Design of a Business Plan for Light Electrical

by

Sean Freimond
25256417

Submitted in partial fulfilment of
the requirements for the degree of

BACHELORS OF INDUSTRIAL ENGINEERING

in the

FACULTY OF ENGINEERING, BUILD ENVIRONMENT AND
INFORMATION TECHNOLOGY

UNIVERSITY OF PRETORIA

Executive Summary

In the midst of the worst energy crisis in modern times in South Africa, the need for suitable backup and replacement power is at an all time high. This document describes a business plan for Light Electrical, which includes detailed market research, product analysis and the necessary business design by which they will be able to supply alternative electrical products to the public effectively.

Table of Contents

List of Figures and Tables

List of Abbreviations

PV – Present Value

AW – Annual Worth

LCM – Least Common Multiple

UPS – Uninterrupted Power Supply

DIY – Do It Yourself

kWh – Kilowatt.hour

VAT – Value Added Tax

1. Introduction and Background

South Africa is currently in the midst of its worst energy crisis in modern times. The chief provider of the country's electricity, Eskom, is unable to cope with rapid development, and the resulting energy needs increase. This is due to a lack of long-term planning, poor maintenance, and management. This shortage of capacity has hit the South African economy hard and almost all sectors have suffered in some way due to "load-shedding". Load shedding is a rolling blackout initiated by Eskom whereby the power is cut off to certain geographical areas for about 2-4 hours at a time to "manage capacity". By all reports, this crisis is far from over as expert estimates indicate it will last another 5-10 years before any real improvement is affected.

This crisis has created a need within many industries firstly for suitable emergency backup power in the shorter and medium term. Currently the most obvious solution is a generator. As the price of diesel rises and a greater emphasis is put on "green" power, the generator might soon become too expensive and heavily controlled by legislation to be a feasible solution. In the light of this, alternative solutions must be considered. Secondly, there is a need for sustainable, preferably "green" permanent energy source for the longer term.

Light Electrical is a start-up company specialising in household electrical infrastructure instalment. Looking to establish a competitive advantage, Light Electrical has requested the expertise of an industrial engineer to establish the feasibility of alternative electrical solutions, as well as a roadmap of how to supply these solutions to the public effectively. This business plan includes a market study, product-, and competitor analysis, as well as specifications for the optimal market entry strategy and business architecture. This document contains all analyses performed as well as the suggested business design for Light Electrical.

2. Project Aim

The aim of the project is to provide Light Electrical with a business plan to empower them to enter the market and win a considerable market share with a relevant product that has a significant life span.

3. Project Scope

The project entails the design of a business plan for Light Electrical. This plan includes a market study, as well as a feasibility-, and life cycle study of alternative household/business emergency backup and alternative electrical solutions. These studies form the context in which the business architecture, market entry strategy, and cost implications are defined through which Light Electrical would effectively enter the market with a feasible product.

4. Literature Review

The goal of this section of the document is to review the relevant literature pertaining to the technology and Industrial Engineering tools that are used, and referred to during the analyses and design phases of the project.

4.1. Competitive Advantage

The choice of a target market can be difficult, but it has to made – ruling out a customer segment that would simply be unprofitable or too hard to serve given the firms capabilities. Core capabilities (or competencies) are the skills that differentiate the service or manufacturing firm from its competitors. What companies need in this world of intense global competition, is not more techniques, but a way to structure a whole new product realisation system differently and better than any competitor (Chase et al, 2006).

4.2. Generator

A generator is a device that converts mechanical energy to electrical energy by fixing a dynamo to a petrol/diesel engine. Generators range in specification from 250W to 100kW output. The current running cost for a generator is approximately R3.20/kW.h

4.3. Solar Energy

Solar energy is energy obtained by converting radiation from sunlight into electricity by the use of photoelectric cells. This technology costs about R 50 per Watt of output.

4.4. Battery and Inverter Technology

An inverter is a product which converts battery power to AC electrical power. Inverters range in output from 75W, which is good for a laptop, to 100kW systems (www.planmypower.co.za). The power usage of different appliances is attached in Appendix 2.

In order to use an inverter system successfully, you need to have 3 basic components;

- Inverter
- Batteries - as source
- Battery Charger (to charge the batteries via Eskom or alternative power.)

4.5. Financing

The appropriate financing strategy is important for any new venture. There are many ways in which to finance a venture and Rwigema & Venter (2004) describe these. The financing strategy for Light Electrical will be determined in conjunction with the market entry strategy.

Industrial Engineering Tools

4.6. PEST Analysis

PEST Analysis is a strategic planning tool used to analyse the market in which a business finds itself. It evaluates the Political, Economical, Social and Technological attributes of the desired market and their influence on a venture. It forms part of the market research aspect of starting a venture (Rwigema, 2004).

- Political factors include political stability, legislation, trade restrictions etc.
- Economical factors include economic growth, inflation, interest rates etc.
- Social factors include cultural aspects, demographic of clientele etc.
- Technological factors include the rate of technological change and technological incentives.

4.7. SWOT Analysis

SWOT Analysis is a strategic planning tool used to evaluate the Strengths Weaknesses, Opportunities, and Threats associated with a business venture. This method identifies the internal and external factors that could prove favourable or otherwise towards certain business objectives. The technique was developed by Albert Humphrey (Stanford University) using information from the fortune 500 (Rwigema et al, 2004).

- Strengths – Identify all attributes that could provide a competitive advantage.
- Weaknesses – Identify all shortcomings that could be harmful to reaching objectives.
- Opportunities – Identify external elements that could help in reaching objectives.
- Threats – Identify external elements that could be harmful to reaching objectives.

4.8. Breakeven Analysis

Breakeven analysis involves the determination of an economic parameter or common variable between two alternatives. In this case it is applied to determine when a battery-inverter system becomes more cost beneficial than a generator for emergency power as well as to determine the feasibility of solar power in households and small businesses. It is also implemented to determine when a venture is profitable.

Blank & Tarquin (2005) prescribes the following steps when performing a breakeven analysis between two alternatives:

1. Define the common variable and its dimensional units.
2. Use PV or AW analysis to express the total cost of each alternative as a function of the common variable.
3. Equate the two relations and solve the breakeven value of the variable.

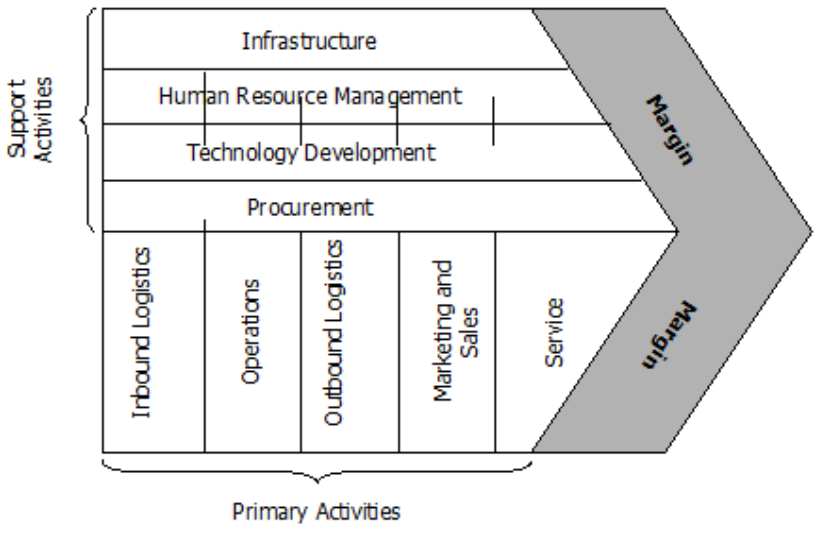
4.9. Supply Chain Design

A supply chain design is critical to any business that delivers a product. Because of the high uncertainty of demand and a low uncertainty supply, a Responsive Supply Chain is required for Light Electrical (Chase et al, 2006, p409).

4.10. Value Chain

Michael Porter's Value Chain is functional in identifying all the primary and support activities associated with any enterprise.

Figure 1: The Value Chain



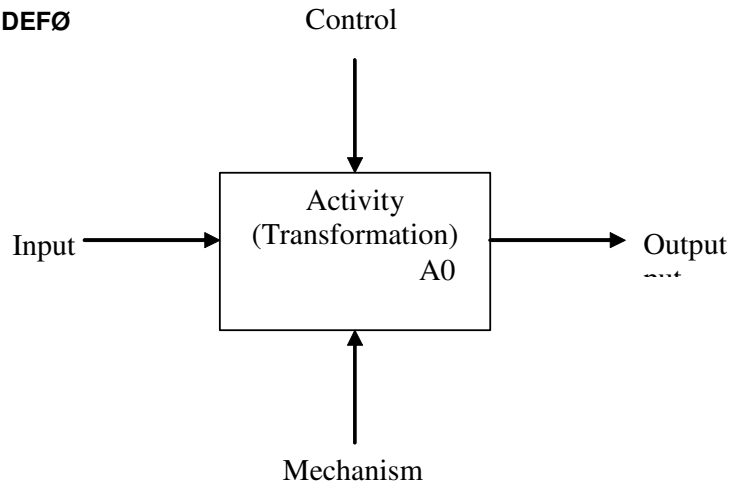
Porter 1985

4.11. IDEFØ Modelling

According to the Draft Federal Information Processing Standards Publication 183 (1993), the IDEFØ technique is designed to model activities, decisions, actions, or functions of the organisation. This method of modelling a business is useful in modelling the current (as-is) as well as the future (to-be) structure of a business.

Refer to Figure 2;
Activity: A process or function that occurs over time that has a defined outcome.
Input: Information/material that is used to produce an output.
Output: That which is produced by the activity.
Control: Things which regulate the process/output.
Mechanism: Things used to realise the activity – People, machines etc.

Figure 2: IDEFØ



4.12. IDEF3 Modelling

IDEF3 is a process modelling tool that captures situations/processes as a series of events. Where IDEFØ is focussed on portraying the structure of an organisation, IDEF3 is focussed on portraying the process flow through the organisation (Richard J. Mayer, Ph.D. et al, 1995). IDEF3 is useful in modelling the current (as-is) as well as the future (to-be) procedures of a business.

5. Market Analysis

The purpose of this section is to analyse the market in which Light Electrical finds itself using Industrial Engineering-, and other tools. This section contains a market analysis, product analysis and competitor analysis. The findings of these studies are critical in defining the optimal business structure and market entry strategy.

PEST Analysis of the Market

Political Factors:

There are no significant political factors that will hinder the business and its objectives.

Economic Factors:

South Africa's electricity provider, Eskom, is suffering capacity shortages throughout the country. This has forced Eskom to implement something they call "load shedding". During load shedding, electricity is shut down in certain geographical areas for 2-4 hours at a time to manage capacity. In a recent study done by TNS Research Surveys it was found that approximately 50% of South Africans have been affected by load shedding with 54% of metropolitan citizens claiming that load shedding has affected them financially. During the South African Chamber of Commerce and Industry's midyear seminar, Eskom's demand side manager, Andrew Etzinger, stated that South Africans needs to reduce their total power usage by 10%. He added that this reduction would be necessary for the economy to grow by 6% by 2010. Etzinger cautioned that South Africa is likely to experience load shedding for the next seven to eight years. This means that for the next seven to eight years there will be a need for backup electricity sources.

Eskom has also received approval for an additional 20.6% hike in tariffs in October of 2008. This is over and above the 12% increase implemented at the beginning of July 2008.

Other economic factors to be considered include firstly the rising petrol/diesel price. At R 10.20 and R 11.50 per litre of petrol and diesel respectively (August 2008), generators become very expensive to run for prolonged time. The cost of running a 1-kilowatt generator for 1 hour is more than R 3, which is considerable if one takes in to account that most households/businesses need far more power to run effectively. Secondly, the rise in the prime lending rate from the Reserve Bank and resulting lack of disposable income will make

consumers weary of making any large investments into products that they do not deem as necessary.

The final economic factor is that installed electrical backup power is a definite selling point for any house. In new housing developments, the installation of any backup electrical system can add value of up to double the cost of installing the feature (Remax estate agency).

Social Factors:
Global warming, and the reality of the effect of civilization on nature, has sparked a worldwide movement for environmental awareness. People are more environmentally conscious now than ever before. It has become a social advantage to be an environmentally friendly business and within the next 10 years, South African legislation will follow the example of their international counterparts in controlling the carbon footprint left by industries.

Technological factors:
Technology is constantly becoming more affordable and alternative electrical solutions are no different. Alternative energy is no longer a far off ideal that is reserved for the wealthiest of people; it is readily available to all people of different backgrounds and income groups.

SWOT Analysis of Light Electrical

Strengths:

- High level of technical knowledge and experience in electrical matters
- Personalised service
- Entrepreneurial culture
- Creativity in solutions

Weaknesses:

- Limited staff
- Limited capital to spend on stock
- Limited client base
- No shop floor or other suitable storage facilities for stock
- Cash flow issues

Opportunities:

- The electricity crisis has lead to a need for backup emergency power sources for many businesses and homes. In a recent study done by TNS Research Surveys, it was found that 10% of South Africans have invested in a generator to cope with Eskom's lack of capacity. Considering Light Electrical's expertise in electrical matters, they could exploit this situation to generate a profit.

Threats:

- The backup power market has been flooded with many products and thus there is competition in the market. Light Electrical will need to find a definite competitive advantage to negate this threat.
- The high interest rate and resulting limited disposable income has made consumers unwilling to invest large sums of money in products that they do not deem as essential.
- The perception that exists in consumer's minds that the load shedding problem is over as a result of the recent stabilisation in electricity supply.

Product Analysis

Because of the unstable power situation in South Africa, many people are exploring the possibilities of being independent of Eskom and their power supply. Let us consider the feasibility of solar energy by taking a conservative household use of appliances during a 10-hour period:

Table 1: Conservative Household Power Usage

	Watt	Hours	Watt.Hour
1xTV	100	8	800
1xDSTV	60	8	480
Geyser	2500	4	10000
2xLaptops (2x100w)	200	5	1000
2xFridge/Freezer	300	6	1800
6xLights (6x15W)	90	4	360
Total	3250		14440

A good assumption to make is that the cost of solar panels is approximately R50 per watt of output on a panel. A solar panel has only an effective 5-6 hours of sunlight with which to operate daily. Taking the above example and calculating the total constant watt need: 14.44kW.h ÷ 6hours = 2400 watt

This amounts to 2400 x R50 = R120 000 in solar panels alone. One then still needs to install a battery inverter pack with which to operate when there is no sunlight. Solar panels are thus still too expensive currently to be used by the broader public.

Traditionally when a consumer wanted a backup energy source, petrol or diesel generators have always been the first and least expensive option. With the advancement in technology and the high fuel price, a generator is no longer the only and most feasible option for a backup energy source. Battery and inverter packs offer an alternative backup energy source worth investigating.

Let us firstly compare a generator to a battery inverter pack by using a typical a household situation. During a 4-hour load shedding situation, one might use the following:

Table 2: Typical household backup power needs

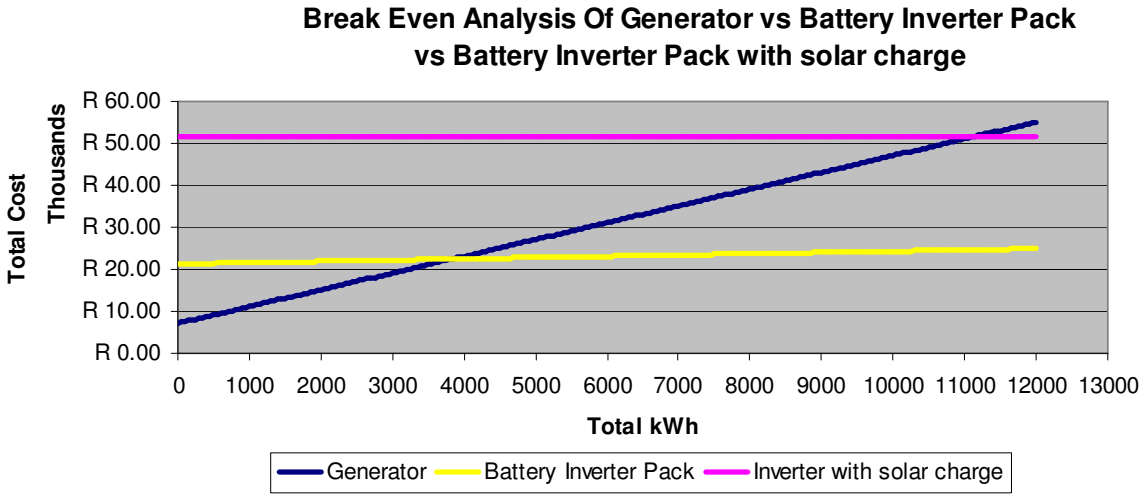
	Watt	Hours	Watt.Hour
1xTV	100	4	400
1xDSTV	60	4	240
1xMicrowave (30 min)	1500	0.5	750
2xLaptops (2x100w)	200	3	600
1xFridge/Freezer	300	2	600
6xLights (6x15W)	90	3.5	315
Additional 500W	500	1	500
Total	2750		3405

If one were to opt for a generator, one would require a 3kW generator at R6125 plus installation cost. If one were to opt for a battery inverter pack, one would need a 3kW Inverter with a battery charger as well as batteries for storing energy. One battery provides approximately 1100Wh of energy. Battery life is significantly increased if batteries are rarely discharged below half their capacity so one would need a minimum of 3 batteries, but a battery pack of at least 6 batteries is recommended. One may assume a price of R2600 per kWh for storage. A third option is to have the battery inverter pack with solar panels to charge them during the day.

Table 3: Household Backup Power Situation Cost

		Generator		Inverter		Inverter+Solar
	1*Generator	R 6,125.00	1*Inverter	R 13,000.00	1*Inverter	R 13,000.00
	Wires etc.	R 500.00	Wires etc.	R 500.00	Wires etc.	R 700.00
	Maintenance	R 500.00	6*Batteries	R 7,800.00	6*Batteries	R 7,800.00
					Solar Panels	R 30,000.00
Initial Fixed Cost		R 7,125.00		R 21,300.00		R 51,500.00
Running Cost/kWh		R 4.00		R 0.30		R 0.00

Figure 3: Break Even Analysis of a Household Backup Power Situation



Considering the break-even analysis shown in Figure 3, in a backup power situation in a household, a customer would be advised to opt for either a generator or a battery inverter pack with Eskom charge. Although solar power is clean and saves money on the electricity bill, it has an unreasonably high initial investment. In the example given above, only 600watt's worth of solar panels were used to charge the batteries that were to be used for 4 hours a day and at a cost of R30 000, it would take many years to make that money back. In the choice between a generator and a battery inverter pack with Eskom charge the customer must consider how often the system is to be used as well as the fact that generators are noisy, emit harmful gases, require refuelling, and need regular maintenance.

Similarly, in a business situation, one might find the following during load shedding:

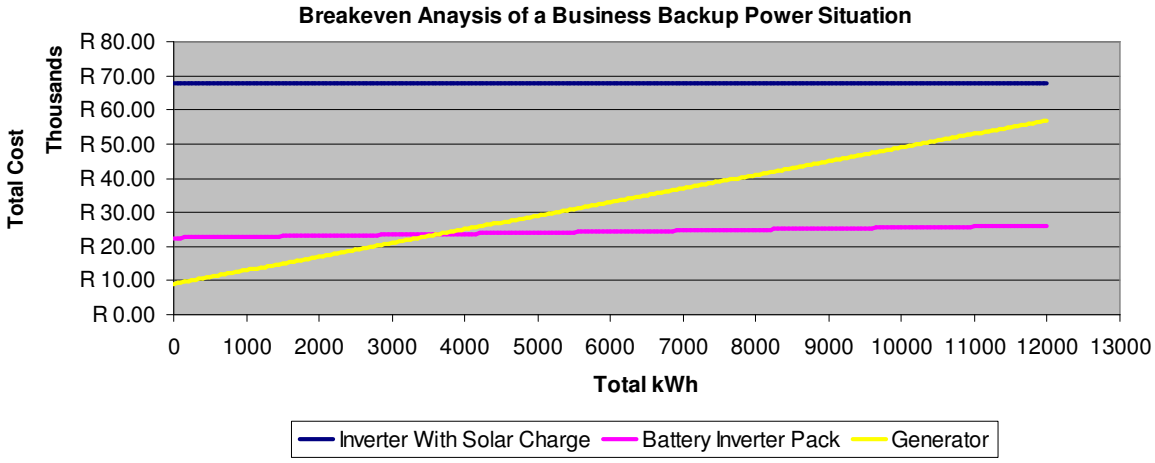
Table 4: Business Power Usage

	Watt	Hours	Watt.Hour
5xPC (5x250)	1250	4	5000
4xLights (4x12V)	48	4	192
Total	1298		5192

Table 5: Business Backup Power Situation Cost

		Generator		Inverter		Inverter+Solar
	1*Generator	R 5,000.00	1*Inverter	R 9,000.00	1*Inverter	R 9,000.00
	Wires etc.	R 500.00	Wires etc.	R 500.00	Wires etc.	R 700.00
	Maintenance	R 500.00	10*Batteries	R 13,000.00	6*Batteries	R 13,000.00
	Additional UPS	R 3,000.00			Solar Panels	R 45,000.00
Initial Fixed Cost		R 9,000.00		R 22,500.00		R 67,700.00
Running Cost/kWh		R 4.00		R 0.30		R 0.00

Figure 4: Break Even Analysis of a Business Backup Situation



As shown in Figure 4, the situation in a business is similar to a household with the only truly feasible options being either a generator or a battery inverter pack with Eksom charge. Because of the amount of electronic equipment being used in a business, a battery inverter pack is more ideal to ensure the safe operation of these appliances. Generators are prone to power surges that are harmful to electronic equipment.

To conclude: Solar electricity and independence from Eskom is too expensive presently to be a feasible solution for a green replacement power option. When buying emergency power however, it is all about one's personal power needs. If a customer will need backup power very often and possibly use electronic equipment, a battery inverter pack with Eskom charging is recommended because it does pay for itself in the end if it is used often. If a customer is looking for an absolute emergency backup system that does not cost too much in investment, a generator is recommended as it is the cheapest initially.

Competitor Analysis

With competitor analysis, the aim is to find out the following:

- Who are the major market share holders?
- How are they selling their product (distribution channels)?
- How are they marketing their product?
- Who is buying their product?
- What additional services are provided?
- Which of these aspects could be seen as a core capability for Light Electrical?

In a study of 12 different companies, there were found to be three main types of businesses that have interests in backup electrical solutions:

Wholesalers:

- Wholesalers include enterprises like Trade Centre, Macro and Mica hardware stores.
- These predominantly large stores sell a wide range of backup electrical sources but offer no real personalised installation service or after sales service.
- Wholesalers tend to advertise in the printed media through promotional catalogues that focus on communicating the competitiveness of their product price.
- The quality of the product is varied.
- People who buy their products are generally DIY inclined or ignorant of the installation and after sales support required.
- Battery and inverter packs are rarely available.

Alternative Energy Specialists:

- These are businesses deal exclusively in alternative energy solutions like Plan my Power.co.za
- These businesses commonly offer delivery and installation services for their product.
- Quality of customer care is often a concern but after sales service is of high standard in general.
- Customer Education is average to good.
- Supply battery and inverter packs.
- Advertising is done via internet and printed media inserts and is focused on communicating that they are the one-stop alternative electricity specialists that have the appropriate solution for any customer.

- Businesses and people interested in more advanced systems generally make up the clientele of these businesses.

General Electric Companies:

- These are companies like Waterkloof Electrical that offer a range of general electrical services as their primary business function and in addition to this, also sell, and provide installation services for alternative electrical solutions.
- These businesses commonly offer delivery and installation services for their product.
- The quality of the product sold is often average.
- Battery and inverter packs are rarely stocked.
- The quality of service, before and after sales, is high.
- These companies often use their physical shop as well as the Yellow Pages for advertising. As backup power sales is not the core of the business, the advertising is not very functional in promoting their sales, as it is merely an “add on” service.
- Customer education is of an acceptable level.
- Customers of these enterprises range from loyal frequent customers to people/businesses seeking a quick solution for their current energy problem.

Light Electrical does not fit easily into one of the before mentioned categories. Considering the SWOT analysis in conjunction with the competitor analysis, the design for the Light Electrical business plan will reflect the fact that they are a combination of two of the categories. Light electrical does possess the expertise of the alternative energy specialists, but also the personal customer service capabilities of the general electric companies. The one factor that does however separate Light Electrical from the categories is their inability to carry stock because of the limited capital to their disposal. Here follows the details of the design of the Light Electrical business with particular emphasis on the core processes required to implement the backup power aspect of their business.

6. Business Strategy

The purpose of this section of the document is to define a specific strategy and core functions that will enable Light Electrical to enter the backup power market.

Core Capabilities

Light Electrical has not yet established a considerable market share with the current business of electrical infrastructure installation. Considering all analyses, Light Electrical should focus on the following core capabilities to be effective in the marketplace:

- Personalised customer service
- Fully customisation of service and/or installation
- After sales service and customer education
- Carry little or no stock (consumables excluded)
- Have contracts with suppliers that enable them to negate cash flow and capital issues
- Have low overheads to increase margins without affecting sales price

Marketing

Light Electrical must focus their backup electrical power business on selling and installing battery and inverter packs as these are often the optimal feasible solution for a customer, but not many businesses stock them. It would be wise for Light Electrical to also source generators for customers on demand, as this will not bind them in terms of their product.

With the suggested core capabilities in mind, Light Electrical must focus their advertising on their ability to provide a personal service at a reasonable price. The one thing that most competitors within the market lack is proper after sales service and customer education. Light Electrical must be exemplary in this area and this will promote word of mouth advertising.

Pricing

As backup electrical systems are not the main business of Light Electrical, they should charge a mark-up of 30% on all electrical equipment (excluding VAT). This will ensure that their prices are competitive with regards to the equipment. The installation will however not be included in the sales cost. The installation cost of R200/h and the sales of extras will provide margin that will provide profit.

7. Business Structure

The purpose of this section of the document is to define the optimal business structure through which Light Electrical will be able to perform the necessary business activities required for adding backup electricity solutions to their business.

Value Chain

The value chain (See figure 5) is a breakdown of the primary value adding processes for Light Electrical as well as the processes that support the primary processes.

Figure 5: The Value Chain

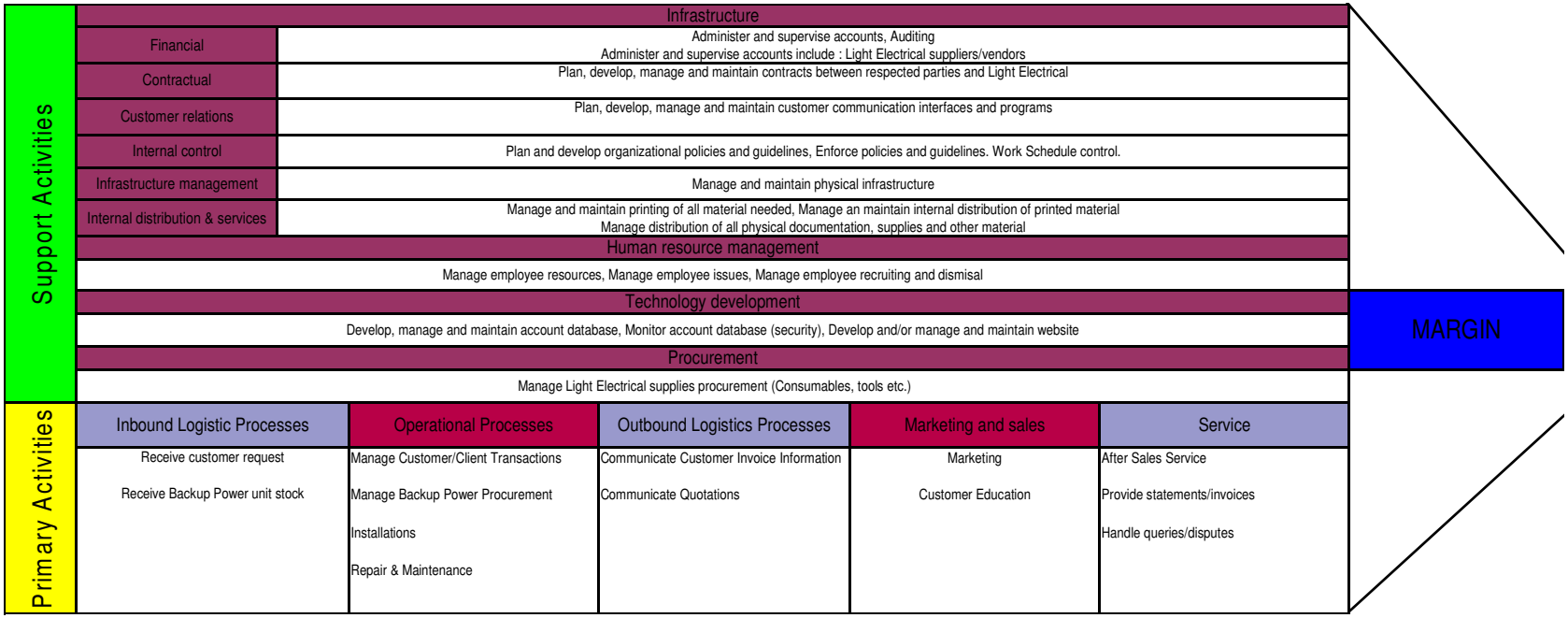


Figure 6: IDEF3 Decomposition of the primary operations process

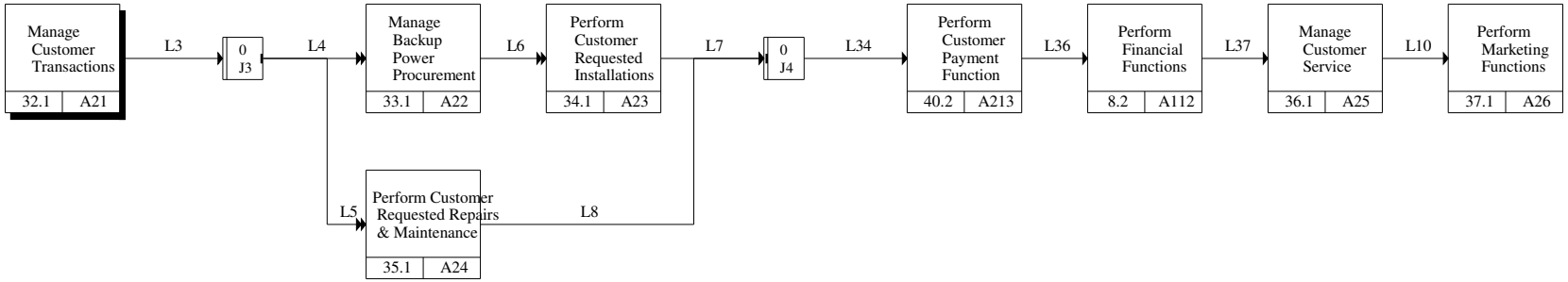
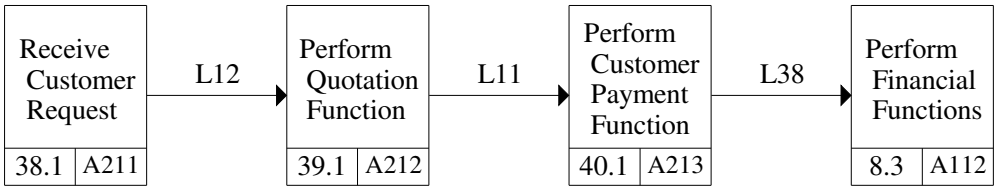


Figure 7: IDEF3 Decomposition of the Manage Customer Transactions process



Core Process (IDEF3)

The primary operations process is shown in Figure 6 on the previous page along with Figure 7, which is the decomposition of the Manage Customer Transactions process. This process is critical to the business design of Light Electrical. The flow is as follows:

1. Receive a customer request for either a purchase & installation (backup electrical power or other) or for a repair of an electrical fault.
2. Perform the quotation function, which includes a job assessment and the issuing of a quote. Upon accepting a quote, a 50% deposit is required in the case of installations. This deposit, along with an overdraft facility, will provide the capital to buy stock for the client. The other option is to negotiate a buy on credit deal with the supplier. This is critical in negating Light Electrical's cash flow problems.
3. Perform the customer payment function, which handles the opening of a customer account on the database as well as any deposit.
4. Perform any financial (bookkeeping, system update) function that is necessary.
5. Perform the requested operation which is either:
    a. A requested repair and maintenance project, or
    b. A requested installation, which is preceded by the purchase of the relevant product. This procurement function is critical. Light Electrical will need to negotiate a deal with their supplier that allows them to supply the customer on an assemble-to-order basis. They must be able to get stock with one to three days notice without having to keep any stock for extended times. Backup electrical equipment is not their main business and until the business grows accordingly, Light Electrical should avoid stock keeping situations. Instalments will generally take place approximately 3 days after the acceptance of the quotation.
6. Perform the payment function, which entails receiving the balance of the amount owed.
7. Perform the financial function, which entails updating the customer account and any accounting functions.
8. Perform customer service, which entails the settling of any queries and the provision of the invoice and user manual.
9. Perform the marketing function that entails the education of the customer, as well as any other required marketing functions.

This process forms part of the functional structure of the business that follows.

Functional Design (IDEFØ)

The suggested functional design of Light Electrical's future business structure is given in the following figures. In the interest of relevance, only the top three levels of decompositions as well as the infrastructure support function are given. The remaining decompositions are provided in appendix 1. The functional design has taken into account the current structure at Light Electrical, as well as the before mentioned core capability requirements.

Figure 8: Top level breakdown

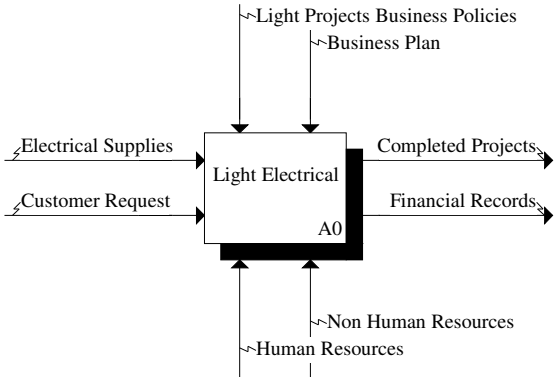


Figure 9: Second Level Breakdown

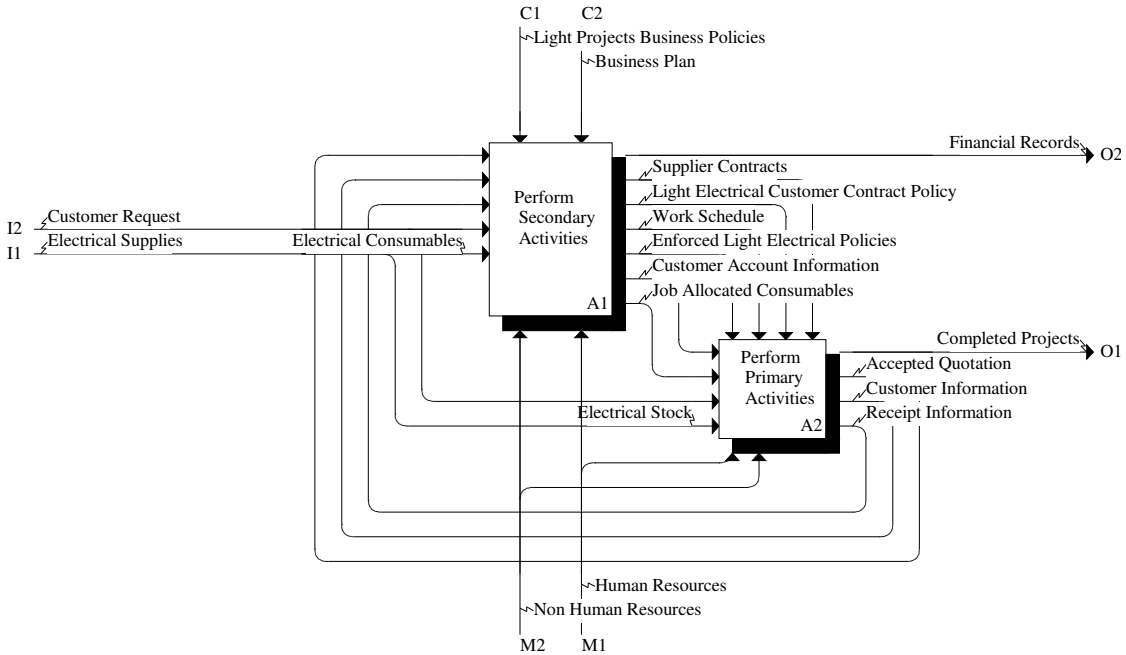


Figure 10: Secondary Activities Decomposition

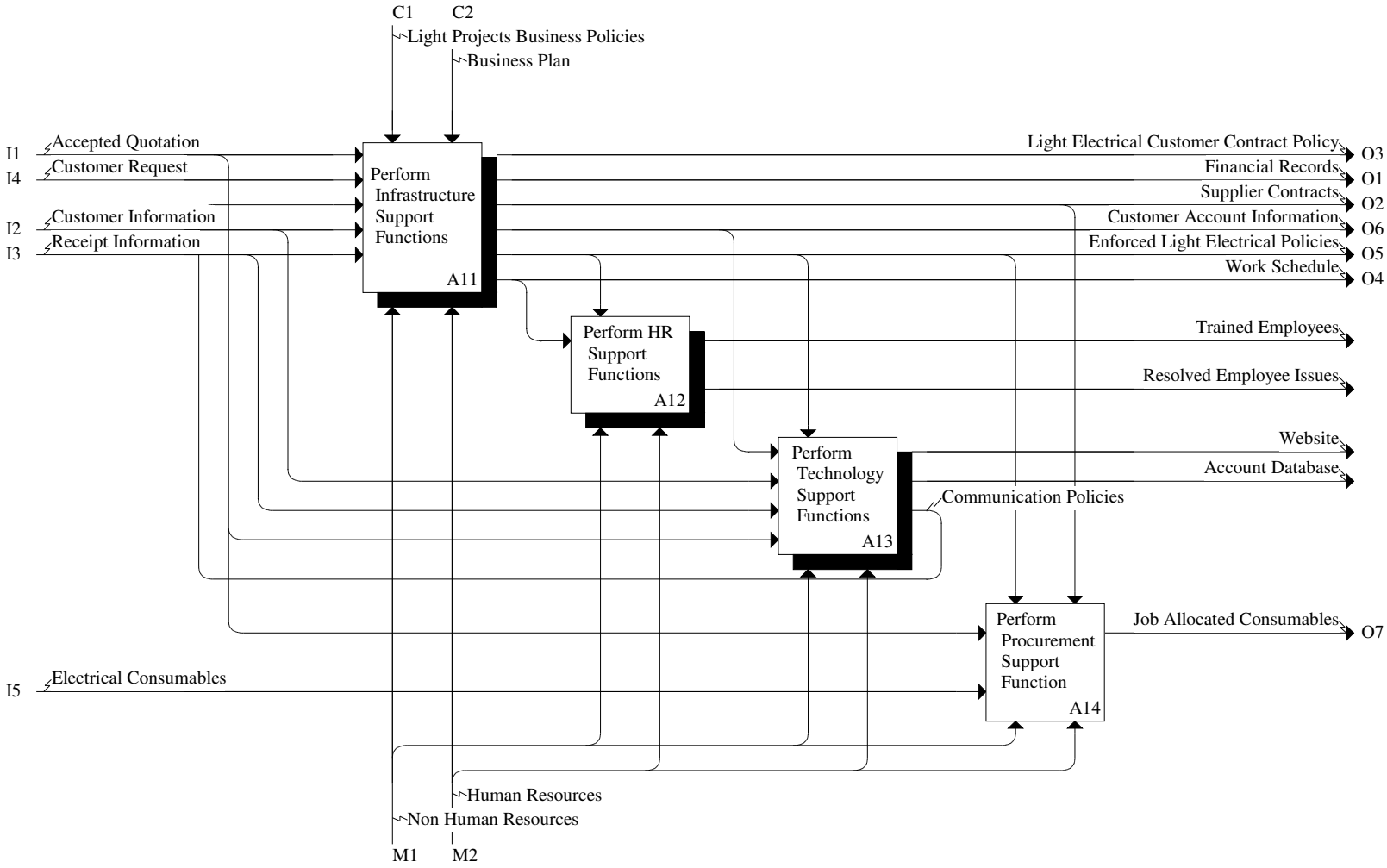


Figure 11: Infrastructure Support Activity

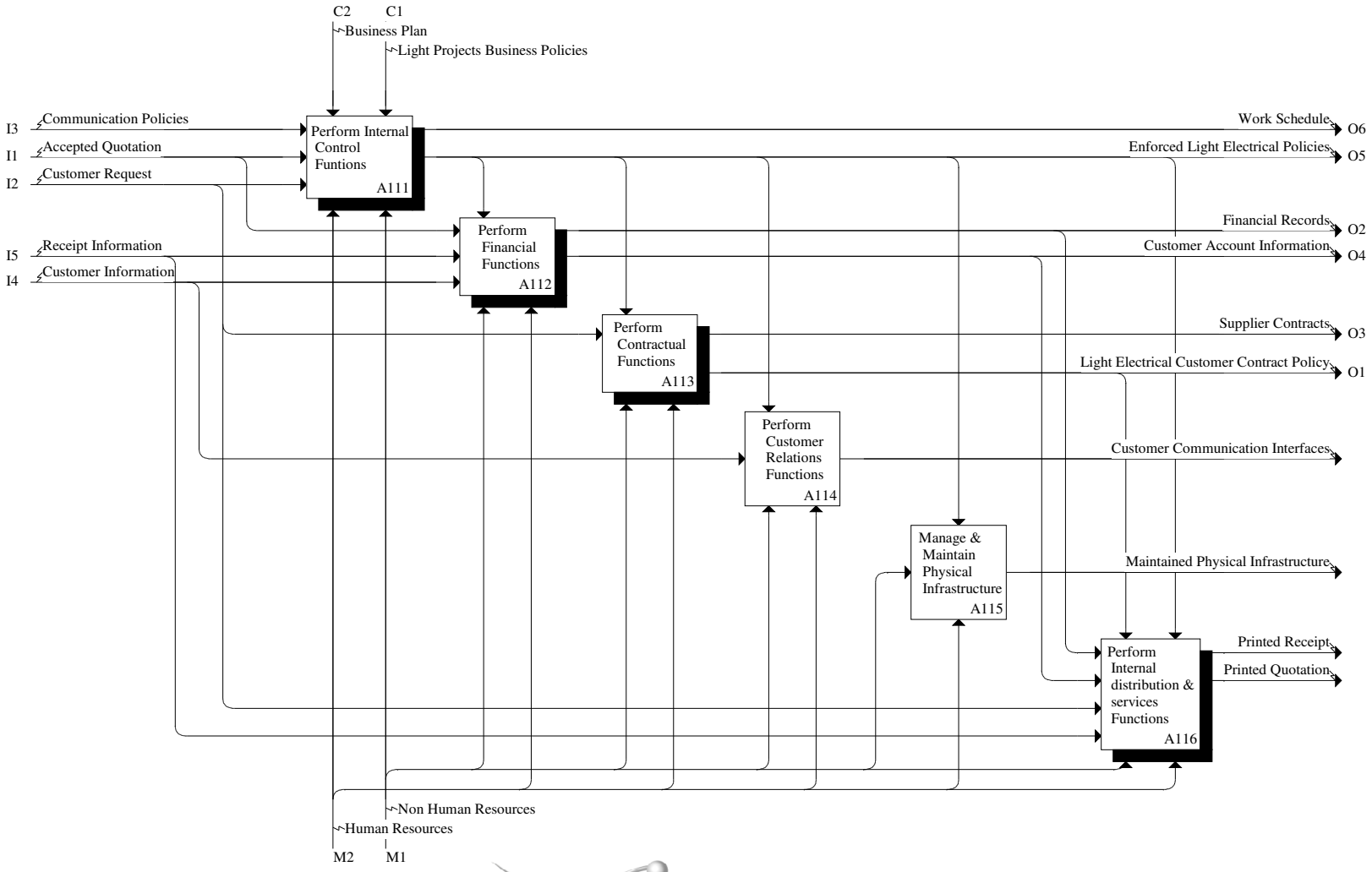
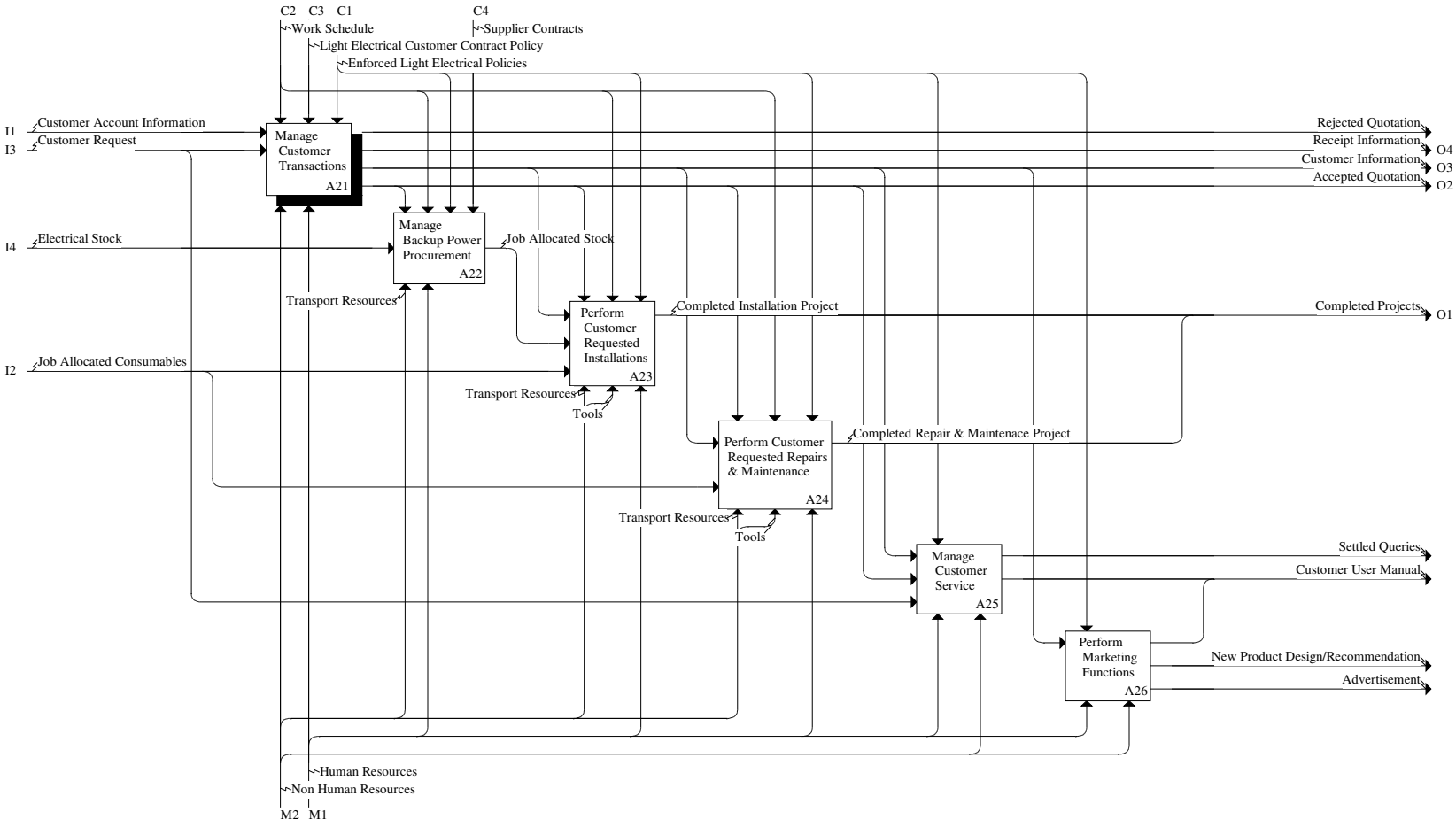


Figure 12: Primary Activities Decomposition



Market Entry Cost

There are many factors contributing to the market entry costs. These factors make it almost impossible to represent all of the actual costs of entering the market accurately. However, it would be foolish not to make an estimation of such a cost. The estimated cost of entering the market is given below in table 6.

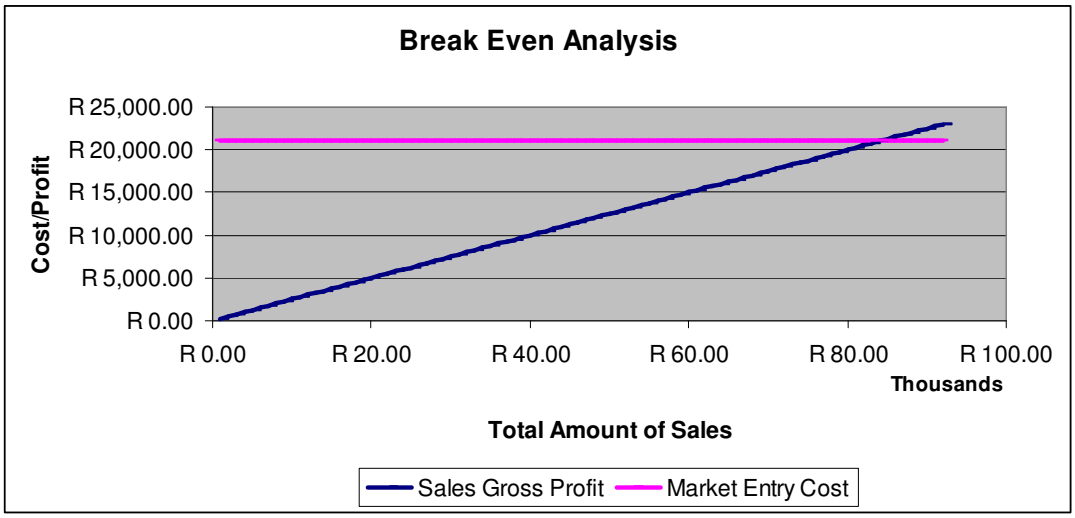
Table 6: Market Entry Cost Calculation

Market Entry Cost Calcualation	
Additional Staff Memeber	R 5,000.00
Procurement of additional specialised tools	R 3,500.00
Additional Training	R 7,000.00
Initial Advertisement	R 2,000.00
Negotiate supplier deal (R1000-R10000)	R 3,500.00
Total	R 21,000.00

With a business plan (such as this one) Light Electrical should be able to get a business loan from the bank although the most probable source of investment will come in the form of venture capital from their parent company, Light Projects.

With an average mark-up of 25%, the following break-even analysis indicates how much stock should be sold to break even with the market entry cost. Not included in this calculation is the estimated additional installation income generated by this additional service.

Figure 13: Break Even Analysis



Light Electrical should thus sell approximately R 80 000 worth of backup electrical equipment to generate enough to cover their market entry investment. This is not a large amount considering one job could easily cost over R 20 000. With the prospects of paying off their initial investment within the timeframe of four big jobs, it would make a worth wile investment for an investor.

8. Conclusion

Although South Africa's electricity situation has stabilised somewhat, most experts agree that load shedding will continue for another 5-10 years. The result of this is that there is a market for backup emergency energy sources for that same period. Light Electrical has the technical expertise to take advantage of this situation to gain a market share that will realise additional profit for their business. Using the strategies and recommendations provided, Light Electrical will have a structured and well-defined approach that will stand them in good stead in the market place.

9. References

CHASE, JACOBS & AQUILANO. 2006. *Operations Management for Competitive Advantage with Global Cases*, 11th edition, McGraw-Hill publishers. Boston.

RWIGEMA, H & VENTER, R. 2004. *Advanced Entrepreneurship*. Oxford University Press. South Africa.

www.planmypower.co.za/alotofinfo

GORDON, I. 1989. *Beat the Competition: How to Use Competitive Intelligence to Develop Winning Business Strategies*, Basil Blackwell Publishers, Oxford, UK.

BLANK & TARQUIN. 2005. *Engineering Economy 6th Edition*. McGraw-Hill publishers. New York.

Draft Federal Information Processing Standards Publication 183 of 1993 December 21, *Integration Definition For Function Modeling (IDEF0).* Federal Information Processing Standards Publications.

MAYER, Ph.D., MENZEL, Ph.D., PAINTER, DE WITTE, Ph.D., BLINN, PPERAKATH, Ph.D. September 1995. *Interim - February 1991 to September 1995. IDEF3 Process Description Capture Method Report*. Knowledge Based Systems, Incorporated. Texas.

PORTER, M. 1985. Competitive Advantage. The Free Press.

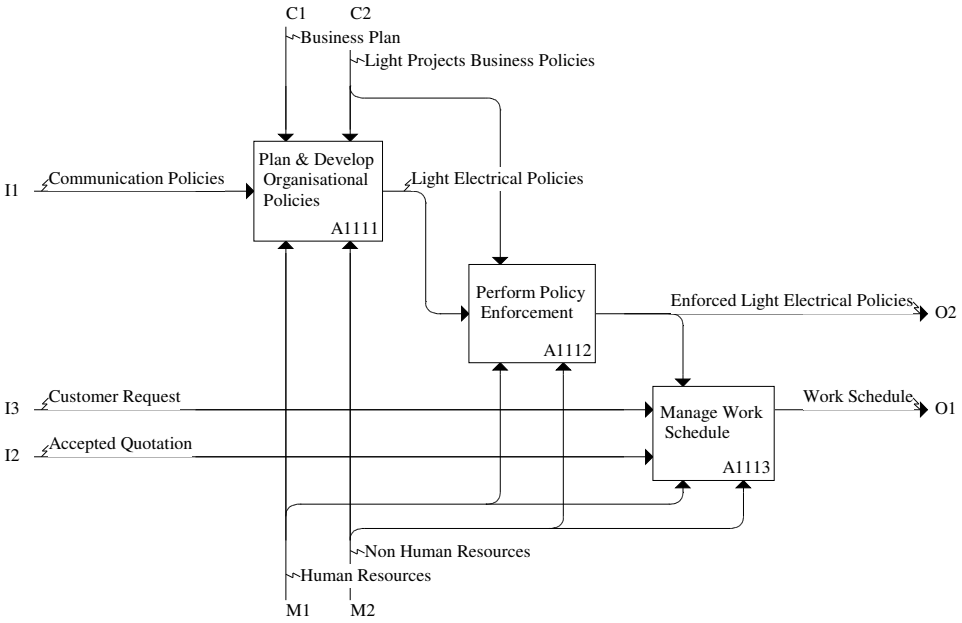
BOTHA, M. Remax Estate Agency.

TNS Research Surveys, http://www.bizcommunity.com/Article/196/19/23029.html

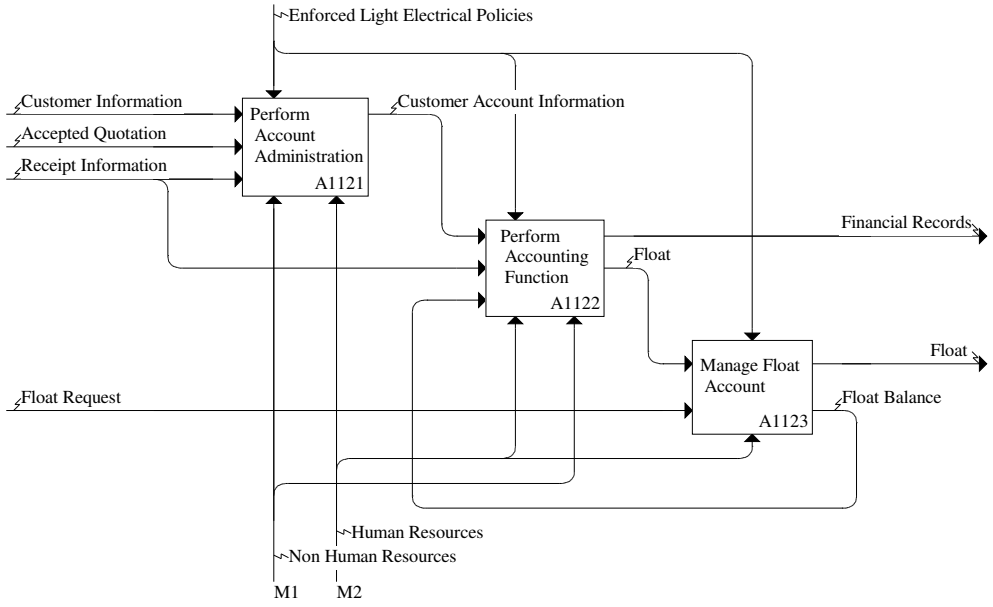
O'DONNELL, S. 11 June 2008. Shifting the load not good enough anymore, says Eskom's Etzinger, Engineering News

Appendix 1: Complete IDEFØ decomposition

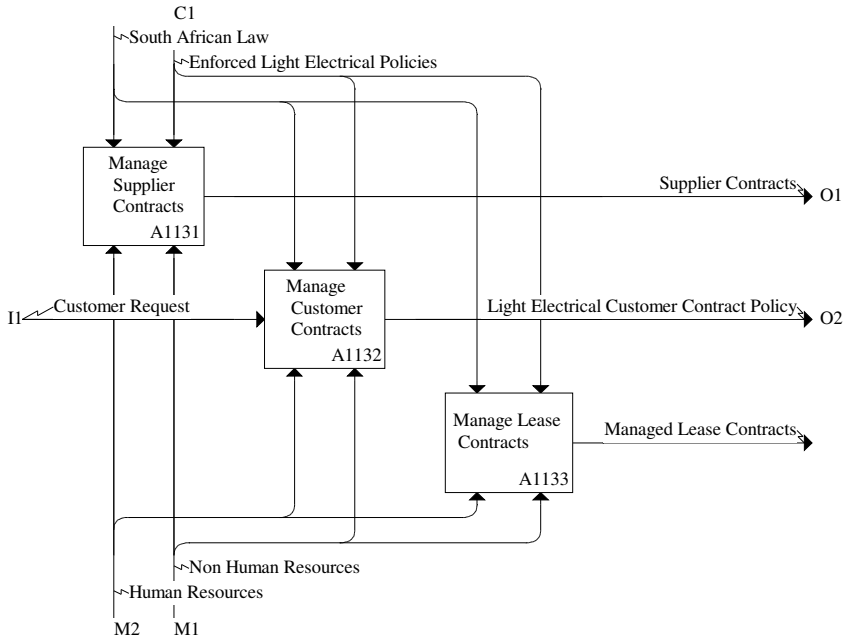
Title:A111: Perform Internal Control Functions



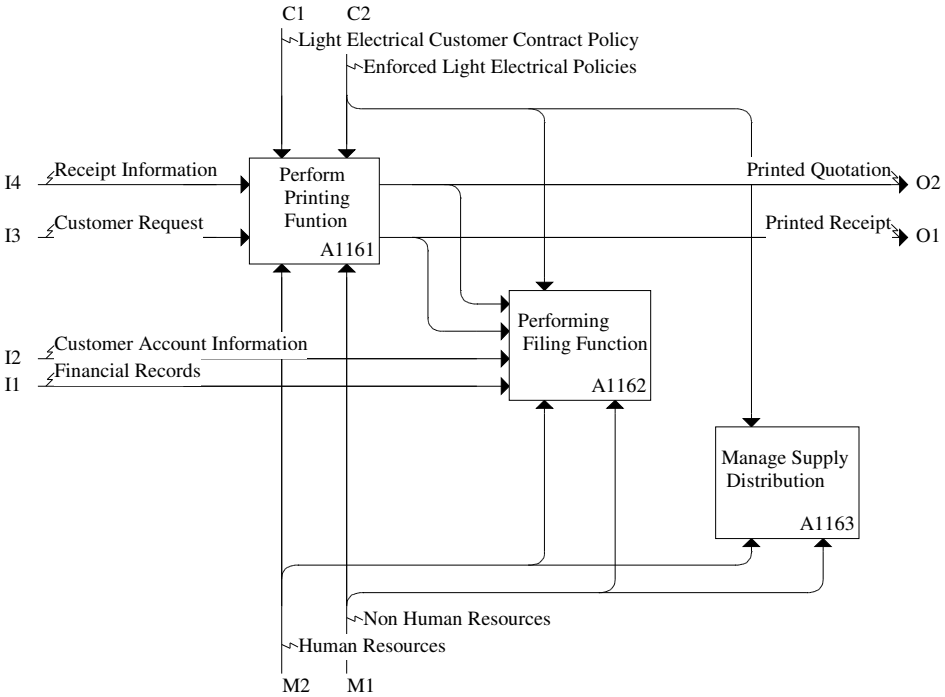
Title:A112: Perform Financial Functions



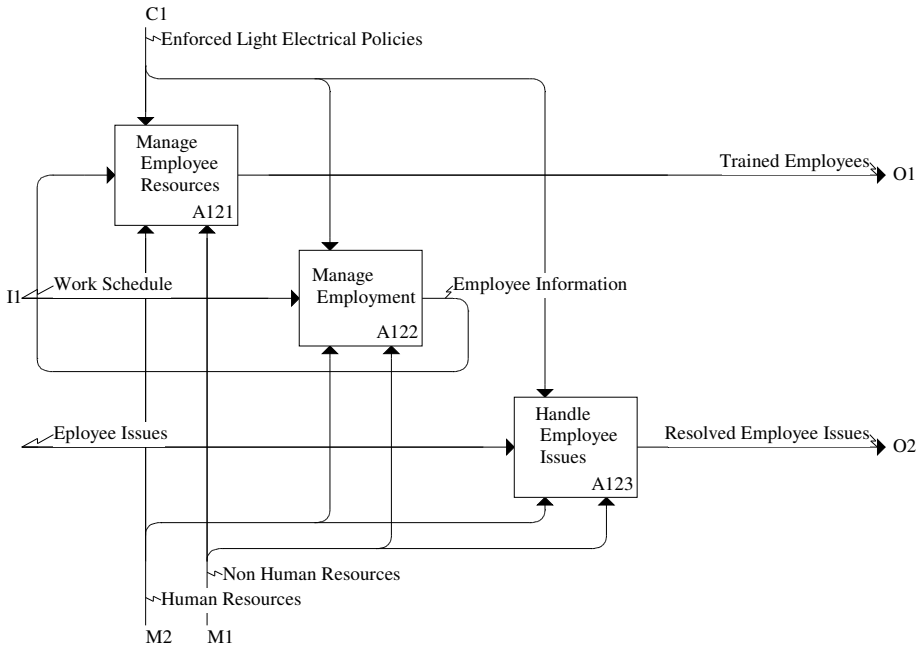
Title:A113: Perform Contractual Functions



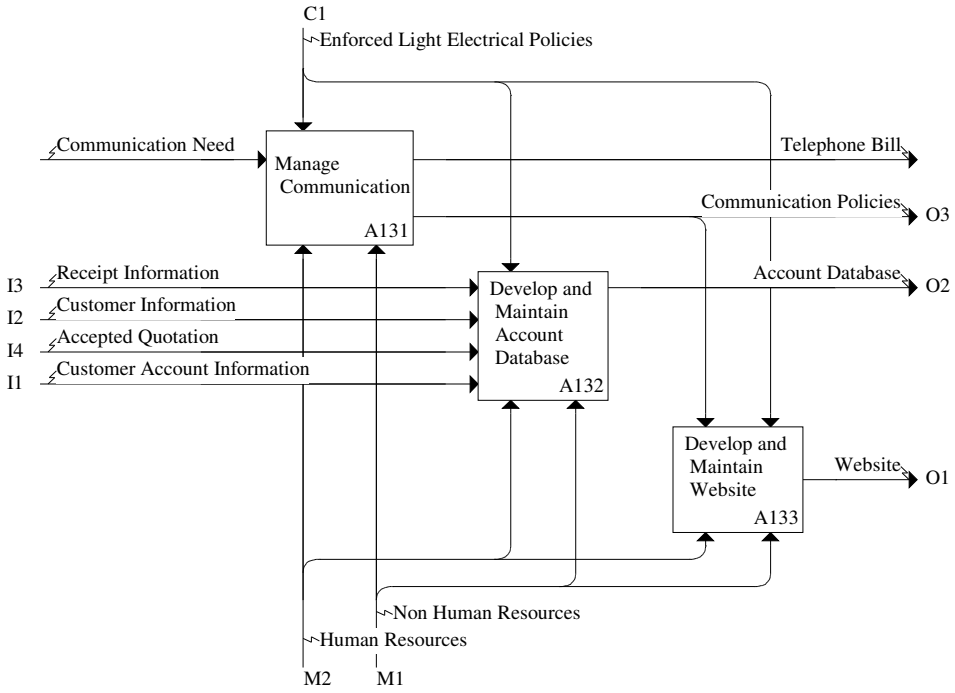
Title:A116: Perform Internal distribution & services Functions



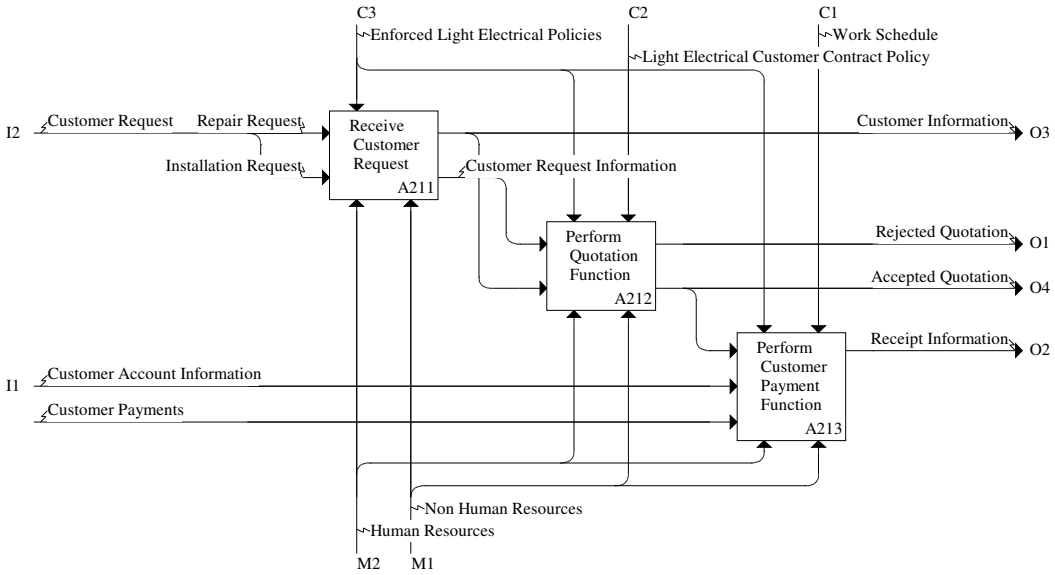
Title:A12: Perform HR Support Functions



Title:A13: Perform Technology Support Functions



Title:A21: Manage Customer Transactions



Appendix 2: Average Appliance Power Usage

TABLE OF AVERAGE WATTAGES

APPLIANCE	AVERAGE WATTAGE
HOUSE LIGHTS - STANDARD	60
ENERGY-SAVING LIGHTS	11
ELECTRICAL BALLAST LIGHTS	40
MAGNETIC BALLAST LIGHTS	40
SPOTLIGHTS (QUARTZ HALOGEN)	500
SODIUM LIGHTS	500
LAPTOP	150
DESKTOP	150
INKJET PRINTER	75
LASER PRINTER	750- 1,00
DOT MATRIX PRINTER	100
PHOTOCOPIER (SMALL)	400
4-IN-1 COPIERS - LARGE	3,000
GEYSER	2,500
KETTLE	1,500
MICROWAVE	1,500
STOVE	1,000
FRIDGE/FREEZER COMBO	300
FREEZER	250
WASHING MACHINE	3,000
DISHWASHER	3,000
HAIRDRYER	1,000
AVERAGE COLOUR TV	70-100
AVERAGE SOUND SYSTEM FOR TV	75-300
PVR OR DVD RECORDER	50
GATE MOTOR	750
SINGLE GARAGE DOOR OPENER	500
DOUBLE GARAGE DOOR OPENER	750
ALARM SYSTEMS	50
ELECTRIC FENCING	
COMPRESSORS	1,500
SWIMMING POOL PUMPS	1,500
12,000 BTU AIR CONDITIONER	2,500
18,000 BTU AIR CONDITIONER	4,000