

GNG2101

Deliverable G - Business Model and Economics Report



Team 1.1

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ABSTRACT

This report covers the business and economic plan for Human Powered Light company *Light Support*. The business model used will be the “manufacturing model”, which utilizes and combines raw materials/components to sell products to a consumer. Expenses are summarized to include the cost of manufacturing and selling the products to the consumers. Some of these expenses are rent, electricity, materials, machine costs, workers’ salaries, and overhead. Using these expenses over a 3-year period and expected number of units sold. Based on the income statement over the 3-year period, the operating income is found to be \$1,261,774.68. The Net Present Value also over a 3-year period assuming a 1% interest rate compounding monthly demonstrate that 420 units should be sold each month to break even. These numbers were calculated based on a series of assumptions for similar start-up businesses and typical costs. The report overall found that the prototype and concept could be converted to a profitable company.

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1 INTRODUCTION

As the concept of an efficient and environmentally friendly method of personally producing energy would be critically and commercially viable, it would be wise to commercialize the prospective final product of our current project. To do this, one must find a potential business model that caters to the goods or services that it may provide. Following this, a list of expenses is established and classified based on the idea of manufacturing. An income statement is forecasted based on the business model to see if the concept is fiscally viable. Finally, a NPV (Net Present Value) analysis is created to determine the breakeven point. Throughout the economic and business reports the assumptions are made and clearly stated. This document serves as the basis for turning a prototype and idea into a startup business.

2 BUSINESS REPORT

The business model chosen that would be well suited for the team's product is the "manufacturer model". In this business model, the business utilizes and combines raw materials/components in order to sell a product to consumers [A1]. This business model allows for the selling of the product directly to the customers. The reasons why the team has chosen this business model are as follows. First, the product that the team is designing and would like to sell is a physical product composed of mechanical and electronic components that are assembled in a specific architecture. The next reason is that the other business models are not compatible with the product that is being sold. For example, the razor blade model involves utilizing components that need to be refilled. This product ideally does not require any maintenance or refilling. Another example of a business model that is not compatible is the subscription model, as there is nothing to subscribe to since the product is purely hardware. The following figure shows the triple bottom line business model canvas, created with Lucidchart.

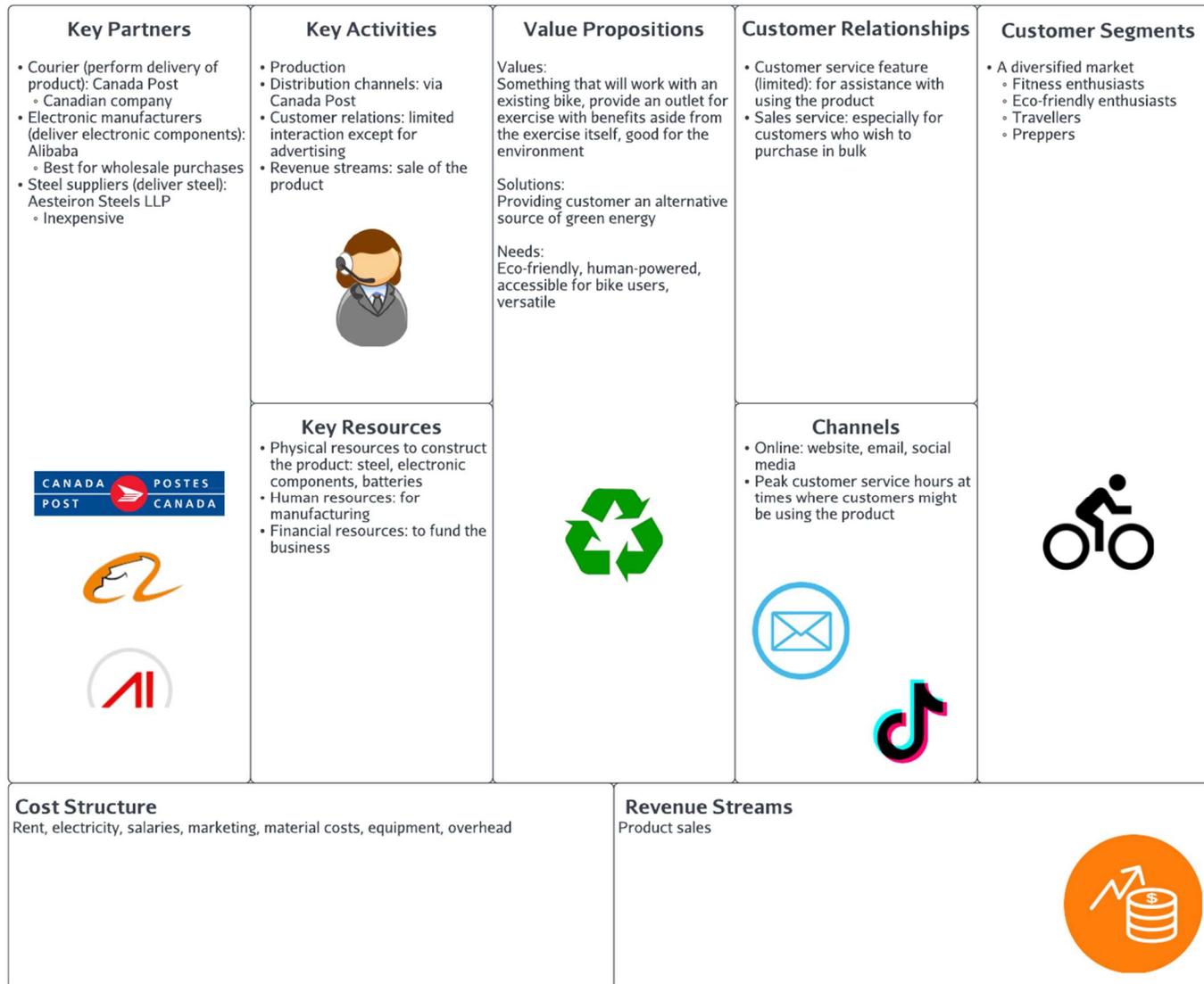


Figure 1: Triple Bottom Line Business Mode

The following are several assumptions made for the business model canvas. First, one can assume that the customer demographic is a union of people who are interested in fitness and of people who are interested in alternative sources of energy. This assumption is a feasible assumption given that the product is centralized around the client's bike and the use of the bike. The main problem being addressed is providing people with an alternative source of energy by allowing them to use the energy they expend through exercise.

It can also be assumed that the business is only selling the product; we are not selling repair or maintenance services. Since the manufacturer business model is being employed, there will not be as extensive customer relations as a business that is utilizing the subscription model. These assumptions are feasible since the business's main pipeline is manufacturing and selling the product, using extensive customer relations may take too many resources. Furthermore, since the business model is primarily focused on manufacturing the product, it is reliant on a partner courier company to fulfill the delivery.

In terms of fiscal concerns, it can be assumed that the primary source of revenue will come from the sale of the product given the manufacturer business model. This is feasible since there is no other feasible means of obtaining a significant source of revenue. The following assumptions will address how the business functions. First, the most important key partners will be a courier for delivery and raw material/electronic component suppliers for the manufacturing of the product. The primary key activity, given the manufacturing model, would be the production of the product. The products being manufactured are the tools needed to produce them as well as the products themselves. All these assumptions are feasible as the nature of the product conforms with the business model.

3 ECONOMIC REPORT

3.1 Expenses

A list of costs is established for the company. Each cost is classified as either an indirect or direct cost and then further classified as a direct or indirect cost. Each of these company costs are based on research for similar sized companies. Overall, a yearly cost is established for each expense. All cost assumptions are justified in section 3.4 of this report.

Table 1: Expense Classifications

Expenses	Expenses Classification	Research	Cost/year
Rent	Indirect Fixed	Warehouse =16,400 sf Yearly rent=\$15.48 sf/year	\$253,872
Electricity	Indirect Fixed	Warehouse =16,400 sf Electricity cost per sf/year=\$6.00	\$100,000
Salaries	Indirect Fixed	Employees=13 Salary/Year=\$50,000/\$60,000/ \$80,000 *Depending on position	\$1,550,000
Marketing	Indirect Fixed	A fixed budgeting for the year	\$162,000

Material Costs	Direct	Based on units sold, per unit:	\$29 a unit
	Unfixed	\$24.30 of steel alloy \$4.70 electronic/miscellaneous	
Equipment	Direct	\$20,000 metal cutter	\$142,000
	Fixed	\$5,000 Paints	
		\$5,641.40 Welding machines \$50,000 Miscellaneous	
Overhead	Direct	\$20,000	\$20,000
	Fixed		

3.2 Income Statements

Based on the expenses generated in the previous section, an income statement can be created for the company for the first three years of operation. This statement can be found below. All assumptions are justified in section 3.4 of this report.

Table 2: Income Statement

Revenue/ Sales		
Units	Price per Unit (\$)	Total (\$)
18000	450	8100000
Gross Profit (\$)		8100000
Op - Expenses		

Expense	Price (annual) (\$)	Price (total) (\$)
Marketing	162,000.00	486,000.00
Electricity	100,000.00	300,000.00
Salaries	1,550,000.00	4,650,000.00
Rent	253,872.00	761,616.00
Depreciation	(See Section 3.4 Assumptions)	32,766.42
Equipment (laser cutter)	one time purchase	20,000.00
Equipment (welding machines)	one time purchase	5641.40
Equipment (paint)	one time purchase	5,000.00
Equipment	one time purchase	50,000.00
Overhead	20,000.00	60,000.00
Total Operating Expenses (\$)	6,351,023.82	
Material		
	Price per Unit (\$)	Total (\$)
Steel Alloy	24.3	437,400.00
Power Banks	3.20	1,440.00
Diodes	0.20	90.00
Buck Converter	0.10	45.00

Motor	0.53	238.50
Wiring	0.01	108.00
Argon Gas	2.66	47,880.00
Total Material (\$)		487,201.5
Operating Income (\$)		1,261,774.68

3.3 NPV Analysis

NPV analysis will be done to compare the income and expense over a period of 3 years and using a monthly compounding interest rate. The goal is to compare the present values of all the potential income and expense streams.

Assumptions:

- Monthly Expenses include rent, electricity, and salaries for a total of \$159,000
- To initially purchase equipment, the combined cost is \$130,000
- Each following year, \$6,000 is spent on repairs and upgrades to equipment
- At the end of the year, \$155,000 will be spent on marketing and other overhead
- Material cost is dependent on the number of units sold and are bought at the start of the year
- Interest rate is 1% compounded monthly
- Calculated monthly over a 3-year period

- N is units sold per 1 month period
- Only Income comes from sales
- Based on bench marking unit price should be 450

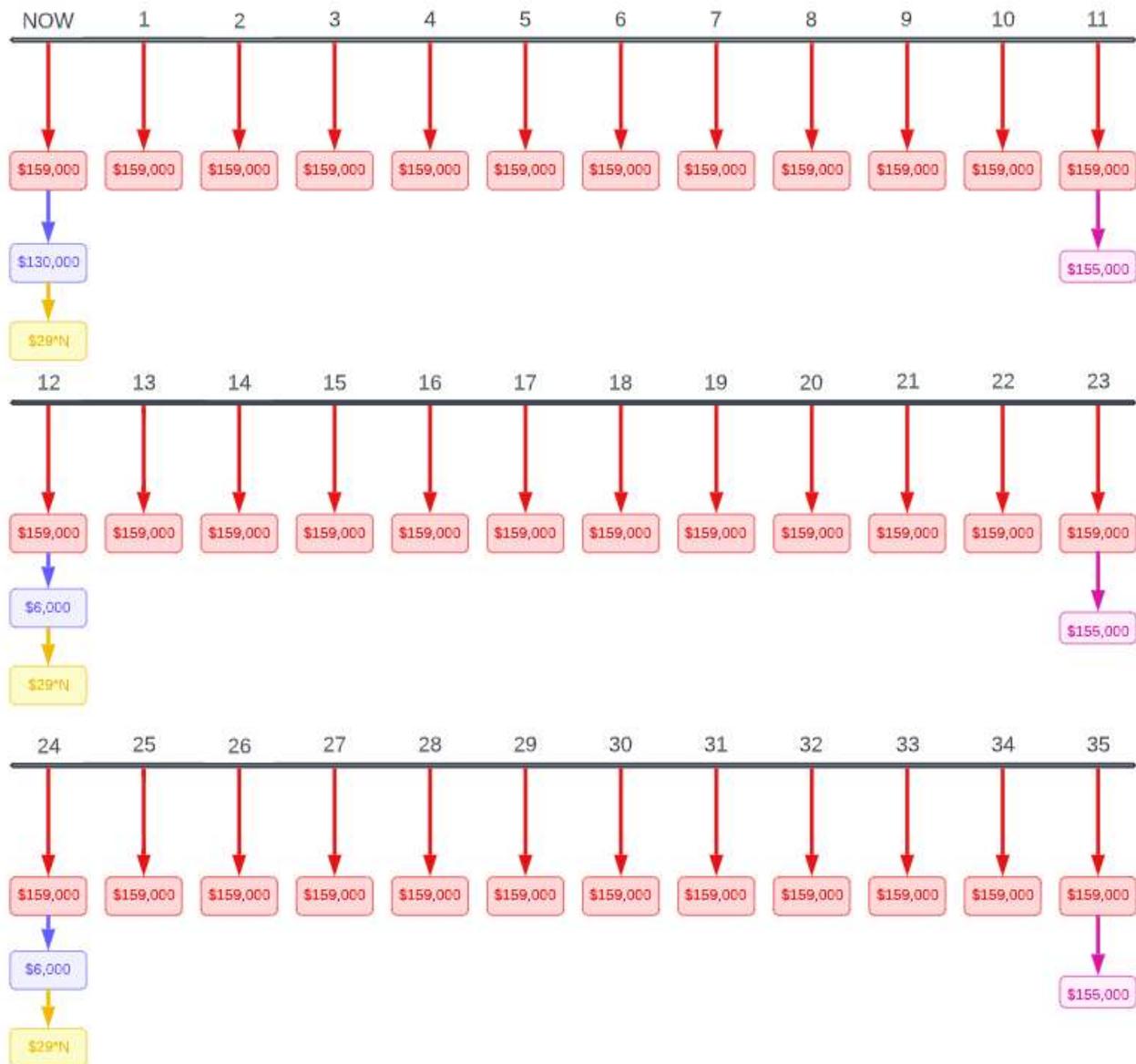


Figure 2: Expense NPV

$$\text{Total Expense NPV} = 5,346,654.68 + 12 * N * 77.58$$

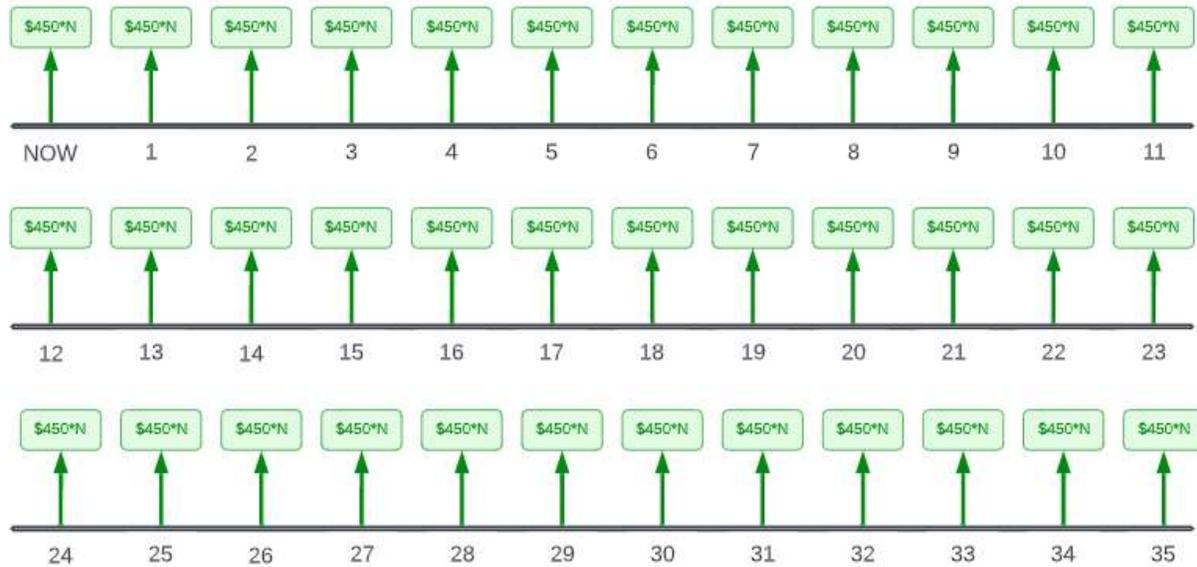


Figure 3: Income NPV

Total Income NPV= $N*13683.86$

Break Even:

To determine how many units the company needs to sell the expenses need to be compared to the income and find the difference. Both the income and expenses are parameterized for the number of units sold and the function will be solved for N which is the number of units sold per month. Calculations were done using excel.

$$\begin{aligned} \text{Total Expense NPV} &= \text{Total Income NPV} \\ 5,346,654.68 + 12*N*77.58 &= N*13683.86 \\ 5,346,654.68 &= 12752.90*N \\ N &= 420 \end{aligned}$$

To break even 420 units, need to be sold each month, which is 5040 units a year.

3.4 Assumption Justification

When benchmarking costs for rent costs for large warehouse like facilities, Websites such as *Thomasnet* [5] reported that for an average warehouse size of 16,400 feet, the annual rent is \$15.48 sqft/year. For rent, the assumptions made were that Light Support required a large enough facility to house the equipment and allow enough space for all employees to work inside comfortably. The total cost for rent for a single year was calculated to be \$253,872.00. In addition, according to *Thomasnet* [5], the electricity cost per year for a commercial warehouse \$6.00/sqft/year. The annual total electricity cost will be \$100,000 for a warehouse of 16,400 square feet. When it comes to employees, *AQUILA commercial* [7] researched that in high density work environments, employees should have around 80-150 sqft/employee of personal space, average density work environments should have around 150-250 sqft/employee, and low-density work environments should have 250-500 sqft/employee.

The number of Employees and salaries will be reported based on benchmarking from job sites. Light support plans to employee a total of 13 employees at this warehouse.

To assemble the trainers, we will need 3000 hours of welding labor (0.5 hours a unit for 6000 units a year. If two employees actively work for 6 hours a day (this considers break times and rest) for 42 weeks (this includes 10 weeks of paid time off) this will be accomplished. Thus, we will hire two welders. The average salary of a welder in Ontario is \$43,875 a year [17]. We will pay our welders \$60,000 a year to offer a competitive wage. The salary estimated here is based on recent job postings from Talent.com. Light support will also need employees for assembly. We estimate from the time it took us to physically assemble the system it will take them 30 minutes for the assembly workers to assemble a trainer. If we hire two employees with 10 weeks of paid

time off, they should be able to accomplish this. The industry standard salary of an unskilled factory worker is \$45, 858 a year [17]. We will pay our assembly workers \$50,000 a year, slightly above industry standards, to retain talent.

Light support also needs to keep its warehouse clean, to help with team morale and to reduce employee dissatisfaction. Based on Talent.com, an average janitor makes \$16 dollars an hour and makes \$31,200 annually [17]. It is estimated that the janitor will work 40 hours an hour.

Human resources departments are important because they help with maximizing employee productivity and protecting Light Support from any conflicts that may arise from within the workforce. In Ontario, the average salary for an HR professional is \$61,750 [17]. The HR individual will have a salary of \$70, 000 a year to offer a competitive wage to retain talent.

The position of the Secretary is important because they are responsible for making meetings are effective and organized. Secretaries are also tasked with maintaining open and healthy communication lines between the employees and the managers/administrations. The average salary of a secretary in Ontario is \$47,758 [17]. The secretary will have an annual salary of \$55,000 to offer a competitive wage to retain talent.

Accountants are tasked with accumulating and organizing financial statements and reports about the company's performance, cash flow, and financial position. The average salary of a CPA in Ontario is \$70,604 [17]. The accountant will have a salary of \$80,000 a year to offer a competitive wage and retain top talent.

Light Support team members' wages have all been calculated. The five members of this team will take on managerial positions. These will be salaried at \$200,000 a year each.

Miscellaneous:

An additional \$80,000 salary will be allotted for an additional full-time staff member, or multiple part-time staff members. \$ 8 800 will be allocated for 40 hours of legal fees if necessary.

Marketing:

According to BDC.ca, companies often spend 2-5% revenue on marketing. Assuming a revenue of 8, 100, 000 a year, an approximate of 162,000 should be spent on marketing to advertise the product. It is assumed that all marketing techniques applied will bring in a constant stream of employees that will bring in constant annual revenue.

Material Costs:

Most of the bike trainers are made of steel alloy like the benchmarked bike trainer. Seamless steel alloys are 2.76 USD per kg as per Aesterion Steels [4]. As per the benchmarked bike trainer, each trainer weighs around 8.8 kg. So, it would cost \$24.30 for each bike trainer. Aesterion was chosen as the supplier for metals because of how cheap it was, and its ability to sell the types of steel needed in bulk.

Equipment:

To cut metals, laser cutting machines cost around \$20,000. Welding Machines, given that we are producing 5000 units a year, we estimate that it will take a professional welder 30 minutes to make a trainer (as an amateur welder, we estimate that will take us 60 minutes, and professional welders usually work at least twice as fast as amateur welders). This totals 2500 hours of welding over a year, which can easily be done by 2 welders. We would need two welding machines because of this. A TIG welding machine costs \$2 820.70 so two of these machines cost \$5641.4. For paint it is around \$50 for a gallon+ paint tools, assume 100 gallons=\$50,000. \$50,000 for any other Miscellaneous equipment. For the TIG welder we will need 0.5 hours' worth of compressed gas

per unit. For most applications in TIG welding a gas flow of 20 cfh is sufficient. Thus we need 10cf of argon per unit. Argon is usually sold at \$80/250 cf, thus it will cost 2.66 per unit in gas.

Electronic Costs

Bulk buy buck converters on Alibaba. Buck converters are 0.10/piece if you buy 15,000, resulting in \$1500 total. Power banks are \$3.20/ piece if you order more than 99,999. Ordering 15,000 totals to \$48,000 total. Diodes are 20 cents apiece for orders over 5000, ordering 15,000 totaling \$3000. DC Motors are \$0.53 a piece when it is bought in bulk on Alibaba for an order of over 5000. Alibaba was chosen as the supplier for the electronics because of its use of use, and ability to bulk buy components. Buying components in bulk is important for Light Support because the company plants to make a large amount of the products, and to do so, it is beneficial to get more parts at a fraction of the “normal market cost”.

Depreciation:

The prime cost depreciation rate of a welding machine is 10.0% . That means the total depreciation of the welding machine is:

The laser cutter depreciates at a prime cost rate of 14.29%.

For the miscellaneous equipment we will assume a depreciation rate of 15% and this is a conservative, yet reasonable estimate.

Totaling this the total depreciation cost is 32 766.42.

Assuming 20 cm of wiring is needed per unit. Wiring costs about \$0.03/m, thus it costs \$0.006 per unit.

Market share, Unit price and Demand

The demand for human powered electrical generation systems has been steadily increasing since 2020. From IEA.org [29], renewable energy use has increased 3% since 2020, and the demand for new electricity generation sources and systems has grown 7% since 2020. This trend gives us evidence that the demand for products that Light Support produces will increase in the future, making it an up-and-coming, emerging technology that investors should invest in.

Light Support's human powered electricity generation system holds its place in the market as a very niche and emerging technology. At this time, there is not enough information on the internet to benchmark an expected % of the market share Light support would own.

The price per unit will be \$450 per unit. This price is the least we can charge while selling a minimal number of units. Similar systems cost \$2000, so we have very competitive pricing [28].

4 CONCLUSION

Light Support is found to have a profitable potential if converting it from an idea to a startup company. A “manufacturing model” was used as the business model with a focus on turning raw material to product and selling to potential consumers. Expenses include rent, electricity, materials, machine cost, workers' salaries and overhead. These expenses over a 3-year period are combined with a potential number of units sold to generate an income statement. This operating income was \$1,261,774.68. The NPV also over a 3-year period assuming a 1% interest rate compounding monthly gave a breakeven of 420 units per month sold. Overall, with the current findings, *Light Support* can be found to be profitable.

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