly shown in the next questions. The question supports the previous findings.

The farmer responses about willingness to use a SWP instead of the current pump sets are demonstrated in the following figure:

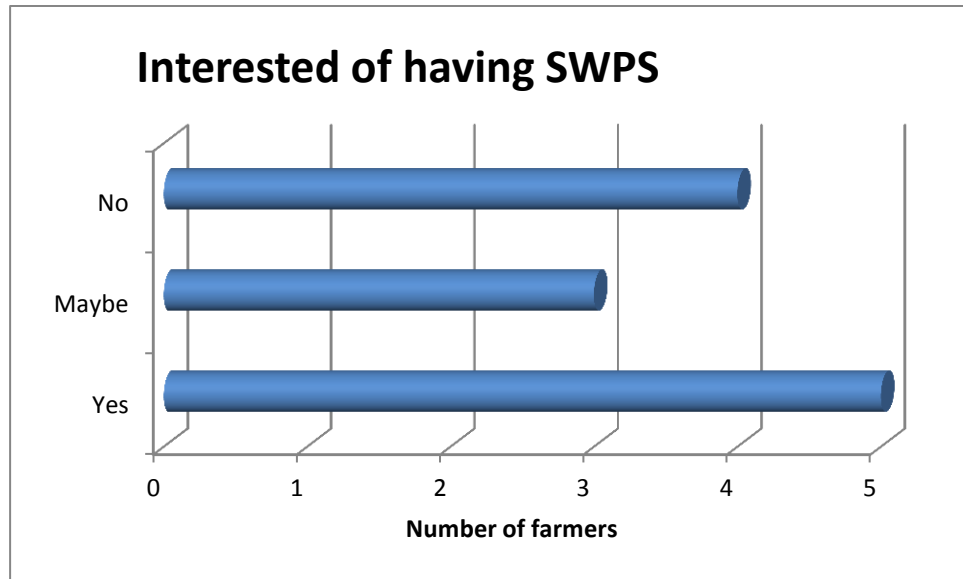


Figure 21: Farmers willingness to buy the product

The figure shows the responses of interviewed customers. The farmers' responses are linked with their energy bill, land size and water table. The farmers who have no interest toward SWP are the users of EP. As a result of cheap electricity in their farms and cheap running cost of the pump set. The yes respondents are the users of DP whose energy bill is high and they seek for other energy options to replace diesel. The users of both are still not sure because their energy cost is less than users of DPs but higher than users of EPs. Consequently, users of both pumps are indifferent about having SWP. As a result the right market segments are:

- Small, semi-medium and medium land holders
- Users of DPs and users of both EPs and DPs
- The tube well overhead (water table) up to 10 meters. This is can change when SSPs introduce an effective product for deeper wells

4.8 Marketing mix

The marketing mix is based on interviewing the off-grid solar applications stockholders and solar power system providers SSPs. The two approaches mix and match and the product customizing are used for designing and installing the product. The different needs of the farmers segments require different SWP mix.

The Product: SWP is an industrial product, that means it is bought to be used for production and conducting a business. The SWP is a capital item where the farmer uses the pump to aid production and operations. So, the marketing mix of industrial products has different combinations of the consumer products. The product can be divided into three levels. Each level describes a certain part of the market offering.

The core benefit is the basic level of the product. It is related with the value offered to customers. The product brings an immediate effect to farmer's energy bill without compromising in product functions. So, the core product shouldn't be only a device to pump water but also reduce the cost of using other energy sources. The interviewed farmers expect the core benefit of using SWP to be reliable, economic and environmental, without the essential benefit, the product will be useless.

The core product is the solar water pump SWP. In terms of capacity, the existing products in the market are 900 Wp solar pump and 1800 Wp. Within the project boundary, SSPs have the flexibility to create a core product up to 5 kW. New product combination and efficiency are crucial for SSP to position the product against competitors.

Based on the market segments, three product mixes can be offered as follows:

- SWP has a certain capacity, but the pump has to be powered by using diesel as a backup. This product targets users of diesel pump. SWP with ability to run by diesel will be effective and reliable at times where the sun is not shining and water is needed.
- SWP has a certain capacity; it can be powered either by DC or AC. This product targets farmers who have a water storage tank. This product allows them to full the tank, and then use the water at times the sun is not shining.

- SWP has a certain capacity, but the pump is provided with an inverter to adapt the DC to AC. This product targets end-users who use EP and DP as a backup. The reason behind using an inverter is the ability to backup the system.

The idea of the product mix offering is to satisfy different needs. The product can easily adapt to fit individual farmers. So, the project designers can target each market segment with different product mix or all the market segments with similar needs. The following table illustrates the mix and match principle in the product mix context:

Table 13: Product mix

Farm Size	Water Table (M)	Type of pump used	The Product offerings
Small farm	Up to 10	User of Diesel	>1000 Wp SWP, the pump motor can run on diesel as well.
Semi-medium farm	Up to 10	User of both (connected to grid)	1800 Wp SWP, the pump motor with inverter.
Medium farm	Up to 10	User of water storage tank	>2000Wp, the pump motor can run on DC, AC or even diesel.

Actual product is related to the product's features, design, quality, country of origin and brand. The imported brand from Europe is already an advantage. The country of origin image is crucial in implementing projects and promoting the product [Mr. Gau., Naps system, 2011]. Also, the customers in India prefer imported products from western countries than the ones from India or China. The perception of imported products has a big impact on customers in such countries. Quality and strength of the pump must be the major positioning tool. Most end-users emphasized a strong and effective pump more than price. The SSP can add features to the system but the minimum required should be included. Design can attract more end-users but customizing the system with respect to individual farmer's needs is more important. Customizing includes identifying the farm

water needs, the water depth, the crops pattern and the site preparation. Packaging doesn't matter on industrial products. End-users worry more about the quality and the efficiency of the system.

Augmented products include delivery, installation, guarantee, warranty and after sales services. The researcher discussed those services with the customers. Delivery to the site should be complete and on time. The SWP installation must be the duty of SSP to ensure the best performance. The project conditions require installation to the SWP in the farm. During the interviews, end-users identified the factors influence their pump set choice by the quality of installation and maintenance, the product warranty period, and the service after buying. Most of them complained about the installation quality and the maintenance of their current pump sets. Some of farmers stated that “there is no free installation and the maintenance is for limited time. If there is a company offering free installation and maintenance, we will buy more and we will recommend it to others.”

Service after sales is essential for industrial products. Users of SWP expect a decent service after buying new technology such as SWP. The farmer's responses toward the effect of after sales service on buying decision divided to:

- Most farmers stated that, “There is a strong effect on the buying decision. It is the only way to build a long relationship with customers.”
- A small number stated, “There is a moderate effect because after sales service should be combined with proper maintenance and installations.”
- Only two farmers stated. “Service after sales is not a part of the buying decision.”

The SSP must provide a sufficient guarantee on their products in order to register as a channel partner. Project administrators require at least a 10 years performance guarantee on the PV array and at least one year on motor set and other accessories. [JNNSM, mnre.gov.in, 2010]

The Price: “One of the most common misconceptions about the solar industry is that declines in average selling prices are harmful to the industry’s growth and the profitability of photovoltaic companies” [seekingalpha.com, 2011].

Charging the highest price doesn’t mean making the maximum profit because high prices should be combined with high volumes as well. In 2008, the financial crises and over supply of solar panels lead to a sharp drop of 10-20% in solar cells prices. But it didn’t hurt the industry. On the contrary, the demand has soared by 143% and profit margin has increased. [seekingalpha.com, 2011] The price elasticity of demand shows charging a competitive price maximizes profit as well.

The pricing of the SWP product mix is not flexible. The MNRE already set a benchmarked price for all off-grid applications based on market price. For example, a solar system with battery storage such as lantern or standalone home system are subsidized based on INR 300/W approximately €4.6/W. System without battery is benchmarked by INR 210/W approximately €3.2/W. However, the charging prices to the end-users must be determined strategically. The researcher suggests three selling approaches that can lead to different prices for the product mix. The different selling approaches are:

Direct sales through project: The mixture of subsidy and soft loan up to 80%. The rest is paid by the end-users. This was the approach of previous projects. In case the SSP select the direct sales then benchmarked price should be implemented.

Lease agreement between the SSP and the end-users, the leasing will be only for the rest of the total price (at least 20% of the total product price) after the subsidy and the soft loan. This approach can change how the market and projects operate. The lease agreement allows farmers to pay the rest of price in monthly installments based on the saving rate of the energy cost. For example, the saving amount in diesel by using SWP can be paid as installments to cover the balance price of the system. This approach will add some flexibility to set a higher price based on the period of the lease. The lease agreement can use 5% interest rate

because this is the rate of subsidized loan. For instance, two users of DP capacity of 7 HP stated during the field research an average of €384 is spent monthly on buying diesel. Assume there are three months in the year the pump is in maximum use (November, December and February) [iwmi.cgiar.org, 2003] at least a sum of €1152 is saved yearly by using SWP. This amount can be paid on monthly basis. The monthly installment will be about €90. So, 20% end users share is €2067 minus €1085 (first year payment) equal €982. The balance for the second years is €982 + €103 = €1085 is the amount to be paid by end of the next year. The following table shows how the lease agreement works:

Table 14: Lease agreement installments

Total Price (€)	Subsidy of 30% (€)	Soft loan 50% from IREDA (€)	Balance (€)	Simple Interest Rate 5 % (€)	Yearly payment (€)
5906	1772	2067	2067	103	1085

Collaborative buying fits the Indian farmers because social networking is a strong feature of farmers. There is a collaborative buying of tractors in India. It is a successful way to own a tractor for certain period of time and share the costs. The tractors are easy movable. The collaborative buying already exists in the Indian agricultural sector. “Custom hiring of farm machinery was first introduced in Indian agriculture in 1912 when a 30inch (diameter) steam thresher was used for custom hiring in Layallpur district. These machines were taken to about 10 different places working for 2 or 3 days at each place” [Sharma et al, agricoop.nic.in: p129]. The solar companies can plan projects through collaborative buying if the product designed to be portable. The farmers who share the product must share the same water demand and water table. It is an efficient way to promote using SWP among farmers but the project has to be designed carefully.

Funding mix is a way to involve international financing stakeholders to invest in emission reduction project. SWP for irrigations can be considered under the Clean Development Mechanism (CDM) of Kyoto Protocol. The emission rate was

calculated and it was eligible to be covered by the CDM. [Purohit et al, HWWI, 2005] The funding mix requires the SSP to design a project based on CDM requirements and coordinate with MNRE. The funding mix allows the SSP to charge part of end-users share to NGOs. Thus, the affordability of the farmers will be enhanced.

The main problem of marketing SWP is the initial cost compared to other available electric and diesel pump. The initial cost of solar water pump reach 10 times the price of diesel pump but the operating and maintenance costs make SWP cheaper. The payback period influence pricing. Factors such as increasing in the price of diesel, electricity or maintenance costs make SWP payback period shorter. As mentioned earlier, every 10% increase in diesel price there will be 5% shorter the period of breakeven. [self.org, 2008: p 7] Shorter payback make end-user willing to pay more for the SWP.

The Place is related to where the end-users get their product. The MNRE requires from solar companies to establish a product and service providing point in the project area. There are some limitations for investor in off-grid applications because under the project scheme, MNRE allows for certain system components to be imported but is not possible to import the whole system. So, the company should identify the core competitiveness of product; in this case the solar panels imported but the rest of system must be outsourced to companies operating in India. Moreover, adding transportation cost will increase the price of the final product and reduce the company competitive costs. Minimizing the imported items will reduce the number of containers. The place importance for the industrial product is less than with the consumer products. The idea is the solar power system provider must be reachable to obtain the product and service. Here, the channels of distribution and networking are essential.

Channels of distributions are controlled by the company objectives and the entry mode choice. However, the functions of the distribution channels are how to reach the market segment and deliver the product. The SSP is advised to set the company location close to the targeted states in India and build networking

channels in other states. Here, the researcher suggests the city of Chandigarh (Capital of Punjab and Haryana states and it is close to New Delhi) the capital area is well planned and all stakeholders offices are in the capital. Transportation to the project locations is easy accessible.

Promotion mix related to the ways of communicates with the end-users in order to:

- Create the SWP demand.
- Introduce the subsidy and loan available under this scheme.
- Educate the end-users about the product and service.
- Show the product competitiveness with diesel and electric pump.

Promotion is responsibility of the company but the project stakeholders such as MNRE and financing agency IREDA will promote the subsidy and loan availability. The SSP will coordinate with stakeholders to promote the project by using local newspapers and other forms of leaflets and brochures. Fortunately, mass media advertising and sales promotion are not needed to promote the product or the project. The farmers' main sources of information are their friends and social networking. The following figure shows where famers get information about the available types of pump sets.

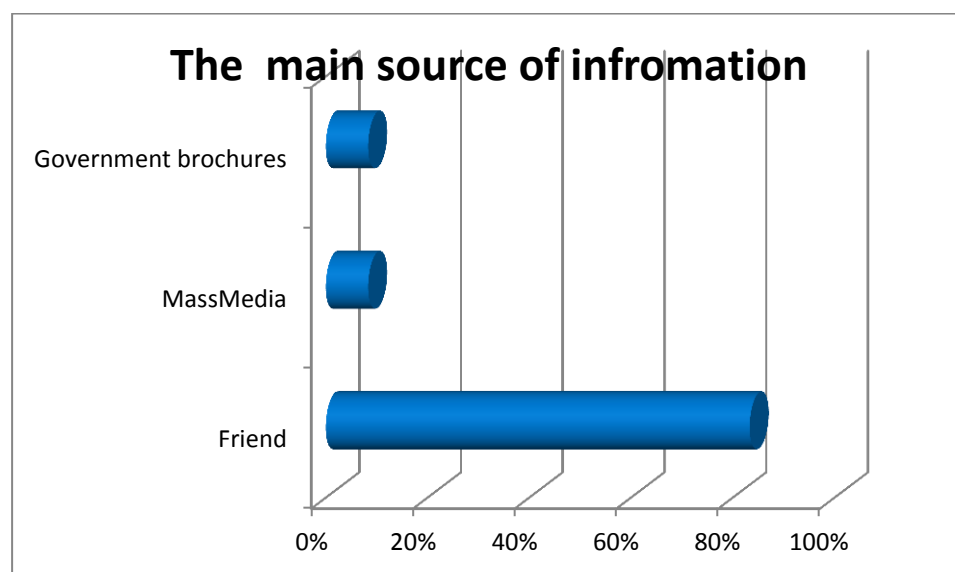


Figure 22: Source of information

The farmers trusted source of information is a friend who has experienced the product. Consequently, personal selling and direct marketing are the main promotion strategies to communicate with end-users. Sales personnel are very important; they have to be experienced with the product features and well trained in installations skills. The sales personnel reflect the company capability to deliver and reach the market segments. When a farmer's need is satisfied for sure he will talk about his own experience with others, then new end-users will come to get the same experience.

The internet is essential for helping end-users and stakeholders reaching you and knowing you. The company webpage should be available in English and Hindi. Webpages designed to fit the Indian taste will be useful. Availability of customer service is necessary. Many farmers complained about customer services and the difficulty to reach the existing pump companies. Membership in platforms and websites related with agriculture activities will make farmers and irrigation companies aware of you and your products. For instance, a forum for farmers and agricultural activities called agricultureinformation.com. Also, the company can take benefit of solar power exhibitions and conferences across India. This is a very effective way to communicate with stakeholders and new end-users. Participation provides an idea about new opportunities in new target states. Good public relations with publicity and stakeholders will build up a good image about the firm services and products.

The People and the physical layout overlap. The heart of modern businesses is the customer service. End-users are not interested to visit your facilities; rather they would receive good customer services. Well-designed services are what customers focus on. The experience of buying and services perception differentiates your product from others. The researcher noticed during the field trip, that the services offered by existing companies don't meet the farmer's expectation. Most of them were unhappy with the level and the quality of service provided. They said "there are no options". So, local employees should be trained by personnel from the mother company. "Most available employees in India are not specialized in renewable energy" [Mr. Varshnei, Saur Oorja director].

Luckily, new initiatives have been launched by educational institutions to start offering new programs related to RE.

The Processes: Industrial products should be combined with good processes. Delivering the product service is part of the company image and it is required by the project administrators. Besides, customers of industrial products invest big capital so they expect to get a different service than consumer products. The stakeholders require the solar power system provider to ensure good processes in order to accept their project proposal. Installation is the responsibility of the solar company. As mentioned earlier, customized installation to fit different customer`s needs and follow mix and match principle are essential for process planning. Operating and maintenance are obligated under the guarantee period. User manual must be available in English and Hindi. A long relationship with customers has to be one of the company priorities instead of one time contact.

4.9 Entry mode

The market choice of entry mode is about choosing the right tool to implement the company objectives and goals. The long term commitment to India solar market is the key factor for success. This result isn't arbitrary. Marketing strategy and business model require a certain degree of control over the company operations that will not occur unless long term investments take place in the right form of entry mode. At the time, when the researcher conducted the field research, he was able to meet entry mode stakeholders. The meetings were with:

- Invest India Institution. It is a government nominated agency for investment facilitation.
- KMAFICS India. It is a private consulting company. The company assists many European and Finnish companies to invest in Indian market. Also, it

provided all facilities for foreign investors such as assistants of selecting the right location, registering the investor, and negotiating with possible partner if needed.

Both interview stakeholders agreed on the long term commitment to the market as the key factor to success. “Once you took a decision to invest in India, you have to be patient and committed” [Mr. Ajaya Khullar, KMAFICS-India)

The types of entry mode can take any form of exporting, contractual management, and investments. The degree of resource commitment is the determinant of each type. The reasons behind choosing certain entry mode are divided between internal factors related to the company and external factors related to the target market operating environment. The internal factors include factors such as the company overall strategy, objectives, resources and capabilities. The external factors related to the physical and social factors which we discussed earlier in the PESTLE framework.

The following figure shows the tradeoff between control and risk of possible market entry modes; also the figure links the firm`s experience relation to entry mode. For example, exporting is lowest risk and highest control. Besides, companies without international experience prefer exporting than other modes.

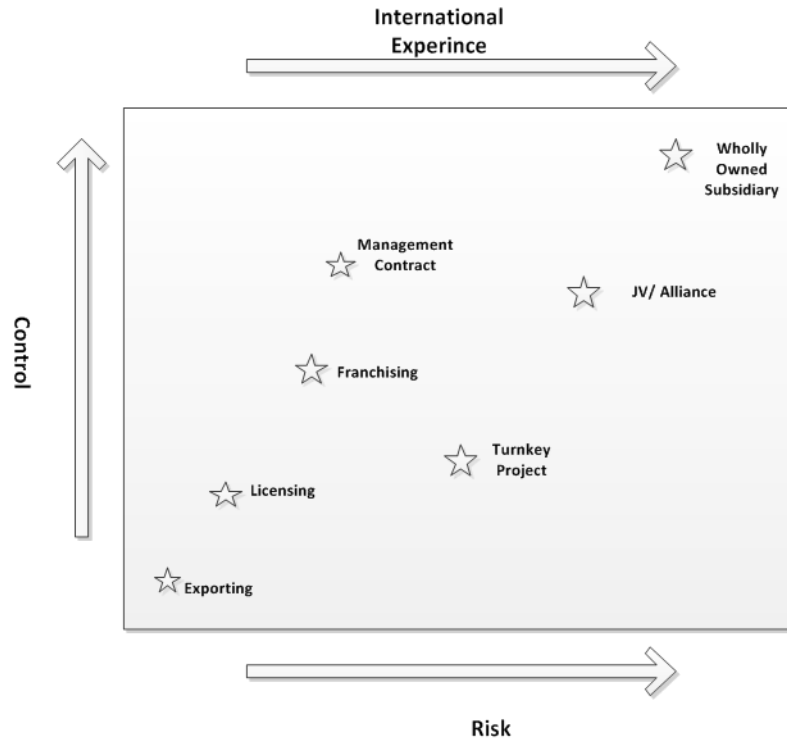


Figure 23: Entry modes control and risk trade off

The choice of entry mode must take into account the following limitations: The MNRE allows only for certain components to be imported, not the whole system. Also, the company should register as a channel partner. That will not occur unless the company enters the market through FDI modes. The market attractiveness forces the company to have a high degree of control over the market strategy and the business model. It is more cost competitive to produce in India than European countries and cut off the shipping cost.

With respect to the above mentioned, the solar company can select any of the entry modes. However, discussing advantages and disadvantages of each entry assists the investor to make the right choice. For instance, exporting works only if the foreign solar company is able to persuade a solar company in India to import certain components or the design for solar power system. Exporting is risky when the importer company in India learns how to develop their own system. Also, the exporter company will have very limited control over operation. The advantages of exporting are moderate risk and require less experience than joint venture (JV) or wholly owned subsidiary (WOS). However, the control on implementing the marketing strategy and business model is small.

Management contracts are widely used in hotels and airport management. It is a low risk combined with higher control than other contractual modes. But it is not the right entry for this type of investment. It lasts for limited time and investing in solar off-grid application requires a long term commitment. Also, it will be hard to find a solar company in India which operates by this type of entry.

Turnkey project is a form of entry mode used by Naps Systems. [Mr, Alessio, Giorgio., Naps System, 2011] the company operates on the basis of risk aversion investor. The company targets countries where the Finnish Ministry of Foreign affairs or the host government is willing to finance the whole project. This type of entry works under the same conditions only. If the solar company able to arrange with the Indian government, International organizations NGOs, or Finland Ministry of Foreign Affairs to finance such projects then, this option should be considered. The turnkey project assists the company to collect more data and knowledge about the market before taking further investment steps.

Now, the JV and WOS are most likely modes of entry for this type of investments. The following tables show the advantages and disadvantages of JV and WOS.

Table 15: JV advantages and disadvantages

Joint Ventures	
Advantages: <ul style="list-style-type: none"> • Share risks. 	Disadvantages: <ul style="list-style-type: none"> • Difficulty of finding appropriate

<ul style="list-style-type: none"> • Combining the resources and know-how. • Use the existing partner experience in the local market. • Faster project processing If the partner already a channel partner. • Overcome many obstacles facing the foreign company in new environment. 	<p>partners and agree on certain conditions.</p> <ul style="list-style-type: none"> • It’s difficult to manage a foreign partner. • Lack of flexibility and control. • Limited ability to integrate and coordinate activities. • More likely to break up. • The partner might easily copy your core competitiveness • Profit sharing.
--	---

Adapted from [Daniels et al, 2007] and [Johnson et al, 2008]

Table 16: WOS advantages and disadvantages

Wholly Owned Subsidiary	
<p>Advantages</p> <ul style="list-style-type: none"> • Maximum control over operations • Take advantage of host country especially cheap labor and resources. • Get the incentives of investing in RE sector. • Stronger competitive position. • Easier to achieve strategies. 	<p>Disadvantages</p> <ul style="list-style-type: none"> • Assets risk exposure • Require financial resources • It is time consuming especially Greenfield entry. • Require a high degree of international experience.

Adapted from [Daniels et al, 2007] and [Johnson et al, 2008]

As a result, the researcher recommends the WOS to be the entry mode for this market. Furthermore, the following drivers are the major key factors for foreign companies considering entering the Indian market [Johnson et al., Journal of Marketing, gtellis.net, 2008]:

- *“Success is higher for smaller firms than larger firms*
- *Success is higher for firms that use a mode of entry with greater control*
- *Joint ventures are the most popular mode of entry accounting for 41% of entry modes. Second, the WOS accounts for 33%.*
- *Earlier entrants enjoy greater success than later entrants, especially in India*

- *Entry strategies that involve high control (e.g. Wholly owned subsidiaries) are more successful than those that involve low control*” [Johnson et al, Journal of Marketing: p 10, gtellis.net, 2008]

“Firms should choose the entry mode that affords them the highest degree of control while entering emerging markets. Doing so implies not taking on partners and alliances in the host nation and may add to the cost and difficulty of entry. However, the greater control provides the entrant an opportunity to compete on its own unique strengths, monitor success and failure closely, and makes changes in strategy as soon as necessary” [Johnson et al, Journal of Marketing, gtellis.net, 2008]

The FDI laws favor the foreign companies to enter the market. The company can invest directly in the market under the Automatic Route where 100% FDI is allowed by the government. For opening of the foreign company, a specific approval from Reserve Bank of India is required. Companies incorporated in India and branches of foreign corporations are regulated by the Companies Act, 1956. The Registrar of Companies and the Company Law Board are both working under the Department of Company Affairs to ensure compliance with the Act. [Overseas Indian Facilitation Centre, oifc.in, 2001]

4.10 Proposing the possible business model

“In today`s world, where the only constant is change, the task of managing innovation is vital for companies of every size in every industry” [Henry Chesbrough, 2006: xvii]

The possible business model in this research depends on the marketing strategy. It has to respond to any change of the marketing mix, market segment and market competition. As discussed in the theoretical framework, the business model is a result of innovation in the product technology or the process. The innovation in technology can take place in two directions. First, new product design, in this case

new SWP layout combined with new components in order to reduce costs and increase efficiency. Second, develop a new technology for any components of the system such as the pump, solar panels, even switches and wiring. The innovation in processes can be through new project design or new value delivery to the end-users.

Most of the business model blocks were already discussed in the marketing strategy such as the customer segment, customer relation, and distribution channels. However, the cost structure has to be based on the value more than the cost because the long term relationship with customers and technology diffusion are controlled by customer`s value proposition. The revenue stream can be based on the yearly targets of the firm. The JNNSM will last till 2022. The technology diffusion can be predicted by using S-curve. Here, we can introduce the adoption curve.

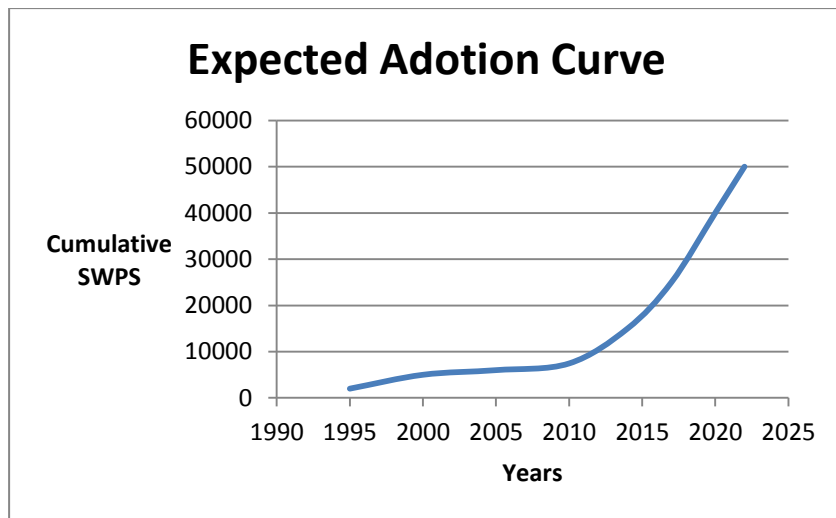


Figure 24: Expected adoption curve of SWP

The following table estimates the cost of crystalline based solar module from three different sources Germany, Japan and China. The interviewed solar company stated that 60% of the cost goes for the solar module and 40% goes for pump, inverter, wires, switches and installation. For instance, assume the 40% is €1200 in average regardless of the type of the solar module. The following table shows the margin. All numbers are for one unit and in euros.

Table 17: Estimated cost and profit margin

Module type (€/W)	Cost of 1800 Wp array (€)	Total cost of the System (€)	Benchmarked price (€)	Margin
Germany 1.33	2394	3594	5906	40%
Japan 1.27	2286	3486	5906	41%
China 0.9 8	1764	2964	5906	50%

[solarserver.com, 2011]

5 CONCLUSIONS

The Indian energy sector is one of the most attractive markets for foreign investors. Agriculture is the most important sector in the whole country. The solar

water pump is the optimal choice to reduce the country's energy gap and sustain the development of the farmer's life. The market size is enormous. It is comprised of 12 million electric pumps and the 9 million diesel pumps. However, only the users of DP and users of EP with DP as a backup are in urgent need to adopt alternative energy source to irrigate their land. The alternative energy must be sustainable financially and environmentally. It clearly shows the user of EP will rethink their energy sources only when the government reduces or stops subsidy of the farmer's electricity. In my opinion, all national governments aim for efficient use of resources and India is not an exception. The Indian authorities completely recognized the subsidy on electricity led to insufficient power usage. So, it is just a matter of time for EP users to be the new target market.

Planning of the marketing strategy is essential to approach the market. Strategically the planning starts by identifying the emerging business opportunity, understanding the current market situation, considering the external environment factors, knowing the customer segments and offering the marketing mixes. The research findings provide a solid ground to strategically approach the Indian solar water pump market by taking into consideration the following:

- Changing the end-users' perception of the product is essential to create the demand and widen the target customers.
- The marketing mix offerings must target small, semi-medium and medium land holders and meet their needs and expectations. So, marginal farms are not the market segment. Large land holders require a big size pump which might exceed the boundary of the MNRE scheme or so expensive to afford.
- The farmer's affordability is raised by the leasing agreement. That is based on the monthly saving of the diesel. Collaborative buying is only considered if the SSP is able to offer an efficient portable product. Funding mix is also an option.
- Personal selling and direct marketing are the main promotion strategies to communicate with end-users
- The recommended mode of entry allows the foreign investor to implement his own market strategy and get the fruits of long-term commitment to the

market.

This study laid out the short cut for approaching the Indian market of SWP. Besides, it is a good base to extend the study to other off-grid applications. It is a starting point to develop strategic market approaches for different off-grid applications in India.

As a result, the research findings provide strategic marketing techniques to enhance the adoption rate of this technology. But, the selling of SWP through projects can face many challenges such as, the end-users' awareness of the technology is still at minimum level and that can influence their buying decision. A sharp decline in oil prices can hit the demand of SWP badly. Furthermore, the allocation of JNNSM's funds among off-grid applications is not clear yet. So, how does the MNRE prioritize SWP among the other off-grid applications? How much funding is available only for the SWP? Both are valid questions.

The research focused mainly on the external environment factors. So, the internal origin factors must be assessed before considering entering this market. Thus, the company resources can focus on either the technology or process innovations. The research pointed out the recommended paths of innovation based on end-users expectations.

Another set of questions concern the developers of new technologies related to solar power applications. How do related authorities deal with new innovations in the field of off-grid application? Can developers charge higher prices than the MNRE benchmarked price in order to cover R & D costs? Do MNRE and state governments facilitate promoting new technologies by raising end-users' subsidies and soft loans?

During the field research, some issues related to the business area and government prioritization areas across India have come up. For example, which state is the most focusing in SWP? Where SWPs are most needed? Do the state governments prefer certain areas than others? Also out of this research scope, what is the

drinking water pump market? That includes the household usage and animal husbandry water pump markets. This is also a huge market which must be studied further. It might be another emerging opportunity. Organic farming in India becomes a growing market. The SWP fits the organic farming perfectly. Using the SWP in organic farming can be used to market and promote the organic products.

5.1 Recommendations for market strategy and business model

Marketing strategy contains planning and tactics. The researcher tried to introduce both but some issues should be addressed. The crucial considerations which the researcher recommends related to the elements of the market strategy planning:

- Setting the marketing plan objectives
- Targeting the market segments
- The marketing mix offers
- The social networking of the business model

The marketing objectives have to be set based on the company's available resources. Then marketing control, as discussed earlier in the theoretical framework of this research, can be created to measure the outcomes of the MS. In case the achievements are below the targets, the solar company has to create more marketing research to adjust the market segments or the marketing mix. Furthermore, the action programs should be assigned for each stage of the MS. The experts from the mother company are vital to ensuring implementation of the MS. They have to assign clear and written tasks for local workers when they implement the selling, installation and service of the product.

The contingency plan should always be ready. A new financial crisis can hit at any time. That might lead the Indian government to cancel some development programs. Also, changing some legal issues of the guideline of the off-grid applications is highly possible. For instance, it is crucial to build a relationship with a local PV manufacturer in case the MNRE restricts the regulations on using importing materials in executing local projects. So, it is advisable to keep a local reliable supplier on your side by using his solar panels in certain projects.

The recommendations for the business model are to consider the importance of social networking among farmers and farmers' families in India. The solar company can arrange meetings and events among farmers who already adopted the new technology and others who are considering it. Also, they can assist them to share their experiences of using the product. Another issue worth considering is cooperation with companies providing farmers with irrigation tools such as pipes, sprinklers etc. The solar company can develop an integrated solar irrigation system with them or both design projects for farmers. Drip irrigation is also subsidized by government authorities.

The researcher recommends the foreign companies organize an online meeting with the market entry mode stakeholders of this research such as Invest India and KMAFICS-India before entering the market. Invest India can be reached by visiting the Indian embassy in your area. Invest India assists foreign investors in discussing not only the legal issues to enter the market but also they can arrange you meeting with the state government officials by using video conference. The following issues can be discussed:

- The procedures to settle down a business in a particular state.
- The states' own strategy of promoting SWP and off-grid applications.

Moreover, KMAFICS- India can be contacted to explore the services they provide for foreign investors. The company brought to the Indian market many Finnish such as Polar Tulikivi and Noiro, as well as other European companies.

*For Further information, please do not hesitate to contact the researcher at:
manasrinen@gmail.co*

6 REFERENCES

Books sources

Armstrong Gary., Kotler Philip. 2004.10th Ed, Principles of Marketing, (Active book version 2.0). Pearson Prentice Hall, US.

Chesbrough Henry William. 2006. Open Business Models: how to thrive in the new innovation landscape, Harvard Business School Press, US.

Daniels, John D., Radebaugh, Lee H., Sullivan, Daniel P. 2007. 11th Ed, International Business (environments and operations), Pearson Prentice Hall, US.

Johnson, Gerry., Scholes, Kevan., Whittington, Richard. 2008. Exploring Corporate Strategy, Text & Cases. 8th Ed, Pearson Education Limited, England.

Kaplan, Robert S., Norton, David P. 2008. The executive Premium, Harvard Business School Press, Boston, US.

Marshall, Greg W and Johnston, Mark W. 2010. Marketing Management, McGraw-Hill/Irwin, New York, US.

Maylor, Harvey., Blackmon, Kate. 2005. Researching Business and Management, Palgrave Macmillan, New York, US.

Osterwalder, Alexander ., Pigneur, Yves. 2010. Business Model Generation. John Wiley & Sons, Inc. Hoboken, New Jersey, US.

Internet sources, online Reports and articles:

A Cost and Reliability Comparison between Solar and Diesel powered Pumps, Jul 2008, Solar Electric Light Fund (SELF), (accessed 31.10.2011). Available at: <http://www.self.org/SolarvsDiesel.pdf>

A New Marketing Mix Structure: The 7 Ps, 2011, (accessed 21.6.2011). Available at: <http://www.sales-and-marketing-for-you.com/marketing-mix-structure.html>

Abdullah, Farooq. Jan 2010. Minister`s speech, The Ministry of New and Renewable Energy (accessed 18.08.2011). Available at: <http://www.mnre.gov.in/speeches/jnns-16062010.pdf>

Alesina, Alberto., Özler, Sule., Roubini, Nouriel ., Swagel, Phillip. Sep 1992, Political Instability and Economic Growth. National Bureau of Economic Research, Working Paper No. 4173, (accessed 22.08.2011). Available at: <http://www.ssc.upenn.edu/ier/Political%20Economy%20Archives/Political%20Economy%20Working%20Papers/Political%20Instability.pdf>

Best practices in solar water pumping, Dec 2002, Auroville Renewable Energy (AuroRE) , (accessed 05.04.2011). Available at: <http://www.aurore.in/Best%20practices%20in%20Solar%20Pumping%20manual.pdf>

Bjarnegard, Fredrik., Chou, Allen., Phunpunyakorakul, Sukon "Tae", Pupaolan Yotin., Tavaranan, Salinee. 2011, Ram Pump and Solar Pump Training, (accessed 15.11.2011). Available at: <http://www.palangthai.org/docs/WaterPumpingManualJun06.pdf>

Business Environment, 2011, Module -3 Business around Us,(accessed 31.08.2011). Available at: <http://www.nos.org/srsec319new/319EL3.pdf>

Campbell, David. Jan 2008, all about stakeholders – part 1, relevant to ACCA Qualification Paper P1, Student Accountant. The Association of Chartered

Certified Accountants ACCA, (accessed 06.10.2011). Available at:
http://www2.accaglobal.com/pubs/students/publications/student_accountant/archive/sa_jan08_campbell.pdf

Coalition government in India, The Views paper, 2009, (accessed 22.08.2011).
Available at: <http://theviewpaper.net/coalition-government-in-india/>
Constitution of India, 2011,(accessed 22.08.2011). Available at:
http://india.gov.in/govt/constitutions_india.php

Cooke, Robert. Newsday. San Francisco Chronicle, May 1999, History of Ancient
Indian Conquest Told in Modern Genes, the Caste System of India, (accessed
30.08.2011). Available at:
<http://www.raceandhistory.com/historicalviews/casteindia.htm>

Corruption Perception Index 2010 Results, 2010, Transparency International,
(Accessed 21.08.2011). Available at:
http://www.transparency.org/policy_research/surveys_indices/cpi/2010/results

Demand for solar and wind power drops as banks stop financing related projects,
Feb 2009, Environment News network, (accessed 06.09.2011). Available at:
<http://www.enn.com/business/article/39256>

Economy of India, 2010, (accessed 27.12.2010). Available at:
<http://www.pteducation.com/gk/India.pdf>

Emerging markets, Stumble or fall? Jan 2009, the Economist online, (accessed
3.01.2011). Available at: <http://www.economist.com/node/12896793>

Energy in India, Sep 2001, Overseas Indian Facilitation Centre (OIFC), (accessed
15.10.2011). Available at: <http://www.oifc.in/Sectors/Energy-%26-Environment>

Enhancing Sustainable Production, Financing Model for Solar Water Pumping
Systems in Agriculture, March 2004, (accessed 11.08.2011). Available at:

<http://enviroscope.iges.or.jp/contents/APEIS/RISPO/inventory/db/pdf/0079.pdf>

Ernst & Young private Limited, 2010, Doing Business in India, (accessed 02.07.2011). Available at:

http://www.investindia.gov.in/e&y_doing_business_india.pdf

Fellow, Shirish Garud and Purohit, Ishan. Research Associate, Making solar thermal power generation in India a reality – Overview of technologies, opportunities and challenges, The Energy and Resources Institute (TERI), (accessed 01.08.2011). Available at:

http://www.cognizance.org.in/main/pages/technovision/Dr_Garud_Teri.pdf

Fifield, Paul. Published by Elsevier Ltd, 1992, 1998, 2007, Marketing Strategy, The Difference between marketing and markets, (accessed 16.08.2011). Available at: <ftp://ftp.monash.edu.au/pub/rlmartin/ARCHIVE/BOOKS/BOOK%20-%20MARKETING%20STRATEGY.pdf>

Finnish companies increasing focus on India Sep 2010, (accessed 13.1.2011). Available at: <http://www.ibrnews.org/2010/09/finnish-companies-increasing-focus-on.html>

Fisheries and Aquaculture Department, Stakeholder Group 2011, FAO Corporate Document Repository, (accessed 04.10.2011). Available at: <http://www.fao.org/DOCREP/003/W8623E/w8623e05.htm>

Fitzgerald-Moore, P. and Parai, B.J. 1996, the Green Revolution, University of Calgary, (accessed 20.08.2011). Available at: <http://people.ucalgary.ca/~pfitzger/green.pdf>

Germany nuclear power plants to close by 2022, May 2011, BBC News Europe, (accessed 02.09.2011). Available at: <http://www.bbc.co.uk/news/world-europe-13592208>

Golafshani, Nahid. Dec 2003, University of Toronto. Understanding Reliability and Validity in Qualitative Research, (accessed 14.07.2011). Available at: <http://www.nova.edu/ssss/QR/QR8-4/golafshani.pdf>

Gross domestic product, 2010, PPP, World Bank, (accessed 11.09.2011). Available at: http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP_PPP.pdf

Gross national income per capita 2010, Jul 2011 Atlas method and PPP, World Bank, (accessed 25.08.2011). Available at: <http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf>

Hax, Arnolando C and Majluf, Nicolas S. 1986, Strategy and the Strategy Formation Process, Sloan School of Management, (accessed 20.05.2011). Available at: <http://dspace.mit.edu/bitstream/handle/1721.1/2149/SWP-1810-15686178.pdf>

History of Punjab - Comprehensive text of Punjabi history, 2011, (accessed 10.08.2011). Available at: <http://www.punjabonline.com/servlet/library.history?Action=Page&Param=2>

Howe, Kenneth R. 1988, Against the Quantitative-Qualitative Incompatibility Thesis or Dogmas Die Hard, University of Colorado, (accessed 01.09.2011). Available at: http://nepc.colorado.edu/files/Howe_Against_the_Quant_Qual_Incompatibility_Thesis.pdf

India Aims for Title of World's Fastest-Growing Economy by 2014, Feb, 2010, Bloomberg Business Week, (accessed 21.12.2010). Available at: <http://www.businessweek.com/news/2010-02-25/india-aims-for-title-of-world-s-fastest-growing-economy-by-2014.html>

India- Finland sign agreement on economic cooperation, Press releases, Government of India, Ministry of Commerce and Industry, Mar 2010, (accessed 24.08.2011). Available at:

http://commerce.nic.in/pressrelease/pressrelease_detail.asp?id=2573

India Information, 2011, Punjab, (accessed 10.08.2011). Available at:

<http://www.whereincity.com/india/punjab/>

India Mysore, 2011, (accessed 30.08.2011). Available at:

http://www.lisindia.net/punjabi/Punjabi_demo.html

India peak power deficit to widen 12.6 pct in 09/10, Jul 2009. Thomson Reuters (accessed 27.12.2010). Available at: <http://in.reuters.com/article/idINIndia-40958020090710>

India Solar PV Advisor, 2011, Energy Alternatives India EAI, (accessed 06.09.2011). Available at: <http://www.eai.in/ref/reports/solar.html>

India: Economic Indicators, 2011, Central Bank raises interest rates by 50 basis points, (accessed 25.08.2011). Available at:

<http://www.focuseconomics.com/en/asiapacific/india/economic->

India: Government, 2011, Michigan State University, global EDGE, (accessed 23.08.2011), Available at: <http://globaledge.msu.edu/countries/india/government/>

India`s Macroeconomic Indicators, Aug 2011, Export- Import Bank of India (EXIM Bank), (accessed 10.09.2011), Available at:

<http://www.eximbankindia.in/ind-eco.pdf>

India`s Renewable Energy sector – Potential and investment Opportunities, 2011, (accessed 28.08.2011). Available at:

<http://www.mepcoeng.ac.in/sunwins/123.PDF>

India's Renewable Energy Sector -Potential and Investment Opportunities, 2010, (accessed 27.12.2010). Available at: <http://www.direc2010.gov.in/pdf/India's-RE-Sector-Potential-and-Investment-opportunities-SSM.pdf>

India's Role in World Agriculture, Dec 2007, European Commission, (accessed 25.08.2011). Available at: http://ec.europa.eu/agriculture/publi/map/03_07.pdf

Indian Economy 2010, Economy Watch, April 2010, (accessed 21.12.2010). Available at: <http://www.economywatch.com/indianeconomy/>

India's Politics, 2011, (accessed 23.08.2011). Available at: <http://www.asianinfo.org/asianinfo/india/politics.htm>
[indicators/2011/2011-07-26-central-bank-raises-interest-rates-by-50-basis-points.html](http://www.asianinfo.org/asianinfo/india/politics.htm)

Jawaharlal Nehru National Solar Mission: Towards Building Solar India, 2010, the National Portal of India, (accessed 18.08.2011). Available at: <http://india.gov.in/allimpfrms/alldocs/15657.pdf>

Johnson, Joseph and Tellis, Gerard J. 2008, American Marketing Association, Journal of Marketing, Vol. 72 (May 2008), Drivers of Success for Market Entry into China and India, (accessed 11.09.2011). Available at: <http://gtellis.net/Publications/ChinaIndia.pdf>

Karn Merchant Bankers Ltd, Is India ready powering the Future, 2010, (accessed 25.12.2010). Available at: <http://www.karnbanker.com/projectreport/Research%20Report%20for%20POWER.pdf>

Key, James P. 1997, Oklahoma State University. Research Design in Occupational Education (accessed 01.07.2011). Available at: <http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage21.htm>

Kohli, Deepali Singhal and Singh, Nirvikar, April 1995, revised Sep 1997 The Green Revolution in Punjab, India: The Economics of Technological Change, (accessed 11.08.2011). Available at: <http://people.ucsc.edu/~boxjenk/greenrev.pdf>

Konrad, Tom CFA, June 2011, The PV Module Supply Glut, Solar Panel Installation, (accessed 03.07.2011). Available at: <http://www.easy-solar-quote.co.uk/the-pv-module-supply-glut/>

Leading Solar Module Suppliers Should Experience Gross Margin Expansion in Second Half, Jun 2011, (accessed 23.09.2011). Available at: <http://seekingalpha.com/article/275878-leading-solar-module-suppliers-should-experience-gross-margin-expansion-in-second-half>

Lifting diesel subsidy: good idea, terrible timing, Aug 2011, First Post Business, (accessed 06.09.2011). Available at: <http://www.firstpost.com/business/lifting-diesel-subsidy-good-idea-terrible-timing-54590.html>

List of states and union territories in India, 2011, (accessed 17.08.2011) Available at: <http://www.harshitsinghal.com/list-of-states-and-union-territories-in-india/>

Marketing Mix History, Jan 2009, Sooper Tutorials, (accessed 20.05.2011). Available at: <http://www.soopertutorials.com/business/marketing/1897-marketing-mix.html>

Mathankar, S.K., Singh, P.L., and Gangil, S. Google Books. SPV Energized Drip Irrigation System: Scope and Limitations, Oct 2003. Google Books, (accessed 22.12.2010). Available at: http://books.google.fi/books?id=_efyMpehGuUC&pg=PA266&lpg=PA266&dq=%E2%80%9CSPV+water+pump+most+needed+in+india&source=bl&ots=O8Dx18Ch3f&sig=MwsjYu6m6bbbAy3o9VJuZuBl6uw&hl=fi&ei=XL4VTeajIITusgbcnajfDA&sa=X&oi=book_result&ct=result&resnum=1&ved=0CBYQ6AEwAA#v=onepage&q=%E2%80%9CSPV%20water%20pump%20most%20needed%20in%20india&f=false

Meisen, Peter. 2006, updated 2010, Global Energy Network Institute (GENI), Overview of Sustainable Renewable Energy Potential of India, (accessed 18.08.2011). Available at: <http://http://www.geni.org/globalenergy/research/renewable-energy-potential-of-india/Renewable%20Energy%20Potential%20for%20India.pdf>

Minister`s Speech, 2010, Ministry of New and Renewable Energy, (accessed 11.05.2011). Available at: <http://www./speeches/jnns-16062010.pdf>

National Solar Mission JNNSM, 2010, Ministry of New and Renewable Energy, (accessed 10.07.2011). Available at: <http://www.mnre.gov.in/solar-conclave2010.htm>

Parvaiz, Athar. Nov 2011, Country profile – India, New Agriculturist, (accessed 10.05.2011). Available at: <http://www.newag.info/en/country/profile.php?a=2249>

Prakash, Ravi. 2010, Making India a Solar Energy Economy, Hidayatullah National Law University, Raipur, (accessed 18.8.2011). Available at: <http://ebookbrowse.com/making-india-a-solar-energy-economy-prospects-challenges-pdf-d103407549>

Progressive Punjab – an investment destination of India, 2011, New Global Indian, (accessed 20.08.2011). Available at: <http://newglobalindian.com/article-of-the-week>

Punjab Energy development agency, 2008, (accessed 10.08.2011). Available at: http://www.usea.org/programs/APP/Punjab_Workshop/07_PED1.PDF

Punjab state, 2011, (accessed 10.08.2011) Available at: <http://www.punjab-state.com/maps/main.php4>

Purohit ,Pallav and Michaelowa, Axel. 2005, CDM potential of SPV pumps in

India Hamburg Institute of International Economics (HWWI), (accessed 20.08.2011) Available at:
http://www.hwwi.org/uploads/tx_wilpubdb/HWWI_Research_Paper_4.pdf

PV Group White Paper- the Solar PV Landscape in India, April 2009, PV Group-India (accessed 31.12.2010). Available at:
http://www.pvgroup.org/cms/groups/public/documents/web_content/ctr_029171.pdf

PVX spot market price index solar PV modules, Oct. 2011, (accessed 31.10.2011). Available at: <http://www.solarserver.com/service/pvx-spot-market-price-index-solar-pv-modules.html?gclid=CP6lrcLDxKsCFcMXzQod8lUi3Q>

Qualitative Research Assessment Tool, Jun 2011, (accessed 04.10.2011). Available at:
<http://www.researchconnections.org/childcare/datamethods/downloads/QualitativeResAssessTool.pdf>

Quotable Quotes on India, 2011, India Brand Equity Foundation,(accessed 24.08.2011). Available at: <http://www.ibef.org/india/quotes.aspx>

Raghavan, Shuba V., Bharadwaj, Anshu, Thatte, Anupam A., Harish, Santosh, Iychettira, Kaveri K., Perumal, Rajalakshmi, Nayak, Ganesh, 2010, Harnessing Solar Energy: Options for India, Center for study of science, technology and policy CSTEP, (accessed 15.10.2011). Available at:
http://www.cstep.in/docs/Harnessing_Solar_Energy-Options_for_India-Full%20Report.pdf

Raza, A. Direc-2010 Off-Grid Lighting in India, Oct 2010, (accessed 25.01.2011) Available at: <http://www.direc2010.gov.in/pdf/Off-grid%20Lighting%20in%20India.pdf>

Realize a world of opportunity, May 2011, Export Development Canada EDC,

(accessed 25.08.2011). Available at: http://www.edc.ca/english/docs/gindia_e.pdf

Renewable Energy – Solar, 2011, India Opportunities, Embassy of India in Madrid, (accessed 15.06.2011). Available at: <http://www.india-opportunities.es/solar.php?lang=ing&sub=solarwater>

Renewable Energy – Solar, India- Opportunities, 2011, a guide to do Business in India, (accessed 01.09.2011). Available at:
<http://www.indiaopportunities.es/solar.php?lang=ing&sub=solarwater>

Revised DTA between India and Finland will be applied from 2011, Jul 2010. BNA International, (accessed 24.08.2011). Available at:
<http://www.taxtreatiesanalysis.com/2010/07/revised-dta-india-finland-applied-2011/>

Rural - Urban distribution of population India and States / Union Territories, 2001, (accessed 30.08.2011). Available at: <http://hetv.org/india/population-2001.htm>

Scaling up investments in renewable energy technologies, 2010, Delhi International Renewable Energy Conference, (accessed 04.04.2011). Available at:
http://www.direc2010.gov.in/pdf/2209-10_GTZ_GRIP-Studie_RZ_SCREEN.pdf

Schemes of Tamil Nadu Energy Development Agency, 2011, (accessed 01.09.2011). Available at: <http://www.tn.gov.in/schemes/teda.pdf>

Service Marketing Mix, Jan 2011, (accessed 22.06.2011). Available at:
<http://www.marketing91.com/service-marketing-mix/>

Sharma, V.K. , Singh, Kulvinder and Panesar, B.S. (ArtsNSW n.d) Punjab Agricultural University. Custom Hiring of Agricultural Machinery and its Future Scope, (accessed 20.08.2011). Available at:
<http://agricoop.nic.in/Farm%20Mech.%20PDF/05024-07.pdf>

Sidhu, H.S. Production Conditions in Contemporary Punjab Agriculture, 2005, Journal of Punjab Studies (V 12, No. 2), Guru Nanak Dev University, (accessed 11.8.2011). Available at: http://www.global.ucsb.edu/punjab/12.2_Sidhu.pdf

Social unrest, Economist Intelligence Unit, 2007, (accessed 22.08.2011).

Available at:

http://viewswire.eiu.com/site_info.asp?info_name=social_unrest_table&page=noads&rf=0

Solar Photovoltaic Technology, 2007, (accessed 07.09.2011). Available at:

<http://www.solarpanels.in/>

Solar Photovoltaic Water pumping, 2011, Practical Action, The Schumacher Centre, (accessed 14.11.2011). Available at: <http://practicalaction.org/solar-photovoltaic-waterpumping-1>

Solar Power in India, 2011, Karmayog, (accessed 03.07.2011). Available at:

http://www.karmayog.org/solarenergy/solarenergy_30939.htm

Solar Water Pumping applications guide. Kyocera Solar, INC2002, (accessed 01.06.2011). Available at:

<http://www.kyocerasolar.com/pdf/specsheets/WHOLEGUIDE.pdf>

State Profile, 2011, Government of Punjab/ India, (accessed 10.08.2011).

Available at: <http://punjabgovt.nic.in/stateprofile1.html>

The Caste System Today, 1997, (accessed 23.08.2011). Available at:

<http://internet.cybermesa.com/~rotto/caste4.html>

The extended marketing mix, 2010, (accessed 17.06.2011). Available at:

[http://www.thetimes100.co.uk/theory/theory--the-extended-marketing-mix-\(7ps\)--319.php](http://www.thetimes100.co.uk/theory/theory--the-extended-marketing-mix-(7ps)--319.php)

The History of Foreign Affairs Administration in Finland, updated OCT 2010, Ministry for Foreign Affairs of Finland (accessed 21.12.2010) Available at: <http://formin.finland.fi/Public/default.aspx?nodeid=15179&contentlan=2&culture=en-US>

The importance of agriculture in Indian economy, 2010, (accessed 21.12.2010). Available at: <http://www.rajputbrotherhood.com/articlelibrary/201008302003/essay-on-the-importance-of-agriculture-in-the-indian-economy.html>

The Solar PV Landscape in India-an Industry Perspective, April 2009, Semiconductor Equipment and Materials International SEMI, (accessed 03.02.2011). Available at: http://www.domain-b.com/industry/power/The_Solar_PV_Landscape_in_India.pdf

Tiwana, N.S., Jerath , Neelima, Ladhar, S.S., Singh, Gurharminder, Paul, Rajesh. 2007, State of Environment-Punjab-, Punjab State Council for Science & Technology, (accessed 05.07.2011). Available at: <http://moef.nic.in/soer/state/SoE%20report%20of%20Punjab.pdf>

Trade policy review: First Press Release, Jun 2002, Secretariat and Government Summaries, World Trade Organization, (accessed 24.08.2011). Available at: http://www.wto.org/english/tratop_e/tpr_e/tp195_e.htm

Trochim, William M.K. 2006, Research methods, (accessed 02.07.2011). Available at: <http://www.socialresearchmethods.net/kb/dedind.php>

Unity and Diversity, 2011, Indian Society, (accessed 29.08.2011). Available at: <http://nos.org/331courseE/L-24%20UNITY%20AND%20DIVERSITY.pdf>

Water Policy Briefing, Nov 2003, IWMI-Tata Water Policy Program, Issue 10, (accessed 09.11.2011). Available at: http://www.iwmi.cgiar.org/publications/Water_Policy_Briefs/PDF/wpb10.pdf

Wind & Solar Report: Opportunities for New Entrants in Manufacturing, Aug 2011, Sustainable Business News, (accessed 06.09.2011). Available at:

<http://www.sustainablebusiness.com/index.cfm/go/news.display/id/20931>

World Energy Outlook 2010, 2010, The Electricity Access Database, IEA, (accessed 30.8.2011). Available at:

http://www.iea.org/weo/database_electricity10/electricity_database_web_2010.htm

Interviews and Meetings

Interviewees in Finland:

FCG Finnish Consulting Group Ltd, Project Director: Mr. Kurvi Mikko , Email : Mikko.Kurvi@fcg.fi, interviewed on 30th May, 2011.

Naps Systems Oy (Solar Company) sales Director: Mr. Pierre Gau, Pierre.gau@napsystems.com, and Sales Manager: Mr. Giorgio Alessio, Giorgio.alessio@napssystems.com, meeting on 29th June 2011.

Interviewees in India:

Government Agencies:

India Renewable Energy Development Agency (IREDA) Assistant General Manager / Solar Energy Group, Mr. R.K.Vimal, Email: r.k.vimal@ireda.gov.in, interviewed on 20th July 2011.

Ministry of new and renewable energy (MNRE) Head of Solar Thermal & Photovoltaic R&D, Solar Grid, Solar Demonstration Projects, Dr. B. Bhargava , Email:bhargava@nic.in, interviewed on 18th July 2011.

National Bank for Agriculture & Rural Development (NABARD) Assistant

General Manager Punjab, Dr. M. Biswas interviewed on 25th July 2011.

Punjab Energy development Agency (PEDA) Senior Manager, Mr. P.C. Bains, interviewed on 27th July 2011.

Market Entry Stakeholders:

Finpro, senior consultant, Mr. Parikshit Shrivastava Email: parikshit.shrivastava@finpro.fi and Consultant, Mr. Dharmesh Sharan, Email: dharmesh.sharan@finpro.fi, interviewed on 19th July 2011.

KMAFICS- India (consulting for India market Entry) Chief Executive, Mr. Ajaya Khullar, Email: ajaya@kmafics.in, interviewed 22nd July 2011.

Invest India, General Manager, Mr. Dushyant Thakor, Email: dushyant.thakor@ficci.com, interviewed on 20th July 2011.

Solar Companies:

Chandigarh Marketing Research Solutions, Manager, Mr. Rajesh Kumar, Email: chandigarh14@gmail.com, working on developing the farmer`s interviews from 13th June – 30th July 2011.

Maya Engineering works, Manager, Mr. Avtar Singh, Email: mayaengg@sify.com, interviewed on 20th July 2011.

Saur Oorja Solutions LTD (Solar Companies) Director, Mr. D.K. Varshnei, Email: oorjasol@rediffmail.com, interviewed on 18th July 2011.

List of farmers (end-users)

Ajaib Singh . village Nogawan , Fatehgarh Sahib district, Punjab state,
08.07.2011 (SWP)

Amarjit Singh. Village Dasarna- Mohali, Rupnagar district, Punjab state,
15.07.2011 (EP)

Amrik Singh. Village Rampur Kaleran, Nawanshahr district, Punjab state,
15.07.2011 (EP and DP)

Garib Singh. Village Chatamali, Rapor, Rupnagar district, Punjab state,
15.07.2011 (EP)

Singh Gurpal. Village Dyanpura, Gurdaspur district, Punjab state, 20.07.2011.
(EP)

Singh Harpreet. Village Dyanpura, Gurdaspur district, Punjab state, 20.07.2011.
(EP)

Singh, Balwinder. Village Rampur Kaleran, Nawanshahr district, Punjab state,
08.07.2011(EP and DP)

Singh, Jagroop. Village Nogawan, Fatehgarh Sahib district, Punjab state,
15.07.2011. (DP)

Singh, Jagtar. Village Thabal, Fatehgarh Sahib district, Punjab state, 20.07.2011.
(SWP)

Singh, Rulda. Village Nogawan, Fatehgarh Sahib district, Punjab state,
15.07.2011. (EP and DP)

Singh, Surjeet. Village Nogawan, Fatehgarh Sahib district, Punjab state,
15.07.2011. (DP)

Singh, Tarlochan. Village Nogawan, Fatehgarh Sahib district, Punjab state,
15.07.2011. (EP and DP)

7 APPENDICES

Appendix 1: Interview questions for potential customers.

Appendix 2: Interview questions for legal stakeholders and financing agencies.

Appendix3: Interview questions for solar companies and Finpro.

Appendix 4: Interview questions for market entry stakeholders

Appendix 5: Guidelines for solar off-grid applications as distributed by MNRE

Appendix 6: Submitting Project Proposals for installation of Individual
Solar Photovoltaic (SPV) Systems

Appendix 1: Interview questions for potential customers.

Name and title of the interviewee:

Time and Place of the interview:

1. What is your position in the farm?
 - A. Partner
 - B. Owner
2. How long have you been in this farm?
3. What is the size of your farm?
4. What kind of crops do you plant?

Questions to understand the process of buying decision

1. Are you a part of the farm decision making?
 - A. Yes
 - B. No
 2. How do you describe the need to have water pump?
 3. What are the criteria you take into the account when you buying water pump?
 4. When you decide to buy a water pump which one do you consider more environmental or financial issues?
-

Questions to identify who will be more willing to shift for SWP.

5. Are you connected to electricity grid?
 - A. Yes
 - B. No
6. How do you describe the electricity in your area?
 - A. Reliable most of the time
 - B. Unreliable
 - C. Other descriptions
7. Which type of pump do you use?
 - A. Electrical
 - B. Diesel
 - C. Solar
 - D. Manual
 - E. Other type:-----
8. What is the strength of your water pump?
9. How much is the cost of pumping water for the farm monthly?

Questions to identify the potential target customers

10. Is there any governmental financial support to cover pumping costs?
 - A. Yes
 - B. No
11. Can you specify when the water is most needed?

A. Sunny weather B. early stage of plantation C. close to harvest D. Other: -----

12. What is the source of your water?

A. Well B. Pond D. River C. Other: -----

13. How many meters the water table or overheads?

14. How often do you need to pump water?

A. Daily B. weekly C. Monthly D. Other:-----

15. Which irrigation method do you use?

A. Drip B. Sprinkler C. Flooding D. Other: ----

Questions to explore the effective ways of promotion

16. Where do you get information about the quality of pumps?

A. Media B. friend C. Governmental agencies D. Other sources

17. Have you ever heard or experience using the solar water pump systems?

A. Yes B. No

18. What do you know about solar water pump system?

19. Are you interested of having solar water pump system?

Open discussion questions about competitors

- Which company do prefer to deal with and why?
- Do the water pump providers offer free installation and maintenance services for their pumps?
- How the services are after buying the water pump affect your buying decision?
- Do you think company warranty or guarantee of the pump effect your pump choice?
- How do the availability of financing or installment will influence on the buying decision?

Appendix 2: Interview questions for legal stakeholders and financing agencies

Company / Organization or Authority:

Name and Title of the Interviewee:

Time and Place of the Interview:

1. Can you state your position in your institution?
2. How long have you been in this organization?
3. How is your organization related to renewable energy and solar power?
4. How is your organization related with farming and farmers?
5. What are the challenges for foreign companies to invest in Indian solar market?
6. The investing level in solar water pump is too much lower than the real market potential. How do you explain that?
7. Can you tell me about governmental support for using solar water pumping and any other financial incentives?
8. How do you think the influence of using solar water pump will be on Indian farmer if they adapt using the solar power in pumping water?

In case the stakeholder is a financing agency the following questions will be discussed:

1. What are the differences between your institution and commercial bank?
2. Is there loans for farm`s equipment? And is SWP one of them?
3. How much the limit, the interest rate and payback period?
4. What other financing methods do you offer?
5. Can you explain the process to get a farming loan?
6. What about the loan guarantee or agreement?
7. How do you work with companies which provide the farming equipment`s such as irrigation or solar water pump system?
8. The solar WP market is huge but the famers adopted only a small number of these systems how do explain that?

Appendix 3: Interview questions for solar companies and Finpro

Company / institution name:

Name and title of the interviewee:

Time and place of the interview:

1. Can you state your duties in this organization?
2. Do you target foreign market?
3. If yes, which countries do you target and why?
4. Do you produce solar panels locally or abroad?

Open discussion issues:

1. Are you involved in producing other products than solar panels?
2. Do you produce the solar panels locally (in the company) or abroad?
3. How do you position the solar water pump among your products?
4. Do you produce the pumps of solar water pump in your company or you buy them from other company?
5. What are the main challenges of solar power industry?
6. Who are the main customers of solar water pump and why?
7. Do you offer any financing for solar water pump buyers?

Discussion questions for Finpro in India:

1. What are your duties and responsibilities in your organization?
2. How do you assist Finnish companies to invest abroad?
3. Do you target specific markets than others?
4. What are the main steps the companies in Finland should consider before entering new markets?
5. How do you describe the Indian market in general?
6. How do you evaluate Indian renewable energy market especially the solar power market?
7. What are the main challenges for Finnish companies to enter Indian market?
8. What are the main factors for Finnish companies to succeed abroad?

Appendix 4: Interview questions for market entry stakeholders (Invest India and KMAFICS)

Company / institution name:

Name and title of the interviewee:

Time and place of the interview:

1. Can you state your duties in this organization?
2. How do you assist foreign companies to invest in India?
3. Do you have certain programs to attract foreign investment in general and foreign investment in renewable energy?
4. Do you encourage some investments than others for example are there a special procedures or programs for certain industries?
5. What are the main attractive for foreign companies to choose India?
6. Can you tell me about incentives to promote foreign investments to India?
7. Which form of entry mode to Indian market is more common and why?
8. Do you coordinate with commercial attaché or counselor to attract foreign investments?
9. What are the main challenges face foreign companies in India?

To understand the process of FDI, JV,

1. Can you describe the process of registering and open a branch of foreign company?
2. Did you deal with Finnish companies trying to entre Indian Market?
3. How do you describe Finnish investors?
4. Do you have advices for foreign investors?

Appendix 5: Summary of the Guidelines for solar off-grid applications

5/23/2009 – P&C Dated: 16.06.2010, MNRE

Government of India

Ministry of New and Renewable Energy

GUIDELINES FOR OFF-GRID AND DECENTRALISED SOLAR APPLICATION

1. Background:

The Government has recently launched the Jawaharlal Nehru National Solar Mission, which is a major initiative of the Government of India and State Governments to promote ecologically sustainable growth while addressing India's energy security challenge. It will also constitute a major contribution by India to the global effort to meet the challenges of climate change.

The immediate aim of the Mission is to focus on setting up an enabling environment for solar technology penetration in the country both at a centralized and decentralized level. The first phase (up to March 2013) will, inter alia, focus on promoting off-grid systems including hybrid systems to meet / supplement power, heating and cooling energy requirements. These systems still require interventions to bring down costs but the key challenge is to provide an enabling framework and support for entrepreneurs to develop markets.

In order to create a sustained interest within the investor community, it is proposed to support viable business models. Flexibility is an integral feature of this scheme. The scheme is completely demand driven as it offers a bouquet of incentive instruments from which eligible entities can tailor a package appropriate to their needs and circumstances within the boundary conditions of the scheme.

2. Objectives:

2.1 To promote off-grid applications of solar energy (both SPV and Solar Thermal) for meeting the targets set in the Jawaharlal Nehru National Solar Mission for Phase-I.

2.2 To create awareness and demonstrate effective and innovative use of Solar systems for individual/ community/ institutional/ industrial applications.

2.3 To encourage innovation in addressing market needs and promoting sustainable business models.

2.4 To provide support to channel partners and potential beneficiaries, within the framework of boundary conditions and in a flexible demand driven mode.

2.5 To create a paradigm shift needed for commoditization of off-grid decentralized solar applications.

2.6 To support consultancy services, seminars, symposia, capacity building, awareness campaigns, human resource development, etc.

2.7 To encourage replacement of kerosene & diesel, wherever possible.

3. Scope of the Scheme:

3.1 The scheme would be applicable to all parts of India and would, to begin with, be co-terminus with Phase-I of the Jawaharlal Nehru National Solar Mission and will, inter alia, focus on promoting off-grid and decentralized systems, including hybrid systems to meet/ supplement lighting, electricity/power, heating and cooling energy requirements.

3.2 Various off-grid solar photo voltaic systems / applications up to a maximum capacity of 100 kWp per site and off-grid and decentralized solar thermal applications, to meet / supplement lighting, electricity/power, heating and cooling energy requirements would be eligible for being covered under the Scheme. For mini-grids for rural electrification, applications up to a maximum capacity of 250 kW per site would be supported.

3.3 Soft loans for projects, including a component for working capital, will be available to SME manufacturers of solar thermal systems and Balance of systems manufacturers for Solar PV (excluding battery manufacturers), in order to promote technology up-gradation, improvement in technology, expansion in production facilities, etc. through refinance facility implemented through IREDA.

3.4 Boundary conditions for the scheme are at Annexure IA.

3.5 A provision of 3% of the annual budgeted outlay for scheme shall be made for administrative expenditure, evaluation and other studies, seminars, information dissemination, IEC activities, capacity building and support for putting in IT enabled monitoring mechanisms, etc. An incentive scheme for banks has been detailed out in Annexure 2.

4. Implementation Arrangements:

4.1 The Scheme would be implemented through multiple channel partners for rapid up-scaling in an inclusive mode. It is envisaged that these channel partners would enable significant reduction in transaction cost and time, since without these arrangements, individuals and small groups of clients may not be in a position to access the provisions of the scheme. Channel partners which would be used for implementation could include the following:-

- a) Renewable Energy Service Providing Companies (RESCOs)
- b) Financial Institutions including microfinance institutions acting as Aggregators
- c) Financial Integrators
- d) System Integrators
- e) Programme Administrators

4.2 The details of the channel partners are as under:

- a) Renewable Energy Service Providing Companies (RESCOs):

These are companies which would install, own & operate RE systems and provide energy services to consumers. These entities may tie up with FIs for accessing the financial support under the scheme.

- b) FIs including MFIs acting as Aggregators:

These would be institutions which are involved in consumer finance and have established base of customers in rural/urban areas and outreach through self help groups, etc. These would typically access interest subsidy through refinance facility as also credit linked capital subsidy on behalf of their borrowers from IREDA.

- c) Financial Integrators:

These are entities which would integrate different sources of finance including carbon finance, government assistance and other sources of funds to design financial products/ instruments and make these available to their clients at an affordable cost. These entities would tie up with manufacturers and service providers.

- d) System Integrators:

These are companies/ entities which would provide RE systems & services to clients including design, supply, integration and installation, O&M and other services. These entities may tie up with FIs for accessing the financial support under the scheme.

e) Programme Administrators:

These would include, inter alia, Central and State Government Ministries and Departments and their organizations, State Nodal Agencies, Utilities, Local bodies, PSUs and reputed Non-Governmental Organizations (NGOs). These entities would directly implement the scheme and access capital subsidy (non credit linked) from MNRE.

4.3 The various channel partners who can participate in this Scheme have been described above and a transparent methodology for accrediting these entities by MNRE would be put in place. The parameters for accrediting an entity could comprise of:

- a) Net worth / turnover of the participating entity
- b) Technical capability for carrying out services which would, inter alia, include site selection, feasibility study, design, value engineering, cost optimization, time scheduling, procurement, installation/commissioning and O&M functions
- c) Credit rating, if any
- d) Track record
- e) Tie-ups with equipment providers.

4.4 The accreditation process would categorize the various entities into grades which would determine the quantum of work in terms of financial limits that they could undertake under the Scheme. This accreditation process would also enable inclusion of start ups with the requisite technical and installation skills. There would be a provision for up gradation and down gradation commensurate with their performance in implementing projects under this Scheme. Reputed rating agencies would be involved by the Ministry.

4.5 An opportunity would be provided for young entrepreneurs to participate as channel partners in order to tap their creative potential as innovators. Separate templates on eligibility of different channel partners would be evolved.

5.11 The CFA from MNRE would not preclude the channel partners from availing other fiscal and financial benefits being provided by State, Central Governments and any other agency so long as the same is clearly disclosed in the project report. This is to avoid multiple financing.

6. Bouquet of Incentive Instruments:

6.1 In the interest of sustaining of satisfactory performance and generation of output in the envisaged energy forms a flexible funding approach can be considered from the following bouquet of instruments:

a) RE Voucher/Stamp

A Transaction-cost free redeemable financial instrument, denominated in physical or monetary units. Placed in the hands of ultimate beneficiary it empowers him by giving him enhanced degree of freedom to choose. Hence, it can be used as an effective instrument to gauge and enhance consumer satisfaction at the retail level.

b) Capital Subsidy (Credit Linked and non credit linked)

An instrument which lightens the burden of financing the initial project cost to enable financial closure of viable business proposition.

c) Interest Subsidy An instrument aimed at neutralizing the high cost of capital given after due diligence of credit appraisal by FIs, NBFC, Micro finance institutions.

d) Viability Gap Funding Financial support provided mostly in the form of initial grant in one or more installments to finance the project cost so as to create a viable business model. PPP Scheme of Ministry of Finance has this arrangement for physical infrastructure projects. It is supplemented by similar arrangement at the state level.

e) Green Energy Bonds A form of low interest bearing long-term redeemable security, which could be issued by IREDA/ MNRE for Renewable Energy Projects. Analogy: Infrastructure Bond/Gold Bonds.

6.2 These would adhere to the boundary conditions specified and would be available individually or in combination, (to the borrowers, in case of credit-linked subsidy) through all channel partners, in addition to any fiscal benefits available to the sector.

7. Release of Funds:

7.1 The release of funds for the project shall be back ended as reimbursement on completion and verification thereof. However, for programme administrators, the release of funds could be front ended, with installments of 70% on sanction and 30% on completion. However, this could be extended to other entities on provision of appropriate sureties.

7.2 In respect of credit linked capital subsidy and interest subsidy the scheme would be implemented through IREDA, which will be the designated Nodal agency for disbursement of funds.

7.3 MNRE would place 50% of the estimated annual requirement of funds with IREDA upfront at the beginning of the year. The balance 50% would be released as second and final tranche of the annual requirement to IREDA after receipt of Utilisation Certificate, of not less than 50% of the first tranche released to IREDA. While releasing the second tranche, MNRE would take into consideration, revision in initial annual estimate (if any) for appropriate funding. IREDA would present an audited annual statement of accounts.

8. Approval Mechanism

The Committee constituted by MNRE, would approve the project within 45 days of receiving the project. Deficiency, if any, would be communicated in writing to the proposer/channel partner within 30 days and the Committee would then, on receipt of clear proposal approve the proposal. The project proposals shall be considered and sanctioned by a Project Approval Committee (PAC). This committee would provide approval as also review progress. The entire process of receiving proposals, processing them and giving approvals would be IT enabled. The committee would also frame rules and prescribe formats etc, for project approval, within the overall framework of this scheme, so as to make the process transparent.

9. Project Management Consultant (PMC)

The government would engage a reputed agency as a Project Management Consultant (PMC). This agency would handle all the processes such as assistance for formulation, appraisal and screening of proposals preceding the formal approval which would be a sovereign function of MNRE. It would also assist the Ministry in formulating the detailed implementation guidelines/ formats, if any

10. Monitoring and Evaluation:

10.1 Information and Communication Technology must form the backbone of monitoring system. Since the scheme envisages IT enabled monitoring and verification protocols, 5% of the total project cost would be available to the various channels partners for compliance. It is proposed that the monitoring is done as under:

- i) At the primary level of monitoring, channel partners would be responsible for monitoring parameters such as end-use verification and KYC compliance and also compilation of statistical information as one time MIS for all credit linked cases.
- ii) As an additional level of monitoring, reputed Civil Society Groups, eminent persons, corporate houses (as an activity under Corporate Social Responsibility), SNAs and MNRE officials would be involved, for ground truthing on random sample basis.
- iii) For projects with applications above 10 kW, the system providers, would also make available generation data to MNRE at intervals specified.

10.2 It is envisaged that certified energy auditors, scheme monitors and others would be empanelled for certifying whether the outputs of the system correspond to the parameters laid down in the in-principle approval for non credit linked projects.

11. Technical Requirements

11.1 The scheme would require the project proponents to strictly adhere to the national/international standards specified by the Ministry from time to time.

11.2 The Use of imported complete PV systems will not be permitted under the scheme. However, use of imported components of a complete PV system would be permitted, subject to adequate disclosure and compliance to specified quality norms and standards.

11.3 The minimal technical requirements and Quality Standards in respect of the off-grid SPV power plants/ systems are given in Annexure-3. These will come into effect from 1st September 2010 to allow sufficient time to the SPV industry to gear up for the same. Existing guidelines w.r.t. technical requirements/ Quality Standards under the Ministry's SPV programmes will be valid during the interim period.

12. Supporting Innovation

The Ministry could provide 100% CFA for undertaking pilot and demonstration projects through manufacturers and other organizations for demonstrating new and innovative applications of solar

13. Interpretation of the Guidelines In case of any ambiguity in interpretation of any of the provisions of these guidelines, the decision of the Ministry shall be final.

13. Interpretation of the Guidelines

In case of any ambiguity in interpretation of any of the provisions of these guidelines, the decision of the Ministry shall be final.

14. Review

The scheme would be reviewed by an Internal Review Committee at 6 month/yearly interval and modifications therein would be incorporated by the Ministry. In addition, a platform for experts to discuss best practices, debate over issues to overcome bottle necks and provide effective policy suggestions for ensuring wide spread off-grid solar solutions deployment would also be established at the national level.

Use of the best/competitive and innovative technologies available globally would be allowed, subject to standards and technical parameters, laid down by MNRE.

To meet unmet community demand for electricity or in unelectrified rural areas, standalone rural SPV power plants with battery storage in a micro grid mode/ local distribution network, would be provided Rs.150/Wp of capital subsidy AND soft loan at 5%.

3. AUTHORIZED TESTING LABORATORIES/ CENTERS

3.1 The PV modules must be tested and approved by one of the IEC authorized test centers. Test certificates can be from any of the NABL/ BIS Accredited Testing / Calibration Laboratories. Qualification test certificate as per IEC standard, issued by the Solar Energy Centre for small capacity modules up to 37Wp capacity will also be valid.

3.2 Test certificates for the BoS items/ components can be from any of the NABL/ BIS Accredited Testing-Calibration Laboratories/ MNRE approved test centers. The list of MNRE approved test centers will be reviewed and updated from time to time.

5. IDENTIFICATION AND TRACEABILITY

5.1 Each PV module used in any solar power project must use a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module laminate, but must be able to withstand harsh environmental conditions.

1. Name of the manufacturer of PV Module
2. Name of the Manufacturer of Solar cells

3. Month and year of the manufacture (separately for solar cells and module)
4. Country of origin (separately for solar cells and module)
5. I-V curve for the module
6. Peak Wattage, I_m , V_m and FF for the module
7. Unique Serial No and Model No of the module
8. Date and year of obtaining IEC PV module qualification certificate
9. Name of the test lab issuing IEC certificate
10. Other relevant information on traceability of solar cells and module as per ISO 9000 series.

For full guidelines, visit MNRE website

Appendix 6: Submitting Project Proposals for installation of Individual Solar Photovoltaic (SPV) Systems

Ministry of New and Renewable Energy
Jawaharlal Nehru National Solar Mission
(Off-grid and Decentralized Solar Applications)

Format for Submitting Project Proposals for installation of Individual Solar Photovoltaic (SPV) Systems

(Maximum SPV system capacity each: 1kWp)

(Maximum SPV Water Pumping System capacity each: 5 kWp)

1. Title of the Project :
2. Name of the Project Proponent :
3. Socio- Economic Justification of the Project:

PART-A: Details of the Project Proponent

i	Name and Category of Project Proponent a) Renewable Energy Service Providing Company (RESCO) b) Financial Institutions (Banks, NBFCs, MFIs) c) Financial Integrator d) System Integrator e) Program Administrator	
ii	Name, Designation and Address of the Authorized Representative for Correspondence with telephone no., fax & email	
iii	In case of Channel Partner other than Programme Administrator, the following information will be provided: a) Whether commercial or non-commercial. b) Copy of Articles of Association, Registration No. & Date; PAN/TAN No. c) Audited Balance Sheet for last three years d) Annual Report of previous year e) Whether MNRE has earlier sanctioned any SPV projects for implementation to the Project Proponent, if yes, please furnish information.	
iv	In case of 1 (e), please indicate: a) Government Department, Autonomous Institution set up by Central/ State Government, State Renewable Energy Development Agency, Public Sector Undertaking b) Others	

PART-B: Details of the Project

1. Summary of the Proposal:
2. Details of Project site: (State, District/ City, Block, Panchayat, Village/ Hamlet, Building/ Institute and accessibility to site)
3. Details of Project Beneficiaries

4. Details of Proposed Systems

SPV Lighting Systems / Water Pumping Systems / Power Packs / Other Systems.

System Components	Make and Model	Capacity	Numbers	Indigenous/ Imported
PV Module				
Charge Controller/ Invertor				
Power Conditioning Unit				
Storage Battery				
Motor-Pump Set				
Other components				

PART C: Implementation Schedule

- Major Monitorable Milestones

- Project Commissioning Timeline

PART D: Performance Monitoring Mechanism:

Own Mechanism	
Third Party	
Remote Monitoring for SPV systems having capacity above 1 kWp, if any	

PART E: Project Cost and Financing Details.

i. Cost of Systems Hardware ii. Cost of transportation, insurance, installation and Commissioning iii. Cost of Annual Maintenance for 5 years iv. Any other related costs	
Total Cost of Systems	
Total kWp SPV Capacity	
Means of Finance a) Contribution of Project Proponent b) Contribution of Beneficiaries c) Envisaged CFA from MNRE d) Other Source (s) of Funding (capital grant) e) Envisaged Soft Loan assistance, if any f) Whether funds are in surplus or deficiency	
Details of Project Revenue recurring, if any	
Project Duration	

PART F: Operation and Maintenance Arrangements

- Details of Operation and Maintenance Arrangements.

- Details of Service Network established by System Supplier in the Project Area. .

- Training of beneficiaries / users for operation and maintenance
- Training of local youth for Servicing of Systems

PART G: Declarations and Certificates

- A. It is certified that I/we have read the guidelines issued by the Ministry vide 5/23/2009/P&C dated 16th June, 2010 and the related provisions/terms and conditions for availing financial support from the Ministry of New and Renewable Energy and I agree to abide by these guidelines and related terms and conditions.
- B. I understand that failure to comply by these guidelines may result in denial of financial support by the Ministry.
- C. I confirm that the present proposal in full or part has not been submitted / has been submitted to any other agency for seeking support (In case proposal has been submitted to any other agency or under consideration all details and a copy of the proposal must be submitted along with the present proposal).
- D. I confirm that I will not submit the same proposal or a part thereof to any other funding agency, without prior knowledge of the Ministry of New and Renewable Energy.
- E. I confirm that the share of project proponent/beneficiaries shall not be lower than 20% in any circumstances. Projects owned by the Programme Administrators are exempt from this condition.
- F. I confirm that the proposed solar PV system(s) have not been installed/supplied at the proposed sites or to the proposed beneficiaries, prior to the receipt of project sanction letter from the Ministry.
- G. There is no duplication in the proposal and the submitted proposal is the only proposal by the proponent and to the best of my / our knowledge no other organization has submitted any proposal for the systems at these site(s) to MNRE for financial support.
- H. A detailed site survey has been done/or will be undertaken to identify the beneficiaries before actual supply and installation takes place.
- I. This is to certify that the various components of the SPV systems will conform to the Relevant Standards, as mentioned in the Guidelines for Off-grid and Decentralized Solar Applications (Annexure-3) for SPV modules and components under JNNSM. Copies of the Relevant IEC/ BIS Certificates should be enclosed.

J. It is mandatory to provide technical performance specifications of each category of system proposed to be supplied under the project. And for which the performance will be warranted.

K. All technical parameters and warranty requirements must meet or exceed the requirements mentioned in the guidelines issued by the Ministry.

I confirm that in case of any dispute, the decision of Secretary, Ministry of New and Renewable Energy, Government of India will be final and binding on all.

Signature _____

Name & Designation of Authorized Signatory

Seal

Place:

Date: