PREFEAIBILITY STUDY ON
MANUFACTURING OF POWER INVERTORS IN NIGERIA

DEVELOPED BY
STARTUP BUSINESS FOUNDATION

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DISCLAIMER

ACKNOWLEDGMENT

Startup Business Foundation is thankful to all organizations and individuals who have helped in several ways in preparation of this prefeasibility study.

We also wish to extend our gratitude to all those who reviewed the content and provided valuable inputs for improving the quality, coherence, and content presentation of this prefeasibility study.

ABOUT THIS REPORT

This prefeasibility study is designed to provide potential and startups entrepreneurs' valuable information on setting up fruit squashing business in the Renewable Energy (RE) industry of Nigeria's market; aimed at encouraging and facilitating industrial activities across the country. It is our realization that industrialization is at the heart of economic development and that every effort has to be made to bring about industrial growth and encourage our people to be part of it.

Fruit squashing business has over 80% local content in terms of availability of raw material, equipment and machinery, manpower and other requirements.

The key areas covered in this report include:

i) Technical and economic analysis of the production, marketing and profitability of the project.

ii) Recommendations in respect of procurement of equipments and associated problems.

iii) Recommendation on suitable agronomic management practices to ensure efficient running of the projects.

iv) Detailed financial analysis including project cash flows for the projects.

This prefeasibility report provides a comprehensive and detailed coverage of the above terms of reference and is designed to facilitate investment decisions.

The implementation of this project will also impact positively on the economy of the immediate community where the project is located. This is in terms of employment-direct and indirect, skilled and unskilled. Government also stands to benefit from internal revenue from taxation.

In view of the result of the analysis using some economic indicators as stated in the proposed project, it is hereby recommended that the project is viable.

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PART I

1.1 EXECUTIVE SUMMARY

This particular prefeasibility study is for manufacturing and marketing of Power Invertors.

Electricity demand estimates and projections for Nigeria suggest that demand is already substantial and increasing rapidly due to population and income growth. According to experts, the following assertions were made about Nigeria's electricity demand;

- Nigeria is one of the most underpowered countries in the world, with actual consumption 80% below expectations based on current population and income levels.
- Peer countries consume far more electricity per capita than Nigeria does currently. Ghana consumes over twice as much, Tunisia over ten times, and South Africa almost thirty times as much.
- Self-generation in Nigeria is extremely prevalent; nearly 14GW capacity exists in small scale diesel and petrol generators, and nearly half of all electricity consumed is self-generated. This implies a huge unserved demand.

This is micro enterprise project. It can be sited in the metropolitan area in any city in Nigeria with consideration to availability skilled manpower and access to raw materials.

This business idea is premised on production of 15 Invertors per month which translates into 180 Invertors per year.

1.2 SUMMARY OF TOTAL PROJECT COST

S/N	DESCRIPTION	QTY	UNIT PRICE	TOTAL
1	Land and building		250,000	250,000
2	Machinery & equipment		**26,250**	82,500
3	Utility equipment		**250,000**	**250,000**
4	Office equipment		**200,000**	**200,000**
	Total Capital Cost		**2,126,250**	**2,182,500**
5	Working capital		1,400,000	1,400,000
6	10% contingencies & preliminary expenses		218,250	218,250
	Total Project Cost		**2,344,500**	**2,400,750**

1.3 FINANCIAL ACCOUNTING RATIOS ANALYSIS

PERFORMANCE RATIOS AVERAGES

(a) Return on Sales =26%
(b) Return on Equity =268%
(c) Return on Investment =91%
(d) Positive NPV = ₦19,234,826
(e) IRR =47%
(f) ARR =91%
(g) Payback Period = 10 months

PART II
MARKET ANALYSIS

2.1 INTRODUCTION

The electrical power production in our country is much less than the demand. It is true that federal government is making efforts to bridge the gap between demand and supply by inviting private sector participation, the condition is expected to continue as demand is growing at a much further pace. Railway, telecom, industrial clusters, computer institute, Bank, ATM counter, Medical equipment are the major commercial sector that uses the inverter for standby power supply.

With the demand for power backup devices like inverters systems increasing at a fast pace, many players, including a large number of SMEs, are venturing into manufacturing these devices, while those already established in the sector, are planning to expand their existing facilities.

2.2 MARKET AREA ANALYSIS

The Inverters market in Nigeria have witnessed a growth in recent years on account of rising demand fueled by the demand and supply gap in electric power supply, expansion of industries, and rising income levels of consumers.

The market is highly fragmented in Nigeria; however, it is dominated by large organized players. Small scale players are also doing very well in this market. The usage of UPS in the household sector where PCS is installed is also increasing.

According to experts, the power market in Nigeria is expected to grow at a CAGR of approximately 12.39% during the forecast period of 2019 – 2024. Thus, inverter manufacturing is a profitable and viable investment opportunity for small business entrepreneurs.

2.3 DEMAND AND SUPPLY ANALYSIS

There is an ever-increasing demand for Invertors due to power shortages and interruptions. The rapid economic growth and rising disposable incomes of individuals in the country have enabled them to spend more on products like power inverters, which enhance their lifestyles and provide comfort. Along with this, with rapid urbanization and growing electrification rates, most people nowadays rely on electronic appliances and gadgets. This has resulted in a significant need for an uninterrupted power supply, in turn increasing the sales of power inverters as an alternate backup solution in case of outages.

Besides this, they are noise-free and environment-friendly in nature as they do not emit carbon emissions and eliminate the need for gasoline, which is required for running generators.

2.4 TARGET MARKET ANALYSIS

Given the increasing demand for the products and services, no segment of the society is left out of the market. However, the affordability is another important factor to be considered as the cost of product is slightly high.

In this regards, the entrepreneur should target academic institutions, banks, hospitals, corporate organization as well as the general public.

PART III
TECHNICAL ANALYSIS

3.1 PRODUCT DESCRIPTION

An inverter is an electric device that changes direct current (DC) to alternating current (AC). This conversion may be accomplished by electromechanical means namely motor, Generator sets entirely by electronics means.

The following are types of inverter manufacturing specifications < 5KW, 5KW to 95KW, 100KW to 495KW, above 500KW. These can be applied on Motor Drives, Uninterruptible Power Supply (UPS), Rail Traction, Wind Turbines, Electric Vehicles/Hybrid Electric Vehicles (EVs/HEVs), Solar PVs etc.

3.2 LOCATION ANALYSIS

The project can be sited can be sited in any part of the country most especially at the metropolitan city. Owing to the increasing demand for alternative sources of power supply, the product and service of invertor is a veritable part of the modern society today.

3.3 RAW MATERIALS

The performance required for raw materials depends on the different features of power inverter. Raw materials must be able to produce good results. It is important to understand what is important to the properties of raw materials and how they affect these factors if manufacturers are to obtain reliable and correct quality. Raw materials should meet the needs of overseas technology.

The following are some raw materials required for manufacturing of inverter system, resistors, diodes, capacitors, switches, transistors, mosfet, heat Sink, ICs, LED, connectors, auto wires, wire & sleeves, relays, lug, cabinet etc.

3.4 PRODUCTION PROCESS

This manufacturing operation does not demand a lot of space. The assembling process is also simple. Inverters find applications where emergency standby power is required and/or there is no AC power available. The inverter is generally used with various sophisticated electronic and mechanical equipment that requires a continuous and un-fluctuating power supply for effective functioning.

Production process involves making a metallic box, sealing all its corners with solidal welding, building the oslators, Inverter system, charging system and automatic system, putting in switches and sockets.

3.4 SOURCES OF FUNDS

The project can be funded through a number of sources which include but not limited to the following; Agric-Business, Small & Medium Scale Investment Scheme (AGSMEIS), Bank of Industry, Nigeria Export-Import (NEXIM) Bank, International Finance Corporation (IFC), grants etc., though the conditions and criteria for accessing the loans and grants varies.

PART IV
FINANCIAL ANALYSIS

Basically, the financial section of this prefeasibility study consists of three financial statements: Income statement, Balance sheet, Cash flow projection. This section determines whether or not the project is viable using some economic indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and payback period as are detailed in the appendices below.

ASSUMPTIONS

1. Assuming that the project will last for the period of five years and the salvage value at the end of the project life ignored.
2. The Machineries, Equipments and Utility Equipment have uniform depreciation of 20%
3. Production capacity assumed is for 312 days per year with monthly capacity of 150 assumed to be 60% installed capacity.
4. The proposed capacity utilization are 60% in the first year of commercial production, 70%, 80% in the 2nd and 3rd year respectively and 90% in the 4th and 5th years.
5. Raw materials will be sourced locally and Market for the product is readily available.
6. Staff and labour cost will increase by 10% yearly.
7. Prices and unit costs are assumed unchanged in the five years of projection.
8. The valuation currency used is Naira

4.2 ACCOUNTING /FINANCIAL ANALYSIS

4.2.1 NET PROFIT

The projected Annual Trading Profit and Loss Account is proposed to make the following Net Profit after tax during the corresponding projected periods – all things being equal.

4.2.2 NET PRESENT VALUE (NPV)

NPV is one of the four methods of discounted cash flows techniques which state that money that is immediately available for use, has a greater value than same amount receivables in future date.

Using this method however, all net cash inflows will be discounted to present value using the estimated interest rate of 60% discount factor. At **12%** discount factor the project produced a positive **NPV NGN 19,234,826**

4.2.3 INTERNAL RATE OF RETURN (IRR)

This is the discount rate which gives zero NPV or the rate which equates the present value of cash inflows with present value of cash outflows of the project.

The cash flow of this project was discounted systematically until the NPV of the project finally become zero. The project produces the **IRR** of **47%.** Thus, the project accepted as being viable. This is because **IRR** is more than the cost of capital.

4.2.4 ACCOUNTING RATE OF RETURN (ARR)

ARR uses accounting information as revealed by financial statements (Income Statement) to measure profitability of the project under consideration. The forecast **ARR** of the project is **91%.**

4.2.5 PROFITABILITY INDEX (PI)

This is the present value of future cash flows over the present value of cash outlays. The project PI further confirm the viability of the project , because as the rules of the accepting and rejecting hold, a project should be accepted if the PI is equal or greater than one (1). Consequently, the PI of this project is **1.72** and thus recommended as being viable to be accepted for financing.

4.2.6 PAYBACK PERIOD

The payback period of any project is the length of time it would take the business investors to recover the capital invested in a project in spite of asset replacement. For this particular project the capital investment is expected to be fully recovered in about 10 months.

APPENDIX I
TOTAL PROJECT COST

S/N	DESCRIPTION	QTY	UNIT PRICE	TOTAL
	LAND AND BUILDING			
1	Factory rentage	1	250,000	250,000
	Sub total	**1**	**250,000**	**250,000**
	MACHINERY & EQUIPMENT			
2	Soldiering machine	1	10,000	10,000
3	Drill	1	10,000	10,000
4	Hand tools	10	6,250	62,500
	Sub total		**26,250**	82,500
	UTILITY EQUIPMENT			
5	Generating set	1	250,000	250,000
			250,000	**250,000**
	OFFICE EQUIPMENT			
6	Computer & printer	1	150,000	150,000
7	Furniture & Fittings	1-	50,000	50,000
	Sub total	**2**	**200,000**	**200,000**
	Total Capital Cost		**2,126,250**	**2,182,500**
12	Working capital		1,400,000	1,400,000
13	10% contingencies & preliminary expenses		218,250	218,250
	Total Project Cost		**2,344,500**	**2,400,750**

APPENDIX II
ESTIMATION OF WORKING CAPITAL REQUIREMENT

N'000

Year of Commercial Operation	1 week	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization (Inventory)	60%	70%	80%	90%	90%
1 week stock of raw material	1,000	8,194	11,713	15,530	15,530
1 Day stock of finished products	300	3,443	4,887	5,376	5,376
Work in Progress	100	1,071	1,098	1,169	1,169
Bank/ Cash (5% sales of the products)	-	2,287	2,516	2,768	2,768
Working capital	**1,400**	**11,248**	**13,192**	**15,419**	**15,419**

APPENDIX III
FINANCING PLAN

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DESCRIPTION	EXISTING	PROPOSED	TOTAL
Equity	400,750	-	400,750
Term loan from	-	2,000,000	2,000,000
Total project cost	400,750	**2,000,000**	**2,400,750**
% Contribution	**15%**	**75%**	**100%**

APPENDIX IV
TERM LOAN REPAYMENT SCHEDULE

LOAN AMOUNT: 2,000,000 (Two Million Naira Only)
TYPE : ANY LOCAL AVAILABLE SME FUND
INTEREST RATE USED: 12%
REPAYMENT: 5 YEARS EQUAL INSTALLMENT (Annually)

YEAR	OPENING BALANCE	REPAYMENT	INTEREST DUE	TOTAL YEAR INTEREST
1	2,000,000	400,000	240,000	640,000
2	1,600,000	400,000	192,000	592,000
3	1,200,000	400,000	144,000	544,000
4	800,000	400,000	96,000	496,000
5	400,000	400,000	48,000	448,000
Total		**2,000,000**	**720,000**	**2,720,000**

APPENDIX V
FORECAST STAFFING SCHEDULE (1ST OPERATIONAL YEAR)
N'000

POSITION	No	Unit Scale	Scale/ Month	Scale / Year
DIRECT LABOUR				
Managing Director	1	70	70	840
Skilled labour	2	50	100	600
Sub total	**3**	**120**	**170**	**1440**
INDIRECT LABOUR				
Accounts/ Admin	1	40	40	480
Marketing Officer	1	40	40	480
Sub total	**2**	**100**	**100**	**960**
Total on staff (1st year)	**5**	**220**	**270**	**2,400**

APPENDIX VI
ESTIMATE OF ANNUAL DEPRECIATION ALLOWANCE
N'

ITEMS	INITIAL VALUE	DEPRECIATION (20%)
Machinery and Equipments	82,500	16,500
Utility Equipments	250,000	50,000
Office Equipments	200,000	40,000
TOTAL	**532,500**	**106,500**

APPENDIX VII
ESTIMATION OF ADMINISTRATIVE / OVERHEAD EXPENSES
N'

COST ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Utilities (Electricity & Diesel)	140,000	148,000	198,000	212,800	212,800
Publicity & advert	80,000	98,000	116,000	137,600	137,600
Miscellaneous	100,000	120,000	140,000	160,000	160,000
TOTAL	**320,000**	**366,000**	**444,000**	**510,400**	**510,400**

APPENDIX VIII
ESTIMATION OF PRODUCTION AND OPERATION COSTS

N'

Cost Item	Units	@	Qty	Prod. cost	Prod. Cost/ month	Prod. Cost/ yr
Orslator	No.	10,000	1	10,000	260,000	312,0000
Transformer	No.	30,000	1	30,000	780,000	9,360,000
Diodes	No.	2,000	1	2,000	52,000	624,000
Thermostat	No.	3,200	1	3,200	78,000	936,000
Circuit board	No.	1,200	1	1,200	26,000	312,000
Capacitors	No.	1,600	1	1,600	36,400	436,800
Resistor	No.	120	1	120	2,800	31,200
Switch	No.	1,600	1	1,600	41,600	499,200
Fetes	No.	2,000	22	44,000	1,144,000	13,728,000
Box (metallic)	No.	10,000	1	10,000	260,000	3,120,000
Sub-total		**61,720**		**10,3720**	**2,680,800**	**32,167,200**

APPENDIX IX
ESTIMATION OF RAW MATERIAL/PRODUCTION COST AND SALES

Year of Commercial Production	Year 1	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization	**60%**	**70%**	**80%**	**90%**	**90%**
1. Output					
Invertor	180	198	216	238	238
Total output	**180**	**198**	**216**	**238**	**238**
2. Cost of Production	**N'**	**N'**	**N'**	**N'**	**N'**
Inverter @ N178,706.6	32,167,188	35,383,906.8	38,600,625.6	42,532,170.8	42,532,170.8
Total cost of production	**32,167,188**	**35,383,906.8**	**38,600,625.6**	**42,532,170.8**	**42,532,170.8**
3. SALES					
Inverter @ N200,000	36,000,000	39,600,000	43,200,000	47,600,000	47,600,000
TOTAL SALES/ TURNOVER	**36,000,000**	**39,600,000**	**43,200,000**	**47,600,000**	**47,600,000**

APPENDIX X
FORECAST INCOME STATEMENT (PROFIT & LOSS ACCOUNT)

Year of commercial operation	Year 1	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization	60%	70%	80%	90%	90%
1. SALES	N'	N'	N'	N'	N'
Gross Sales	36,000,000	39,600,000	43,200,000	47,600,000	47,600,000
VAT @ 5%	1,800,000	1,980,000	2,160,000	2,380,000	2,380,000
Net Revenue	**34,200,000**	**37,620,000**	**41,040,000**	**45,220,000**	**45,220,000**
2. OPERATION COST					
Cost of Raw materials consumed	32,167,188	35,383,906.8	38,600,625.6	42,532,170.8	42,532,170.8
Staff and labour	2,640,000	2,904,000	3,168,000	3,485,000	3,485,000
Admin. & Overhead Expenses	320,000	366,000	444,000	510,400	510,400
Depreciation	722,000	722,000	722,000	722,000	722,000
Total Operating Cost	**11,440,000**	**12,551,800**	**13,563,600**	**14,897,000**	**14,897,000**
3. OTHER COSTS					
Interest on Term Loan (12%)	480,000	384,000	288,000	192,000	96,000
Loan Repayment	800,000	800,000	800,000	800,000	800,000
Total (Other Costs)	**12,720,000**	**13,735,800**	**14,651,600**	**15,889,000**	**15,793,000**
Profit Before Tax	**4,767,600**	**5,500,560**	**6,333,520**	**7,192,390**	**7,288,390**
Tax @ 12%	572,112	660,067.2	760,022.4	863,086.8	874,606.8
Profit after tax (NET PROFIT)	**4,195,488**	**4,840,493**	**5,573,498**	**6,329,303**	**6,413,783**
% Return on Sales	0.24	0.25	0.27	0.28	0.28
% Return on Equity	2.06	2.37	2.74	3.10	3.15
% Return on Investment	0.70	0.80	0.92	1.05	1.06

APPENDIX XI

FORECAST HIGH RATE AND LOW RATE COMPUTATION

Year	C/F	DF 12%	NPV
	N'		N'000
0	(6,039,000)	1	(6,039,000)
1	4,195,488	0.893	3,746,571
2	4,840,493	0.797	3,857,872
3	5,573,498	0.712	3,968,331
4	6,329,303	0.636	4,025,437
5	6,413,783	0.567	3,636,615
Total Profit	**27,352,565**		**19,234,826**
Average Profit	**5,470,513**		

Year	C/F	DF 60%	NPV
	N'		N'
0	(6,039,000)	1	(6,039,000)
1	4,195,488	0.625	2,622,180
2	4,840,493	0.3906	1,890,697
3	5,573,498	0.2441	1,360,491
4	6,329,303	0.1526	965,852
5	6,413,783	0.0954	611,875
Total Profit	**27,352,565**		**7,451,094**
Average Profit	**5,470,513**		

APPENDIX XII

FORECAST IRR AND ARR COMPUTATION

$$IRR = a + \frac{(A)}{A+B} * (b-a)$$

Where

a = 12%

b= 60%

A = 19,234,826

B= 10,843,632

$$12\% + \frac{19,234,826}{19,234,826 + 7,451,094} (60-12)$$

12%+ 34.6

47%

$$ARR = \frac{\text{Estimated Average Profit}}{\text{Estimated initial investment}} \times 100$$

$$ARR = \frac{5,470,513 \times 100}{6,039,000}$$

91%

APPENDIX XIII
CASH FLOW PROJECTION

Year of Comm. Production	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
% Capacity Utilization		60%	70%	80%	90%	90%
A) CASH RECEIPTS	**N'**	**N'**	**N'**	**N'**	**N'**	**N'**
Equity Capital	400,750	-	-	-	-	-
Term Loan	2,000,000	-	-	-	-	-
Gross Revenue		34,200,000	37,620,000	41,040,000	45,220,000	45,220,000
Total Receipts	**2,400,750**	**34,200,000**	**37,620,000**	**41,040,000**	**45,220,000**	**45,220,000**
B) CASH PAYMENTS						
Capital Payment						
Machinery & Equipments	82,500	-	-	-	-	-
Utility Equipment	250,000	-	-	-	-	-
Office equipments	200,000	-	-	-	-	-
TOTAL	**532,500**	-	-	-	-	-
(ii) Operating Expenses						
Depreciation	-	722,000	722,000	722,000	722,000	722,000
Change in working capital	1,868,250	10,718,000	11,829,800	12,841,600	14,175,000	14,175,000
Sub total	**1,868,250**	**11,440,000**	**12,551,800**	**13,563,600**	**14,897,000**	**14,897,000**
(iii) Financial Expenses						
Repayment of Term Loan	-	800,000	800,000	800,000	800,000	800,000
Interest on Term Loan	-	480,000	384,000	288,000	192,000	96,000
Value Added Tax	-	1,800,000	1,980,000	2,160,000	2,380,000	2,380,000
Corporate Tax	-	572,112	660,067.2	760,022.4	863,086.8	874,606.8
Sub total	-	**3,652,112**	**3,824,067**	**4,008,022**	**4,235,087**	**4,150,607**
Total cash payment (ii)-(iii)	**1,868,250**	**7,787,888**	**8,727,733**	**9,555,578**	**10,661,913**	**10,746,393**
Net cash flow c/f	1,868,250	7,787,888	8,727,733	9,555,578	10,661,913	10,746,393

APPENDIX XIV
BALANCE SHEET PROJECTION

Year of comm. Operation	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
ASSETS	**N'000**	**N'000**	**N'000**	**N'000**	**N'000**	**N'000**
(i) Fixed assets						
Machinery and Equipments	82,500	-	-	-	-	-
Utility equipment	250,000	-	-	-	-	-
Office Equipment	200,000	-	-	-	-	-
Value at Acquisition		532,500	532,500	532,500	532,500	532,500
Less Cumulated Depreciation	-	106,500	213,000	319,500	426,000	532,500
Net fixed assets	**532,500**	**426,000**	**319,500**	**213,000**	**106,500**	**0**
(ii)Current Assets/ liability						
Stock of Raw Materials	1,400,000	2,213,326	10,158,267	16,030,224	20,553,464	25,369,702
Debtors /prepayment	-	11,453,000	12,098,000	13,308,000	14,139,000	15,653,000
Bank and Cash Balances	468,250	4,150,024	5,160,031	6,170,539	7,180,674	7,180,741
Creditor / accruals	-	(11,074,000)	(16,039,000)	(22,947,000)	(28,013,000)	(33,785,000)
Company Tax	-	(572,112)	(660,067.2)	(760,022.4)	(863,086.8)	(874,606.8)
Net current assets	**1,868,250**	**6,170,238**	**10,717,231**	**11,801,741**	**12,997,051**	**13,543,836**
TOTAL NET ASSETS	**2,400,750**	**6,596,238**	**11,036,731**	**12,014,741**	**13,103,551**	**13,543,836**
(ii) FINANCED BY						
Equity Capital	400,750	400,750	400,750	400,750	400,750	400,750
P&L	-	4,195,488	4,840,493	5,573,498	6,329,303	6,413,783
Retained Profit	-	-	4,195,488	4,840,493	5,573,498	6,329,303
SHAREHOLDERS FUND	**400,750**	**4,596,238**	**9,436,731**	**10,814,741**	**12,303,551**	**13,143,836**
Long Term Loan	2,000,000	2,000,000	1,600,000	1,200,000	800,000	400,000
TOTAL EQUITY & LIABILITY	**2,400,750**	**6,596,238**	**11,036,731**	**12,014,741**	**13,103,551**	**13,543,836**