CHAPTER I
INTRODUCTION

1.1 Background of the study

Energy development and consumption is one of the key factors in economic development of a country. Energy resources, which are continuously available for the long duration and which have no detrimental to social effects, are compulsory for sustainable development. The facts that fossil originated energy sources are both exhaustible and have detrimental effects to environment has made inevitable to focus on alternative resources. The alternative energy resources including hydropower have some important advantage such as being sustainable, renewable, environmentally friendly and clean resources. Hydropower or Hydroelectricity is an energy generated by the force of moving water in the penstock of a hydropower unit. It is a leading source of energy as it provides more than 97% of all electricity generated by renewable sources. Other sources including solar, geothermal, wind, marine energies and biomass account for less than 3% of renewable electricity generated.

Hydropower is a clean source of energy as it burns no fuel and does not produce green house gases (GHG) emissions, other pollutants or wastes associated with fossil fuel or nuclear plant. Hydropower has been used for centuries. The Greek used water wheels for grind wheat into flour more than 2000 years ago. In the early 1800s, American or European factories used the water wheels to power machines. The first modern turbine designed by James B. Francis in 1849 AD leads to the development of hydroelectricity sector. The first hydroelectricity power plant was built at Niagara Falls in New York, 1879 AD. Today, Hydropower is the most efficient way to generate electricity. Modern hydro turbines can convert as much as 90% of available energy into electricity. The best fossil fuels are only about 50% efficient. Producing electricity from hydropower is cheap as once a dam has built and the equipment installed, the energy source flowing water is free. Hydropower plants are ling loved and their maintenance cost are low as compared to coal or nuclear plant.

Hydropower's low cost, near zero emission and ability to be dispatched quickly to meet peak electricity demand have made it one of the most valuable renewable energy

worldwide. Worldwide about 20% of energy is generated by hydropower. According to International Energy Agency (IEA), currently 8,08,000 megawatt of hydropower generation capacity is in operation or under consumption around the world. Energy information administration (EIA), office of energy market (2007-09) forwarded that China ranks first in terms of energy generation with the generation capacity of 429.98 billion kilowatts hours, Brazil ranks second with 370.63 billion KWhs, Canada ranks third with 365.30 billion KWhs, whereas Nepal generates only 2.69 billion KWhs. The inherent technical, economic and environmental benefits of hydroelectric power make it an important contribution to the future world energy mix, particularly in the developing countries like Nepal.

The Major energy resources base in Nepal consists of biomass, hydroelectricity, petroleum products, natural gases, and coal reserves. Among the entire energy resource base, it is evident that biomass is the dominant resource base of the country with respect to utilization. Nepal is blessed with immense hydroelectric potential and rank 2nd in terms of water resources after Brazil on global scenario. Nepal has more than 6000 rivers and rivulets with the total length of about 45,000 Km. so, it has huge hydropower potential. In fact the perennial nature of Nepali rivers and the steep gradient of the country's topography provide ideal conditions for the development of some of the world's largest hydroelectric projects in Nepal. Nepal has roughly 83,000 MW of hydropower potential but only 43,000 MW is economically exploitable. According Nepal Electricity Authority (NEA), the current installed capacity of hydropower is 563.87 MW. Out of this 162.016 MW is contributed by Independent Power Producers (IPPs). Besides, such installed capacities in the system, the power plants were generating only 511 MW. Hence, Bulk of economically feasible generation has not been realized yet. Although it has tremendous hydropower, only about 40% of Nepal's population has access to electricity. Only 1% energy needs is fulfilled by electricity. The bulk of the energy needs is dominated by fuel wood (68%), Agriculture (15%), Animal dung (8%), and Imported fossil fuel (8%).

The Hydropower development in Nepal began with the development of 500 KW Pharphing power plants in 1911 AD. In 1936 AD the 640 KW Sundarijal Hydropower plant was commissioned and in 1965 AD the 2.4 MW Panauti Hydropower plant was installed. The 92 MW Kulekhani Hydropower plant (I & II) commissioned in 1982 AD

is the only project offering seasonal water storage in Nepal. The 144 MW Kali Gandaki-A, hydropower project, commissioned in 2003 AD is the biggest hydropower project in Nepal so far. The hydropower system in Nepal is dominated by Run-of river projects. There is only one seasonal storage project in the system. Because of the seasonal variation of the river flow, there is excess power supply during the monsoon season (July-September) and shortage in the dry season.

Nepal electricity sectors predominantly a public sector story. In 1974 AD Small Hydel Development Board (SHDB) which performs planning, survey, design, implementation, and operation/ maintenance of small hydropower plants throughout Nepal. Later in 1985 AD Nepal Electricity Authority (NEA) was formed under the Nepal Electricity Act, 2041 BC after merging Electricity Department, Nepal Electricity Corporation and SHDB. The Nepal Electricity Authority (NEA) is vertically integrated power utility charged with responsibility of generation, transmission, and distribution of electric power in the country. It has operated virtually as a monopoly power utility. Until 1990 AD, Hydropower development was under the domain of government utility, NEA only. To promote and encourage private Nepalese and foreign investment in hydropower sector, government had adopted Hydropower Policy 1992, Water Resource Act 1992/Regulation 1993, Electricity act 1992/ Regulation 1993. The Hydropower Power Policy 1992 and other related Act provide excellent incentives to develop hydropower in Nepal like generation license validity for 50 years, Income Tax holiday of 15 years, Income tax when applicable at the rate of 10% below prevailing corporate income tax, 1% custom duty on imported goods for the project, exemption of import license, exemption on sales tax, government land to readily available on lease for duration of license. No license shall be required for the Hydro project having capacity up to 1000 kilowatt. Later on after decades, in October 2001 AD, new Hydropower Policy 2001 came into existence. This policy includes incentives provision and transparent process for attracting private investors. Foreign investors are allowed to invest 100% for developing hydropower. Private investment in hydropower began with the 5.1 MW Andhi Khola in 1991AD followed by the 12.3 MW Jhimruk Project in 1994 AD. Today, there are many Independent Power producers (IPPs) under domestic and foreign investment. Himal Power Limited, Bhotekoshi Power Company, Chilime Power Company, National Hydropower Company, Butwal Power Company, Syange Vidyut Company, Arun Valley Hydropower Development Company are operating under

domestic investment. The foreign investors such as Asian Brown Boveri (ABB), Panda Energy Group, and Statkraft are also involved in some of these companies. Snowy Mountain Engineering Corporation of Australia is another company operating in Nepal for West Seti Project intended to export power to India. The Butwal Power Company is first Independent Power Producer preceding to 1992 AD Hydropower Development Policy.

Two types of market are available for the sales of generated electricity, domestic and export. NEA operates as a Single-Buyer and Single-Seller of electricity in the country. Under NEA, there is separate "Power Trade Department", which concludes Power Purchase Agreement (PPA) with enthusiastic Independent Power Producers (IPPs). Power Trade Department is primarily responsible for processing of the application for Power Purchase Agreements (PPAs) filed by Independent Power Producers (IPPs) and execution of the PPAs for technically and financially viable power projects. This department also coordinates the power exchange and trade with India, monitors, and provides support in the administration of PPAs including processing of the invoices. One of the most important events related to private sector participation is establishment of standard terms in PPA agreement in 1998 AD which include; Rs. 3 per Kwh in wet season, Rs. 4.25 per Kwh in dry season, purchase rate escalated till 5 years at 6% p.a. and PPA validity of 25 years. However, PPA policy is restricted only to the project of 5 MW capacities and below. This rate was revised in 2003 at the level of Rs. 3.90 per Kwh for wet season and Rs. 5.52 per KWh for dry season.

It does not matter in what business an organization is? The aim of it is to minimize cost and maximize profit. Due to existing risk and competition conditions, company management needs management accounting, which is a component of company's accounting system and designed solely to help managers in decision making process. The main aim of management accounting is to achieve cost effectiveness and increase profitability of the organization. Cost effectiveness as practiced from the house wife who attempts to run household on a fixed budged to the public utility that choose between nuclear energy and fossil fuel. Cost effectiveness analysis and Cost benefit analysis, together with system analysis, policy analysis, operational research, management science and other decision disciplines provide advices to make various decisions. Cost effectiveness compares various actions that might be taken in terms of

their costs and their effectiveness in achieving desired goals. While the terms cost effectiveness did not become popular until very recently, cost effectiveness thinking has been practicing since 11th century. The first treatise on cost effectiveness was appeared in 1887 AD by A.M. Wellington entitled: The Economic theory of the location of Railways. The concept of cost effectiveness did not become an organized activity, did not attract much attention in the literature of decision making and did not get the name until after World War II. Cost effectiveness as known today represents the meeting point of three stream of development. These originated, respectively, in economic theory, in practical engineering, and in the operational analysis of World War II. The time has brought about considerable improvement with best practices in Cost-effectiveness analysis and Cost-benefit analysis.

Today, Cost effectiveness analysis, cost benefit analysis, decision making analysis, etc. are condensed under one discipline called Management accounting. Management accounting is defined as the process of identifying, measuring, accumulating, analyzing, preparing, interpreting, and communicating information that helps managers to make various decisions and fulfill the objective of the organization. Management accounting is a young discipline as compared to financial and cost accounting but an outmost discipline in today's business management. Management accounting is continuously evolving, with the emphasis shifting from a cost determination and financial control focus to the provision of advice that results in addition or creation of value. It provides accounting information that is useful in planning, controlling, and evaluating an organization. It summarizes the information from financial and cost accounting and provide the base for decision making, planning, controlling and directing activities.

The success of any business organization as measured in terms of profit depends upon sales volume, price and cost. The sales volume and price must be sufficient enough to cover all costs and allow satisfactory margin for net income, but what our competitor and potential competitors are doing should also needed to be considered. Otherwise, we may price ourselves out of the market or miss the opportunity to increase our profit. Hence, to manage any kind of business one must understand how cost respond to changes in sales volume and the effect of costs and revenues on profit. Management must make many critical operating decision regarding cost, volume, & price that affect the firm's profitability. There are various tools and techniques in Management

accounting regarding cost volume and profit relationship like Cost behavior analysis, Budgeting, Linear Programming Model, Standard Costing, Cost-Volume-Profit analysis, Pricing decision etc. Among the various techniques Cost-Volume-Profit (CVP) Analysis is also considered as important one.

Cost-volume-profit (CVP) analysis:

CVP analysis is a technique that examines changes in profits in response to changes in sales volumes, costs, and prices. It is a cost evolution model, which point out relations among cost, production volume and profit. It is one of the most important tools in profit planning and control (PPC). PPC tool are incomplete without CVP analysis.

CVP analysis is a useful forecasting as well as managerial control tool used in management accounting. This technique expresses the relations between income, sales structure, costs, production volume and profits and includes breakeven point analysis and profit forecasting procedure. These relations provides a general economic activity model, which may be used by manager to make short term forecasts, to access company performance and to analyses decision making alternative. Cost volume profit analysis is evolved as a management tools to study the interrelationship among the following factors:

- Prices of products
- Volume or level of activity
- Per unit variable costs
- Total fixed costs
- Mix of products sold

Cost–Volume-Profit analysis examines the behavior of total revenues, total costs and income as changes occur in the output level, the selling price, the variable cost per unit and fixed cost of the product. It is a technique which helps to estimate the profit or loss at different activity level. It summaries the effects of changes in organization volume of activity on its costs, revenue and profit.

CVP analysis is a key factor in many decisions, including choice of products lines, pricing of products, marketing strategy and utilization of productive facilities. CVP Analysis is undoubtedly the best tool the manager has for discovering the untapped

profit potential that may exist in an organization. Accountants often perform CVP analysis to plan future levels of operating activity and provide information about:

-Which products or services to emphasize?

-The volume of sales needed to achieve a targeted level of profit

-The amount of revenue required to avoid losses

-Whether to increase fixed costs

-How much to budget for discretionary expenditures?

-Whether fixed costs expose the organization to an unacceptable level of risk

CVP analysis also helps managers make business decisions such as whether to increase or decrease discretionary expenditures like advertising. It helps Managers to estimate future revenues, costs, and profits to help them plan and monitor operations. They use cost-volume-profit (CVP) analysis to identify the levels of operating activity needed to avoid losses, achieve targeted profits, plan future operations, and monitor organizational performance. Managers also analyze operational risk as they choose an appropriate cost structure.

Managers often want to know the level of activity required to break even. A CVP analysis can be used to determine the breakeven point, or level of operating activity at which revenues cover all fixed and variable costs, resulting in zero profit. We can calculate the breakeven point from any of the preceding CVP formulas, setting profit to zero.

1.2 Company Profile

It can be known that Nepal is rich in water resources, so, it has huge potential of hydropower. Despite, hydropower being major resource endowment of Nepal. It is underutilized. Power shortage remains severe and this in turns puts a strong brake on the industrial development. In this light, the development of cost effective hydropower should be considered an extremely high priority issue under National Planning in order to raise productivity in all sectors of economic activity. The development of hydropower sector helps to achieve the millennium development goals with protecting environment, increasing literacy, improving health with better energy, contribution to GDP and many more advantages. Until 1990 AD, hydropower development was under the domain of government utility, Nepal Electricity Authority (NEA) only.

For the growth of hydropower industry government has issued Hydropower Development Policy, 1992 (Revised in 2001) which has opened door to private entrepreneurs, domestic & foreign enterprises both for the investment in the study and development, operation and maintenance of hydropower projects. As a result many Independent Power Producers (IPPs) came into existence. Among them Chilime Hydropower Company Limited (CHPCL) and Butwal Power Company Limited (BPC) has a huge contribution towards the development of hydropower sector in Nepal. They are the listed companies of Nepal in Nepal Stock Exchange (NEPSE). The study focus on Cost-Volume-Profit (CVP) analysis of these two companies.

) Chilime Hydropower Company Limited (CHPCL)

The Chilime Hydropower Company Limited (CHPCL) was established in 1996 AD with the objective of promoting the utilization of resources within the country for the development of hydropower. It is the first public company formed with 51% of the share participation of the Nepal Electricity Authority, 25% of the share participation of employees of the Nepal Electricity Authority (ex-directors, ex-employees) and Chilime Hydropower Company Limited and remaining 24% is being allocated to the general public. But shares are not still issued to the general public. The Citizen Investment Trust is the share registrar for share transaction in the market.

Chilime Hydropower plant is a peeking run off river type plant constructed and owned by Chilime Hydropower Company limited. It is located at the bank of Bhotekoshi River in Rasuwa district. The plant with the installed capacity of 22.56 MW is delivering the power of 20 MW under the Power Purchase Agreement (PPA) with Nepal Electricity Authority (NEA) since 24th August 2003 AD. The plant is designed to generate 137 GWh energy per annum. The generated electricity from the plant is purchased by NEA at the powerhouse and evacuated as per the PPA made on 11th Ashad 2054 BC. The annual deemed energy salable to NEA is 132.9 GWh, excluding penalty –free outage of 36 hours (720 MWh) annually.

The plant started commercial generation from 00:00 hours of 8th Bhadra 2060 BC (24th August 2003 AD). During the five years of operation, the plant has been operating successfully in terms of meeting the generation targets and productivity in terms of building up a long lasting system of rationalized operation, diligent observation system,

careful maintenance and getting a very high availability of the plant despite few obstacle.

The main objective of the CHPCL is also to be a leading enterprise in the power sector. In order to achieve this objective it has been focusing on the development and construction of various projects. At present, the company is having four hydroelectric projects in pipe line. Two projects namely, Sanjen upper hydroelectric projects with the installed capacity of 11 MW and Sanjen Hydroelectric project with the installed capacity of 35 MW in cascade are planned to develop by forming a new subsidiary company to share the hydropower benefit to the local people and VDCs of Rasuwa also. The Middle Bhotekoshi Hydroelectric project with the installed capacity of 80 MW is located in Sindupalchowk district and it is planned to develop with minimum equity share participation of the company and giving opportunity to local hydropower developers and financial institution. The company has recently received the study license of another medium sized project, the Rasuwagadhi Hydroelectric project with installed capacity of 75 MW, for feasibility study and environmental impact assessment study.

⁾ Butwal Power Company Limited (BPC)

Butwal Power Company Limited (BPC) was established in 29 December, 1965 AD (2022/09/14 B.S.) as a private limited company under Company act 2021 of Nepal by the promoters- United Mission to Nepal Government of Nepal (GoN), Nepal Electricity Authority (NEA) & Nepal Industrial Development Corporation (NIDC) with an objective to develop the hydropower project using appropriate training and technology transfer and human resource as well. BPC was converted into Public Limited Company in 2049 BC(1993 AD) and it was privatized in 2059 BC(2003 AD). Its main shareholders now are Shangri-La Energy Limited (68.95%), General Public (10%), Government of Nepal (9.09%), Interkraft Nepal As (6.05%), United Mission to Nepal (2.79%), Employees (2%), Nepal Electricity Authority (1.06%), and Nepal Industrial Development Corporation (0.06%).

The core businesses areas are generation of electricity, distribution of electricity and providing engineering & consultancy services to hydropower and infrastructure project. In addition the company has strategic investment in other companies. BPC wholly owns and operates the 12 MW Jhimruk Hydropower Plant and 5.1 MW Andhi Khola

Hydropower Plant and developed the 4 MW Khudi Hydropower Projects, which is in operation since 2007 AD. It provides consultancy services through BPC Hydro consult a leading hydropower consultant in Nepal.

BPC's generation business is responsible for the smooth operation & maintenance of two power plants, the 5.1 MW Andhi Khola and the 12 MW Jhimruk. The generated electricity is sold to NEA under Power Purchased Agreement (PPA) and local consumers. The major portion of revenues comes from generation business.

The main objective of the company is to be a leading enterprise in the power sector with excellence in providing innovative and quality products and services to meet the growing demand for efficient and clean energy. BPC is committed to providing quality and competitive products and services to satisfy customers need and conducting business in an environmentally and socially responsible manner. The mission of the company are to be a competitive hydropower developer and an electric utility, provide innovative engineering solutions and management services, practice corporate social responsibility and maximize value for all stakeholders.

BPC has been actively involved in the establishment of subsidiaries for vertical and horizontal expansion and integration of its business operations. They include Himal Power Limited, Nepal Hydro & Electric limited, Khudi Hydropower limited, BPC services Limited, Nyadi Hydropower Limited, Keton Hydropower Limited, Jhimruk Industrial development Centre (P) Limited & Hydro Lab Private Limited

BPC has aggressive plan to develop green field projects and expand business in the energy sector. The company has a number of green field projects in hand. Mix of medium and large projects ranging from 10 to plus to 100 MW plus are targeted for expansion of generation business. The project in progress are Kabeli A Hydropower project (30MW), Nyadi Hydropower Project (20 MW), Andhi Khola upgrading project (Upgraded to 9.4 MW), Bhim Khola Hydropower Project (9 MW), and Marsyangadi III Hydropower project (42 MW).

1.3 Statement of the problem

In the present situation, the world has been facing the energy problem. Hydropower can be the best alternative source of energy. No other energy source, renewable and non-

renewable can best solve present energy problem. Nepal has an enormous hydropower potential which may have huge contribution to world energy. But is very low in terms of utilization i.e. about only 1% of available capacity. The major problem behind this are policy inconsistencies, planning deficiencies, licensing problem, PPA related problem, financial constraints, political instability, NEA monopoly in buying electricity etc. These problems are major constraints in the growth of Hydropower Company which can solve major problems in the country.

The problem of the study was directed towards the study of CVP analysis in two major Hydropower Company of Nepal: Chilime Hydropower Company Limited (CHPCL) and Butwal Power Company Limited (BPC). It focused on the problem of how CVP analysis can be used in planning and decision making of both companies?. There are various tools and techniques used under CVP analysis. The study identified whether both the company practiced the tools of CVP analysis or not. There are various problems regarding the use of CVP analysis in Hydropower Company in Nepal as there is no use of direct costing which classify the cost on the basis of operating volume. Hydropower Company uses a high proportion of machinery and equipment in producing revenue which generate high fixed cost. The study focus on the problem of effective capacity utilization of such machine. Thus, the main problem of the study was how the CVP analysis techniques was used to carry out planning, decision making and controlling functions.

The current study mainly focuses on the following problem:

- Whether the CHPCL & BPC generate electricity as per their installed capacity or not?
- What is the influence of Nepal Electricity Authority (NEA) in both companies regarding price?
- Whether CHPCL and BPC practiced the technique of CVP analysis in planning and decision making or not?
- What are the major problems regarding the use of CVP analysis?
- Which firm is more competent regarding cost, volume and profit?
- Whether the firm is able to satisfy the need of local consumer or not?
- Whether the firm is able to supply the electricity as per the demand of Nepal Electricity Authority or not?

1.4 Objective of the study

Objectives are the measurable outcomes of the program. Objectives must be tangible, specific, concrete, measurable, and achievable. It can be known that objective of every firm is to make profit or plan profit. The main objective of this study is also to identify the various tools and techniques of CVP analysis used in CHPCL and BPC for profit planning. It aimed to estimate the fair value of total cost, total revenue, and profit at various sales levels and their relationship. The objective of the study is to provide base for the analysis which suggest manger with a powerful tool for identifying the course of action that will improve the profitability. Only by learning to think in CVP terms can manager move with assurance towards the firm's profit objectives.

As, the main objective of the study is to determine how the various tools & techniques of CVP analysis are used in profit planning and decision making of CHPCL & BPC. Beside this,objective of the study are as follows:

- To study and analyze the electricity generated by CHPCL and BPC as per their installed capacity.
- To study and analyze the variable and fixed cost of BPC and CHPCL along with contribution margin and operating profit.
- To analyze the breakeven level and margin of safety of both companies them.
- To assess the most favorable combination of variable cost, fixed cost, selling price, sales volume to maximize the profit.
- To examine how Power Purchase Agreement (PPA) affect the pricing of both companies.
- To evaluate the sensitivity of various factors on profitability of both companies.
- To analyze the Cost Volume Profit (CVP) relationship and examine how the information derived from CVP analysis can be useful for profit planning and improving performance.
- To study and analyze the major problems regarding the use of CVP analysis

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1.5 Significance of the study

Cost-Volume-Profit analysis was a key factor in many decisions making regarding cost, volume, price, product mix, profit and many others. The subject matter included in CVP

analysis itself shows its significance in the organization. It identifies the level of activity needed to avoid losses, achieve targeted profit, plan future operations and monitor organizational performance. It helps manager to estimate future revenues, cost and profits to help them plan & monitor operations. The information derived from the CVP analysis helps manager to analyze operational risk as they choose an appropriate cost structure.

This research studies about the practice of CVP analysis in Hydropower Company namely Chilime Hydropower Company and Butwal Power Company. The significance of the study is to provide various results of CVP techniques which can be used by company for planning and decision making. The applied technique of CVP analysis in both company derived some important figure. These figures are significant for potential manager, entrepreneurs, accountant, policy makers and planner. Besides this, the study is significant in many other ways. They were listed below:

- It suggests use of CVP analysis as managerial tools in decision making.
- It provides information about the relationship among revenues, cost & Profit.
- It assist with plans & decision on different CVP variables such as:
  - -Selling price
  - -production or activity level
  - -proportion of fixed versus variable cost
  - -required sale to make profit
- It helps to monitor operation by comparing expected and actual
- It determines the profitability risk of the company with the help of CVP analysis.
- It provides literature to the researcher who wants to carry out further research in the related field.
- This research work may also provide recommendation to related department of the company.

1.6 Limitation of the study

This study was limited to CVP analysis of CHPCL and BPC so the result obtained cannot be applied to the overall performance of the organization. As far as possible

every effort was taken to provide real picture of both companies. However, it has some limitation. They were listed below:

- The study focused on cost volume profit analysis of CHPCL and BPC..
- The study was based on average price which may not provide actual result.
- This study was confined to the sampled Hydropower Company Chilime Hydropower Company and Butwal Power Company.
- The analysis is based on short period of time covering six fiscal year from 2060/61 to 2065/66
- The study was mostly based on secondary source of data.
- The study was based on certain assumptions related to CVP analysis which may change as per change in time.

1.7 Organization of the study

Every research work was carried on in a certain procedure. It should be organized in certain steps. This is known as the organization of the study. In this research, the study was carried out at different stage & procedure as needed. The aim of this research work was to explain the use of CVP analysis in Hydropower Company and it was explained by dividing whole study into five chapters. Each chapter was devoted to some aspect of the study.

The major chapters of the study was as follows:

Chapter one: Introduction

Chapter Two: Review of Literature

Chapter Three: Research Methodology

Chapter Four: Presentation and Analysis of Data

Chapter Five: Summary, Conclusion and Recommendation

Chapter One: This chapter dealt with the initial proposal of the thesis incorporated with a view to explain in detail the aspect of Hydropower Company and a brief overview of Chilime Hydropower Company Limited and Butwal Power Company Limited. It also provides some historical aspect. The subject matter covered by this chapter are statement of problem, objective of the study, significance of the study, limitation of the study and organization of the study.

Chapter Two: This chapter reviewed the available literature regarding finding and recommendation of previous thesis work made in respect of CHPCL and BPC. It explained the various elements associated with CVP analysis. Here all types information obtained from the various sources about CVP analysis was presented. This chapter was divided into two sub-headings: Conceptual Framework and review of previous thesis.

Chapter Three: It dealt with research methodology. This chapter explained the various statistical tools and techniques used in the study. It included research design, types and sources of data collected, data collection procedure, method of analysis and analytical tool used.

Chapter Four: It provided the information about the data collected from various sources and their analysis. It contained the presentation and analysis of collected data through definite course of research methodology. The data were presented in mathematical and graphical approach. The derived results after the application of the research method were analyzed and interpreted in this chapter.

Chapter Five: The final chapter of the study covered summary, conclusion and recommendation. The whole subject matter of the study was summarized in this chapter. The suggestion for further improvement is included in this chapter. Besides these, bibliography and appendices were also included.

CHAPTER II

REVIEW OF LITERATURE

2.1 Conceptual Review

An Organization is a group of people working together to achieve common objectives. There are different kinds of organizations which affect our daily life. They may be manufacturer, retailer, service industry firm, agribusiness companies, nonprofit organization, hydro business, government agencies etc. which provides us with vast array of goods and services. All of these organizations have two things in common. The First one is, every organization has a set of goals or objectives and second one is, in achieving goals manager need information. Generally, Business organization is divided into three group's i.e. Sole trading concern, Partnership and Company on the basis of ownership. They are designed to make a profit. In a profit seeking organization, the effectiveness of management is measured by the profit realized. The profit of those organization is affected by various factor, namely cost, selling price, volume (in units or Rs.), managerial activities, government policies etc. Hence the profit should be carefully planned.

Managerial Accountancy plays an important role in planning profit. It is an integral part of the management process. It refers to the process of identifying, measuring, analyzing, interpreting and communicating information in pursuit of an organization. **The Chartered Institute of Management Accountants (CIMA), London** defines "Managerial accounting as an integral part of management concerned with identifying, presenting, and interpreting information used for formulating strategy, planning and controlling activities, decision taking, optimizing the use of resources, disclosure to shareholders and other external to the entity, disclosure to employees and safeguarding assets."

Managerial accounting involves techniques, application of appropriate techniques and concept which helps management in establishing a plan for reasonable economic objectives. It utilizes the principles and practices of financial accounting and cost accounting in addition to other modern management techniques for efficient operation of a company (Saxena & Vashist, 2008:1.4).

Managerial accounting uses various tools and techniques for planning of profit. Any workable concept or technique, whether it is drawn from financial accounting, cost accounting, economics, mathematics and statistics, can be used in managerial accounting. It accumulates, synthesizes and analyses the available data and presents it in relation to specific problem, decision and day to day task of management. Among the various tools & techniques used by managerial accounting CVP analysis is important one.

2.1.1 Cost

Cost is the amount of expenditure, actual (incurred) or notional (attributable) relating to specific thing or activity. The specific thing may be a product, job service, process or any other activities. It is the amount of resources given up in exchange for some goods or services. The resources given up are generally in terms of money or expressed in monetary term. Cost could be in the form of deferred cost (asset) or expired cost. Deferred costs are unexpired cost, capitalized cost which provides benefit in the future period like inventory of material, prepaid insurance, plant etc (Lal, 2002:14).

Cost consists in value forgone for the purpose of achieving some economic benefit which will promote the profit making ability of the firm (Lynch & Williamson, 2003:8).

On the basis of cost behavior or from the view point of cost volume profit analysis cost can be classified into three heading:

i) Fixed cost
ii) Variable cost
iii) Mixed cost(semi-variable or semi fixed)

Fixed costs are the costs which remain constant over wide range of activity for a specified time period. They are the expenses incurred on the basis of a certain amount per period of time, independent of the number of units that might be produce during that period. Such as real state taxes, insurance, depreciation, salary etc. The total fixed costs are constant for all level of activity whereas unit fixed cost decreases proportionally with the level of activity. Some fixed remains constant over a wider range of activity but jumps to a different amount for activity outside that range, such cost are called step fixed cost.

Variable costs are the costs which fluctuate directly to the volume of activity i.e. doubling the level of activity will double the total variable cost. But the variable cost per unit will be constant for all level of activity. For example direct material, direct labor, fuel & power etc. Total variable costs are linear. Some costs are nearly variable but they are increase in small steps instead of continuously. Such costs are called step variable cost, usually include inputs that are purchased and used in relatively small increment.

Mixed costs are the costs which are partly fixed and partly variable. It shows mixed relationship. Mixed cost may remain fixed within a certain activity level, but once that level is exceeded, they vary without having direct relationship with volume changes. It does not fluctuate in direct proportion to volume. For example telephone bill, electricity bill etc.

Semi variable cost creates a great problem in cost analysis, because there is no readily ascertainable relationship between cost and volume. For the purpose of various types of cost analysis manager needs to classify cost as fixed or variable element.
There are several methods to separate semi variable expanses into variable and fixed component. Some of them are:

a) High and Low method (Range method):
Under this method level of highest and lowest expenses are compared with one another and related to output attained in those periods.

$$\text{Variable cost per unit (VCPU)} = \frac{\text{High Cost - Low Cost}}{\text{High Unit - Low Unit}}$$

$$\text{Fixed cost} = \text{Total Semi-variable cost - variable}$$

b) Scatter graph method:
Under this method a semi variable expense is plotted on the vertical axis (y-axis) and activity measure is plotted on the horizontal axis (x-axis). Then, a regression line is fitted by visual inspection of the plotted x-y data. The scatter graph method is relatively easy to use and simple to understand. But it should be used with extreme caution because it does not provide an objective test for assuring that the regression line drawn is the most accurate fit for the underlying observation.

c) Least square method (Regression analysis)

One popularly used method for estimating the cost volume formula is regression analysis. Regression analysis is a statistical procedure for estimating the average relationship between the dependent variable and the independent variable. Under this method all the data are observed to find a line of best fit. Regression equation is given by: $y = a + bx$

Variable cost per unit (b) = $\frac{n\sum xy - \sum x \sum y}{n\sum x^2 \quad \left(\sum x\right)^2}$

Fixed cost (a) = $\bar{y} - b\,\bar{x}$

Where,

n= Number of items

x = Independent variables (activity level)

y = Dependent variable (Total cost)

$\bar{y} = \frac{\sum y}{n}$, $\bar{x} = \frac{\sum x}{n}$

The survey reported that statistical techniques are not widely used to separate fixed and variable cost. The following results were reported.

2% used statistical regression techniques;

59% classified cost on a subjective basis based on managerial Experience;

28% classified all overhead as fixed cost and direct cost were classified as variable cost;

11% did not separate fixed and variable cost (Drury, et al: 1992).

Cost structure i.e. combination of fixed cost and variable cost plays an important role in the profit planning of the company. The question arise which cost structure is best – high variable cost and low fixed cost, or opposite. No any categorical answer to this question is possible. There may be advantages in either way depending upon the situation. The answer to which company has best cost structure depends on many factor, including the long run trend in sales , year to year fluctuations in the level of sales and the attitudes of the managers towards risk.

Let's illustrate the example of two firms i.e. X and Y, having opposite cost structure- X has high variable cost and low fixed cost which is just opposite of Y. If the Rs. 100000 represents maximum sales, and if the sales are expected to trend above in the future, the

firm Y has the best cost structure because it has high contribution margin. Similarly, if the sales are expected to drop, the firm x has best cost structure as it has low Contribution margin and low fixed cost.

If we talk about the cost in Hydropower Company, the main operating costs of those are the cost of building and maintenance the dam, the steel lined pressure shaft, the power house and turbines. Moreover, these costs may depend upon the size of the reservoir, the type of the hydropower plant (storage or run-of- river) as well as on the number of plants operated by a single company. An analysis of the cost structure of these companies should take account of the fact that the same quantities of electricity can be produced using several and/or different type plants (storage, pumps-storage and run of river). In the cost model specification it is therefore important to introduce some variables related to both type of power plants.

One single output is considered in the cost model for the hydropower plants. Input cost primarily of labor, material and capital. The main reason for choosing the estimation of a variable instead of a total cost function is that the investment into the plants were made some decades ago and therefore the capital costs and depreciation can be considered fixed at least in the short and medium term.

Assuming that output and input prices are exogenous, and that firm adjust input levels so as to minimize costs, the firms total costs of operating a hydropower company can be represented by the cost function.

$$VC= V (Q, N, P_L, C, D_{R1}, D_{R2}, D_S, D_{PS}, T)$$

Where, VC represents variable cost, Q is the output represented by the total number of GWh produced and N is the number of plants. P_L is the price labor and C stands for capital stock describes as the book value of the companies. Four dummy variables (D_{R1}, D_{R2}, D_S, D_{PS}) are introduced in the models to check for the difference in the cost among different types of hydropower plants used by the companies. T, the time trend is included as a way of capturing the effects of neutral technical change.

A well defined variable cost function should be increasing with respect to output and input price, concave with respect to input price and non-increasing with respect to capital stock.

The properties of cost function are that it is concave and linearly homogenous in inputs prices and output, and regarding capital stock, non- increasing. To estimate the cost function a translog functional form is employed. This functional form is second order approximation arbitrary cost. The translog cost function permits the economics of scale to vary with the level of output factor and the variable characteristics of output.

Economics of scale (ES) in hydropower is defined as the proportional increase in the total costs brought about by a proportional increase in output, holding all input prices and the number of plants fixed. It is equivalent to the inverse of the existence of variable cost with respect to output.

$$\text{Economics of scale (ES)} = \frac{1 - \frac{\partial \text{In VC}}{\partial \text{In C}}}{\frac{\partial \text{ In VC}}{\partial \text{In Q}}}$$

If ES is greater than 1, there is economics of scale and accordingly, identify, diseconomies of scale if ES is below 1. In the case of ES -1 no economics or diseconomies of scale exist. Economics of scale exist if the average costs of a hydropower company decrease as the quantity of electricity produce with a fixed number of plants increases (Filippini & Luchsinger, 2005:44) .

2.1.2 Volume (level of activity)

The term volume means output or productive activity. The volume or the level of activity is the current condition of the market and the company. It is a snapshot of what the sales look like. It tells if products are moving or if the business is dead in the water.

Volume means the quantity of units produced for sales. It can be in terms of rupees or unit. It can be measured in terms of unit of production or sales, hour worked, miles traveled, patient seen, student enrolled, kilowatt hour, or any appropriate measure of the actual of an organization. Cost varies with the volume or level of activity. Generally, cost increases with increase in volume.

The term volume refers to the level of activity. This may be expressed in any of the following manners:

i) Sales capacity as a percentage of maximum production.

ii) Value of sales

iii) Quantity of sales

iv) Production capacity as a percentage of maximum production.

v) Value of production

vi) Quantity of production

vii) Direct labor cost

viii) Direct labor hour and

ix) Machine hour (Maheshwori & Maheshwori, 2002:175-176).

Production is a transformation of physical input into physical outputs. The functional relationship between physical inputs and physical output of a firm is known as production function. Algebraically, Q=f (a, b, c, d...), where q= quantity of output and a, b, c, d, etc = quantities of factor (Ahuja, 2001:341).

2.1.3 Profit

Profit means income over expanses. The basic objectives of running business organization are to generate profit. Profit is a reward for enterprise and the fourth factor of production. Profit determines the financial position, liquidity and solvency of the company. Profit result when selling price of the goods exceeds the cost of production. It serves as yardstick for judging the competence and efficiency of the management. Profit is primary measure for success of an organization.

Accountant defines profit as the excess of firms revenue over the expense of producing revenue in a given fiscal year i.e. Profit = total revenue – total expenses. For CVP analysis, this definition is applied. But Economist from time to time has expressed diverse and conflicting views about the profit.

Profit has been associate by F.H knight with uncertainty, by Schumpeter with innovation, by Hawley with risk bearing, and by Mrs. Robinson, Prof. Chamberlain and Mr. Kalecki with the degree of monopoly power.

Profits are residual income left after the payment of the contractual rewards to the other factor of production. He pays wages to the worker, rent on the land employed, interest on loan taken at the rate already been fixed by contract (Ahuja, 2001:933-943).

Profit planning is a fundamental part of the management function and is a vital part of the total budgeting process. Profit planning involves forecasting activity level in order to gain or maintain specified amount of profit. Under profit planning start is made from the end result. Profit figure is planned and activity level necessary for yielding that profit is attempted. The management should determine the profit goals and prepare budget that will lead them to the realization of these goals.

Profit planning is a short term financial plan. It is an action plan to guide manger in achieving the objective of a firm. A profit plan is a comprehensive plan of an enterprise for same specified period in future (Myers, 1995:250).

Profit planning can be done only when management is aware about the various factor which affect profits. Some of important factor affecting profit are selling price, cost, volume and product mix (Maheshwori, 2002:175-176).

Under profit planning, the ultimate objectives of management are to maximize profit over the long term consistent with its social responsibility. To plan profit intelligently, management needs to know:

- The economic characteristics of the firms operation.
- The nature of the market for its products
- The cost of its factors of production: the material, the labor, the productive capacity, the capital.
- The relationship of the price it can get for its good to the expenses of producing and selling those (Lynch & Williamson, 2003:100).

2.1.4 Marginal costing (Variable costing)

CIMA defines marginal costing as “the accounting system in which variable costs are charged to the cost units and fixed cost of the period are written off in full against the aggregate contribution. Its special value is in decision making”. It is a contribution approach to the income statement and is widely used by manufacturing companies and other organization.

CVP Analysis uses Variable Costing concepts. In this context we will divide all costs into one of two categories: Variable or Fixed. We refer to this as "cost behavior." In CVP Analysis cost behavior will be discussed on both a total cost and per unit basis.

Only variable manufacturing cost are used for determine cost of production in this approach. The fixed costs are taken directly to the income statement as expenses of the period.

Marginal costing advocates argue that no part of the fixed production cost of one year should ever be carried forward as an asset to the following year. Such costs do not result in future cost avoidance – the key test for any asset (Green, 1960:218-26).

Although the marginal costing cannot be used externally either for financial reporting or tax purpose, it is frequently used internally by manger. The margin costing data are immediately used in cost volume profit relationship for profit planning. If management wishes to consider the effect of increasing the volume of production, it cannot calculate the effect on profit from absorption costing statement but it can with marginal costing system. The proponent of marginal costing holds the opinion that it is more efficient to present important Cost-Volume-Profit relationship as integral parts of major financial and operating statement (Mohan & Goyal, 1992:155).

2.1.5 Concept of Cost-volume-Profit (CVP) analysis

Profitability analysis involves examining the relationship between revenues, costs and profit. Performing profitability analysis requires an understanding of selling price and the behavior of activity cost drivers. Profitability analysis is widely used in the economic evaluation of existing or proposed products or services. Typically, it is performed before decisions are finalized in the operating budget for a future period.

Considering, the cost behavior, there are two approach to profitability analysis.

i) A unit level approach based on the assumption that units sold or sales dollars is the only activity cost driver.

ii) A cost hierarchy that incorporates non- unit and unit level activity cost drivers.

Profitability analyses which consider only unit level activity cost drivers are identified as Cost Volume Profit analysis. CVP analysis is widely used by profit and non-profit organization. It is equally applicable to service, merchandise and manufacturing firm.

Cost-volume-profit analysis is a technique that examines the changes in profit in response to change in such volume, cost and price. It is the study of the effect of changes in cost and volume on company's profit. It is a vital factor in management

decision such as setting selling price, determining product mix and maximizing use of production facilities. There are five components that make up a CVP analysis. They are:

i) Volume or level of activity of products or services produced and sold

ii) Unit selling price of product or services

iii) Variable cost per unit

iv) Total fixed cost

v) Sales mix

Cost-volume-profit (CVP) analysis considers the relationships that each of the above components have with each other and the overall profitability of a company. A better understanding of what these components are will help set the basis of understanding how the CVP analysis works.

The COST-VOLUME-PROFIT analysis is a profit forecasting model that studies the relationship between various factors.

- The volume of work;
- Unitary variable cost;
- Total fixed cost;
- Product's price;
- The structure of production (Hilton, et al, 2003:476).

Cost-volume-profit analysis provides a sweeping financial overview of the planning process. Cost-volume- profit (CVP) analysis examines the behavior of total revenues, total cost and operating income as changes occur in the output level, selling price, variable costs or fixed or fixed costs. The term CVP analysis is widely used as representing special case (single revenue driver (output), single cost driver (output), and short term decision). In the CVP model Volume (V) refers to unit manufactured or unit sold (Horngren, et. al, 1999:60).

Cost-volume-profit analysis is defined as a managerial tool showing the relationship between various ingredients of profit planning, viz., cost (both fixed and variable), selling price and volume of activity, etc. Cost-volume-profit analysis is an important media through management can have an insight into effect on profit on account of variations in costs and sales and take appropriate decision (Maheshwori, 2002:178).

The cost-volume profit (CVP) analysis allows the estimation of profit for a long term in order to obtain useful information for manger for the fundamental business decision making. This type of analysis is a development of the direct costing method, a method which is used on a series of indicator with a wide range of information (the threshold of profitability, operational level, etc.). Using such analysis manager can manage uncertainty with the possibility of examining the effects of interaction that exist between the coordinate of this type of analysis (variable unitary cost, fixed cost, selling price, target exploiting profit (Elena, 2008:114).

2.1.6 Application (use) of CVP analysis in decision making

Cost-volume-profit (CVP) analysis is a key factor in many decisions, including choice of product lines, pricing of products, marketing strategy, and utilization of pervasive in managerial accounting that it touches on virtually everything that a manager does. It is undoubtedly the best tool that manager has for discovering the untapped profit potential that may exist in an organization.

Using CVP Analysis we can analyze a single product, a group of products, or evaluate the entire business as a whole. The ability to work across the entire product line in this way gives us a powerful tool to analyze financial information. It provides us with day-to-day techniques that are easy to understand and easy to use. The concepts parallel the real world, so they are easy to visualize and use.

CVP analysis is simple but flexible tool for exploiting potential profit on cost strategies and pricing decision. CVP may be helpful for the following task:

- To forecast profit by considering relationship between cost and profit on one hand and production volume on other hand.
- To prepare a flexible budget showing cost at different level of production.
- To help evaluate a start up operation.
- To evaluate performance for the purpose of benchmarking and control.
- To set pricing by projecting the effect of different price structure on cost and profit.

  (Sources: Management Accounting)

Manager uses the CVP analysis with a view to making decision; many of them can be considered strategic decisions. This type of analysis allows the estimation of

profitability expected on a long term for each chosen option (different option can influence the selling price, variable unitary cost, fixed cost, number of unit sold, as well as operating profit). Strategic decision making involves a dose of risk, CVP analysis ensuring the impact assessment a failure of the provided initial volumes can have (for example if the effective are lower than those estimated). CVP analysis helps manager to estimate future revenues, cost and profit for planning and monitoring operation. It helps manager to examine the effects and interaction of changes in the selling price, variable cost, fixed cost, as well as operating target profit. CVP analysis, examining the evolution of total revenues, total cost, potential profits, guide the planning studies of manager.

CVP analysis has great utility in the following area of managerial decision making:

- Fixation of selling price: CVP analysis helps in fixing the selling price of he products. The cost of product and the desired profitability are factor which govern fixation of selling price.
- Maintaining a desired level of profit: The industry has to cut price of its products from time to time on account of competition, government regulation and other compelling reason. The contribution margin per unit on account of such cutting is reduced in maintaining a minimum level of profit.
- Accepting of price less than the total cost: Sometimes prices have to be fixed below the total cost of the product to meet the situation during trade depression. The selling price may be fixed at a level above marginal cost though it may not be enough to cover the total cost.
- Decision involving alternative decision: The technique of CVP analysis helps in making decision involving alternative choice, viz., discontinuance of a product line , change of sales mix , make or buy , own or lease , expand or contract, etc (Maheshwori, 2002:202-208)

Management uses of Cost-volume-profit analysis are:

- Management plans future operations with cost volume profit analysis.
- Management uses budgeted amounts to control operations throughout the month.
- Management use Cost-volume-profit analysis to analyze past performance (Lynch & Williamson, 2003:119-120)

Thus, CVP analysis operates under system which is known as CVP system. It shows how input data of CVP analysis are used in profit planning of organization. The CVP system can be observed from the following table.

Table 2.1

CVP system

Input data, assumption and use of CVP analysis

Input data for CVP analysis	**CVP analysis and assumption**	**Describe Volume, Revenues, Cost and Profit**
- Expected revenues (Volume & selling price) - Expected cost (cost function) - Sales mix (for multiple product)	- Calculate number of units or revenues needed for: ⁾ Break even analysis ⁾ Target profit analysis - Assumption	-Values at Break even or target profit: ⁾ Units sold ⁾ Revenues ⁾ Variable, fixed & total cost - Sensitivity of results to change in: ⁾ Level of activity ⁾ Selling price ⁾ Cost function ⁾ Sales price - Indifference point between alternatives - Feasibility of planned operation -Assist with plans and decision such as: ⁾ Budgets ⁾ Product emphasis ⁾ Selling price ⁾ Production or activity level ⁾ Employee work schedule ⁾ Raw material purchases ⁾ Discretionary expenditure ⁾ Proportion of fixed and variable cost -Monitor operation by comparing expected and actual: ⁾ Volumes, revenues, cost & profits ⁾ Profitability risk

2.1.7 Assumptions of Cost-volume-profit analysis

The mechanism of Cost-volume-profit analysis stresses in fact, "how operating profit evolves with the change in the quantity of sold products, variable costs or fixed costs." CVP analysis relies on several assumptions to simplify the complex relationship among costs, revenues, and activity levels which are to be rarely found in practice and place definite limitations on the conclusion which can be drawn from its result. Some of the key assumptions are:

- The analysis presumes that cost can be reliably divided into fixed and variable category.
- This analysis presumes an ability to predict cost at different activity volumes.
- The analysis presumes that a series of break even chart may be necessary where alternative pricing policies are under consideration.
- It assumes that variable cost fluctuates with volume proportionally.
- It assumes that efficiency and production remain unchanged. In other words, it presents a static picture of a dynamic.
- This analysis presumes that selling price is constant at all levels of sales.
- It assumes that volume is the only relevant factor affecting cost.
- This analysis presumes only a single product or product mix will not change.
- The fixed cost remains constant over a given volume range.
- The analysis presumes that influence of managerial policies, technological method, and efficiency of the man, material, and machines will remain constant and cost control will be neither strengthen nor weakened.
- This analysis presumes that production and sales will be synchronized at all points of time, or in other words change in beginning and ending inventory level will remain insignificant in amount.
- This analysis also presume that price of input factor will remain constant (Saxena & Vashist, 2008:15.28-15.290)

Horngren, et al., discuss the following assumption of CVP analysis:

- Total cost can be divided into fixed component and a component that is variable with respect to the level of output.
- The behavior of total revenues and total costs is linear (straight line) in relation to output units within the relevant range.

- The unit selling price, unit variable costs and fixed costs are known.
- The analysis either covers a single product or assumes that a given revenue mix of products will remain constant as the level of total units sold changes.
- All revenues and costs can be added and compared without taking into account the time value of money.

These CVP assumptions clearly are extreme in the sense that they would rarely match reality. Managers should always question whether a more complicated approach than CVP is warranted.

2.1.8 Basic Terminology under CVP analysis

CVP analysis can be only understood after understanding the various terminology used under it. This terminology combines to form a CVP analysis. It include following key features and terminology:

a) **Total Revenue:** The amount of money received by the seller from selling a given amount of the product or services is called Total revenue. Revenue can be divided into operating and non-operating revenue.

Total revenue = operating revenue + non-operating revenue

b) **Total cost:** Total cost are made up of from variable cost and fixed cost.

Total cost = Variable cost + Fixed cost

c) **Operating income:** Operating income is total revenue from operation minus total costs from operation (excluding non-operating revenues and costs).

Operating income = Total Revenues for operation – Total costs from operation

d) **Net Income:** Net income is operating income plus non-operating revenues such as interest) minus non operating cost minus income taxes.

Net income= operating income + non-operating income – non-operating expenses – income taxes

e) **Gross margin:** Financial income statement uses the term gross margin. Gross margin is the difference between sales a cost of goods sold. Cost of goods sold in cludes both fixed and variable costs.

Gross margin = Revenue – Cost of goods sold

Contribution margin calculation emphasize the distinction between fixed and

variable costs. Hence, contribution margin is more useful concept than gross margin in CVP analysis.

Contribution margin: Contribution margin is the difference between total revenue and the variable cost of sales. It is most essential part of variable costing and managerial costing. Contribution margin is the profit available to cover fixed cost and provide net income to the owner. The contribution margin determine the change in net income from given change in sales.

Contribution margin in total = sales revenue – variable cost

= fixed cost + profit

$$\text{Contribution margin per unit} = \frac{\text{Sales - Variable Cost}}{\text{Unit sales}}$$

=Selling price per unit – variable cost per unit

Both contribution margin and contribution margin per unit are valuable tools when considering the effects of volume on profit. Contribution margin per unit tells us how much revenue from each unit sold can be applied toward fixed costs.

f) Contribution margin ratio (CM ratio): Contribution margin ratio is the contribution margin divided by the sales amount. It is the percentage of sales amount available to cover fixed cost. It established a relationship between the contribution and the sales value. It is also called Profit/volume ratio (P/V ratio) or Contribution/sales ratio(C/S ratio). CM ratio is expressed as a percent.

$$\text{Contribution margin ratio} = \frac{\text{Sales - Variable cost}}{\text{Sales}}$$

$$= \frac{\text{Contribution margin}}{\text{Sales}}$$

$$= 1 - \frac{\text{Variable cost}}{\text{Sales}}$$

=1 – variable cost ratio

$$= \frac{\text{Change in contribution margin}}{\text{Change in sales}}$$

$$= \frac{\text{Change in profit}}{\text{Change in Sales}}$$

Above discuss contribution is for a single product company. But in real life companies produces a range of product, not just one kind. Different product will

have different selling price, variable cost per unit and as a result different contribution margin and contribution margin ratio. In such situation calculation become complicated for CVP analysis. So we use weighted average contribution margin for analysis.

g) Sales mix (Revenue mix): Many organizations sell a combination of different product or services. Sales mix is the relative combination of quantities of products or services that constitute total revenue. For example sales mix of product X and Y may be 2:3 unit or 40% and 60% respectively. Managers try to achieve that combination or mix that will yield the greatest amount of profits. All the products of company are not equally profitable. Profit will be greater if high margin items make up a relatively large proportion of total sales than if sales consist mostly of low margin items.

If a mix changes, overall revenues targets may still be achieved. But the effects on operating income depend on how the original proportion of lower or higher contribution margin products have shifted. A shift in the sales mix from high margin item to low margin items can cause to decrease even though total sales increase. Conversely, a shift in the sales mix from low margin items to high margin items can cause total profit to increase though total sales decrease.

h) Weighted average contribution margin (Overall contribution margin):

Weighted contribution margin is the sum of the contribution margin for the individual products. It is average contribution margin of the company. The weighted average contribution margin per unit is calculated by multiplying each products contribution margin per unit (sppu-vcpu) by the mix ratio applicable to that product and then summing the results. The mix ratio represents the weights.

The equation for weighted average contribution margin per unit (WCMPU) is given by:

$$WCMPU = \sum[(sppu\text{-}vcpu) \times (mix\ ratio)]$$

where, sppu= selling price per unit,

vcpu=variable cost per unit

sppu-vcpu=contribution margin per unit for each product

$\sum$=summation (sum up)

Also, WCMPU= $\frac{\text{Total Contribution margin}}{\text{Sales unit}}$

Managers calculate the weighted average contribution margin for each different proposed product mix and then compare the CVP analysis results for each proposed product mix to determine which product mix should be produced and sold.

Let's illustrate it on XYZ company example. Assume it produces two types of product i.e., P & Q. The following data is available.

Table: 2.2

Weighted average contribution margin per unit

Details	Product P		Product Q		Total
	Unit	Total	Unit	Total	
1. Share in physical volume sold, %		25%		75%	100%
2. Sales unit		250		750	1,000
3. Selling price (Rs.)	20	5,000	10	7,500	12,500
4. Variable cost (Rs.)	12	3,000	4	3,000	6,000
5. Contribution margin (Rs.) (3-4)	8	2,000	6	4,500	6,500
6. Contribution margin ratio (5/3)	.40		.60		
7. Fixed cost	Rs. 10,000				

Now, Weighted contribution margin per unit (WCMPU) = .25x8 + .75x6=6.5

Also, WCMPU=6,500/1,000=6.5

i) **Weighted average contribution margin ratio (WCMR):** Weighted average contribution margin ratio for the firm is the overall contribution margin divided by overall sales. If a business make two products one with a CM ratio of 80%, the other with a CM ratio of 70%, the weighted CM ratio will not be equal to 75% (which would be the simple average of the two CM ratios). The weighted CM ratio has to be based on the weighted average of the two. WCMR is also based on sales mix. By changing the sales mix in a situation where the value of the CM ratio change from product to product, the weighted average value of a CM ratio also changes, and unless this point is appreciated, the result of any CVP analysis could be easily invalidated. The equation for weighted Average contribution

margin ratio can be given by:

WCMR = [(CMR) x (Mi)

Where, = Summation (sum up)

CMR = contribution margin ratio for a product

Mi = the mix ratio for a product based on sales Rupees. But the ratios are not equal to the mix ratio bases on units

Also, $WCMR = \frac{\text{Total contribution margin}}{\text{Sales in Rupees}}$

Now, considering above illustration,

Revenue mix of; Product P=5,000/12,500=.40

Product Q=7,500/12,500=.60

Here,

WCMR= cm ratio of p x mix of p + cm ratio of q x mix of q

= .40 x .40 + .60 x .60 = .52

Also, WCMR= 6,500/12,500 =.52

2.1.9 Presentation of Cost-volume-profit analysis:

CVP analysis examines how various "what if" alternative being considered by a decision maker affect operating income. This analysis can be done by different method. Cost volume relationship can be presented in any of the following manner (Saxena & V ashist, 2008:15.18-15.19).

a) **Algebraical Formulae:** Cost-volume-profit relationship is frequently expressed by algebraical formulae. It involves finding out different values by use of marginal cost equation. Basic marginal equation includes difference of sales and variable cost yields contribution, which provides for fixed cost and profits. The equation is given by:

Sales – variable cost = fixed cost + profit

Or, SPPU x qty – VCPU x qty= fixed cost + profit

Any missing value can be easily found with the help of this equation.

b) **Report and statement:** It presents the CVP relationship in statement form. A statement showing how the relationship is presented through statement is given in following table:

Table 2.3

CVP Relationship

Plant capacity	70%	80%
Sales unit	7,000	8,000
Price per unit	Rs.1	Rs.1
Sales value	7,000	8,000
Variable cost	3,150	3,600
Contribution margin	3,850	4,400
Fixed cost	1,500	1,500
Profit	2,350	2,900
P/V Ratio	.55	.55

c) **Graph presentation of Cost-volume-profit relationship:** Graph chart furnishes an effective means of presenting Cost-volume-profit relationship. In graph presentation, a diagram of the relationship among various factors like cost, volume, profit relationship. This pictorial presentation makes this relationship easy to understand. CVP graphs are a great way to convey information. They are especially useful in presenting alternatives to decision makers, many of whom may more easily grasp the concepts with a visual presentation, rather than page full of numbers.

The important chart portraying CVP relationship are:

1) Break even chart
2) Profit/volume chart
3) Sequential profit graph

The first two methods are most useful for analyzing operating income at a few specific levels of sales. The graph method is useful for visualizing the effect of sales on operating income over a wide range of quantities sold.

2.1.10 Break Even analysis

CVP analysis is sometimes referred to simply break even analysis. A part of a CVP analysis which aims to determine breakeven point is called break even analysis. Break even analysis is a widely used technique to study Cost-volume-profit relationship. Break even analysis denotes the study of the breakeven point, which is often only an

incidental part of the relationship between cost, volume, and profit. The techniques of break even analysis are so popular for studying CVP analysis that the two terms are used as synonymous term.

Break even analysis indicates at what level cost and revenues are in equilibrium. It is a simple and easily understandable method of presenting to management the effect of change in volume on profit (Lal, 2002:546).

The term 'break even analysis may be interpreted in two sense – narrow sense and broad sense. In narrow sense, it refers to a system of determining that level of operations where total revenues equal total expenses, i.e. the point of zero profit. Taken into broad sense, it denotes a system of analysis that can be used to determine the probable profit at any level of operation (Goyal & Mohan, 1992:188).

2.1.10.1 Breakeven point (BEP)

Breakeven point is the output level at which total revenues equals total costs, the point at which operating revenues is equal to zero. It is output level at which total contribution margin equals to fixed cost. Breakeven point can be expressed in unit or rupees.

Br eakeven point is the level of output or sales at which there shall be neither profit nor loss. At this point, the income of the business exactly equals its expenditure. If production is enhanced beyond this level, profit shall accrue to the business, and if it is decreased from this level, loss shall be suffered by the business (Maheshwori, 2002:180).

The profitability threshold (PR) represents that sold quantity of production for which total revenue are equal to total cost. So, breakeven point is also known by profitability threshold. Determining the profitability and production volume to achieve by comparing the marginal contribution to fixed cost. In general, managers are interested in profitability threshold wishing to avoid operating loss (Elena, 2008:116).

The methods by which breakeven point can be determined are: (Foster, et. all, 1999:60-69)

1) **Equation method:** Under this method, the income statement can be expressed in equation form as follows:

Revenues – variable cost = fixed cost + operating income

(USP x Q) – (UVC x Q) = FC + OI

For break point in units, operating income=0

(USP x Q) – (UVC x Q) = FC + 0

For break point in Rupees,

Sales = Variable cost ratio x sales + fixed cost

For Multi- Product Company, BEP depends upon sales mix. Considering table 2.2 the sales mix for product P and Q is 1: 3 respectively. Now, breakeven point;

Let, x= number of units of product P break even

3x= number of units of product Q break even

Revenues – variable cost – fixed cost = operating income

(20x x + 10x 3x) – (12x x+ 4 x 3x) – 10000= 0

26x = 10000

x = 384.6154=385 units

3x = 1153.8462= 1154 unit

2) Contribution margin method: contribution margin method is simply an algebraic manipulation of the equation method. It uses the fact that:

$$Q = \frac{\text{Fixed cost + Operating income}}{\text{Unit contribution margin}}$$

For breakeven point;

$$\text{Breakeven point in units} = \frac{\text{Fixed cost}}{\text{unit contribution margin}}$$

$$\text{Breakeven point in rupees} = \frac{\text{Fixed cost}}{\text{Contribution margin Ratio}}$$

For multi- product company;

$$\text{Breakeven point in units} = \frac{\text{Fixed cost (joint + deparmental)}}{\text{Weigheted contribution margin per unit}}$$

$$\text{Break even point in rupees} = \frac{\text{Fixed cost(Joint } \Gamma \text{ departmental)}}{\text{Weighted contribution margin ratio}}$$

3) Graph method: In graph method, we plot the total cost line and total revenues line. Their point of intersection is the breakeven point. At this point total revenue equal total cost. It is discussed under break even chart.

2.1.10.1.1 Cash breakeven point:

It is also known as Cash flow breakeven point. It is the point where cash breaks even, i.e., the volume of sales where cash realization on account of sales will be just sufficient to meet immediate cash liabilities. It helps management to know what volume of sales is required to cover all cash payments. Not all fixed operating costs involve cash payment. For example, depreciation expenses are non-cash expenses. To find the cash breakeven point, the non-cash expense must be subtracted from total fixed operating cost. Cash breakeven point is lower than the accrual accounting breakeven point. It is calculated as:

$$\text{Cash Breakeven point} = \frac{FC - d}{CMPU}$$

Where, FC = fixed cost, d= depreciation or amortization,

CMPU = contribution margin per unit

Cash flow breakeven point after tax is the point where the cash inflows after taxes are equal to cash outflows after taxes. We simply convert the contribution margin and total fixed cost to an after tax basis by multiplying (1-T). The equation is as follows:

(1-T) x (SPPU-VCPU) x Q = (1-T) x TFC – Non cash fixed costs

2.1.10.1.2 Cost breakeven point:

It refers to a situation where the cost of operating two alternative plants is equal. The point enables the firm to identify which is the best to operate at or a given level of output assuming that sales price per unit is the same. This is also known as **Indifference point**, which defines the level of activity at which equal cost or profit occurs across multiple alternatives.

It can be understood by following example.

Let cost function of plant are;

Plant A = 6,00,000 + 12x; Plant B = 9,00,000 + 10x

Now, 600000 + 12x = 9,00,000 + 10x

x = 1,50,000 unit

Cost breakeven point = 1,50,000 unit

The above working shows that plant A will make more profit when output is less than 1,50,000 units using more variable cost. However, Plant B will make more profit when output is greater than 1,50,000 units using more fixed cost and less variable cost.

2.1.10.1.3 Breakeven point in variable costing and absorption costing:

If variable costing is used, the break even is computed in the usual manner. It is unique. The break even shown by variable costing is not equal to break even shown by absorption costing. If absorption costing is used, the break even is not unique. The following formula is used to compute the breakeven point under absorption costing:

Breakeven point in units =

$$\frac{\text{Total fixed cost} + \bullet\text{fixed mfg cost rate}f\text{Break even sales in unit} - \text{unit produced}\acute{A}}{\text{unit contribution margin}}$$

2.1.10.1.4 Breakeven point using Activity based costing (ABC)

In ABC costing cost are classified as unit, batch, product, or facility level so CVP analysis must be modified accordingly. Batch and product level costs are likely to vary with cost drivers related to the complexity of a product or product diversity. So batch and product level costs are included with fixed costs in the break even formula. Break even analysis is more useful in decision making under ABC costing because cost behavior information in an ABC system is more accurate.

Robin Cooper state that the idea of ABC costing is to combine ABC with the contribution margin approach to reveal contribution at the unit, batch , product , distribution and customer levels. This expanded information will indicate which product distribution channels and customers really are profitable and perhaps help to avoid the potential trap set by the contribution margin logic that keeps companies from ever dropping anything.

$$\text{Breakeven point in units} = \frac{\text{Fixed cost} + \text{batch - level cost} + \text{product level cost}}{\text{unit contribution margin}}$$

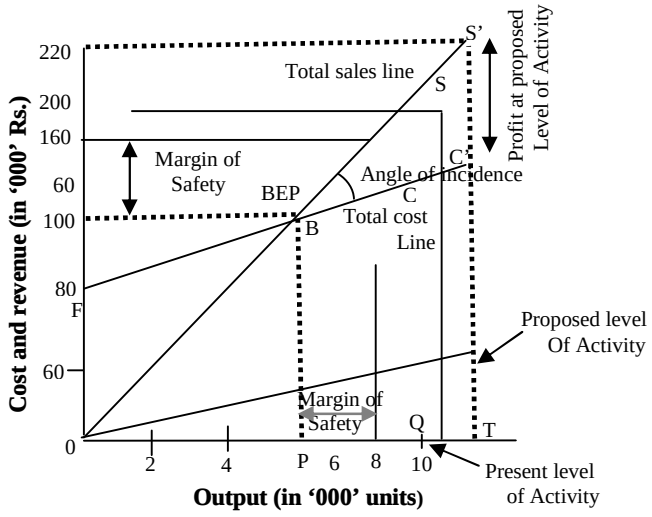
2.1.10.1.5 Break even chart

Break even chart which is also known as CVP graph is a chart which shows profit or loss at various levels of activity ,the level at which neither profit nor loss is shown being terms as breakeven point. It highlights CVP relationship over wide ranges of activity. It is frequently used where a business is new or where it is experiencing trade difficulties. Following are the important break even chart (Saxena & Vashist, 2008:15.19-15.23)

1) Simple break even chart: These charts present only the basic relationship of cost, volume and profit. It shows breakeven point as well as profit or loss at different level of activity.

Figure: 2.1

Simple break even chart



This chart aims to present the breakeven point, margin of safety and angle of incidence.

a) Breakeven point- Breakeven point is the point at which sales line and total cost line intersect. Here, B is breakeven point.

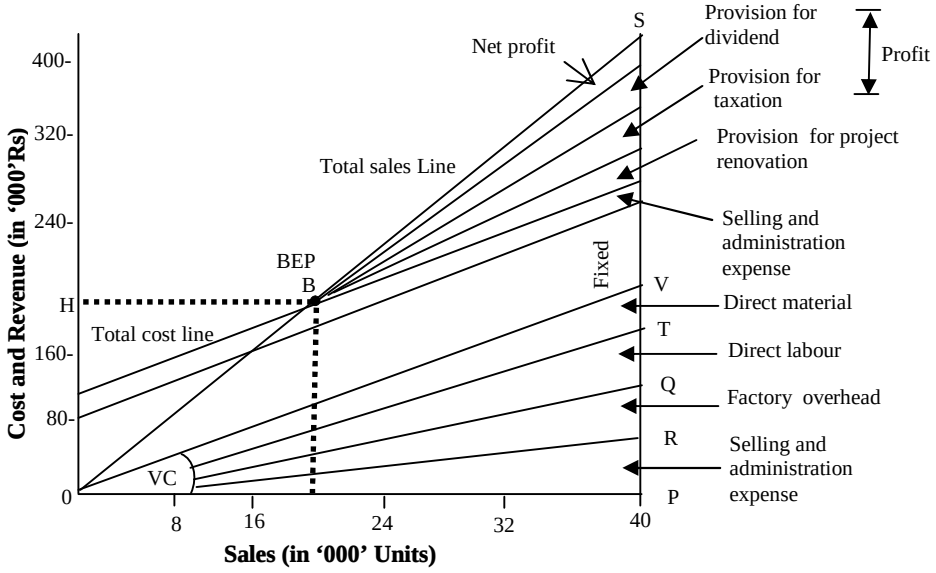
b) Margin of safety- Margin of safety is the difference between sales or units of production and breakeven point. Thus, margin of safety of Rs. 160,000 will be equal to TZ. i.e., Rs. 60,000.

c) Angle of incidence- Angle of incidence is the angle formed by sales line and total cost line at breakeven point. A large angle of incidence shows a high rate of profit being made. It should be noted that the angle of incidence is universally denoted by data. Larger the angle, higher the profitability indicated by the angel of incidence. A narrow angle of incidence shows a slow rate of profit earning. Capacity. High margin of safety, large angle of incidence and low breakeven point shows that firm is making high profits. Here sales line is intersecting the total cost line forming an angle SBC which is angle of incidence.

2) Elaborate break even charts: It provide detailed information of different elements of cost and appropriation of profit as shown below.

Figure: 2.2

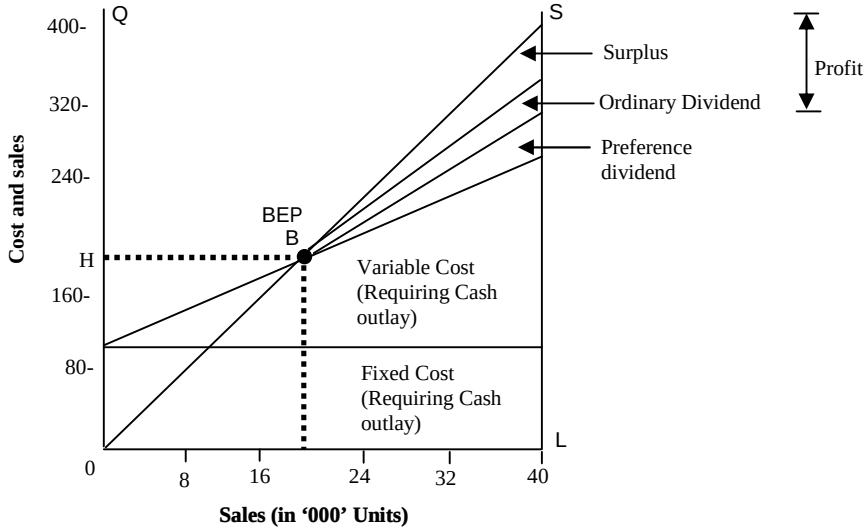
Detailed Break even chart



3) Cash break even chart: This chart is prepared to show that if a particular activity level is attempted, enough cash will be received from sales to meet all cash expenses which are shown below.

Figure: 2.3

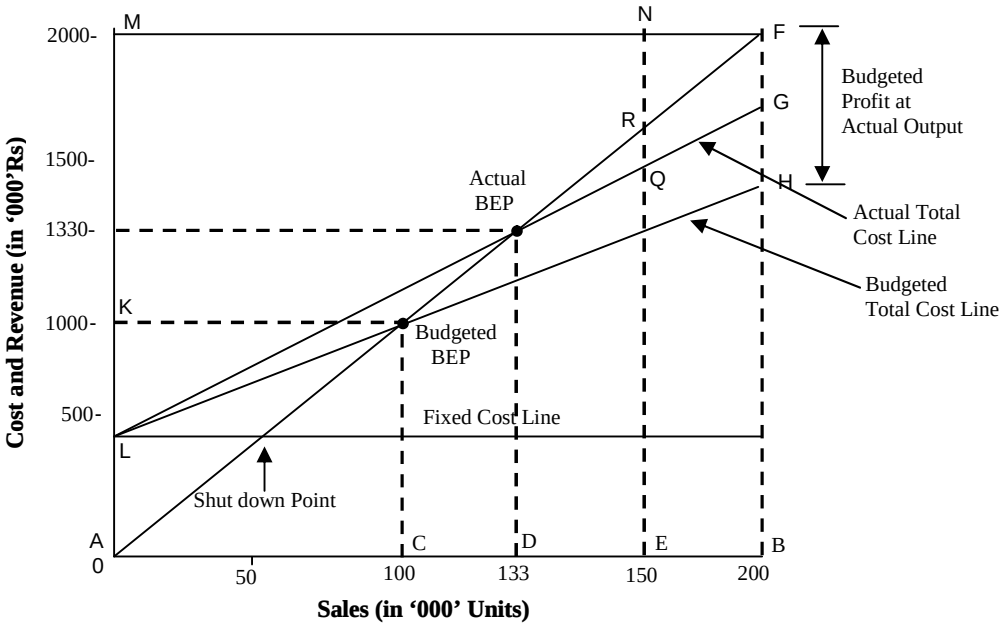
Cash Break- even chart



4) Control Break even chart: Control break even chart are constructed to depict how much actual performance has deviated from budgeted performance.

Figure: 2.4

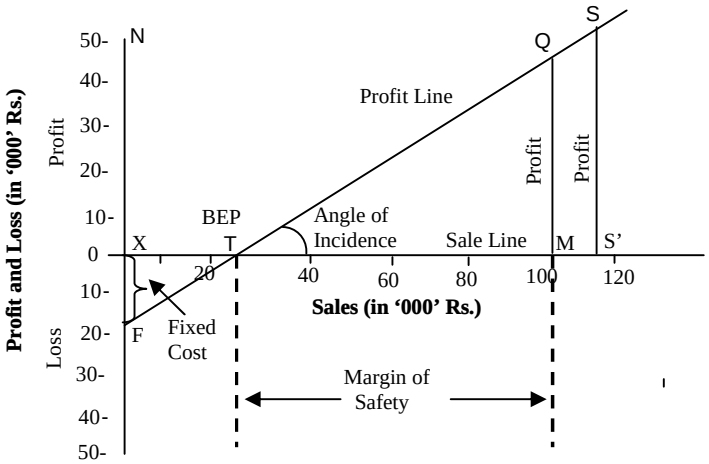
Control Break even chart



5) Profit chart: The breakeven point can also be found out graphically by means of a profit chart.

Figure: 2.5

Profit-volume chart



2.1.10.2 Break even pricing

Break even pricing was referred to as per unit cost of production. As commodity price takers, producer develop marketing plans to obtain price that is higher than their per unit cost of production.

Break even revenues and units sold are calculated for making financial and management decisions. Break even pricing was calculated to assist in helping market the product. Break even pricing is important for producer-owner to value added business because they need to know how to price a product as compared with pricing a commodity. Producer of value added business must assess profit potential of their new business by its competitors in the market. Profit potential is calculated by computing production costs, establishing an expected selling price base on substitute goods, and determining whether the product can be produced for that price. Price premium are based on end users demand and profit goals.

In today's market, commodity producers were price takers and not price makers. The producer- owner value added business should operate as a price maker. Typically, there are two cost associated with production: variable and fixed cost. The budgeting process allocates all costs evenly across production units. But, the reality is that projecting unit sales is difficult. Business typically error by overestimating demand. Sales lower than expected sales result in an increased per unit cost of products sold to business are encouraged to be optimistic in their projections, devoting a sensation analysis taking in suggested sensitivity analysis table shows expected breakeven price , revenue and unit sales levels from ranges of decision variables . This allows the value added business owner to determine best and worst case scenario. Producer sets price based on per unit cost of production, Value added business, or price maker business, set price after calculating their breakeven price.

The break even pricing method was applied to determine the breakeven price. To compute the breakeven price, it was necessary to project the number of unit sold. A poor projection can cause the calculated breakeven price to vary significantly. A small difference between the expected and actual number of unit sold, the breakeven price changes substantially. For large quantities, variable cost per unit may differ because of purchasing volume discounts of inputs. After the projected breakeven price is projected a markup pricing strategy must be set selecting an appropriate pricing strategy helps to

list strategies for markup pricing. Once a producer has projected an asking price, break even revenue and units can be determined.

The breakeven price can be calculated as follows:

$$\text{Breakeven price=variable cost/unit} + \frac{\text{Total fixed cost}}{\text{Sales unit}}$$

2.1.10.3 The Convectional linear (accountants view) and Theoretical (economists view) of BEP analysis:

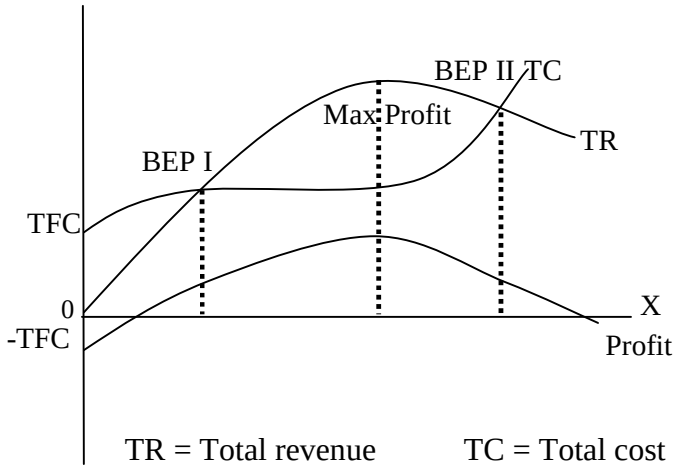
In the linear model there was one breakeven point (BEP) where total revenue is equal to total cost which was discussed above. There was only one BEP because total revenue function, cost function and profit function were linear.

But theoretical model convey a very different picture. There were two breakeven point where total revenue and total cost are equal. The theoretical profit function intersects the horizontal axis at the two break even points and reaches a maximum level at the point where the vertical difference between TR and TC is greatest.

In theoretical model there were two losses areas, one at the left of the first BEP and other to the right of second BEP. The profit area is between the two break even points, thus trying to achieve the maximum level of production and sales which product losses rather than increased profit. Although the concept of theoretical model are important but this model does not provide a practical approach for short term planning.

Figure: 2.6

Theoretical (Economists) BEP chart



TR = Total revenue TC = Total cost

TFC = Total fixed cost BEP = Breakeven point

2.1.11 Margin of safety (MOS) in CVP analysis

Margin of safety was defined as the excess of budgeted (or actual) sales over the break even volume of sales. It is expressed in monetary term (values) or as number of units (volume). It is the difference between total sales revenue and break even sales revenue. The margin of safety indicates that the amount by which sales could drop before profit reaches the break even points.

The margin of safety was computed using actual or estimated sales values depending on the purpose. To evaluate future risk when planning, use estimated sales. To evaluate actual risk when monitoring operations use actual sales. Once the break even sales amount was determined, the margin of safety can be calculated in units or rupees as follows.

Margin of safety (MOS) = Total sales – Break even sales

The size of margin of safety is an important indication of the business vitality. If it is large, there can be substantial falling of sales and yet a profit can be made. A larger margin of safety also gives manager greater confidence in making plans such as incurring addition fixed costs. On the other hand, if the margin of safety is small, then any decrease in sales volume may cause a loss to the company. Similarly, if the margin of safety is small manager may have to put more emphasis on reducing costs and increasing sales to avoid potential losses.

If the margin of safety is unsatisfactory, possible steps to rectify the causes of mismanagement of commercial activities as listed below can be undertaken (Globusz publishing: 2009)

a) Increasing the selling price.
b) Reducing fixed & variable cost.
c) Substitution of existing products by more profitable lines of product.
d) Increase in the volume or output.
e) Modernization of production facilities and the introduction of the most cost effective technology.

The margin of safety can be expressed in percentage form which is also known as margin of safety ratio. The margin of safety percentage is the margin of safety divided by actual or estimated sales, in either units or Revenues.

$$\text{Margin of safety ratio} = \frac{\text{Margin of safety}}{\text{Total sales}}$$

The margin of safety can also be found by using following formulas:

$$\text{Margin of safety (in units)} = \frac{\text{NPBT}}{\text{CMPU}}$$

$$\text{Margin of safety (in Rupees)} = \frac{\text{NPBT}}{\text{CM ratio}}$$

$$\text{Margin of safety ratio} = 1 - \frac{\text{BEP sales}}{\text{Total sales}}$$

$$= 1 - \text{BEP ratio}$$

2.1.12 Target (Desired) profit analysis

CVP analysis assist in the development of detailed profit plant by allowing management to manipulate the cost volume profit relationships to determine the required sales volume needed to achieve desired profit. Target profit analysis is concerned with estimating the level of sales required to attain a specified target. Break even analysis is a special case of target profit analysis in which the target profit is zero. Most companies have a goal to make a profit not just break even so it is important to determine what level of activity is required to realize a specific income. Determination of output level at which a specified target operating income (TOI) is realized requires a simple modification in break even equation, i.e., to add target operating income to the fixed costs that needs to be covered by contribution margin.

Either the CVP equation approach or contribution margin approach can be used to find the number of units (in rupees) that must be sold to attain a target profit. They are:

$$\text{Target operating income} = \text{sales} - \text{variable cost} - \text{fixed cost}$$

$$\text{Unit sales to attain target profit (TOI Point)} = \frac{\text{Fixed cost + Target profit}}{\text{Contribution margin per unit}}$$

$$\text{Sales revenue to attain target profit (TOI point)} = \frac{\text{Fixed cost + Target profit}}{\text{Contribution margin Ratio}}$$

Income tax occupies an important space in CVP analysis. Net income is key financial measure which is affected by income tax. The net income is operating income minus income taxes. Breakeven point is not affected by income taxes because at breakeven point total revenue equal to total cost so there is no operating income to be taxed. So,

CVP analysis uses Target net income (TNI) instead of target operating income for tax purpose.

Target net income = target operating income – income tax (TOI x tax rate)

$$\text{Unit sales to attain TNI (TNI point)} = \frac{\text{Fixed cost} + \frac{\text{TNI}}{(1-\text{T})}}{\text{Contribution margin per unit}}$$

$$\text{Sales revenue to attain TNI (TNI point)} = \frac{\text{Fixed cost} + \frac{\text{TNI}}{(1-\text{T})}}{\text{Contrinutiom margin Ratio}}$$

For company producing several products instead of contribution margin, weighted contribution margin should be used.

2.1.13 Operating leverage in CVP analysis

Leverage means ability to move a large object with a small force. For manager leverage means ability to achieve a large increase in profit (in percent) with only a small increase in sales. Managers need to decide how to structure the cost function for their organization. He should know the advantage and disadvantage of those costs. One of the major disadvantages of fixed cost is that they may be difficult to reduce quickly if activity levels fail to meet expectation, thereby increasing the organizations risks of incurring loss. Operating leverage is the extent to which the cost function is made up of fixed cost.

Operating leverage measure the proportion of fixed costs in a company's cost structure and is used as a indicator of how sensitive profit is to change in sales volume. It is greatest in companies that have high fixed costs and low per unit variable cost and vice versa. If a company has high operating leverage, then profit will be very sensitive to changes in sales, i.e., small percentage increase in sales yields a large percentage increase in profit.

The degree of operating leverage is used of measure the operating leverage of firm by the following formula:

$$\text{Degree of operating leverage (DOL)} = \frac{\text{Total contribution margin}}{\text{Net Income}}$$

$$= \frac{1}{\text{Margin of safety percentage}}$$

$$= \frac{\text{Fixed cost}}{\text{Profit}} + 1$$

Manager uses the degree of operating leverage to gauge the risk associates with their cost function and to explicitly calculate the sensitivity of profits to change in sales (units or revenues)

%change in profit = % change in sales × degree of operating leverage

For example, The DOL of company X is 4. This tells us that if sales increase by 10%, net income will be increase by 40%.

The degree of operating leverage is not constant as the level of sales changes. For example at the breakeven point the degree of operating leverage is infinite since the denominator of the ratio is zero. Therefore, DOL should be used with some caution.

Cost structure of the company largely affects the operating leverage. The relation between operating leverage and the cost structure of the company is contingent. It is difficult to infer the relative proportion of fixed and variable cost in the cost structure of any two companies just by comparing their operating leverages. We can say that if two companies have the same profit, the same selling price, the same unit sales, and the same total expenses then the company with the high operating leverage will have a higher proportion of fixed costs in its cost structure (Lord, 1995:31-229).

Manager use operating leverage to calculate the effect of fluctuation in sales on operating incomes. It helps manager to gauge the risk associated with their cost function and to explicitly calculate the sensitivity of profit to change in sales. It helps manager to decide how to structure the cost function for their organization. Manager needs to consider DOL for potential new products and services that could increase an organizations fixed costs relative to variable cost. If additional fixed costs cause the DOL to reach high level, managers often use variable costs such as temporary labor rather than additional fixed costs to meet their operating needs.

The degree of operating leverage and margin of safety percentage are reciprocal. If margin of safety percentage is small, than the degree of operating leverage is large. In addition, if the margin of safety percentage is smaller as the fixed cost portion of total costs gets larger. As the level of operating activity increase above the breakeven point, the margin of safety increases and the degree of operating leverage decreases.

2.1.14 Sensitivity analysis or What if analysis in CVP

CVP analysis helps manager in the decision making process by allowing them to see how proposed change in selling price and cost structure affect the breakeven point and target income activity level. CVP analysis is used by manager as a 'what-if' sensitivity analysis tool to determine how sensitive the model is to change in the predicted data or if a key assumption changes. Sensitivity analysis examines the effect and interactions of changes in selling price, unit variable costs, fixed costs and target operating incomes. It is one of the most important terms in management accounting.

Sensitivity analysis is the name for a variety of methods that examine how an amount changes if factors involved in predicting that amount change. It is particularly important when a great deal of uncertainty exists about potential level of future sales, volume, prices or costs. An understanding of what happens to break even point and profit when if fixed costs, variable costs or selling prices should increase or decrease is in fact the most valuable part of the analysis for managerial accountant. There are generally three most common methods used for sensitivity analysis; what if analysis using contribution margin and contribution margin ratio, Margin of safety and operating leverage.

Sensitivity analysis is a what-if technique that examines how a result will change if the original predicted data are not achieved or if an underlying assumption changes (Horngren, et. al., 1999:65)

In the context of CVP analysis, sensitivity analysis answers the following questions:

a) What will be the operating income if unit sold decreases by 15% from original prediction?
b) What will be the operating income if variable cost per unit increases by 10%?
c) What will be the operating income if selling price increases by 10%?
d) What will be the effect on operating income if fixed cost increase by 10%? Etc.

The sensitivity of operating income to various possible outcomes broadens the perspective of management regarding what might actual occur before making cost commitments. A spreadsheet can be used to conduct CVP based sensitivity analysis in a systematic and efficient way. Sensitivity analysis can be easily performed by changing input data in CVP spreadsheet.

The sensitivity analysis is used by managers in the studied case had the following results:

- Assessment of some of the risks caused by the probability of a decrease in sales, which would lead to measures regarding the modification of cost structure (increase in variable cost and decrease in fixed expenses)
- The impact on operating profit (target profit) as a result of advertising expenses by deciding to advertise the eventual expansion into new markets.
- The method used (equation method) and the indicators used (the probability threshold and operational level) can influence which will be the analysis used in the next period's projections (Elena, 2008: 117)

2.1.15 Cost-volume profit analysis under conditions of uncertainty

Manager makes prediction and decisions in a world of uncertainty. Uncertainty is the possibility that an actual amount will deviate from an expected amount. The problem began with uncertainties about which product would be produced and sold. Manger could not be known which product would be sell best. They forecast the number and type of products that would sell and then made production decision accordingly. But their forecast may fail. Companies mainly face major uncertainties in their product market, where competition is often fierce and consumer taste changes rapidly. CVP analysis one of the important way for manager to cope with uncertainty. A decision model helps mangers to deal with uncertainty.

A mathematical expression of Cost-volume-profit analysis is:

$$Z = Q (P-V) – F$$

Where, Z = Total profit

Q = Sales volume in units,

P = Unit selling price

V = Unit variable cost

F = Total fixed cost

This accounting model of C-V-P analysis has been traditionally used by management accountant in profit planning. Initially all CVP models were deterministic, assuming demand and other quantities, such as price and variable cost and fixed cost were known with certainty. This traditional CVP analysis, however, ignores the uncertainty feature of the firms operation, thus severally limiting its usefulness. This problem is resolve by

use of stochastic analysis in CVP analysis model. It is a great step forward in profit planning.

Jaedicke and Robichek (1964:917-26) firstly introduce risk into the CVP analysis model. They define a stochastic Cost-volume-profit analysis model as:

$$E(z) = E(Q)[E(P) - E(V)] - E(F)$$

Where, E (Z) = expected value of profit

E (Q) = expected value of sales

E (P) = expected value of unit selling price

E (V) = expected value of unit variable cost

E (F) = expected value of fixed cost

They assume all model parameter are normally and independently distributed and that the resulting profit is also normally distributed. Thus, by computing the mean (Expected) value and standard deviation of the resulting profit function various probabilistic measure of profit can be derived.

2.1.15.1 Probability concept in CVP analysis

Probability is a key aspect the decision model approach to coping with uncertainty in CVP analysis. It helps to estimate uncertainty for each random variable, the likelihood that the random variable will take on various possible values. A probability distribution decision the likelihood of each of the mutually exclusive and collectively exhaustive set of events. The decision is made by choosing that course of action which has the highest expected value (expected monetary value).

The expected value of random variable is calculated by weighting the possible conditional value by their respective probabilities as in given below:

$$\text{Expected Monetary Value} = \sum \text{Probability} \times \text{cash inflow}$$

Probability can be obtained by forecasting model or historical model.

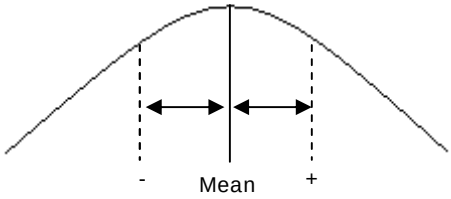
2.1.15.2 Normal distribution concept in CVP analysis

Normal probability distribution is a smooth, symmetric, continuous and bell shaped curve with equal mean and median. The area under the curve sum to 1. One half of the

area lies on left side of the mean and other half lies on the right side of mean on the horizontal axis where the values of the appropriate unknown quantity or random variable are plotted as given below.

Figure: 2.7

Normal probability distribution



A particular normal probability distribution can be determined if its mean(x) and its standard deviation (±) are known. Under this distribution is necessary to be translating into Z-values. Basically, Z-values covert each distribution into a standard normal form with a mean of zero and a standard deviation of 1. The formula used being:

$$Z = \frac{X - \Uparrow}{\exists}$$

Where, Z= standard normal variable X = required target

⊐ = standard deviation ‖ = Mean

In CVP analysis, normal probability distribution is used to determine the probability to achieve a particular target. To convert the Z-value into the actual probability estimate, it is necessary to use normal distribution table. Manager use this for making different decision relating to product. It helps manager to determine the risk involve in product. It suggests manager in the selection of product. For example: what is the probability of selling product more than 6000 unit? If Mean sales = 4000 units, standard deviation = 1200 units. Using the above equation, the value of Z will be 1.67. From the normal distribution table the actual probability estimate of Z-value 1.67 is 0.4525. Then 4.75% (.5-.4525) will be the answer (Phillips, 1994:31-36).

2.1.16 Linear programming (LP) model in CVP analysis

Linear programming refers to a technique for the formulation and solution of problems in which some linear function of two or more variables is to be optimized subject to a set of linear constraints, at least one of which must be expressed as inequality. In order to solve the some practical problems, especially decision making by the business firms, the techniques of linear programming has been developed. Linear programming technique helps to decide which particular production process should be choose for production of a commodity and what amounts of output of various product should be product so as to maximize its profit. With the given constant price of inputs and outputs, the linear programming provides numerical solution to the problem of making optimum (maximization or minimization) choice by the firm (Aujha, 2001:1057).

In CVP analysis linear programming technique is used to extend single product to multiple products with multiple constraints (raw material, labor, machine etc) on production to determine a production plan that maximize contribution margin from the product mix. The LP technique highlights the important point that the most profitable products are those that have maximum contribution margin per unit of scarce resource consumed. Generally two methods are used for LP i.e., Graphical method and simplex method. Simplex method is widely used method for any kind of solution.

LP model helps in the sensitivity of the decision to the data provided. The manager uses sensitivity analysis and parametric programming from a linear programming model to determine which data have the greatest impact on the solution. Thus, LP model are the logical extension to multi product CVP analysis for determining an optimal product mix when constraints on production and sales exist.

2.1.17 Limitations of Cost-volume-profit analysis

Cost volume profit analysis constitutes a very useful tool for management planning. However, certain underlying assumption upon which it rests place definite limitations on conclusion which can be drawn from its result. The following are the major limitation in the cost volume profit analysis:

- It is assumed that the production facilities anticipated for the purpose of cost-volume-profit analysis do not undergo any change. Such analysis gives misleading results if expansion or reduction of capacity takes place.
- In case where a variety of products with varying margins of profit are manufactured, it is difficult to forecast with reasonable accuracy the volume of sales mix which would optimize the profit.
- In cost-volume-profit analysis, it is assumed that variable costs are perfectly and completely variable at all levels of activity and fixed cost remains constant throughout the range of volume being considered. However, such situations may not arise in practical situations. Overall many variable costs are curvilinear costs.
- It is assumed that the changes in opening and closing inventories are not significant, though sometimes they may be significant.
- Inventories are valued at variable cost and fixed cost is treated as period cost. Therefore, closing stock carried over to the next financial year does not contain any component of fixed cost. Inventory should be valued at full cost in reality.

2.2 Review of the previous research work:

To get the idea and knowledge of some previous studies, related to the subject matter various thesis needs to be studied and undertaken. Since research work is related to application of CVP analysis so thesis related to particular subject are reviewed. It was very hard to get the previous dissertation in CVP analysis of Butwal hydropower company ltd and Chilime hydropower company ltd. However, some related thesis is reviewed to get related information which is discussed below.

Mr. Dhakal (2005) has conducted research work on **"Cost volume profit analysis as a tools to measure the effectiveness of profit planning and control: A Case Study of Gorkhakhali Rubber industry Limited"** an unpublished master level thesis , submitted to **Shanker Dev Campus Faculty of Management , Tribhuvan University.**

His main objectives:

- To analyze the cost volume profit for the company.
- To measure the effectiveness of profit planning and control tools.
- To examine the variation between production plan and actual production.

His Major findings:

- Sales plan of GRIL is not properly maintained. The industry uses the various methods for sales planning like market survey, distribution network etc. but up to date record are not maintained. So they have poor budgeting system.
- GRIL is in high interest bracket, out of the total fixed costs almost 60% is to be paid for interest.
- This industry does not have any detailed and systematic practice of planning of cost which is one of the essential elements of profit planning and control.

His main recommendation:

- GRIL should clearly define its goal and objectives and management should develop annual (tactical) and long (strategic) term profit plan.
- The industry if possible should establish separate costing department. Cost classification must be made within the specific framework of responsibility and time.
- GRIL is bearing huge amount of fixed cost for employee expenses which is not good for the organization. It should initiate the cost control program.

Mr. Gurung (2006) has done a research on **"Cost volume profit analysis of public enterprises in Nepal"** an unpublished master level thesis, submitted to **Shanker Dev Campus Faculty of Management ,Tribhuvan University.** He has done comparative analysis between Nepal telecom and Nepal electricity.

His main objectives:

- To study and analyze the existing provision regarding cost of public enterprises in Nepal i.e. NTC and NEA
- To identify breakeven level of both enterprises for avoiding losses.
- To study comparatively about P/V ratio, BEP, margin of safety and sales volume of these enterprises.

His major findings:

- Segregation of fixed and variable cost is ignored by both enterprises. CVP analysis is not practicing by these enterprises. No any method has been adopted to segregate cost into fixed or variable.

- Variable cost of NTC is very less compare to its fixed cost and contribution margin ratio of NTC is very high. But NEA has high variable cost and its contribution margin ratio is less.
- Sensitivity test shows that the changes in various factor cause to increase or decrease the CM ratio. BEP, margin of safety etc. Both the enterprises has same impact on sensitivity test.

His main recommendations:

- In Nepal most of public or private enterprises have not practices CVP analysis in systematic manner. So it is suggested that every public or private enterprises should apply or practice CVP analysis.
- CVP analysis shows the relationship among the variable related to cost, revenue profit. So this tool is very much useful to every organization.
- Cost plan of both enterprises are not systematically maintain so cost of every sector should plan properly.

Mr. Poudel (2007) has conducted research work on **"Cost volume profit analysis tools used to project by salt trading corporation limited"** an unpublished master level thesis submitted to **Shanker Dev Campus Faculty of Management , Tribhuvan University.** . The aim of the study was to determine how CVP analysis is to use project profit in Salt trading corporation limited.

His main objectives:

- To analyze the cost and profit and loss of STCL.
- To study the relationship of cost, volume and profit.
- To analyze the impact of CVP of the company of productivity.

His major findings:

- Total sales of the corporation were unstable.
- Expenses of STCL were fluctuated. Variable cost as well as fixed cost increased or decreased during the period.
- The corporation has no details of systematic expenses plan. The fixed, variable, and mixed expenses planning are essential for profit planning and control.

His main recommendations:

- It is suggested that every public and private enterprises should apply CVP analysis.
- CVP analysis shows the relationship of cost, revenue, profit. So, this tool is very much useful to every organization in formulating profit plan for future.
- STCL should follow CVP analysis to reach breakeven point which helps in presentation of sales plan, purchase plan and selling price of its product.

Mr. Adhikari (2008) has done a research on **"Cost volume profit analysis as managerial tools to plan profit of Bottlers Nepal ltd"** an unpublished master level thesis submitted to **Shanker Dev Campus Faculty of Management , Tribhuvan University.**

His main objectives:

- To study relationship to cost volume and profit as managerial tool to plan profit.
- To analyze the cost volume profit of the company and its impact in planning profit.
- To evaluate the sensitivity on profitability.
- To provide suggestion and recommendation of operation of BNL.

His major findings:

- Segregation of fixed and variable cost is ignored by BNL. No any method has been adopted to segregate cost into fixed or variable.
- Sales and production target are not achieving because there is not an effective forecasting system.
- Enterprises has no financial plan, they have only sales and production plan in terms of required budget.

His main recommendations:

- Analyse the SWOT.
- Apply participatory management system..
- Apply budgetary control system.
- Classify the cost.

Mr. Gurung (2008) has conducted research on **"Cost volume profit analysis of public enterprises in Nepal"** an unpublished master level thesis submitted to **Shanker Dev**

Campus Faculty of Management , Tribhuvan University. He has done comparative analysis between Nepal Telecom and Nepal Electricity Authority.

His main objectives:

- To study and analyze the existing provisions regarding cost volume and profit analysis of public enterprises in Nepal ie NTC & NEA
- To study & find out the current comparative analysis between these two big public enterprises.
- To identify the factors that affects benefit and cost of these enterprises.

His major findings:

- The income of NEA is higher than NTC in each year and expenditure of NEA is also higher than NTC in same ratio.
- After segregated the cost into fixed and variable the percentage ratio of NTC are 66 and 34 respectively whereas NEA's percentage ratio are 46 & 54 respectively. In conclusion this analysis articulate that fixed ratio of NTC is higher than NEA whereas variable ratio of NTC is lower than NEA.
- Ratio of profit to sales of NTC is in linear trend whereas NEA's in non linear trend (decreasing).

His main recommendation:

- Cost volume profit analysis is the part of analysis tools of profit planning & control. The researcher found in rare enterprises utilization of its concept. The important of its use and very sensible to examine the relationship between charges in activity (i.e. output) and changes in total sales revenue, expenses and net profit should be aware/implement to each organization.
- The income of both enterprises i.e. NTC an NEA are increasing trend which shows the status of both enterprises are better. But in reality the expenditure of NEA is higher than NTC. So NEA should reduce its cost to get more profit.
- These enterprises should utilize the full capacity of fixed asset which help to obtain more sales and minimize the operating cost too.

Mr. Poudel (2009) has conducted research on **"Cost volume profit analysis of information technology magazine publication house"** an unpublished master level thesis submitted to **Nepal Commerce Campus, Faculty of Management, Tribhuvan University.**

His main objectives:

- To analysis the trend of break even point
- To analysis the fixed cost utilization at the optimum level.
- To reduce cost by increasing the span of control since fewer supervisors are needed.
- To help the management for considering expected future trends and conditions.
- To suggest the management to give time and adequate attention to the effect of the expected trend of general business condition and recommend with the help of major findings.

His major findings:

- Profit volume ratio is also in decreasing trend due to low contribution margin that can be derived from sales less variable cost.
- Contribution margin per unit is in decreasing trend due to increasing trend of the variable cost per unit and it is all due to increasing price of printing material as well as printing charge.
- Break Even Points are in increasing trend which seems that the company has use higher amount of capacity to over come with break even point.\
- Fixed cost as well as variable cost per unit is in increasing trend.

His main recommendation:

- The company should try to reduce the fixed cost bearing expenses heads if possible and look after the idle fixed costs.
- It should try to increase its current operating capacity because it is under utilized over the years.
- Company should try to make higher pricing decision than current selling price.

Mr. Kairatee (2010) has conducted research on **"Cost volume profit analysis in decision making"** an unpublished master level thesis submitted to **Shanker Dev Campus Faculty of Management , Tribhuvan University.** He has done comparative analysis between Butal Hydropower Company and Chilime Hydropower Company Ltd.

His main objectives:

- To determine how the various tools and techniques of CVP analysis are used in profit planning and decision making of CHPCL and BPC.
- To analysis the Breakeven level and Margin of Safety of both Company and compare them.

- To evaluated the sensitivity on profitability.
- To study and analysis the variable and fixed of BPC and CHPCL along with Contribution margin and operation profit.

His major findings:

- The generation of electricity from the both Company is found increasing every year but still they are unable to meet their installed Capacity.
- Although, the fixed cost of CHPCL is much higher than BPC its has high operating profit due to high sales units and average selling price.
- The sales of CHPCL is far greater than sales of BPC.
- The Fixed Cost of CHPCL is much greater higher than BPC.

His main recommendation:

- The average selling price of BPC with NEA is greater than local consumer. So BPC should focus on selling to NEA.
- The average load factor of both companies is far less i.e. about 30% installed capacity is unutilized. Both the companies should control the major break down to utilize their maximum capacity.
- The internal consumption control over such losses in order to reduce the difference of sales with CHPCL.
- BPC supplies excess energy to grid which should be reduced as it increase the sales of the company.

2.3 Research Gap

Some research studies were made on Cost Volume Profit Analysis. All of these research works have many useful findings as discussed above. But the study didn't find any research work about the particular topics 'Application of cost volume profit analysis in Hydropower Company with reference to Chilime Hydropower Company and Butwal Power Company'. Although some research work were carried on Chilime Hydropower Company and Butwal Power Company but they only focus on analysis of income and expenditure. They lacked detailed CVP analysis. Similarly, the research on CVP analysis on other company. The study attempted to provide clear picture of CVP analysis and its use in planning and decision making in Hydropower Company. Probably this might be the first research study on CVP analysis of Hydropower Company.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design:

A research design is the arrangement of condition for collection and analysis of data in a manner that aims to combine relevance to research purpose with economy in procedure. It is a logical, systematic planning & direction of a piece of research. It provides blueprint for the research work. It includes plan, structure & strategy of investigation to obtain the answers to research questions and to control variances. A detailed outline of various activity to be performed & how, resources required & time taken to complete those activity are presented in research design. The activities are predetermined to be performed during research work under research design.

Research design is an important part of research work; if the design is defective the result obtained will be useless. Therefore, careful attention should be given regarding the preparation of research design; otherwise there will be no effective use of resources. Thus, the research design minimizes the mistake during the period of research work.

This research work attempt to show relationship among cost, volume, and profit for profit planning in Hydropower Company with Reference to Chilime Hydropower Company and Butwal Power Company limited. The comparative cost, volume, & profit analysis of these two companies are presented and analyzed by descriptive research design and analytical method. The Descriptive research design analyses the fact & figures and generalize them in descriptive manner. Basically, secondary data of financial performance are used for study. The descriptive research design in context of CVP analysis of CHPCL and BPC is more focused to show the cause of increase or decrease CVP variables in profit planning.

3.2 Research Population and Sample

The Hydropower Company of Nepal has been used as a research population for the study. Due to various circumstances and lack of time & resources it could not be possible to attempt all the numbers of research population in this research. So, Chilime Hydropower Company Limited and Butwal Power Company is considered as sample study through random judgment basis which are huge and most important Public Limited Company of Nepal in hydroelectricity sector. Similarly, the financial statement of six years beginning from the fiscal year 2060/61 to 2065/66 is selected for the purpose of research.

3.3 Sources of data

There are primary and secondary sources of data. Both the primary and secondary sources are essential to attain the objective of the study. This study is based on secondary sources of data, however, primary sources has not been ignored. They are used for more clarification during the study if required.

The primary data are collected through direct shortcut interview with related personnel of CHPCL & BPC. The secondary data are collected from various published sources like annual report, journals, magazine, books, previous dissertations, websites, SDC & SEBON library, brochures, Publication of Ministry of water resources, newspaper & bulletins etc.

3.4 Data Collection Techniques

For the data collection techniques, primary data are collected from short cut interview with related person of CHPCL and BPC. Various questions have been asked to related officer but they had provided useful annual report to obtain required information. Thus, questionnaire has not been utilized. To collect the quality and realistic data related officer has been visited from time to time as per requirement and to remove confusion.

This study is mainly based on secondary sources of data obtained from various sources. The output of this research work depends upon accuracy of data obtained from various sources. As far as possible full effort has been given to collect accurate data.

In order to collect secondary data, the following procedure has been conducted:

a) Library of SDC and SEBON
b) Books, Journal, Newspaper & Magazine
c) Booklets

d) Companies' publication like Annual reports, Brochures, bulletins, articles etc.
e) Internet and Websites etc.

The collected data, fact & figures has been processed by editing, tabulating & calculating in order to obtain required result which is shown in various form like percentage, amount, volume, ratio & graph for clear presentation.

3.5 Research Variables

This research work is focused to profit planning of CHPCL & BPC through CVP analysis. There are different variables to be analyze under CVP analysis for profit planning which are the research variable for the study. They include:

1) Cost
2) Volume in terms of quantity and amount
3) Price
4) Profit

3.6 Data Processing and Presentation

The data collected for analysis are in raw form which needs to process for its systematic use. It should be summarized. Generally, data processing includes editing, coding, categorizing and tabulation. This research work uses profit & loss account, Balance sheet, cash flow statement, cost details sheet, publication, annual report, previous thesis of Research Company as a raw data. This data are processed by editing & categorizing in a table in a systematic way so, that related data can be easily retrieved. The multiple bar diagram has been used for presentation of data in graphical format throughout the study.

3.7 Data analysis Tools and Techniques

In order to draw the conclusion and recommendation of every research work there is need of data analysis tools and techniques. The collected data needs to analyze by various tools and techniques. The tools and techniques depend upon the type of research work and the systematic presentation of collected data. This research work is directed towards profit planning in CHPCL and BPC through Cost volume profit analysis. So, the tools and techniques of CVP analysis used for analysis in CHPCL and BPC are discussed below.

1) Descriptive tools and techniques

The descriptive technique is used to simplify the understanding as well as analysis of data in theoretical form. It describes how the data are behaving in descriptive way which helps to draw the conclusion and recommendation easily.

2) Quantitative tools and techniques:

Quantitative tools and techniques are the main tools for systematic analysis of data. It provides tools in mathematical form to analyze the data. As the research work is based on use of CVP analysis in CHPCL and BPC for profit planning, the tools used for the analysis of data are given below.

a) Contribution margin = Sales – Variable cost

$$\text{Contribution margin per unit} = \frac{\text{Contribution margin}}{\text{Sales unit}}$$

$$\text{Contribution margin ratio} = \frac{\text{Contribution margin}}{\text{Sales revenue}}$$

This tool is used to analyze profit after deducting the cost which is directly related to sales unit.

b) $$\text{Variable cost ratio} = \frac{\text{Variable cost}}{\text{Sales revenue}}$$

This tool is used to analyze the percentage of variable cost in sales.

c) Break even tool analysis

$$\text{Breakeven price} = \text{Variable cost per unit} + \frac{\text{Fixed cost}}{\text{Sales unit}}$$

This tool is used to analyze the per unit price to be set in order to cover the cost per unit and generate the profit.

$$\text{Break even point (In units)} = \frac{\text{Fixed cost}}{\text{Contribution margin per unit}}$$

This tool is used to determine the minimum quantity to be produced and sold to cover all the cost of the company.

$$\text{Break even point (In Rupees)} = \frac{\text{Fixed cost}}{\text{Contribution margin ratio}}$$

This tool is used to identify the minimum value of goods to be sold to cover all the cost of the company.

$$\text{Break even ratio} = \frac{\text{Break even point (in unit or rupees)}}{\text{Sales (In unit or rupees)}}$$

This tool is used to identify the percentage of breakeven point in sales.

d) Margin of safety tool analysis

Margin of safety (in units) = Sales in unit – Breakeven point in units

This tool is used to identify the quantity remain for generating profit of the company.

Margin of safety (in rupees) = Sales in rupees – Breakeven point in rupees

This tool is used to identify the amount remaining to generate profit after covering all the cost.

$$\text{Margin of safety ratio} = \frac{\text{Margin of safety (In unit or rupees)}}{\text{Sales (In unit or rupees)}}$$

This tool analyzes the percentage of margin of safety in sales to generate profit.

e) Operating leverage analysis

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Operating profit}}$$

This tool is used to analyze the sensitivity of profit with sales.

f) Sensitivity Analysis is done to identify the sensitivity of BEP & MOS with various changes in CVP variables.

3.8 Limitation of Research Methodology

a) It mainly focused on secondary sources of data. The primary sources are only used for clearance of information.

b) It largely uses the tools and techniques regarding CVP analysis. The statistical tools are ignored.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

4.1 Electricity generation and sales of Butwal Power Company Limited (BPC) and Chilime Hydropower Company Limited (CHPCL)

It can be known that Electricity Act has opened energy sector for the private sector. Any person or corporate body who desires to conduct survey, generation, transmission, or distribution of electricity should submit an application to prescribed officer along with the economic, technical and environmental study report. They must obtain survey license, generation license, transmission license, and distribution license. No such license shall be required up to 1,000 kilowatt.

After obtaining the license, electricity can be generated and sold. If any person desires to sell the electricity in bulk, the Government of Nepal purchases such electricity to the national grid. For the sales of electricity, two types of market i.e. domestic and export are available. Domestic market includes local consumer and NEA. Hydropower Company has to sign the Power purchase agreement (PPA) with Nepal Electricity Authority (NEA) which is a government owned national utility for the sales of electricity. PPA policy is restricted only to projects of 5 MW capacities and below. There is no PPA policy for project above 5 MW. The PPA rates from hydropower company i.e. independent power producers (IPP) is set at the level of Rs. 3.90 per KWh for wet season and Rs. 5.52 per KWh for dry season. For the export of electricity bilateral arrangement exist with India.

Butwal power company limited (BPC) and Chilime hydropower company limited (CHPCL) are one of the leading hydropower companies which generate and sells electricity on the basis of above conditions. They only sales electricity to domestic market i.e. local consumer and Nepal electricity authority (NEA). Electricity is produced at large generating stations, which is then transmitted at high voltage to the load centers and transmitted to consumer at the reduced voltage through local distribution systems.

4.1.1 Butwal Power Company limited (BPC)

Energy generation and sales are the core business of the company. The major portion of revenues comes from electricity sales. BPC's generation business is responsible for the smooth operation and maintenance of its two power plants, the 5.1 Megawatt (MW) Andhi Khola and 12 Megawatt (MW) Jhimruk. Both of them were in full operation.

Total capacity = 5.1 MW + 12 MW = 17.1 MW

Total capacity in a year = (5.1x 24x 365) MWh + (12 x 24 x 365) MWh

= 44,676 MWh + 1,05,120MWh

= 1,49,796MWh

=14,9796x 1000 KWh

=14,97,96,000 KWh

Generation of Electricity: Generation division is solely responsible for smooth operation and maintenance of BPC's power plant. The generation of electricity of electricity for 6 years was given below.

Table 4.1

Generation of electricity

Year	Generation				Total		
	Andhi Khola centre		Jhimruk Centre				
	Qty (KWh)	Plant Factor (%)	Qty (KWh)	Plant Factor (%)	Qty (KWh)	Plant Factor (%)	Change (%)
2060/61	3,90,33,000	87.37	5,10,03,906	48.52	9,00,36,906	60.11	-
2061/62	4,02,99,350	90.20	5,75,15,687	54.71	9,78,15,037	65.30	8.64
2062/63	4,03,17,580	90.24	6,17,59,757	58.75	10,20,77,337	68.14	4.36
2063/64	4,07,35,100	91.18	6,32,45,613	60.17	10,39,80,713	69.41	1.86
2064/65	4,01,98,200	89.98	6,71,93,384	63.92	10,73,91,584	71.69	3.28
2065/66	3,66,69,650	82.08	6,45,41,732	61.4	10,12,11,382	67.56	(5.75)
Total	23,72,52,880	-	36,52,60,079	-	60,25,12,959	-	-

(Source: Annual reports of BPC, 2060/61 – 2065/66)

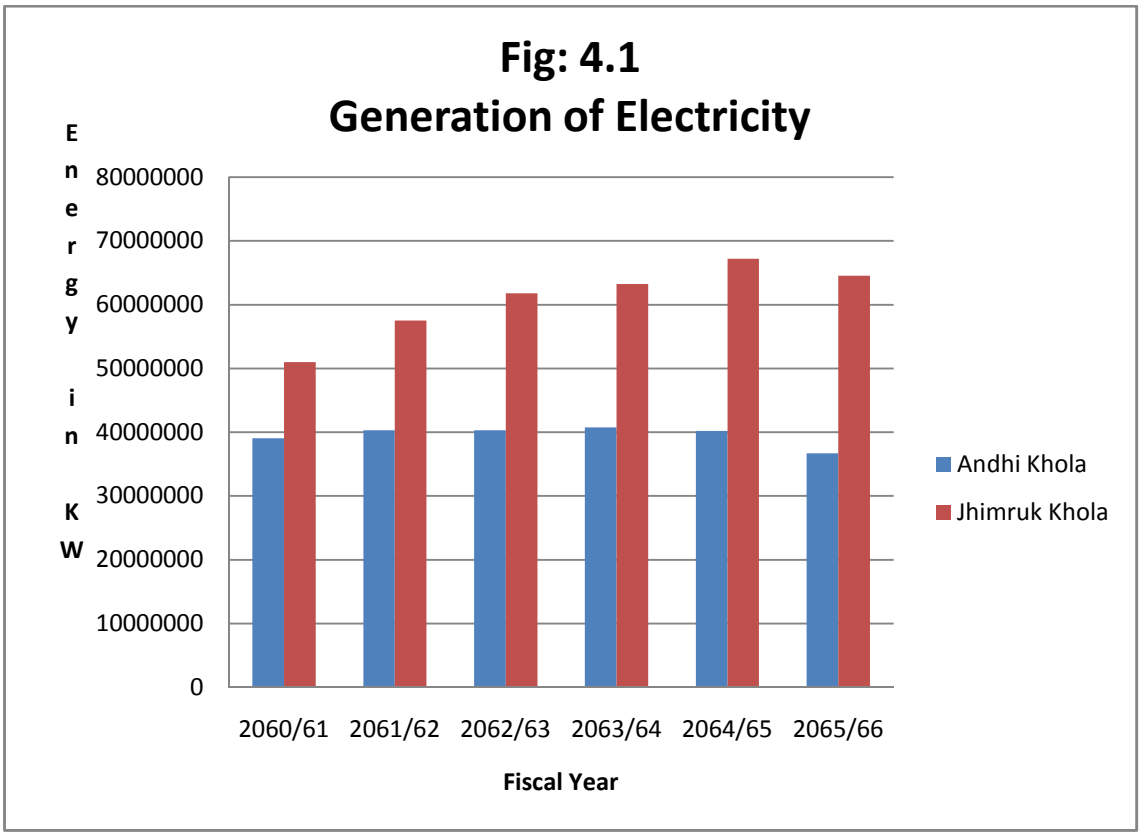


Fig: 4.1
Generation of Electricity
Energy in KW
80000000
70000000
60000000
50000000
40000000
30000000
20000000
10000000
0
2060/61
2061/62
2062/63
2063/64
2064/65
2065/66
Fiscal Year
Andhi Khola
Jhimruk Khola

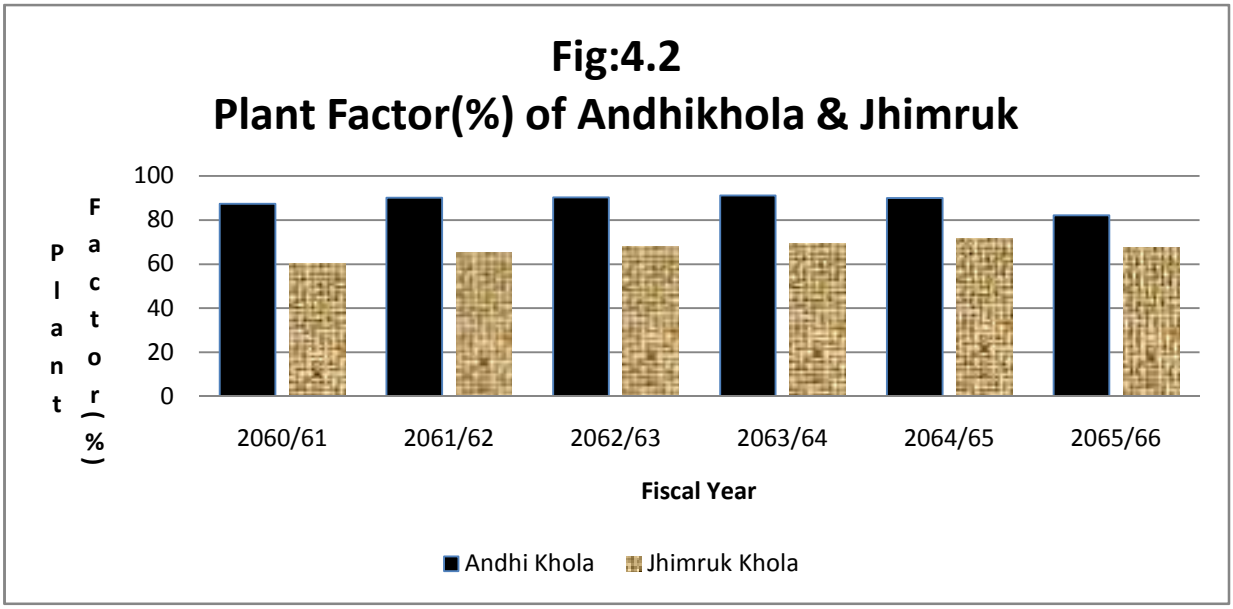


Fig:4.2
Plant Factor(%) of Andhikhola & Jhimruk
Plant Factor (%)
100
80
60
40
20
0
2060/61
2061/62
2062/63
2063/64
2064/65
2065/66
Fiscal Year
Andhi Khola
Jhimruk Khola

The Table 4.1 shows that BPC generates electricity from two plants. In the fiscal year 2060/61 BPC has generated 9,00,36,906 KWh electricity. The generation of electricity from both the plant is increasing every fiscal year in the except fiscal year 2065/66. The total of electricity generation from both the plant reached to 10,73,91,584 KWh in fiscal year fiscal year 2064/65 which is the highest of the study period. The average load factor in the fiscal year is 71.69%. Though the electricity generation is increasing every year it is unable to achieve the installed capacity of 14,97,96,000 KWh. The table shows that the generation has decreased in the fiscal year 2064/65 from Both plant by 5.75%.Andhikhola HP generated 36.67 GWh, 8.78% less than last year ,with a plant factor of 82.08%. The decline in energy generated was due to a major breakdown of the generating unit and low river discharge in the months of Chaitra and Baishakh. Jhimruk HP generated 64.54 GWh with a plant factor of 61.4% ,a decrease of 3.95% over last year. The lack of winter rain and low river discharge in the month of Chaitra and Baishakh were the major reason for the decrease in electricity generation.

Sales of Electricity:

BPC sales electricity from two plants. The sales of generated energy are in two forms- Bulk sales to Nepal electricity authority (NEA) under Power Purchase Agreement (PPA)and retail sales to BPC's own customer(local consumers). The largest portion of revenues comes from sales to NEA.

Sales to NEA

BPC sales electricity to NEA from two plant; Andhi Khola and Jhimruk. The sales rate is different from both plants depending upon wet and dry season. BPC sold electricity to NEA on contract basis. It has a contract of supplying 30GWh and 55GWh from Andhi Khola and Jhimruk respectively till the fiscal year 2065/66.

Table 4.2

Sales to NEA

Year	Centre						Total	
	Andhi Khola			Jhimruk				
	Qty (KWh)	Rate	Amount (Rs)	Qty (KWh)	Rate	Amount (Rs.)	Qty	Amount (Rs.)
2060/61	2,69,49,605	2.65	7,14,16,454	4,85,32,232	3.67	17,81,13,294	7,54,81,837	24,95,29,748
2061/62	2,77,04,586	2.81	7,78,49,886	5,37,13,490	3.89	20,89,45,477	8,14,18,076	28,67,95,363
2062/63	2,74,73,888	2.98	8,18,72,188	5,74,29,867	4.12	23,66,11,053	8,49,03,755	31,84,83,241
2063/64	2,73,37,599	3.16	8,63,86,812	5,69,47,341	4.37	24,88,59,880	8,42,84,940	33,52,46,692
2064/65	2,66,20,967	3.35	8,91,80,239	6,11,96,808	4.63	28,33,41,221	8,78,17,775	37,25,21,461
2065/66	2,38,21,056	3.55	8,45,64,748	5,91,72,776	4.91	29,05,38,330	8,29,93,832	37,51,03,078
Total	15,99,07,701	-	49,12,70,327	33,69,92,514	-	1,44,64,09,255	49,69,00,215	1,93,76,79,582

(Source: Annual reports of BPC, 2060/61 – 2065/66)

BPC sold major portion of electricity to NEA. The table 4.2 shows that the sales of electricity to NEA from Andhi Khola in KWh are in decreasing stage. However, the sales increase by 2.80% in 2061/62. The major reason behind such reduction in supplying electric energy is increase in demand from local consumer. The plant is also unable to meet targeted quantity (30 GWh) to be sold to NEA due to frequent major breakdown of the plant. Though the sales in KWh are decreasing, the sales in rupees are increasing due to increase in tariff rates. Likewise, the sale of electricity in KWh and Rupees from Jhimruk plant to NEA is in increasing stage except reduction in fiscal year 2063/64 by 0.84%. The plant is unable to meet the contracted quantity (55 GWh) to be sold to NEA in fiscal year 2060/61 and 2061/62. Though, the sales quantity to NEA is fluctuating, but revenues obtained from sales are increasing.

Sales to local consumer:

Sales to consumer or distribution in BPC started through Andhi Khola hydroelectric and rural electrification project (AHREP) in 1990 AD. BPC distribute electricity in 4 districts of westerns and mid westerns region of Nepal. The districts are Syangia, Palpa, Pyuthan, and Arghakhanchi. BPC consumer are categorize as either industrial or domestic, and domestic consumer are further subdivided into metered and cutout. There are 28,761 consumers in the fiscal year 2064/65. These consumers are provided service through two distribution centre and two branch offices. These two distribution centre

are Syangia/Palpa distribution centre located at Galyang and Pyuthan/Arghakhanchi distribution centre located at Nayagaun, Pyuthan.

Distribution division is responsible for technical and financial planning, design, construction, operation and maintenance of the distribution. BPC distributes electricity to consumer through user's organizations (UOs) which helps in construction of Distribution Network through labor contribution as well as in the operation and maintenance of network and revenue collection. Presently (2065/66),UOs has reached to 82 to provide service to consumers.

Table 4.3

Electricity sales to consumer

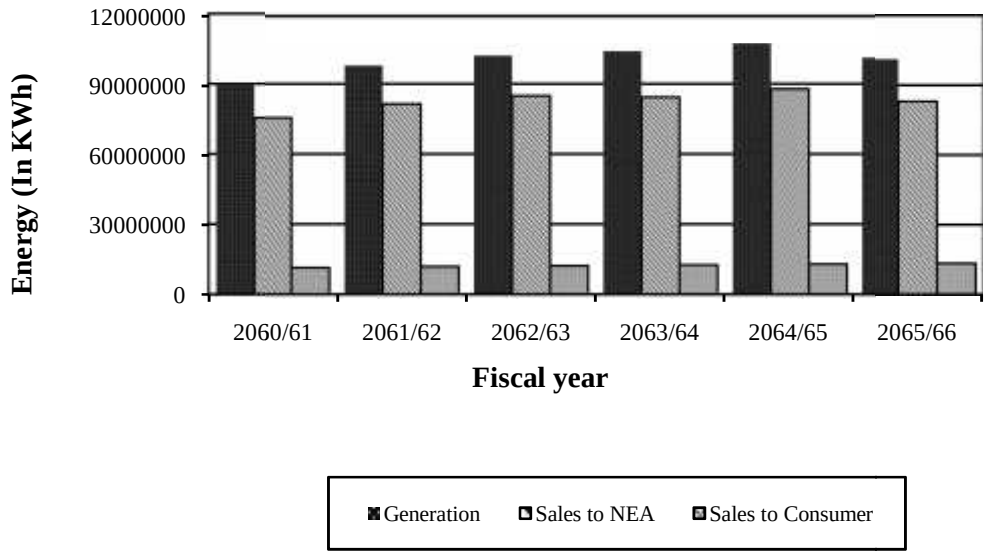
Year	Centre						Total	
	Andhi Khola			Jhimruk				
	Qty (KWh)	Rate	Amount (Rs)	Qty (KWh)	Rate	Amount (Rs.)	Qty	Amount (Rs.)
2060/61	1,01,90,482	2.81	2,86,76,066	11,67,058	4.25	49,61,576	1,13,57,540	3,36,37,642
2061/62	1,04,41,368	2.91	3,03,91,097	13,84,046	4.30	59,47,421	1,18,25,414	3,63,38,518
2062/63	1,05,93,895	3.10	3,27,98,925	15,58,702	4.58	71,36,950	1,21,52,597	3,99,35,875
2063/64	1,08,44,924	3.41	3,70,68,077	16,83,005	5.07	85,34,741	1,25,27,929	4,56,02,818
2064/65	1,09,07,116	3.626	3,95,56,512	19,64,832	4.89	96,09,520	1,28,71,948	4,91,66,032
2065/66	1,11,89,440	3.942	4,41,12,337	21,55,574	5.37	1,15,84,782	1,33,45,014	5,56,97,119
Total	6,41,67,225	-	21,26,03,014	99,13,217	-	4,77,74,990	7,40,80,442	26,03,78,004

(Source: Annual reports of BPC, 2060/61 – 2065/66)

The above table 4.3 shows that revenue from sales of electricity to local consumer is increasing every fiscal year. The revenue from sales reached to Rs. 5,56,97,119 in fiscal year 2065/66 which was only Rs. 3,36,37,642 in fiscal year 2060/61. The main reason behind it is increasing demand from local consumer. Every year new consumers are adding. So, it also purchases electricity from NEA to meet the demand. Similarly, the rate per KWh is also increasing every year. However, it is found that the rate/KWh is decreased by 3.55% from Jhimruk plant in fiscal year 2064/65 and this rate is increased by 9.8%.

Figure: 4.3

Generation, sales to NEA and Sales to consumer (In KWh)



Internal consumption and Transit loss

BPC uses huge amount of energy in internal consumption and transit loss. This is one of the main reasons that cause variation in generation and sales as shown in fig 2.6. This increases the gap between generation and sales which is fulfilled by purchasing from NEA. More internal consumption and transit loss means loss of revenue. The internal consumption has reached to 52,91,209 KWh in fiscal year 2064/65 which was only 32,02,468 in fiscal year 2060/61, although this loss is decreased and reached to 52,43,506 in fiscal year 2065/66.These figures are far greater than internal consumption and transit loss in CHPCL as shown in table 4.8. For loss minimization it uses Tamper Proof seal in the distribution system. It helps to control the unauthorized and illegal use of electricity.

Table 4.4

Internal Consumption & Transit loss (In KWh)

Year	Internal consumption		Transit Loss		Total
	Andhi Khola	Jhimruk	Andhi Khola	Jhimruk	
2060/61	1,06,849	3,29,966	15,92,884	11,72,769	32,02,468
2061/62	1,10,398	2,51,018	20,00,444	8,74,197	32,36,057
2062/63	1,33,765	2,32,990	21,07,042	11,14,942	35,88,739
2063/64	1,20,382	2,34,204	26,73,935	12,91,807	43,20,328
2064/65	1,18,905	2,30,642	30,63,764	18,77,898	52,91,209
2065/66	1,36,313	2,42,313	28,57,031	20,07,849	52,43,506
Total	7,26,612	15,21,133	1,42,95,100	83,39,462	2,48,82,307

(Source: Annual reports of BPC, 2060/61 – 2065/66)

Excess energy after selling to NEA and local consumer are supplied to national grid with free of cost which may contribute sufficient revenue.

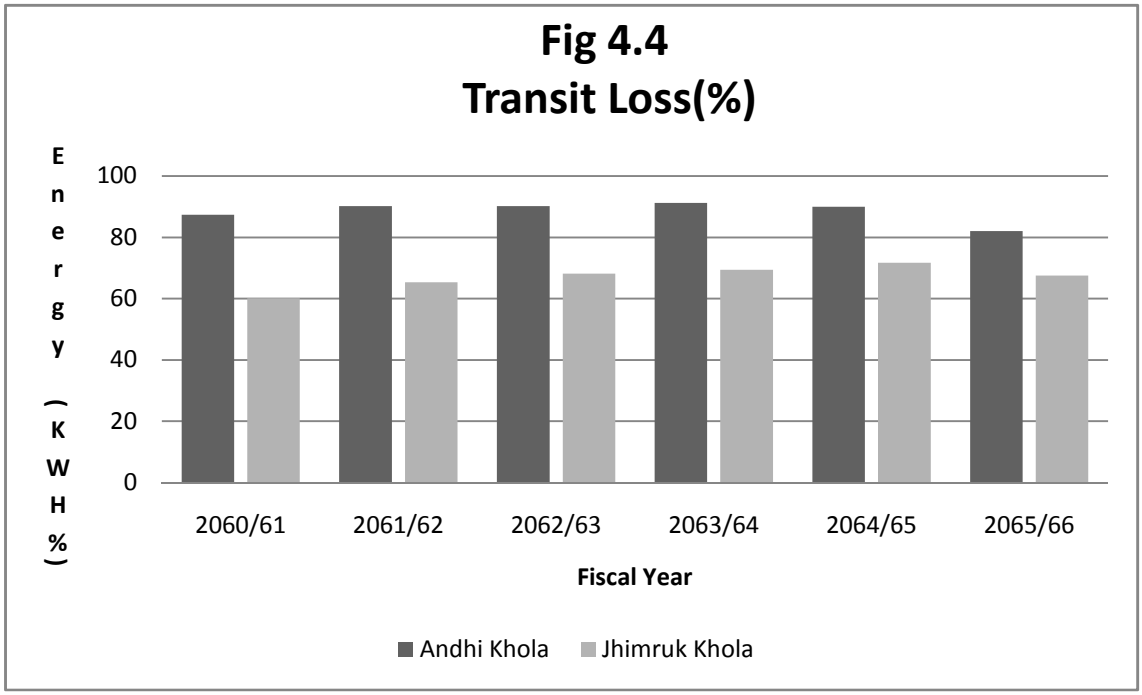


Table 4.5

Excess energy supplied to National grid

Year	Centre		Total
	Andhi Khola	Jhimruk	
2060/61	1,93,180	-	1,93,180
2061/62	42,554	12,92,936	13,35,490
2062/63	8,990	16,74,626	16,83,526
203/64	-	35,18,016	35,18,016
2064/65	10,168	21,86,184	21,96,352
2065/66	-	13,11,130	13,11,130
Total	2,34,556	73,97,020	1,02,37,694

(Source: Annual reports of BPC, 2060/61 – 2065/66)

Purchase of electricity from Nepal Electricity Authority:

BPC also purchase electricity from NEA under the Power Purchase Agreement (PPA). Generally, it purchases the electricity at the rate it has been sold to NEA.

Table 4.6

Electricity purchase

Year	Centre						Total	
	Andhi Khola			Jhimruk				
	Qty (KWh)	Rate	Amount (Rs.)	Qty (KWh)	Rate	Amount (Rs.)	Qty	Amount
2060/61	-	-	-	1,98,119	3.67	7,27,097	1,98,119	7,27,097
2061/62	-	-	-	1,48,343	3.89	5,77,054	1,48,343	5,77,054
2062/63	-	-	-	2,51,371	4.12	10,35,649	2,51,371	10,35,649
2063/64	2,41,740	3.16	7,63,898	4,28,760	4.37	18,73,681	6,70,500	26,37,580
2064/65	5,22,720	3.35	17,51,112	2,62,980	4.63	12,17,597	7,85,700	29,68,709
2065/66	13,34,189	3.55	47,36,372	3,47,910	4.91	17,08,238	16,82,099	64,44,610
Total	20,98,649	-	72,51,382	16,37,483	-	71,39,316	37,36,132	1,43,90,699

(Source: Annual reports of BPC, 2060/61 – 2065/66)

From table 4.6, it is seen that BPC purchased sufficient amount of electricity from NEA to meet the demand of local consumer. The table shows that it mainly purchases the electricity from Jhimruk centre. The purchase of electricity reached to Rs. 64,44,610 in fiscal year 2065/66 which is considered as highest up to this date. BPC purchases electricity at the same rate as it had sold to NEA.

4.1.2 Chilime Hydropower Company limited (CHPCL)

Electricity generation and sale is also a core business of Chilime Hydropower Company limited. Chilime hydropower plant is a peaking run off river type plant Constructed and fully owned by Chilime Hydropower Company limited. The electricity generated from the plant is purchased by Nepal electricity authority (NEA) under Power Purchase Agreement (PPA) made on in Ashad 2054 BC. The plant has started its commercial generation from 00:00 hours of 8th Bhadra 2060 BC. The plant has been operating successfully in terms of meeting generation targets. The generated electricity from the plant is being fed to the National Grid.

Total installed capacity = 22.56 MW

Total capacity in a year = (22.56 x 24 x 365) MWh

= 1,97,625.6 MWh

= 1,97,625.6 x 1000 KWh

= 19,76,25,600 KWh

Generation of Electricity

CHPCL generate electricity from single plant. The Generation of electricity from Chilime hydropower plant for six fiscal years (i.e. from fiscal year 2060/61–2065/66) was given below:

Table 4.7

Generation of electricity

Year	Generation (KWh)		Average yearly plant factor (%)	% change
	Deemed	Actual		
2060/61	11,51,98,000	11,58,38,700	58.62	-
2061/62	13,27,95,000	13,37,12,700	67.66	15.43
2062/63	13,32,23,644	14,20,22,000	71.86	6.21
2063/64	13,27,90,000	14,67,03,010	74.23	3.30
2064/65	13,27,95,000	14,27,96,000	72.26	(2.66)
2065/66	13,27,80,000	14,45,20,000	73.12	1.2
Total	77,95,81,644	82,55,92,410	-	-

(Source: Annual reports of CHPCL, 2060/61 – 2065/66)

The table shows that the generation from the plant, for last Six years, has been fairly higher than the deemed generation. The main equipment has proven to be robust and the whole electro mechanical system design has proven to be effective and equal to the conditional and practices of the Nepalese system. The highest generation of electricity is 14,67,03,010 (average load factor is 74.23%) in fiscal year 2063/64. In fiscal year 2064/65 the generation is reduced by 2.66 % i.e. generation reached to 14,27,96,000 KWh. And then in fiscal year 2065/66 the generation is increased by 1.2% i.e. generation reached to 14,45,20,000 KWh. The average load factor for this period is 73.12%.

Sales of electricity to NEA

The generated electricity from the power plant is purchased by Nepal electricity authority (NEA) under the Power Purchase Agreement (PPA). The annual deemed energy saleable to NEA is 132.9 GWh excluding penalty free outage of 36 hours (720 MWh) annually. It does not sales electricity to local consumers

Table 4.8

Sale to NEA

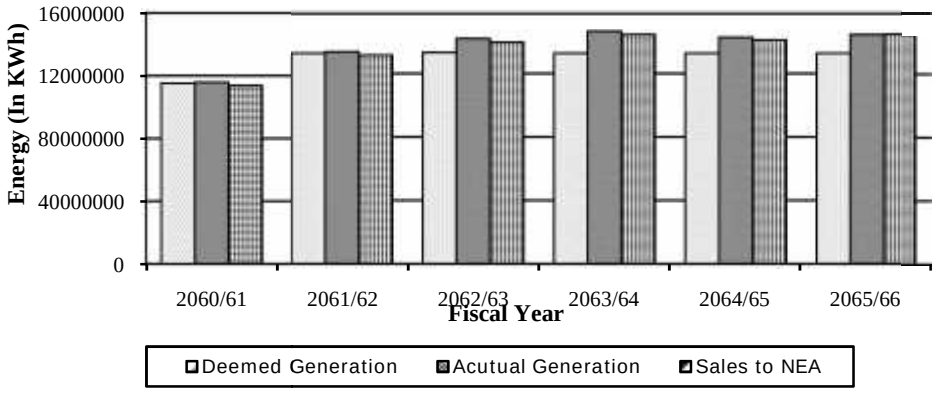
Years	Qty(KWh)	Average rate	Amount(Rs.)	% change
2060/61	11,38,09,970	5.2151	59,35,35,790.49	-
2061/62	13,15,68,000	5.2598	69,20,26,572.73	16.59
2062/63	13,96,69,800	5.8668	81,94,14,839.61	18.41
2063/64	14,45,83,070	6.2493	90,35,40,792.46	10.27
2064/65	14,11,76,000	6.1626	87,00,14,526.97	(3.71)
2065/66	14,48,01,000	6.10	88,34,45,996.07	1.54
Total	81,56,07,840	-	4,76,19,78,518.33	-

(Source: Annual reports of CHPCL, 2060/61 – 2065/66)

The above presented table shows that the sale of electricity was only 11,38,09,970 KWh in fiscal year 2060/61. This figure was increasing every fiscal year as shown in table except decrease in fiscal year 2064/65 by 3.71 %. The highest sales and revenue up to this date is 14,45,83,070 KWh and Rs. 90,35,40,792.46 respectively in fiscal year 2063/64.

Figure: 4.5

Generation & sales of CHPCL



Self consumption and losses:

Company consumes sufficient amount of energy which causes reduction of revenue from sales. There is also loss of energy in station which is generally more than consumption. Internal consumption and losses of energy are given in following table.

Table 4.9

Consumption and losses

Years	Consumption		Station Loss	Total
	Internal	Station		
2060/61	1,44,000	6,17,000	12,67,000	20,28,000
2061/62	1,08,000	7,57,000	12,92,000	21,57,000
2062/63	1,76,000	8,35,000	13,38,000	23,49,000
2063/64	47,000	7,40,000	13,33,000	21,20,000
2064/65	49,000	7,32,000	8,38,000	16,19,000
2065/66	65,000	7,47,000	7,95,000	16,07,000
Total	5,89,000	44,28,000	68,63,000	1,18,80,000

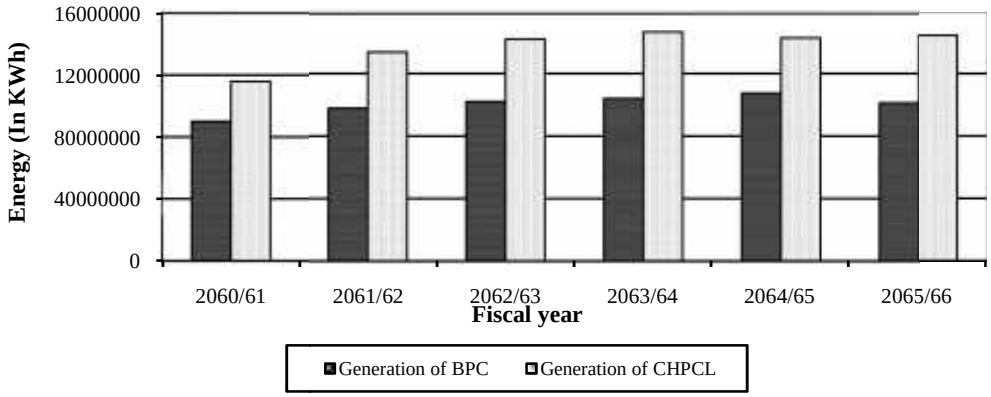
(Source: Annual reports of CHPCL, 2060/61 – 2065/66)

4.1.3 Comparison of Generation and sales of BPC and CHPCL

Both the company generate and sales electricity to NEA. The generation of electricity of CHPCL exceeds the generation of BPC. The reason behind this is huge installed capacity of CHPCL. As the generation of CHPCL exceeds, the sales is also greater than BPC. The comparison of generation and sales of both the company can be shown from the following figure.

Figure: 4.6

Generation of BPC and CHPCL

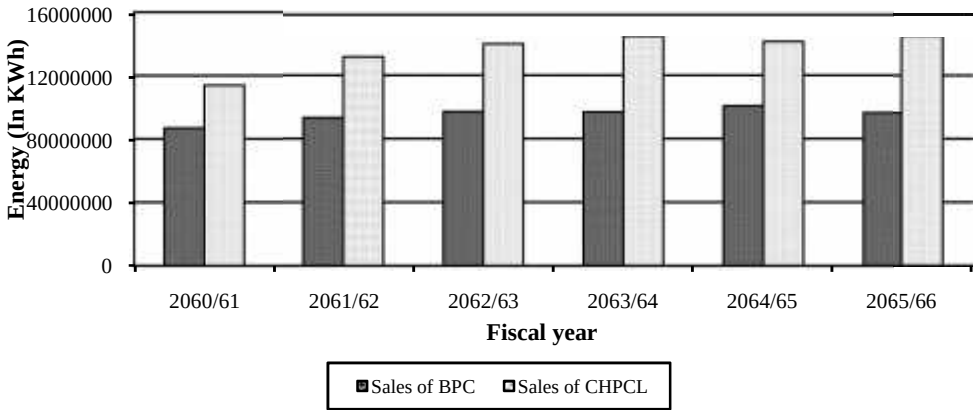


The Figure 4.6 shows that generation of both the company is increasing every fiscal year. However, the generation of both the company is increasing in decreasing return. The generation of CHPCL is found decrease in fiscal year 2064/65, while the generation

of BPC is found increasing in this year. However in fiscal year 2065/66 generation of BPC is found decreasing, while the generation of CHPCL is found increase in this fiscal year.

Figure: 4.7

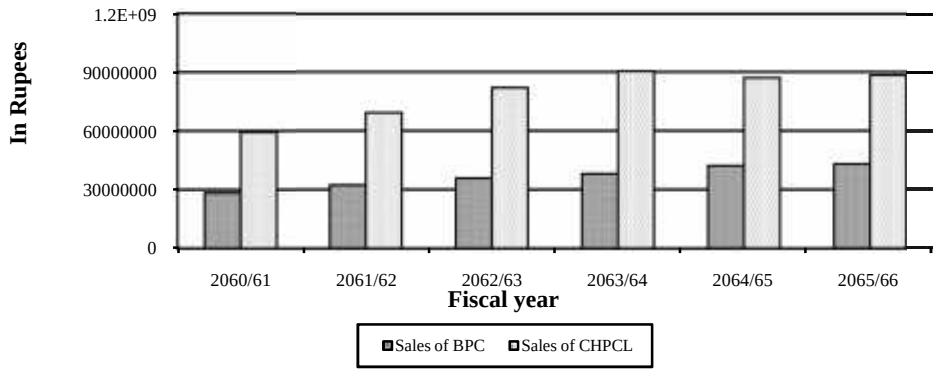
Electricity sales of BPC and CHPCL (In KWh)



The graph shows that the sales of both the company is increasing every year. But they are increasing in decreasing return. There is huge difference between sales of BPC and CHPCL and this difference is increasing every year except in fiscal year 2064/65 due to fall in sale of CHPCL. The sale of BPC is nearly 70% of the sales of CHPCL. The installed capacity and internal consumption and transit loss are reason for such difference in sales. Internal consumption and transit loss of BPC is sometime double of CHPCL.

Figure: 4.8

Electricity sales revenue of BPC & CHPCL



The above presented graph shows that the sales revenue of both the company is increasing every year. But it is increasing in decreasing return in most of the years.

There is a great difference between sales of BPC and CHPCL, i.e. more than the difference in unit sales and this difference is increasing every fiscal year except in fiscal year 2064/65. The sales revenue of BPC is nearly 50% of the sales of CHPCL. This reason behind such difference is high unit sales and high average selling price of CHPCL.

4.2 Cost structure of BPC and CHPCL

Cost structure refers to the relative proportion of fixed and variable cost in an organization. The main cost of operating a hydropower company comprises the cost of building and maintaining the dam, the steel lined pressure shaft, the power house and the turbines. Moreover, these costs depend upon the size of the reservoir, the types of hydropower plants (storage or run of river) as well as on the number of plants operated by a single company. Therefore, an analysis of the cost structure of these companies should take account of the fact that the same quantities of electricity can be produced using several types of plants (storage, pump- storage and run of river). Here, single output is considered in the cost model i.e. electricity. The input consists of capital, labor, material, machines etc.

Cost structure of the company depends upon cost classification. Generally, cost is classified into fixed, variable. Fixed costs in hydropower are those cost which the company incurs regardless of the amount of delivered power. They generally include cost of maintenance of fixed cost, salary, royalty, etc. Variable costs in Hydropower Company are those which vary depending on the amount of delivered power. They generally, include equipment repairing cost, based on working hour, payrolls bonus system , fixed asset depreciation cost can be particularly included into the variable cost based on working hours etc.

After studying the various hydropower companies, it is found that cost structure is dominated by fixed cost. The part of variable cost is very small as there is no use of material, fuel, direct labor etc. There are some semi variable cost which need to be classified. But there is no practice of segregating semi variable cost in Nepalese Hydropower Company. The costs are included in total cost without proper classification. The generally used method for segregating cost are high low method. So, semi-variable cost of BPC and CHPCL are classified into fixed and variable as 60% and 40% respectively based on hypothetical assumption after studying cost behavior of other hydropower company and verbal information of some professional.

Cost classification of BPC into fixed and variable

The classification of cost into fixed & variable for the fiscal year 2065/66 is given below which is the base for other years.

Table 4.10

Cost classification of BPC for 2065/66

Particular	Behavior	Fixed	Variable cost	
			Amount	Per KWh
1.Power plant expense				
Electricity purchase	Variable	-	64,44,610	0.0668
Staff cost	Fixed	3,08,14,462		
Office overhead	Fixed	46,85,871		
Vehicle operation & main.	Fixed	11,17,804		
Env., Community, & mitigation	Fixed	17,79,843		
Mitigation(JDMP)	Fixed	21,48,972		
Power plant operation & Insurance	Semi- variable	45,00,177	21,06,732	0.0209
Power plant maintenance	Semi- variable	53,15,017	49,14,541	0.0367
Deferred expenses-mitigation	Fixed	40,72,918		
Royalty	Fixed	2,00,59,435		
T/L repair & maintenance	Fixed	6,82,331		
Expenses W/O	Fixed	3,26,430		
2. Distribution expenses				
Staff cost	Fixed	2,28,62,195		
Office overhead	Fixed	30,88,839		
Vehicle operation & maintenance	Fixed	16,57,023		
Env., community, & mitigation	Fixed	0		
T/L maintenance	Fixed	1,01,280		
D/L network operation	Fixed	1,15,10,034		
D/L network & maintenance	Fixed	27,63,566		
Royalty	Fixed	46,42,931		
Expense W/O	Fixed	4,45,172		
3.Administrative expenses				
Staff cost	Fixed	3,91,34,575		

Office overhead	Fixed	3,05,63,186		
Expenses W/O	Fixed	6,78,829		
4. Depreciation	Fixed	6,53,62,895		
5. Interest on loan	Fixed	79,12,682		
Total	Semi variable	26,62,26,468	1,29,88,073.2	0.135

Source: Annual reports of BPC, 2060/61 – 2064/65)

Cost classification of CHPCL:

The classification of cost of CHPCL into fixed and variable for the fiscal year 2065/66 is given below:

Table 4.11

Classification of cost of CHPCL for the fiscal year 2065/66

Particular	Behavior	Fixed	Variable cost	
			Amount	Per KWh
1.Cost of Energy sold				
Staff cost	Fixed	1,49,57,416		
Fuel & Mobil	Variable	0	1,92,416	0.0013
Machine& equipment main.	Semi-variable	22,21,277	4,80,851	0.0034
T/L repair & maintenance	Fixed	61,074		
D/L network maintenance	Fixed	33,966		
Royalty	Fixed	1,72,09,238		
Office overhead	Fixed	2,19,75,166		
2. Administrative Exp.				
Staff cost	Fixed	66,43,218		
Office overhead	Fixed	1,36,56,393		
Royalty	Fixed	22,10,000		
Expenses W/O	Fixed	12,89,877		
3. Depreciation	Fixed	10,35,67,873		
4. Interest expenses	Fixed	0		
Total	Semi variable	18,38,25,501	6,73,267	0.0047

(Source: Annual reports of CHPCL, 2060/61 – 2065/66)

Fixed cost and variable cost:

The most of the cost in Hydropower Company are fixed. The proportion of variable cost is very small as show in above tables. The fixed and variable costs of BPC and CHPCL for six fiscal years are given in following table.

Fixed and variable cost of BPC

Table 4.12

Fixed and variable cost of BPC

	Fixed cost		Variable cost		Variable cost/KWh	
Years	Amount	%change	Amount	%change	Amount	%change
2060/61	15,13,40,727		77,00,032		0.0887	
2061/62	16,93,01,465	11.87	92,08,852	19.59	0.0988	11.39
2062/63	16,78,77,821	-0.84	73,70,904	-19.96	0.0759	-23.18
2063/64	19,68,06,215	17.23	83,20,506	12.88	0.0859	13.18
2064/65	24,32,20,809	23.58	99,89,982	20.06	0.0992	15.48
2065/66	26,55,59,485	9.18	1,29,88,073	36.3	0.135	36.08

(Source: Appendix I & II)

Fixed and variable cost of CHPCL

Table 4.13

Fixed cost and variable cost of CHPCL

	Fixed cost		Variable cost		Variable cost/KWh	
Years	Amount	%change	Amount	%change	Amount	%change
2060/61	31,48,96,724	-	3,89,253	-	0.0034	-
2061/62	29,87,51,647	-5.13	4,62,318	18.77	0.0035	2.94
2062/63	30,35,53,523	1.61	5,26,617	13.91	0.0038	8.57
2063/64	22,22,88,888	-26.77	11,40,845	116.64	0.0079	107.89
2064/65	18,95,27,887	-14.74	6,43,455	-43.6	0.0046	-41.77
2065/66	18,38,25,501	3	6,73,267	4.63	0.0047	2.17

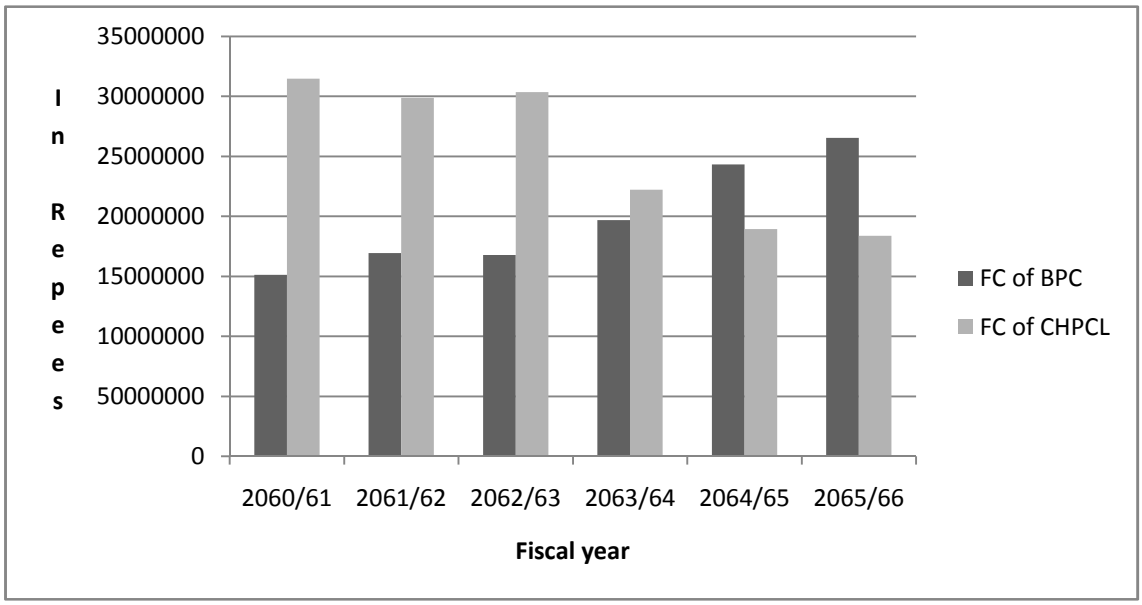
(Source: Appendix IV & V)

Comparison of fixed and variable cost of BPC & CHPCL

The major portion of the cost of both the company are fixed cost. There is huge difference between fixed and variable cost in both companies. The proportion of variable cost is less than 1% in total cost in both companies. The comparison of fixed and variable cost of BPC and CHPCL is shown from the following figure.

Figure: 4.9

Fixed cost of BPC and CHPCL

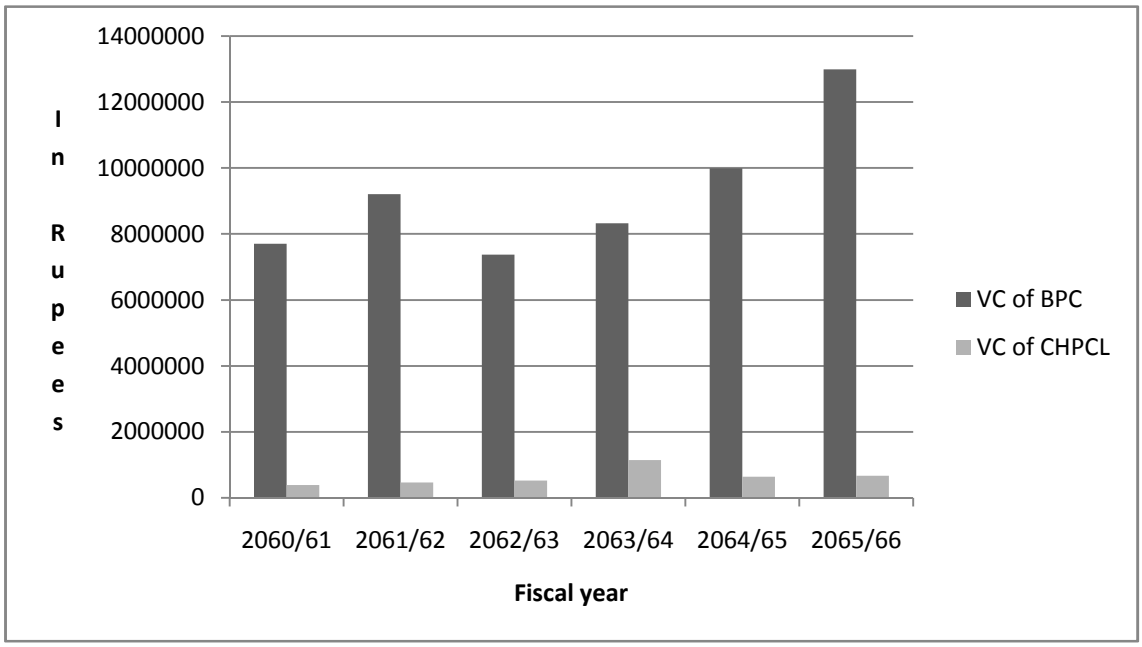


The above presented table shows that CHPCL spent huge amount of fixed cost in comparison to BPC. The fixed cost of BPC were in increasing trend in every fiscalyear and reached to maximum amount Rs.265559485. But the fixed cost of CHPCL were in decreasing trend every fiscal year but it increased the fiscal year in 2062/63.

The fixed of CHPCL is heavily decreased in fiscal year 2063/64 and 2064/65 and reached minimum to Rs.183825501. The main reason behind this is the improvisation in the system, intake trash rack, desander flushing, reservoir flushing etc. Generally, the fixed cost of CHPCL is higher than BPC but in the fiscal year 2064/65.The fixed cost of BPC was more than the fixed cost of CHPCL. The decreasing fixed cost leads to the increment of operating profit.

Figure: 4.10

Variable cost of BPC and CHPCL



The above presented graph shows that BPC spent huge amount of variable cost in comparison to CHPCL. The items of the variable cost are power plant maintenance, fuel expenses, and purchase of electricity for both the company.

There is a huge difference between variable cost of BPC and CHPCL. The variable cost of BPC is about 5% of total cost where as variable cost of CHPCL is less than 1% of total cost. The main reason behind the high variable cost of BPC is purchase of electricity from NEA, where as CHPCL does not make any purchases of electricity. The variable cost of BPC is found highest in fiscal year 2064/65 due to high purchase. There is zigzag increment in variable cost of BPC due to variation in purchases. The variable cost has significant impact on contribution margin which affects the Break even analysis.

4.3 Other income and expenses

Though, energy generation and sales are the core business with the main revenue stream of the company, there are many other income and expense which affect the total income and profit of the company. They may be interest income, consultancy fee, dividend income, profit on sale etc. Although their proportion is small, they are significant in total income.

The other income & expenses of BPC and CHPCL from 2060/61 to 2065/66 is given below.

Table 4.14

Other income & expenses of BPC & CHPCL

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/S66
BPC:						
Other income	25,10,64,218	8,28,00,627	13,52,91,650	13,77,36,240	22,79,19,004	20,04,99,529
Other expenses	11,40,17,654	2,51,24,938	1,97,82,849	3,45,14,540	1,67,43,019	
Net other income	13,70,46,564	5,76,75,689	11,55,08,801	10,32,21,700	21,11,75,985	1,89,57,079
CHPCL:						
Other income	10,37,133	3,39,649	25,79,187	7,15,444	1,46,69,916	5,21,20,501
Other expenses	-	6,496	-	-	15,53,611	0
Net other income	10,37,133	3,33,153	25,79,187	7,15,444	1,31,16,304	5,21,20,501

(Source: Appendix III & VI)

The above table shows that both the company makes huge amount of income from other sources i.e. besides sales. BPC makes more income in comparison to CHPCL. BPC also has more sources than CHPCL. The electricity services, consultancy services, dividend income etc are the main sources of income of BPC. This source helps to maintain the gap of net profit between two companies, i.e. to meet the profit of CHPCL. The highest income of BPC was recorded in fiscal year 2064/65 and income of CHPCL was recorded in fiscal year 2065/66.. There are other expenses which reduces the net income from other sources as shown in table.

4.4 Contribution margin income statement of BPC and CHPCL:

It has been already discussed that contribution margin statement or variable costing shows the contribution margin which plays an important role in Cost-volume-profit analysis. Contribution margin is excess of sales over variable expenses. It shows the amount available for fixed cost and profit.

Contribution margin income statement of BPC and CHPCL from 2060/61 to 2065/66 was given below:

Table 4.15

Contribution margin income statement of BPC

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66
Sales in KWh	8,68,39,377	9,32,43,490	9,70,56,352	9,68,12,869	10,06,89,723	9,63,38,846
AV. Selling price	3.2608	3.4655	3.6929	3.9339	4.188	4.47
Sales Revenue	28,31,67,390	32,31,33,885	35,84,19,117	38,08,49,510	42,16,87,493	43,06,34,641
Less: Variable cost	77,00,032.6	92,08,852	73,70,904	83,20,506	99,89,983	1,29,88,073
Contribution margin	27,54,67,357	31,39,25,032	35,10,48,212	37,25,29,003	41,16,97,510	41,76,46,568
Less: Fixed cost	15,13,40,727	16,93,01,465	16,78,77,821	19,68,06,215	24,32,20,809	26,62,26,468
Operating profit	12,41,26,630	14,46,23,567	18,31,70,391	17,57,22,788	16,84,76,701	15,14,20,100
Add: other income	25,10,64,218	8,28,00,627	13,52,91,650	13,77,36,240	22,79,19,004	20,04,99,529
Less other exp.	11,40,17,654	2,51,24,938	1,97,82,849	3,45,14,540	1,67,43,019	1,89,57,079
Net profit before bonus and tax	26,11,73,194	20,22,99,256	29,86,79,192	27,89,44,488	37,96,52,686	33,29,62,550

(Source: Table 4.2 & 4.3 & Appendix I - III)

Table 4.16

Contribution margin income statement of CHPCL

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66
Sales in KWh	11,38,09,970	13,15,68,000	13,96,69,800	14,45,83,070	14,11,76,000	14,48,01,000
AV. Selling price	5.2151	5.2598	5.8668	6.2493	6.1626	6.1
Sales Revenue	59,35,35,790	69,20,26,572	819414839	90,35,40,792	87,00,14,526	88,32,86,100
Less: Variable cost	3,89,253.6	4,62,318	5,26,617.5	11,40,845	6,43,455	6,73,267
Contribution margin	59,31,46,536	69,15,64,254	81,88,88,222	90,23,99,946	86,93,71,071	88,26,12,833
Less: Fixed cost	31,48,96,724	29,87,51,647	30,35,53,523	22,22,88,888	18,95,27,887	18,38,25,501
Operating profit	27,82,49,811	39,28,12,607	51,53,34,699	68,01,11,058	67,98,43,184	69,87,87,332
Add: other income	10,37,133	3,39,649.7	25,79,187	715,444.58	1,46,69,916	5,21,20,501
Less: other exp.	-	6,496.59	-	-	15,53,611	0
Net profit before bonus and tax	27,92,86,945	39,31,45,760	51,79,13,887	68,08,26,503	69,29,59,488	75,09,07,833

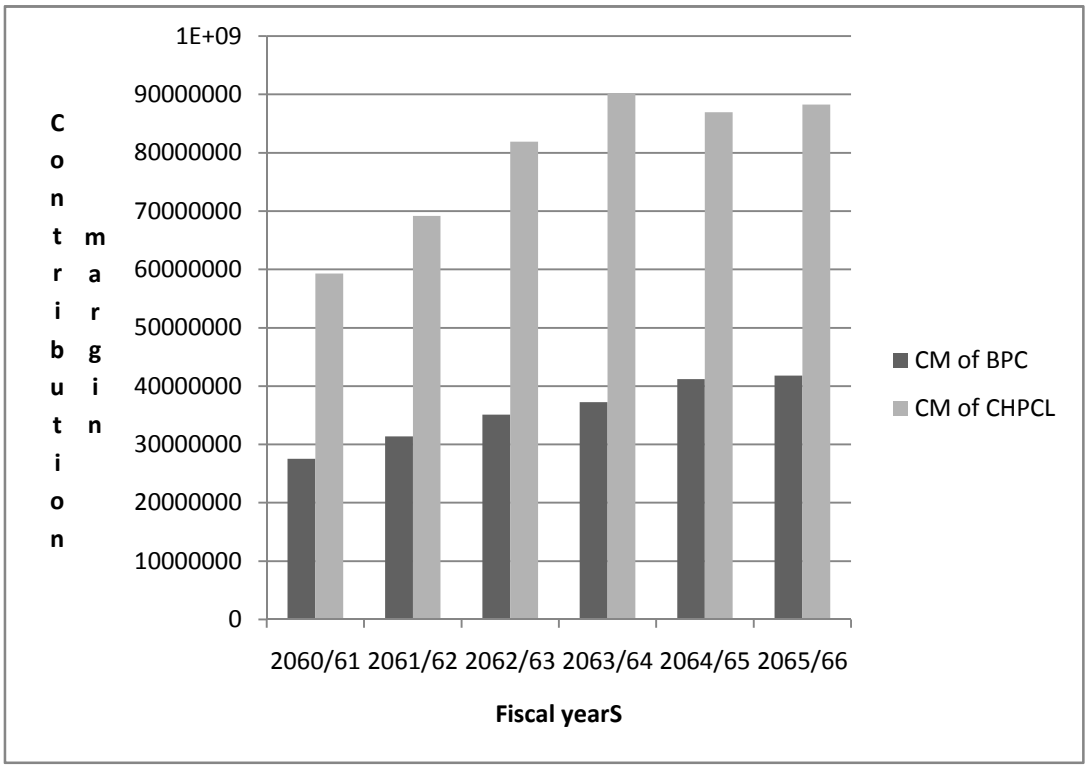
(Source: Table 4.8, & Appendix IV-VI)

The tables shows that the contribution margin of both the company is increasing every fiscal year except fall in fiscal year 2064/65 in contribution margin of CHPCL due to fall in generation and sales. The highest contribution margin recorded up to this date of BPC and CHPCL is Rs. 41,16,97,510 and Rs. 90,23,99,946.8 respectively. The contribution margin of CHPCL is much greater than contribution margin of BPC. The

main reason behind high contribution margin of CHPCL is high sales revenue and low variable cost.

Figure: 4.11

Contribution margin of BPC and CHPCL



The above presented graph shows that the contribution margin of both the company is increasing every year. However, the contribution margin of CHPCL is found decreased in fiscal year 2064/65 due to fall in sales. The contribution margin of CHPCL is almost double of the contribution margin of BPC. The main reason behind the high contribution margin of CHPCL is high sales and low variable cost. BPC has both i.e. sales and variable cost lower than CHPCL. This contribution margin affects the breakeven point of the organization.

4.5 Contribution margin per unit (CMPU), Contribution margin ratio (CM Ratio), & Variable cost ratio (VC Ratio) of BPC & CHPCL

The Contribution margin per unit (CMPU), CM ratio, and variable cost ratio is already discussed in chapter. These terms are useful for the break even analysis of the company. The information related to CMPU, CM ratio, and VC cost of the BPC and CHPCL is given in following table.

Table 4.17

CMPU, CM ratio, & VC ratio of BPC

Year	Variable cost ratio (%)		CMPU		CM Ratio (%)	
	BPC	CHPCL	BPC	CHPCL	BPC	CHPCL
2060/61	2.7193	0.0656	3.1721	5.2117	97.2807	99.9344
2061/62	2.8499	0.0668	3.3667	5.2563	97.1501	99.9332
2062/63	2.0565	0.0643	3.617	5.863	97.9435	99.9357
2063/64	2.1847	0.1263	3.8479	6 .2414	97.8153	99.8737
2064/65	2.369	0.074	4.0889	6.1581	97.631	99.926
2065/66	3.17	0.076	4.34	6.096	96.985	99.94

The above presented table shows that BPC has high VC ratio in comparison to CHPCL. High VC ratio means low contribution margin. The CMPU of the BPC is low in comparison to CHPCL and it is increasing every year of both companies. Similarly, CM ratio the CHPCL is also higher than the CM ratio of BPC. About 99% of the sale amount is contribution margin in CHPCL, whereas about 97% is of BPC. Higher the CMPU and CM ratio lower will be the breakeven point.

4.6 Break even analysis of BPC and CHPCL

Break even analysis is an important part of cost volume profit analysis. It is the point at which fixed cost is covered and profit is zero. It helps manager to decide what quantity should be produced and sold to cover all the cost of the organization. The aim of break even analysis is to determine Breakeven point. Breakeven point helps the firm to know the minimum point of operation. The Breakeven point of any company depends upon the contribution margin and Fixed cost. The company having higher fixed cost and low CMPU has high BEP and vice versa. The detailed information about BEP analysis is given in chapter 2. The different types of Breakeven point of BPC and CHPCL is discussed below.

4.6.1 Operating Break Even Point

Operating BEP is also known as the Accounting BEP. It helps firm to know the point at which it should operate to cover the cost. It is the real BEP of the company. The operating BEP of BPC and CHPCL for six years are given below.

Table 4.18

Breakeven point of BPC

Year	Breakeven point				BEP Ratio
	In KWh	% change	In Rupees	% change	
2060/61	4,77,09,948	-	15,55,71,174	-	0.5494
2061/62	5,02,87,066	5.4	17,42,67,926	12.02	0.5393
2062/63	4,64,13,553	-7.7	17,14,02,718	-1.64	0.4782
2063/64	5,11,46,395	10.2	20,12,01,872	17.39	0.5283
2064/65	5,94,83,188	16.3	24,91,22,521	23.82	0.5908
2065/66	6,13,42,505	3.126	27,45,02,725	10.18	0.6367

Table 4.19

Breakeven point of CHPCL

Year	Breakeven point				BEP Ratio
	In KWh	%change	In Rupees	% change	
2060/61	6,04,21,114	-	31,51,03,432	-	0.5309
2061/62	5,68,36,871	-5.93	29,89,51,346	-5.13	0.432
2062/63	5,17,74,436	-8.91	30,37,48,833	1.6	0.3707
2063/64	3,56,15,228	-31.21	22,25,69,994	-26.73	0.2463
2064/65	3,07,77,007	-13.58	18,96,68,242	-14.78	0.218
2065/66	3,01,55,101	-2.02	18,39,35,862	-3.02	0.208

The above presented table shows that breakeven point in KWh of CHPCL is higher than BPC in the first three years. The main reason behind this is high fixed cost in CHPCL. The BEP of CHPCL is found decreased in fiscal year 2063/64 ,2064/65 and 2065/66 due to fall in fixed cost and rise in contribution margin per unit. High breakeven point means company should have to produce high units of KWh to cover the cost of the company. The BEP in KWh of BPC is found increasing in most of the years in increasing order but it is found decrease in fiscal year 2062/63 by 7.70 % due to fall in fixed cost and increase in CMPU, where as the BEP of CHPCL is decreasing every year and the reason is same which is fall in fixed cost and increase in CMPU. Similarly, the break even point in rupees of CHPCL is higher than the BPC. Though the BEP of CHPCL is decreasing every year it is higher than BPC except in fiscal year 2064/65 and

2065/66. The BEP in rupees of BPC is increasing every fiscal year except fall in fiscal year 2063/64 due to fall in fixed cost and increase in CM ratio.

Considering the BEP of the both company, BPC is considered as more profitable in comparison to CHPCL because it has low BEP in most of the years. Low BEP means high margin of safety which generate high profit. But in reality, CHPCL is more profitable considering the BEP ratio and BEP ratio is the real tool for comparison. The BEP ratio of CHPCL is smaller than of BPC. It means the proportion of BEP in sales is small in CHPCL whereas high incase of BPC. The BEP ratio of both the company is decreasing except an increase in last two years of BPC. It means that the efficiency of CHPCL is increasing every year. Thus, CHPCL is more efficient and profitable than BPC incase of operating BEP.

Figure: 4.12

Breakeven point of BPC & CHPCL(IN KWh)

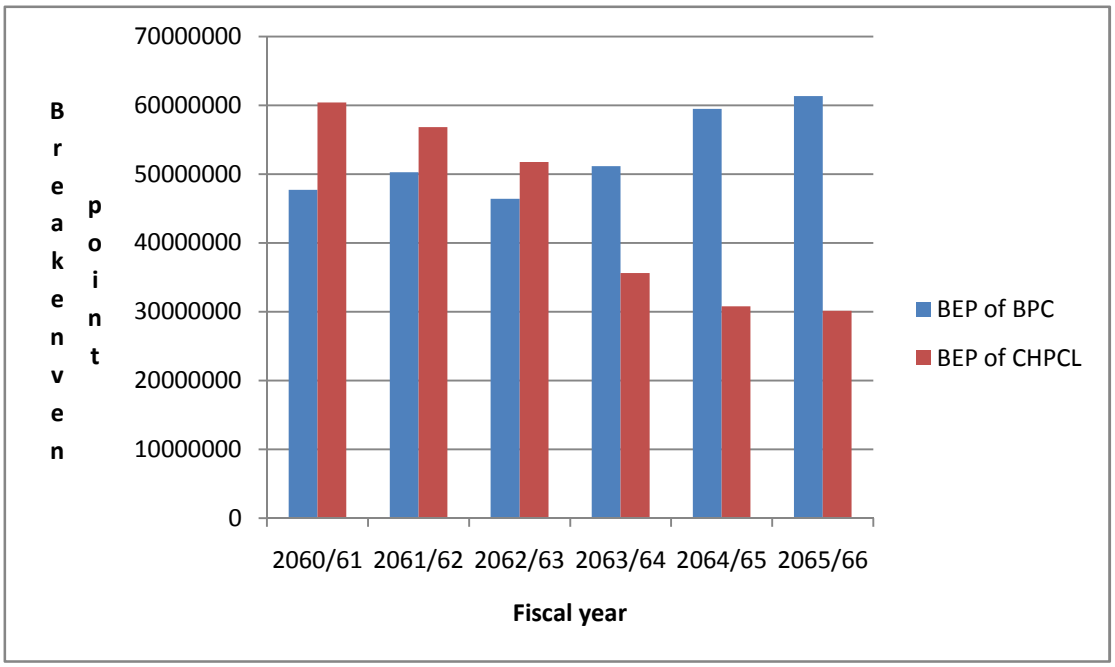
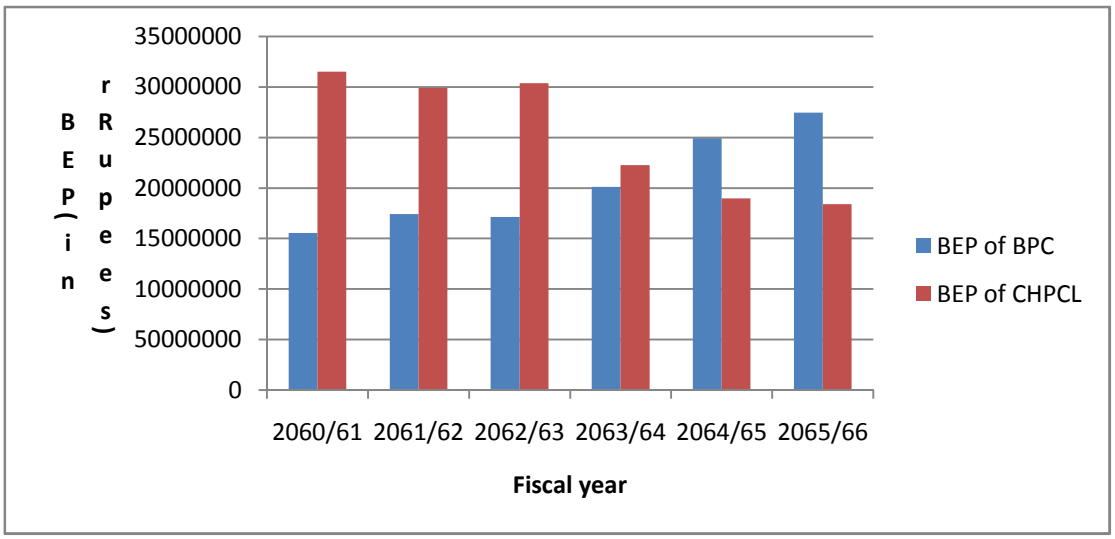


Figure: 4.13

Breakeven point of BPC and CHPCL (In Rupees)



4.6.2 Cash breakeven point of BPC and CHPCL

Cash breakeven point is used to determine the volume of sales required to cover all the cash fixed cost. It is a simple modification of operating breakeven point analysis. It determines the point of no profit/ no loss, only including cash fixed cost only. The costs like depreciation, amortization, write off etc are excluded during calculation. The main non cash expenses of BPC and CHPCL are depreciation and write off of power plant expenses and administrative expenses.

The cash breakeven point of BPC and CHPCL is given in following table:

Table 4.20

Cash breakeven point of BPC

Year	Cash breakeven point				Cash BEP Ratio
	In KWh	%change	In Rupees	% change	
2060/61	3,22,59,368	-	10,51,90,385	-	0.3715
2061/62	3,41,44,475	5.84	11,83,26,387	12.49	0.3662
2062/63	3,09,34,689	-9.4	11,42,40,120	-3.45	0.3187
2063/64	3,64,89,762	17.96	14,35,44,984	25.65	0.3769
2064/65	4,52,48,214	23.91	18,93,70,242	31.92	0.4491
2065/66	4,50,84,482	-0.36	20,17,49,398	6.53	0.468

(Source: Appendix VII)

Table 4.21

Cash breakeven point of CHPCL

Year	Cash breakeven point				Cash BEP Ratio
	In KWh	%change	In Rupees	% change	
2060/61	3,95,48,780	-	20,62,51,678	-	0.3475
2061/62	3,34,18,533	-15.5	17,57,75,252	-14.78	0.254
2062/63	2,47,72,844	-25.87	14,53,36,638	-17.32	0.1775
2063/64	1,87,79,832	-24.19	11,73,60,673	-19.25	0.1299
2064/65	1,37,21,440	-26.94	8,45,60,577	-27.95	0.0972
2065/66	1,29,54,027	-5.59	7,90,15,159	-6.56	0.0895

(Source: Appendix VIII)

The above presented table shows that Cash BEP of BPC is much higher than Cash BEP of CHPCL except in fiscal year 2060/61. The main reason behind this is high non- cash expenses i.e. high depreciation of CHPCL. The Cash BEP of BPC is increasing every year where as CHPCL is decreasing every year. BPC has high Cash BEP because of low depreciation cost and low CMPU. However, the cash BEP of CHPCL in rupees is much higher than BPC in first three years. This is due to high selling price of CHPCL. Similarly, Cash BEP ratio of BPC is much higher than CHPCL. Generally, the company having low Cash BEP is considered as more profitable, assuming the selling price and sales unit are constant. Considering BEP in units CHPCL is more profitable but in case of rupees BPC is more profitable. But in case of Cash BEP ratio CHPCL is more profitable as it provide more margin of safety.

Figure 4.14

Cash breakeven point of BPC and CHPCL (In KWh)

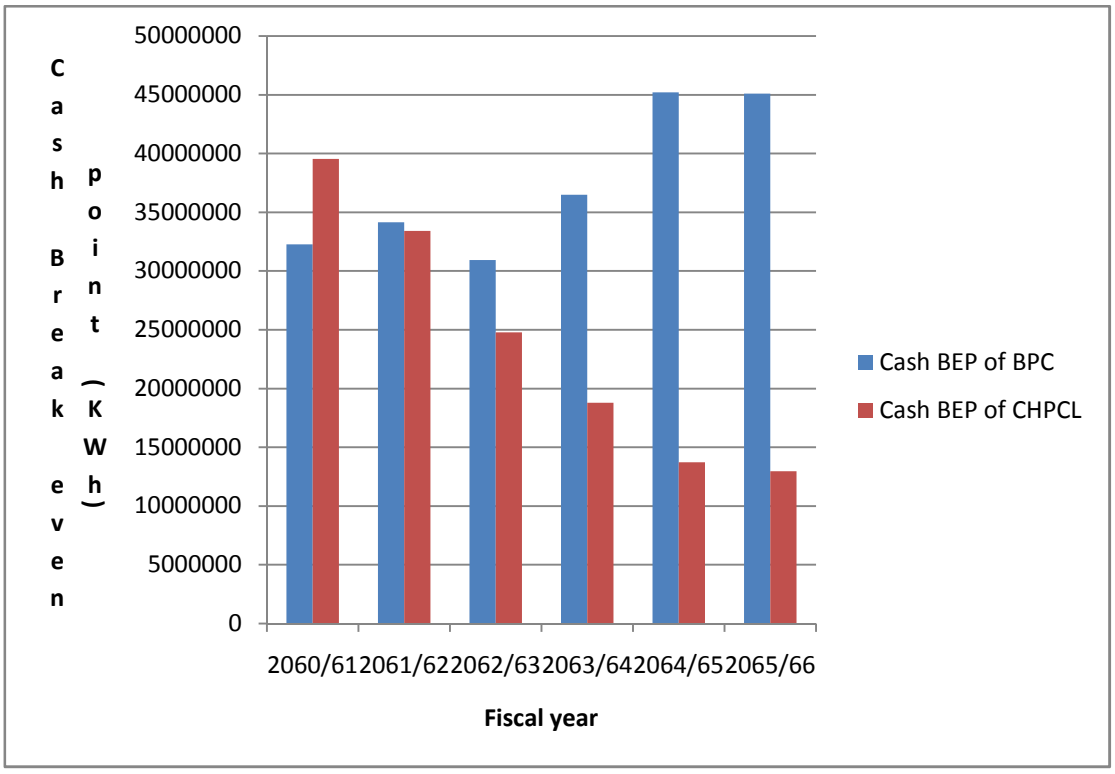
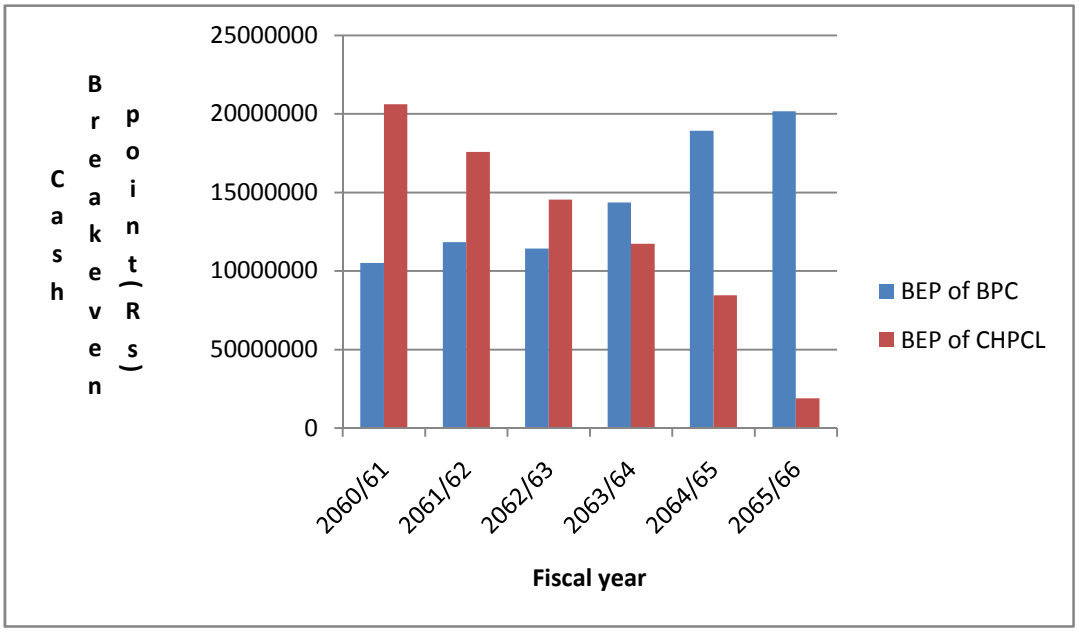


Figure: 4.15

Cash breakeven point of BPC and CHPCL (In Rupees)



4.6.3 Breakeven point including other income and other expenses

Breakeven point including other income and other expenses will be different from Operating breakeven point. Breakeven point under this may be greater or smaller than operating breakeven point depending upon other income and expenses. It is calculated by making simple modification in operating breakeven point i.e. subtracting other income and adding other expenses in fixed cost. The net other income of BPC reduces the BEP of to great extent in comparison to CHPCL.

The beak even point including other income and expenses of BPC and CHPCL for six years is given below:

Table 4.22

Breakeven point of BPC including other income and expenses

Year	Breakeven point including other income & expenses				BEP Ratio
	In KWh	%change	In Rupees	% change	
2060/61	45,06,214	-	1,46,93,730	-	0.0519
2061/62	3,31,55,842	635.78	11,49,00,320	681.97	0.3556
2062/63	1,44,78,578	(56.33)	5,34,68,602	(53.47)	0.1492
2063/64	2,43,20,932	67.98	9,56,74,721	78.94	0.2512
2064/65	78,37,028	(67.78)	3,28,22,386	(65.69)	0.0778
2065/66	1,95,12,446	148.9	8,73,16,613	166.03	0.20

Table 4.23

Breakeven point of CHPCL including other income and expenses

Year	Breakeven point including other income & expenses				BEP Ratio
	In KWh	%change	In Rupees	% change	
2060/61	6,02,22,113	-	31,40,65,618	-	0.5291
2061/62	5,67,73,489	(5.73)	29,86,17,970	(4.92)	0.4315
2062/63	5,13,34,527	(9.58)	30,11,67,986	0.854	0.3675
2063/64	3,55,00,599	(30.84)	22,18,53,644	(26.34)	0.2455
2064/65	2,86,47,079	(19.31)	17,65,42,224	(20.42)	0.2029
2065/66	2,16,05,150	(24.58)	13,17,84,070	(25.35)	0.149

The above presented table shows that BEP of BPC is far less than the BEP of CHPCL in terms of units and rupees. The other income of the company reduces the breakeven

point where as the other expenses increase the BEP point. The other net income (other income minus other expenses) increases or reduces the BEP under other income and expenses. The BEP of BPC is fluctuating every year due to fluctuation in net income. The other net income of BPC is found much higher than CHPCL. The BEP of CHPCL is found decreasing every year regarding both units and rupees due to decreasing fixed cost and other net income. The company having low BEP under this shows that it has more other income. The other incomes helps to make up operating loss and reduces BEP points which helps to cover all the cost at smallest sales and these companies are more profitable. In case of BEP ratio, BPC has very low in comparison to CHPCL. It means it has more margins of safety and profit assuming sale unit and selling prices are constant.

Thus, BPC is more profitable than CHPCL in terms of BEP under other income and expense as it has low BEP points in terms of unit and rupees including BEP ratio. The comparison of BEP of BPC and CHPCL can be seen from the following figure.

Figure: 4.16

Breakeven point including other incomes & expenses of BPC & CHPCL

(In KWh)

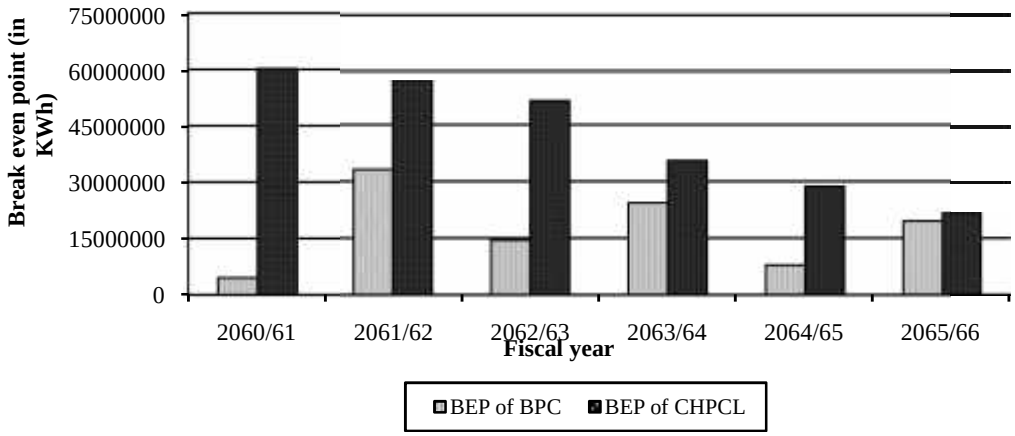
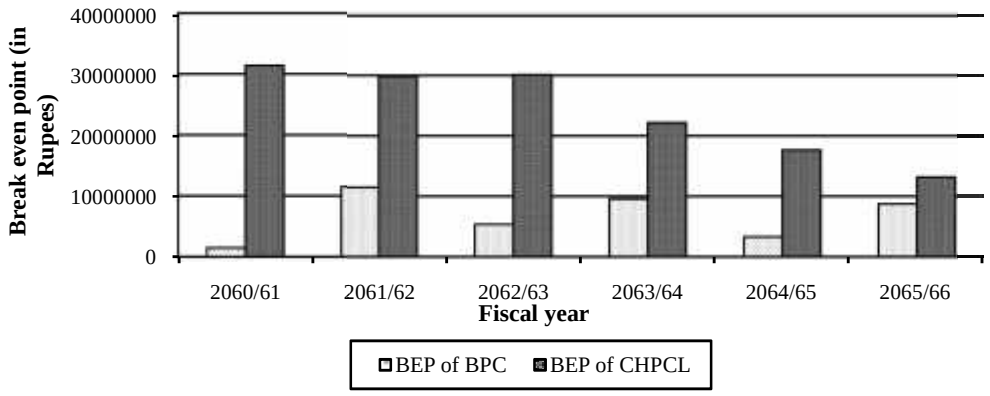


Figure: 4.17

Breakeven point including other incomes & expenses of BPC & CHPCL

(In Rupees)



4.6.4 Cost Breakeven point of BPC and CHPCL

Cost breakeven point helps to determine the unit of the production and sales at which the costs of company will be equal. It shows the indifference point of the two companies. It helps the firm to know which is the best operation of output assuming the selling prices are same. The cost equation (Y= a + bx) is used for this purpose.

The cost equation and cost break even point of BPC and CHPCL for six years are given below:

Table 4.24

Cost breakeven point

Years	BPC	CHPCL	Cost Breakeven point
2060/61	151340727.4+0.0887/Kwh	314896724.9+0.0034/kwh	1917420838
2061/62	169301465.2+0.0988/Kwh	298751647.2+0.0035/kwh	1358343987
2062/63	167877821.2+0.0759/Kwh	303553523+0.0038/kwh	1881771176
2063/64	196806215.6+0.0859/Kwh	222288888.32+0.0079/kwh	326700932.1
2064/65	243220809+0.0992/Kwh	189527887.5+0.0046/kwh	-567578451.4
2065/66	265559485+0.135/Kwh	183825501.13+0.0047/kwh	-627275395.2

The above presented table shows that cost breakeven point is much more than present sales. The highest cost breakeven point recorded up to this date is 1,91,74,20,838 KWh in fiscal year 2060/61. The BPC will get optimum result if the output decreases than 1,91,74,20,838 as it has high variable cost per unit but CHPCL will get optimum result

if output is greater than 1,91,74,20,838 as it has low variable cost per unit. As same condition is applied for other years, but in year fiscal year 2063/64 cost break even point is decreased far below due to reduction in difference of fixed cost of BPC and CHPCL. From the table it has been seen that cost break even point of fiscal year 2064/65 and 2065/66 is negative i.e. -56,75,78,451.4 and -62,72,75,395.24 due to fall in fixed cost of CHPCL. At this point both fixed cost and variable cost per unit of BPC is higher than CHPCL. The cost of BPC will be greater than CHPCL in case of any unit of production.

4.6.5 Break Even Price

Break even price means price per unit of product where cost per unit of product is equal to selling price. Break even price is variable cost per unit plus Fixed cost per unit. Break even pricing model helps to determine the minimum price to be set to cover the cost per unit. The remaining value is known as profit per unit. The detailed information about break even price is discussed in chapter two.

The break even price of BPC and CHPCL for six years is given in following table.

Table 4.25

Breakeven price & Profit per unit

Years	Break even price & Profit per unit(PPU)					
	BPC	%change	PPU	CHPCL	%change	PPU
2060/61	1.8315	-	1.4293	2.7669	-	2.4482
2061/62	1.9145	4.5318	1.5510	2.2742	(17.8069)	2.9856
2062/63	1.8056	(5.6882)	1.8873	2.1772	(4.2652)	3.6896
2063/64	2.1188	17.3460	1.8151	1.5453	(29.0235)	4.7040
2064/65	2.5147	18.6851	1.6733	1.3471	(12.8260)	4.8155
2065/66	2.898	15.259	1.574	1.274	(5.41)	4.826

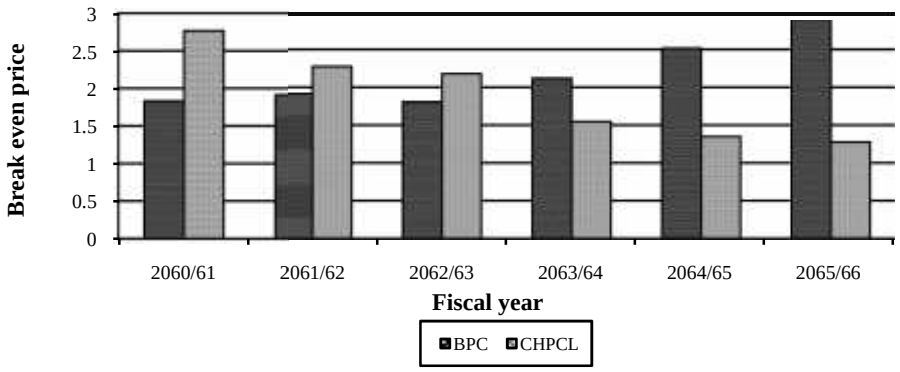
The table 4.25 shows that BEP price of BPC is increasing whereas BEP price of CHPCL is found decreasing. In the beginning of the year the BEP price of CHPCL is higher than BPC but in the last three year the situation is just opposite. Though the BEP price of CHPCL is greater than BPC, it has high PPU because the selling price of

CHPCL is far higher than BPC. Considering the selling price as it is, CHPCL is more profitable in comparison to BPC as it make more profit per unit though it has more BEP price. But if we consider the identical selling price of both companies, BPC is more profitable as it has low BEP price which gives more PPU.

The table also shows that profit of CHPCL is almost double or triple of the profit of BPC. The PPU of both the company is found increasing every year except fall in last two years of BPC due to rise in BEP price. The comparison of BEP price of BPC and CHPCL can be seen from the following figure.

Figure: 4.18

BEP price of BPC and CHPCL



4.7 Margin of Safety (MOS)

The Margin of safety is the excess of budgeted (actual) sales over the break even sales volume. It defines the amount by which sales can be drop before losses begin to be incurred in an organization. The margin of safety includes the profit of the organization. Margin of safety shows the soundness and financial strength of the organization. It is an important indicator of the business vitality. If it is large enough there can be significant falling in sales and company will still able to generate profit. On the other hand, if the margin of safety is small, then any decrease in sales volume may cause a loss to the company. The margin of safety depends upon various factors as discussed in chapter two.

4.7.1 Margin of safety under Operating BEP

This Margin of safety is the difference between sales and operating BEP. It is based on Operating Break even. It shows the operating margin of safety. The operating profit of the company is based on this margin of safety. The margin of safety based on operating BEP point of BPC and CHPCL is given below.

Table 4.26

Margin of safety of BPC

Year	Margin of Safety				Margin of safety Ratio
	In KWh	%change	In Rupees	% change	
2060/61	3,91,29,428.57	-	12,75,96,215.7	-	0.4506
2061/62	4,29,56,423.97	9.78	14,88,65,959	16.67	0.4607
2062/63	5,06,42,799	17.89	18,70,16,398.9	25.63	0.5218
2063/64	4,56,66,473.56	(9.83)	17,96,47,637	(3.94)	0.4717
2064/65	4,12,06,534.61	(9.77)	17,25,64,971.5	(3.94)	0.4092
2065/66	4,12,06,534.61	(15.07)	15,62,97,472	(9.426)	0.3633

Table 4.27

Margin of safety of CHPCL

Year	Margin of Safety				Margin of safety Ratio
	In KWh	%change	In Rupees	% change	
2060/61	5,33,88,855.03	-	27,84,32,357.6	-	0.4691
2061/62	7,47,31,128.59	39.98	39,30,75,226	41.17	0.5680
2062/63	8,78,95,363.19	17.62	51,56,66,006.1	31.19	0.6293
2063/64	10,89,67,841.3	23.97	68,09,70,798.2	32.06	0.7537
2064/65	11,03,98,992.9	1.31	68,03,46,284.9	0.0917	0.7820
2065/66	11,46,45,899	3.846	69,95,10,133.52	2.816	0.7920

The above presented table shows that BPC has low margin of safety in comparison to CHPCL in terms of both Unit and rupees. The MOS of BPC is less than 50% in every fiscal year except in fiscal year 2062/63, which should be greater than that for the profitability. The MOS of BPC is found fluctuating due to fluctuation in BEP units. The MOS of BPC is found highest in fiscal year 2062/63 due to fall BEP units. Similarly, MOS of CHPCL is found increasing every year due to low BEP points. The MOS is

higher than BEP points every fiscal year, but in fiscal year fiscal year 2060/61 MOS is less than BEP due to high fixed cost. The Margin of safety ratio of CHPCL is also higher than BPC in every year and it is the real measure for profit analysis. The margin of safety of CHPCL is higher than BPC every year; it means that CHPCL saves much more profit than BPC. But the profit depends upon the selling price and cost. Average selling price of CHPCL is much higher than BPC, so CHPCL makes more profit due to high MOS. If we compare the profit with the same sales unit than also the profit of CHCP will be higher. Thus, the CHPCL is better or more profitable than BPC in terms of MOS. The comparison MOS of BPC and CHPCL can be seen from the following figure.

Figure: 4.19

Margin of Safety (MOS) of BPC and CHPCL (In KWh)

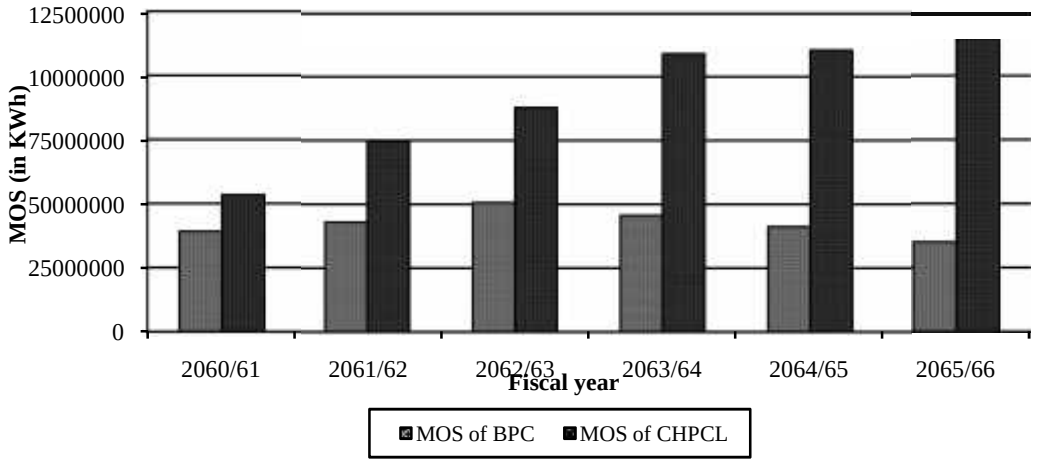
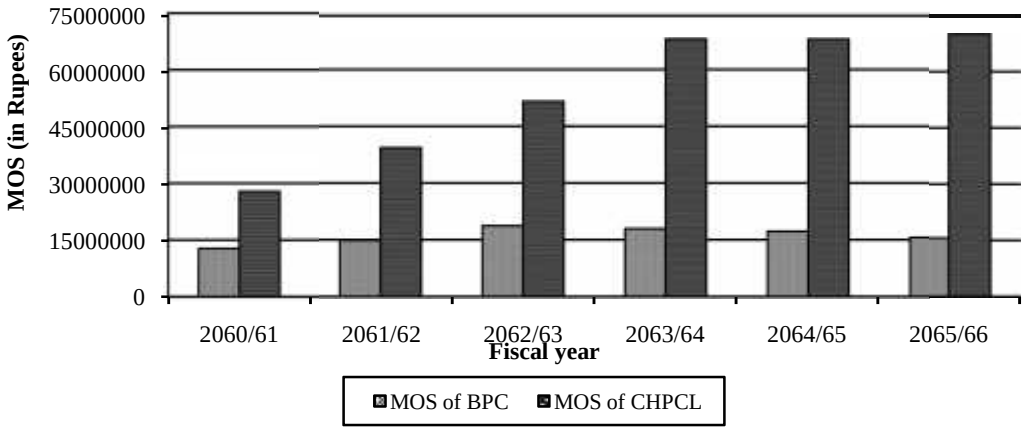


Figure: 4.20

Margin of safety of BPC and CHPCL (In Rupees)



4.7.2 Margin of safety under Cash Breakeven point

This margin of safety is the excess of Actual (budgeted) sales over Cash Break even sales. It depends upon the cash breakeven point. Higher the Cash BEP lower will be MOS and vice versa. Margin of safety under this is greater than the margin of safety under operating breakeven point because of low cash break even. This margin of safety shows profit with cash expenses and exclude the expenses like depreciation, writes off etc.

The margin of safety under Cash break even of BPC and CHPCL is given below:

Table 4.28

Margin of safety of BPC

Year	Margin of safety				Margin of safety ratio
	In KWh	% change	In Rupees	% change	
2060/61	5,45,80,008.32	-	17,79,77,004.4	-	0.6285
2061/62	5,90,99,014.94	8.25	20,48,07,497.1	15.08	0.6338
2062/63	6,61,21,662.02	11.88	24,41,78,996.7	19.22	0.6813
2063/64	6,03,23,106.38	(8.77)	23,73,04,525.1	(2.82)	0.6231
2064/65	5,54,73,635.30	(8.04)	23,23,17,251	(2.10)	0.5509
2065/66	5,12,54,363.51	(7.605)	22,90,50,798.64	(1.406)	0.5320

Table 4.29

Margin of safety of CHPCL

Year	Margin of safety	Margin of

	In KWh	% change	In Rupees	% change	safety ratio
2060/61	7,42,61,189.81	-	38,72,84,111.6	-	0.6525
2061/62	9,81,49,467	32.17	51,62,51,319.8	33.30	0.7460
2062/63	11,48,96,955.6	17.06	67,39,87,978.5	30.55	0.8226
2063/64	12,58,03,237.5	9.49	78,61,80,119	16.65	0.8701
2064/65	12,74,54,559.5	1.31	78,54,53,949.5	(0.09)	0.9028
2065/66	13,18,46,912.77	3.446	80,44,28,836.98	2.415	0.9105

The above presented table shows that MOS of CHPCL is much higher than MOS of BPC. It is higher than in case of MOS under operating BEP. The fluctuation in cash break even causes fluctuation in MOS. The highest MOS of BPC is 6,61,21,662.02 KWh in fiscal year 2062/63 where cash break even is minimum. The margin of safety ratio of BPC is almost greater than 60% ever year except in fiscal year 2064/65 and 2065/66.Similarly, MOS of CHPCL is increasing every fiscal year due to decrease in cash break even. The highest MOS recorded up to this date is 13,18,46,972.7 KWh in fiscal year 2065/66 where cash break even is minimum. The margin of safety ratio of CHPCL has reached to 91.05 % which saves large amount of profit for the organization. Generally, the company having larger MOS under cash break even is considered more profitable. The MOS of CHPCL is higher than BPC in terms of unit, rupees and ratio so it is more profitable. But, the company having high MOS in units may not generate high profit. There is also need of high selling price. CHPCL also has high average selling price which in terms increase the MOS in rupees and generate more profit. Although this MOS helps to find out the profit of the company, it doesn't shows the real profit of the company because non-cash expenses are not included. The comparison of MOS under cash break even of BPC and CHPCL can be seen from the following Figure:

Figure: 4.21

Margin of Safety under Cash BEP of BPC and CHPCL (In KWh)

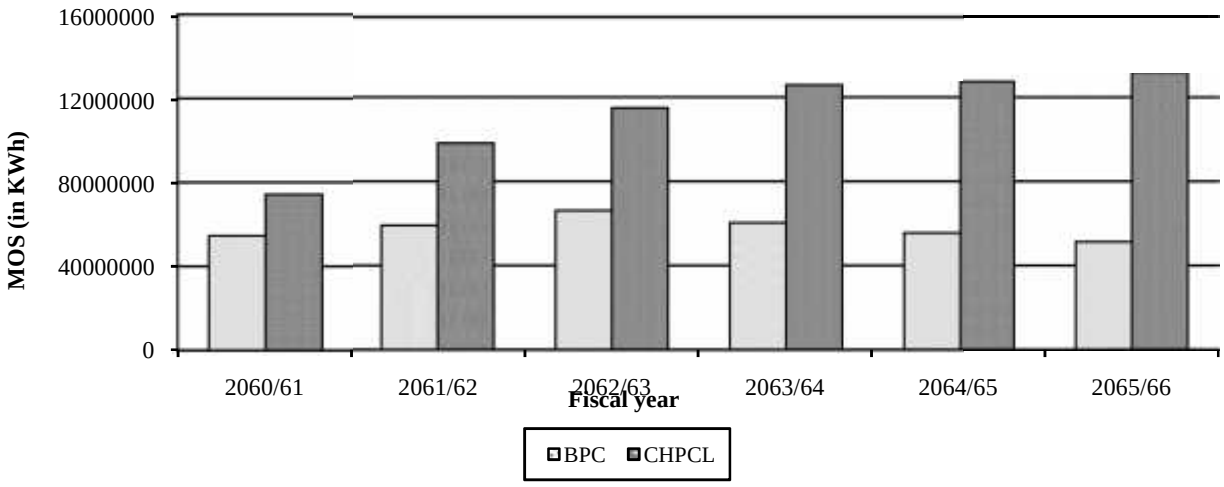
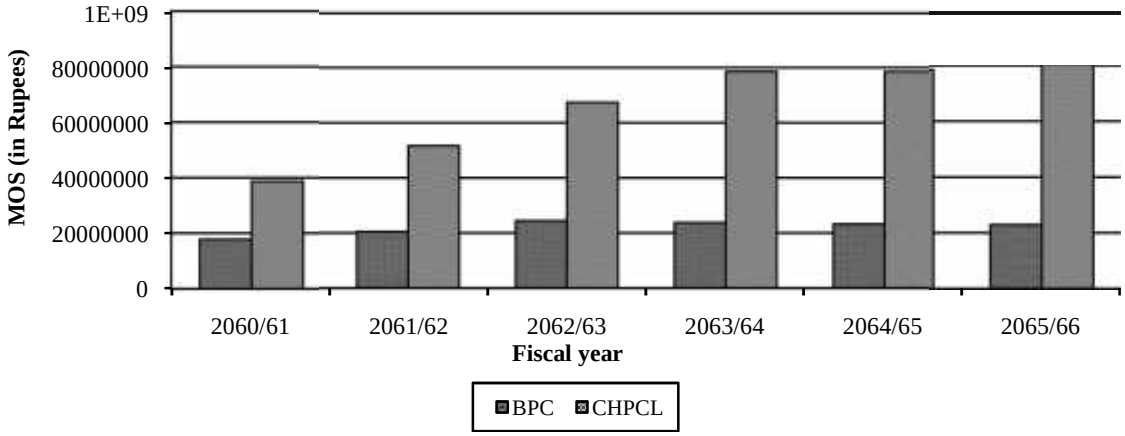


Figure 4.22

Margin of safety under cash BEP of BPC and CHPCL (In Rupees)



4.7.2 Margin of safety under other income and expenses

This margin of safety is determined to know the margin of safety including total income and expenses. It depends upon other income and other expenses. The other income helps to reduce the quantity to the break even point which increases the margin of safety, whereas, other expenses increase the quantity to reach the break even point which decreases the margin of safety. The company having greatest net other income (other income – other expenses) will have low BEP and high margin of safety.

The margin of safety under other income and expenses is given in following table:

Table 4.30

Margin of safety of BPC

Year	Margin of safety				Margin of safety ratio
	In KWh	% change	In Rupees	% change	
2060/61	8,23,33,162.38	-	26,84,73,660	-	0.9481
2061/62	6,00,87,647.13	(27.02)	20,82,33,560.6	(22.44)	0.6444
2062/63	8,25,77,773.01	37.43	30,49,50,514	46.45	0.8508
2063/64	7,24,91,936.65	(12.21)	28,51,74,788.8	(6.48)	0.7488
2064/65	9,28,52,694.95	28.09	38,88,65,106.7	36.36	0.9222
2065/66	7,68,26,399.46	(17.259)	34,34,83,583.09	(11.670)	0.7974

Table 4.31

Margin of safety of CHPCL

Year	Margin of safety				Margin of Safety Ratio
	In KWh	% change	In Rupees	% change	
2060/61	5,35,87,856.09	-	27,94,70,172.4	-	0.4709
2061/62	7,47,94,510.27	39.57	39,34,08,601.8	40.77	0.5685
2062/63	8,83,35,272.45	18.10	51,82,46,853.6	31.73	0.6325
2063/64	10,90,82,470.2	23.49	68,16,87,147.6	31.54	0.7545
2064/65	11,25,28,920.1	3.16	69,34,72,302.8	1.73	0.7971
2065/66	12,31,95,849.12	9.479	75,16,61,925.92	8.391	0.850

The above presented table shows that there is no much difference between Margin of safety under other income and expenses of BPC and CHPCL as in case of other margin of safety. The net other income reduces BEP which increases MOS and simultaneously profit will be increased. The highest MOS of BPC is found in fiscal year 2064/65 due to high net other income. The MOS in rupees is found highest in this year. The MOS ratio of BPC is also much higher than in other cases. The MOS of CHPCL is similar to the MOS under operating BEP and less than MOS under cash break even. The highest MOS in KWh of CHPCL is found in fiscal year 2065/66 where the MOS in rupees is also highest. The MOS of CHPCL is greater than BPC every year except in fiscal year 2060/61. Although the MOS ratio of CHPCL is less than BPC, it has high MOS is terms of both units and rupees. The reason is high sales units and selling price. If we compare

the MOS with same sales unit, the MOS of BPC will be greater than CHPCL in terms of KWh due to high MOS ratio but it is less in terms of rupees because of high selling price of CHPCL. Similarly, if we compare the MOS with same sales unit and selling price, the MOS of BPC will be greater than CHPCL in terms both KWh and rupees. Thus, CHPCL is more profitable than BPC in terms of MOS under other income and expenses though the net other income of BPC is much greater than CHPCL.

Figure: 4.23

MOS of BPC and CHPCL in KWh

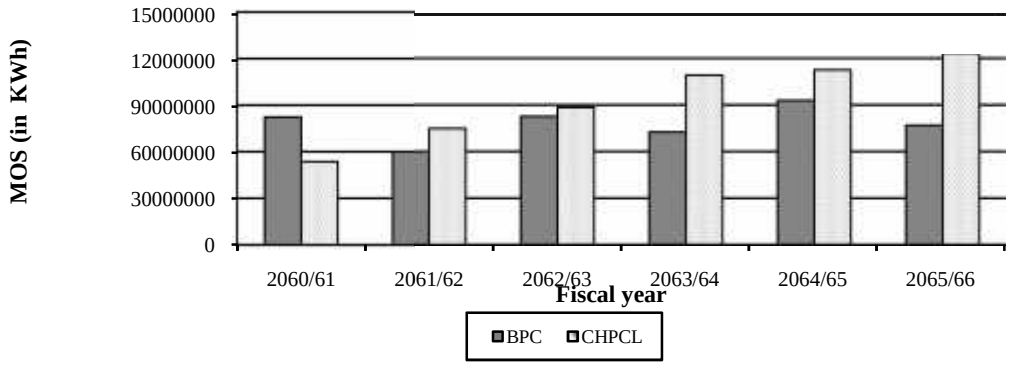
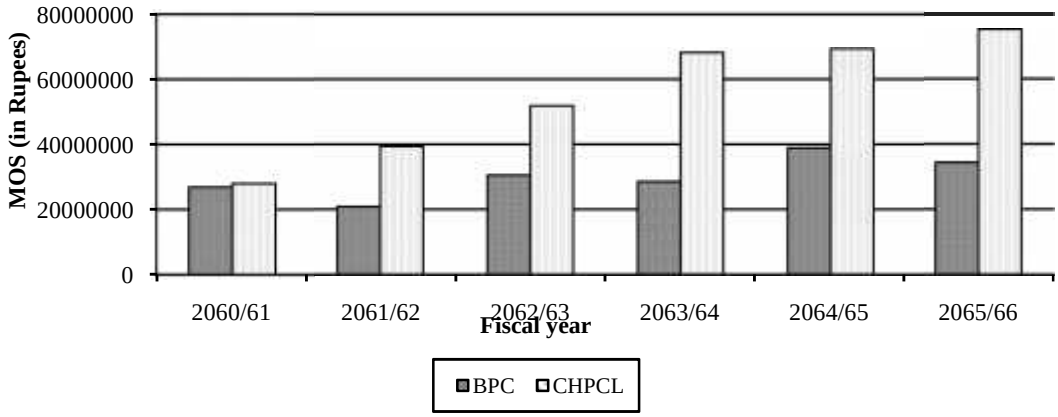


Figure: 4.24

MOS of BPC and CHPCL in Rupees



4.8 Target operating profit analysis of BPC and CHPCL

Target profit is the amount of net operating income that management desires to achieve in the operation of business. CVP analysis is used to determine the sales volume required to meet a target operating profit. CVP equation and formulas can be used for the determination of target profit as shown in chapter two. It shows what quantity of sales to be made to meet the required profit. As we know that table 4.13 and 4.14 shows more operating profit of CHPCL than BPC. The reasons for low operating profit of BPC are low generation capacity, sales and selling price. So, here we determine the target sales in units and rupees of BPC to meet the profit of CHPCL. The target or required sales for BPC to meet the operating profit of CHPCL for 6 years are given below**:**

Table 4.32

Required sales to meet operating profit of CHPCL

Year	Required sale of BPC to meet operating profit of CHPCL

	In KWh	%change	In Rupees	% change
2060/61	13,54,27,804.7	-	44,15,98,939.3	-
2061/62	16,69,62,922.9	23.29	57,86,03,699.4	31.03
2062/63	18,88,89,278.5	13.13	69,75,57,796.3	20.56
2063/64	22,78,95,026.9	20.65	89,65,03,179.1	28.52
2064/65	22,57,48,732.7	(0.94)	94,54,61,987.5	5.46
2065/66	22,23,90,252.30	(1.4877)	99,51,78,321.38	5.25

Table 4.33

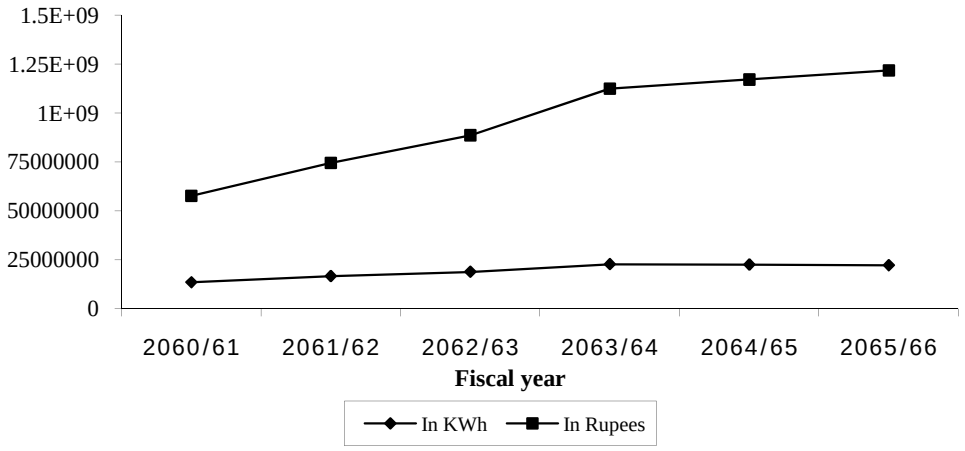
Required sales to meet net profit of CHPCL

Year	Required sale of BPC to meet operating profit of CHPCL			
	In KWh	%change	In Rupees	% change
2060/61	9,25,51,025.85	-	30,17,87,619.8	-
2061/62	14,99,30,655.2	61.9978	51,95,79,019.3	72.1671
2062/63	15,76,67,378.3	5.1602	58,22,57,022.9	12.0632
2063/64	20,12,55,494.9	27.6456	79,17,07,451.4	35.9722
2064/65	17,73,10,355.6	(11.98)	74,25,96,422.1	(6.20318)
2065/66	23,43,99,584.33	32.19	10,48,91,907.07	41.25

It can be known that the operating profit of BPC is much less than the operating profit of CHPCL so, required sales in unit and rupees of BPC is determined to obtain the profit of CHPCL. The operating profit of CHPCL is much higher than BPC because of high sales unit and selling price. BPC needs to sales large amount of unit to make the profit of CHPCL as shown in above table. The reason is low contribution margin and high profit of CHPCL. The required sales of BPC to make a profit of CHPCL is more than 150% of present sales of BPC and more than 120% of present sales of CHPCL. The required sale in KWh is found increasing every year except in fiscal year 2064/65. The reason of decreased required sales in fiscal year 2064/65 is low profit of CHPCL and high contribution margin of BPC. Similarly, the required sales in rupees of BPC is more than 150% of present sales of BPC and more than 75% of present sales of CHPCL.

Figure: 4.25

Required sales of BPC to meet operating profit of CHPCL



4.9 Operating leverage of BPC and CHPCL

Operating leverage results from the existence of fixed operating cost in the firm's income statement which is discussed earlier. It shows the potential use of fixed operating cost to magnify the effects of changes in sales on the firm's operating income. It is a measure of risk and opportunity. Higher the degree of operating, greater the opportunity for profit with increase in sales. Conversely, a higher degree of operating leverage also magnifies the risk of large losses with a decrease in sales. The operating leverage of BPC and CHPCL for five years is given below:

Table 4.34

Operating leverage of BPC and CHPCL

Year	Degree of operating leverage			
	BPC	%change	CHPCL	% change
2060/61	2.2192	-	2.1317	-
2061/62	2.1706	(2.1900)	1.7605	(17.4133)
2062/63	1.9165	(11.7064)	1.5890	(9.7416)
2063/64	2.1200	10.6183	1.3268	(16.5009)
2064/65	2.4436	15.2642	1.2788	(3.6177)
2065/66	2.752	12.620	1.2626	(1.2647)

Table 4.35

Leverage of BPC and CHPCL considering other income and expenses

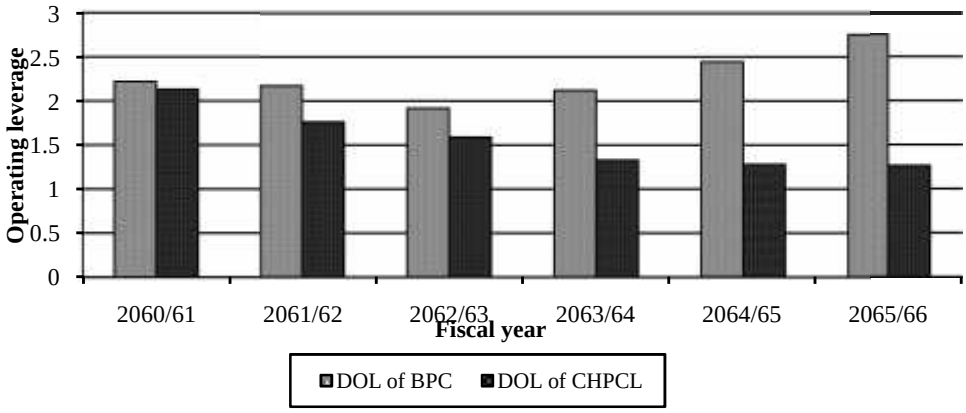
Year	Leverage of BPC and CHPCL			
	BPC	%change	CHPCL	% change
2060/61	1.0547	-	2.1317	-
2061/62	1.5518	47.13	1.7605	(17.41)
2062/63	1.1753	(24.26)	1.5890	(9.74)
2063/64	1.3355	13.63	1.3268	(16.5)
2064/65	1.0844	(18.8)	1.2788	(3.62)
2065/66	1.254	15.64	1.1764	(8.00)

The above presented table shows that DOL of BPC is higher than DOL of CHPCL. Although the CHPCL has high sales it has low DOL due to high profit than BPC. The DOL of BPC is fluctuating due to fluctuation in CM and Profit but the DOL of CHPCL is decreasing every year due to decrease in both CM and fixed cost. The highest DOL of BPC is found in fiscal year 2065/66 where the Contribution margin is highest. Similarly highest DOL of CHPCL is found in fiscal year 2060/61 where it has lowest profit. However CHPCL has lowest DOL in fiscal year 2065/66 due to reduced contribution margin and fixed cost. As we know that the company having more DOL is considered more profitable. So, BPC is more profitable than CHPCL as its DOL is higher every year. But CHPCL is more profitable in terms of normal profit.

The comparison of DOL of BPC and CHPCL can be shown from the following figure:

Figure 4.26

Operating leverage of BPC and CHPCL



4.10 Sensitivity analysis

Economic Entities may use the CVP analysis ratio to estimate the business environment of the future management period and control their operations. These estimates includes changes of the sales price, the amount of the manufactured and sold goods, the variable production cost, the variable sales costs, the fixed sales and administration cost as well as their implication will be analyzed by the company manager. Sensitivity analysis is "what if" technique that manager uses to examine how a result will change if the original predicted data are not achieved or if an underlying assumption changes. In the context of CVP analysis, sensitivity analysis examines how operating income (or the breakeven point) changes if the predicted data for selling price, variable cost per unit, fixed cost or unit sold are altered.

Margin of safety, Degree of operating leverage & what if analyses are the important aspects of sensitivity analysis. Margin of safety & Degree of operating leverage are already discussed before. The "what if analysis" of BPC and CHPCL is discussed below. Today electronic spreadsheets are widely used to find the sensitivity of profit with CVP variable.

There are many questions relating to sensitivity analysis like

i) What will be the effect on profit if the sales increase or decreases by 10%?

ii) What will be effect on profit if the variable cost increases or decreases by 10%?

iii) What will be the effect on operating profit if the fixed cost increases or decreases by 10%.

iv) What will be the effect on operating profit if both fixed and variable cost are reduced or increased at a time?

These are some general questions about the company which can be easily solved by using spread sheet. Some of the important sensitivity analysis of the company is given below

1) What will be the effect on operating profit, BEP & MOS of BPC if the averages selling price of BPC is equal to the price of CHPCL?
2) What will be effect on operating profit, BEP & MOS of both companies if they are able to utilize their installed capacity?
3) What will be the effect on Operating profit, BEP & MOS of BPC if the Variable cost per unit of BPC is reduced to the cost of CHPCL?
4) What will be the effect on operating profit, BEP & MOS of CHPCL if the fixed cost of CHPCL is reduced to the level of BPC based on installed capacity?

Result of above questions

1) If average selling price of BPC is equal to CHPCL, the operating profit of BPC will increases by 137%, 116%, 115%, 128%, 118%,104% in six years respectively. But this profit is still less than the profit of CHPCL due to high sales unit of CHPCL. The BEP in units decreases by 38%, 35%, 38%, 38% , 33% and 27.24 in five year respectively due to increase in selling price. However the MOS in Units increases by 46%, 41%, 34%, 42% , 47% and 47.75% in six years respectively.

2) If the BPC is able to utilize its installed capacity(excluding internal consumption and transit loss), the operating profit of the company increases by 153%, 124%, 97%, 107%, 106% and 157.72% in six years respectively. There will be no changes in BEP of the company. However, the MOS in units of the company increases in the same increase as the operating profit of the company increases. In case of CHPCL the operating profit of the company increases by 153%, 86%, 63%, 47% , 50% and 47.1% in six years respectively. There are no changes in BEP in units of the company but the MOS in units of the company increases in same ratio as operating profit of the company increases.

3) If the variable cost of BPC reduced is to the variable cost of CHPCL the operating profit of BPC increases by 6%, 6%, 4%, 4% , 6% and 8% in six years respectively. Although the variable cost is reduced, the profit is still less than CHPCL. The BEP of the company reduces by 3%, 3%, 2%, 2%, 3% and 4% in six years respectively.

However, the MOS in units of the company increases by 3%, 3%, 2%, 2% , 3% and 4% in six years respectively.

4) If the fixed cost of CHPCL is reduced to the level of BPC based on installed capacity the operating profit of the company increases by 41%, 20%, and 16% in three years respectively. However the operating profit is found decrease in fourth fifth and sixth year by 6% , 19% and 12% respectively. The BEP in units of the company decreases by 37%, 25%, and 27% in three years respectively. However, it increases by 17%, 69% and 45% in fourth fifth and sixth year respectively. The MOS in units of the company increases and decreases in the same ratio as the operating profit fluctuates.

(Source: Appendix IX)

The above presented questions focus on what will be the effect on operating profit, BEP in units & MOS in units of the company if there is a change in related CVP variables of both the companies.

4.11 Major Findings

The major findings of the study are listed below:

1) The generation of electricity from both company is found increasing every six fiscal years but still they were unable to meet their installed capacity of 17.1 MW & 22.56 MW of BPC & CHPCL respectively. The highest Average load factor of BPC is only 71.69% in fiscal year 2064/65 whereas highest load factor of CHPCL is recorded as 74.23% in fiscal year 2063/64. This shows that CHPCL is more effective in terms of capacity utilization.

2) BPC & CHPCL sales electricity to NEA under Power Purchase Agreement (PPA). However, BPC also sales electricity to local consumer. The sales of CHPCL were far greater than sales of BPC i.e. greater than 3,83,28,153 kWh in the fiscal year 2060/62 and this difference were increasing trend in every fiscal year. Even in total sale the sales of CHPCL were far greater. The sales revenue of CHPCL were double in six fiscal years of operation. The BPC was able to meet the targeted sales of 85 GWh in fiscal year 2064/65 whereas CHPCL is only unable to meet the targeted sales of 132.9 GWh in first two fiscal years i.e.

from 2060 to 2062. Although the price is set by NEA, the average selling price of CHPCL is far greater than BPC.

3) The fixed cost of CHPCL is much greater higher than BPC during first four years of operation. The highest fixed cost of CHPCL is found in fiscal year 2060/61(Rs.31,48,96,724.6) and is decreasing. Similarly the fixed of BPC is increasing and reached to Rs. 26,62,26,468 in fiscal year 2065/66. The variable cost of BPC is much higher than of CHPCL. The highest variable cost of BPC is identified in fiscal year 2065/66(Rs.1,29,88,073)whereas the highest variable cost of CHPCL is also found in fiscal year 2065/66(Rs. 6,73,267). In terms of total cost, the cost of CHPCL is much higher than BPC.

4) The contribution margin of both the company is increasing due to increase in sales volume and average selling price in comparison to variable cost per unit, except decrease in fiscal year 2064/65 of CHPCL. The contribution margin of CHPCL is almost double or more than that of BPC. The highest contribution margin of BPC recorded up to this date is Rs. 41,78,12,123 in fiscal year 2065/66 whereas of CHPCL is Rs. 90,35,40,792.46 in fiscal year 2063/64. Similarly the CMPU of both the company is increasing except decrease in CMPU of CHPCL in fiscal year 2064/65 and 6065/66.The CM ratio of BPC is about 97% whereas of CHPCL is 99%.

5) Although, the fixed cost of CHPCL is much higher than BPC it has high operating profit due to high sales unit and average selling price. The operating profit of BPC is found increasing during first three years and decreases due to increase in fixed cost. The operating profit of CHPCL is found increasing except decrease in fiscal year 2064/65 due to decrease in sales unit and average selling price. The highest operating profit of BPC recorded up to this date is Rs. 18,31,70,391 in fiscal year 2062/63 whereas of CHPCL is Rs.69,89,47,227.14 in fiscal year 2065/66.

6) The Net profit of both the company is higher than operating profits due to net other income. There is not much difference between net profits between two companies in comparison to operating profit as BPC has high net other income than CHPCL. The net profit of BPC is fluctuating due fluctuation in net other

income and reached to Rs. 37,96,52,686 in fiscal year 2064/65 whereas the net profit of CHPCL is increasing and reached to Rs. 75,10,67,728.5 in fiscal year 2065/66.

7) The operating BEP of BPC is found increasing in terms of both KWh and Rupees except decrease in fiscal year 2062/63 both in kWh and Rupees whereas the Operating BEP of CHPCL is found decreasing in terms of both Rupees and KWh except increase in fiscal year 2062/63 in terms of rupees. The lowest BEP in kWh of BPC is recorded in fiscal year 2062/63 where the operating profit is maximum. Similarly, the lowest operating BEP in KWh of CHPCL is recorded in fiscal year 2065/66 where the Operating profit is maximum. The lowest Operating BEP in rupees of BPC is recorded in fiscal year 2060/61 whereas of CHPCL in fiscal year 2065/66 but the operating profit is not maximum at this point. The Operating BEP ratio of BPC is not consistent whereas the Operating BEP ratio of CHPCL is consistent in terms of decreasing.

8) The Cash Breakeven point of BPC in terms of kWh is much greater than CHPCL due to high non cash fixed cost of CHPCL except in fiscal year 2060/61. The cash breakeven point of BPC is found increasing in terms both KWh and Rupees except in fiscal year 2062/63 and 2065/66 whereas cash breakeven point of CHPCL is found decreasing. The lowest cash breakeven point of BPC in KWh is recorded in fiscal year 2062/63 where the operating profit is maximum whereas the lowest cash breakeven point of CHPCL is found in fiscal year 2065/66 where the operating profit is maximum. Similarly, the lowest cash break even in rupees of BPC is found in fiscal year 2060/61 whereas of CHPCL in fiscal year 2065/66 but operating profit of both the company is not maximum at this point. The cash breakeven ratio of BPC is not consistent whereas cash break even ratio of CHPCL is consistent in terms of decreasing.

9) The Breakeven point of BPC including other income & expenses is far less than the breakeven point of CHPCL in comparison to other BEP as it has high net other income which reduces the operating BEP. The BEP under other income & expenses of BPC in KWh is fluctuating whereas of CHPCL is decreasing. The lowest BEP of BPC in KWh & Rupees is found in fiscal year 2060/61 but the net profit is not maximum at this point whereas the lowest BEP in KWh and

Rupees of CHPCL is found in fiscal year 2065/66 where the net profit is maximum. The BEP ratio of BPC is not consistent whereas of BEP ratio of CHPCL is consistent in terms of decreasing.

10) The Breakeven price of BPC is found increasing due to increase in fixed cost per unit but it is decreased in fiscal year 2062/63 due to decrease in fixed cost per unit. However, the breakeven price of CHPCL is found decreasing due to decrease in fixed cost per unit. The breakeven price of BPC is greater than CHPCL in last three fiscal year of operation due to high fixed cost per unit of BPC. BPC has high operating profit where the breakeven price is minimum but operating profit of CHPCL is not high at this point.

11) The MOS under operating BEP of BPC is found decreased in last three fiscal years in terms both KWh and Rupees whereas of CHPCL is found increasing in terms of both KWh & Rupees except decrease in fiscal year 2064/65 in terms of rupees. The highest MOS of BPC is found in fiscal year 2062/63 (5,06,42,799 KWh & Rs.18,70,16,398.9). Similarly, the highest MOS of CHPCL is found in 2065/66 (11,46,45,899 KWh & Rs. 69,95,10,133.5) due to high average selling price and sales volume.

12) The MOS under Cash BEP of both companies is far greater MOS under Operating BEP due to high non-cash expenses. The MOS under cash BEP of CHPCL dominates the BPC. The highest MOS under cash BEP of BPC is recorded in fiscal year 2062/63 i.e. 6,61,21,662.02 KWh & Rs. 24,41,78,996.7 whereas of CHPCL is 13,18,46,972.8 KWh and Rs. 80,44,28,836 in fiscal year 2065/66.

13) The MOS under other income & expenses of CHPCL is also found greater than BPC except in fiscal year 2060/61 besides high net other income of BPC. The MOS under other income of BPC is fluctuating due to fluctuation in net other income and reaches to 9,28,52,694.95 KWh & 38,88,65,106.7 in fiscal year 2064/65 as highest. Similarly, the MOS under other income of CHPCL is increasing & reach to 12,31,95,849.1 KWh & Rs. 75,16,61,925.9 in fiscal year 2065/66 as highest. The net profit of both company is highest at this point.

14) As the operating profit of CHPCL is found greater than BPC. So, a required sale of BPC is determined to reach the operating profit of CHPCL. The required sales in KWh & Rupees is found increasing due to increase in fixed cost and operating profit of CHPCL. However it is decreased in terms of KWh in 2064/65 due to decrease in operating profit of CHPCL & increase in contribution margin per unit of BPC.

15) Operating leverage of both companies is determined to identify the sensitivity of profit with sales. The operating leverage of BPC is found greater than CHPCL. It means that operating profit of BPC is more sensitive towards sales than CHPCL. The operating leverage of BPC is fluctuating but it is still more than 2 whereas of CHPCL is found decreasing due to increase in operating profit more than contribution. The operating leverage of BPC is recorded in fiscal year 2065/66 (2.752) whereas of CHPCL in fiscal year 2060/61 (2.1317). However, in terms of Net profit the operating leverage of CHPCL is greater than BPC due to high net other income of BPC. Although, the operating leverage is decreasing, but it is still greater than BPC.

16) Lastly, 'What-if analysis' of both the company is done to identify the sensitivity of profit with various changes in CVP variables like fixed cost, variable cost, selling price, sales volume and their effect on profit. It shows that there is positive correlation between cost and BEP and negative with MOS. It identifies negative correlation between selling price and BEP and positive with MOS. There is positive relation between sales and BEP and MOS depending upon BEP ratio and MOS ratio. It is discussed under topic sensitivity analysis.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Nepal is predominantly an agricultural country and about 80% of economically active population is engaged in agriculture. Still about 80% of energy need of the country is meet by the traditional energy sources as fuel wood, agri residue and animal dung, although it is second richest country in water resources in the world. It is estimated that only 40% of the total population has access to electricity through different sources like national grid, isolated small and hydropower system as well as solar home system so far. Although, Nepal has 43,000 MW of economically feasible hydropower potential, it has only 600 MW of installed capacity in its integrated Nepal Power System (INPS). Nepal Electricity sector is dominated by public sector, Nepal Electricity Authority (NEA) which is monopoly buyer of electricity of electricity. However, The New Hydropower Policy 2001 seeks to promote private sector investment in the sector of hydropower development and aims to expand the electrification within the country and export. Among the various private hydropower, CHPCL & BPC are two huge hydropower on which the study is confined.

Profit making is the main drive for the operation of business organization which is not an easy task. Profit is a result of proper planning and effective used of available resources. Profit planning & control is an important tool in management accounting to plan the profit. Without planning the cost, volume, price and profit, the estimation of profit is not possible. Cost volume profit analysis is a useful forecasting managerial tool well as managerial control tool under profit planning & control to study interrelationship among cost, volume & profit. The key factors involved in CVP analysis include the revenues derived from the sales price charged for goods and services, the fixed and variables cost, the sales volume, the mix of products, the speed and quality of production and the resulting profits. The techniques express interrelationship of the key variables in CVP analysis which provides a general economic activity model which may be used by managers to make short term

forecasting to access company performance and to analyze decision making alternatively. The main objective of this research is to examine the use of cost volume profit analysis in Hydropower Company representing CHPCL & BPC. The focus of the study is to identify cost structure, sales volume, selling price, and their relation including break even analysis & margin of safety analysis for profit planning. The study is mainly based on secondary source of data from fiscal year 2060/61 to 2065/66 for analysis. The descriptive and analytical approaches were used throughout the study. The whole study is divided into five chapter including Introduction, Review of Literature, Research Methodology, Data presentation and analysis and Summary, Conclusion and Recommendation.

CVP analysis under this study aims to determine sales, cost structure, contribution margin, effect of other income & expenses, operating Breakeven point, cash breakeven point, cost breakeven point, breakeven price, operating margin of safety, MOS under cash breakeven point, Margin of safety under other income and expenses, operating leverage and Sensitivity analysis. The research study shows that generation and sales of both CHPCL and BPC was increasing. Although the fixed cost of CHPCL is far greater than BPC, it has low variable cost. Both the company is unable to utilize their full installed capacity due to various technical and policy problem. The contribution margin of CHPCL is far greater than BPC due to high sales volume and average selling price which is the main element in CVP analysis for planning profit. Hence, CHPCL make huge operating profit than BPC in spite of high fixed cost. Besides, the sales business BPC make huge amount of income from other sources which are sometimes greater than operating profit and huge contribution to net profit. CHPCL also generate income from other sources but not as BPC. Although the other income of BPC is far greater than CHPCL it has low net profit. As the proportion of fixed cost is very high in Hydropower Company it requires a huge quantity to cover their cost. The operating Breakeven point of BPC in KWh and Rupees is increasing due to increase in fixed cost whereas Breakeven point of CHPCL is decreasing due to decrease in fixed cost. This shows that Operating Margin of safety of BPC is decreasing whereas of CHPCL is increasing. However, the huge net other income of BPC has reduced BEP to great extent which increases margin of safety and thus profit increases. The operating profit of BPC is more sensitive to sales as shown by operating leverage but net the net profit of CHPCL is more sensitive. The sensitive test of cost volume profit analysis shows that

there is positive correlation between cost and BEP and negative correlation between selling price and BEP and just opposite relation with Margin of safety. Similarly, various tests have been done regarding changes in cost, volume, price & profit on BEP, MOS & profit.

5.2 Conclusion

To conclude, with separating fixed and variable costs helps gathering relevant cost related information useful in short term decision making, such as for instance profit estimate for following 'time interval'. But such practices of segregating cost has not found in CHPCL and BPC. It is concluded that the prognostic production, sales and administration costs and of the future income of the various business units of the company as well as the use of decision making techniques based on relevant cost are possible only a variable costing system approach, since profit is often inaccurately shown in full costing system. As we know that variable costing approach is base for CVP analysis which is not found in both companies. For the research study cost has been segregated into fixed and variable cost under certain assumption based on other hydropower company. No any scientific measures are used to segregate cost. Although there is no formal application of CVP analysis in both companies, the research study aims to use CVP tools in decision making and planning regarding sales volume, prices, cost & profit.

The product of HP is energy which is not freely available in the market. It is generated at one place and transmitted to other through national grid. Their prices are not determined as other product by demand and supply situation. Its price and production is highly influenced by government. Nepal Electricity Authority (NEA) is a monopoly buyer in Nepal and effect the pricing of the product through Power Purchase Agreement (PPA). Thus, there is problem regarding the use of CVP analysis. However, after using and analyzing the tools of CVP analysis in CHPCL and BPC following information has been concluded based on major findings.

1) There is no practice of classifying cost into fixed and variable. Both the companies are not preparing direct costing. However, after classifying cost under certain assumption, fixed cost of CHPCL is higher than BPC whereas Variable cost of BPC is higher than CHPCL.

2) Although the generation and sales of both companies are increasing, they are unable to meet their installed capacity. This shows that there is improvement regarding capacity utilization. The generation and sales of CHPCL is far greater than BPC.

3) The average selling price of CHPCL is found greater than BPC. CHPCL has been awarded extraordinary purchases rate. This shows that the process of PPA lacks transparency.

4) The Contribution margin per unit and CM ratio of CHPCL is in increasing trend whereas of BPC is fluctuating. The CMPU and CM ratio of BPC is less than CHPCL due to low average selling price and high variable cost per unit.

5) The operating profit CHPCL is far greater than BPC in spite of high fixed cost due to high contribution margin per unit. The operating profit of BPC reach to maximum in fiscal year 2062/63 and started to decline whereas operating profit of CHPCL is in increasing trend except fiscal year 2064/65.

6) Although the operating profit of BPC is far less than CHPCL, there is not much difference between net profit of both company due to net other income of BPC.

7) Operating Breakeven point of BPC is lower than CHPCL in first three years but it increases after that due to increased in fixed cost. It means BEP of BPC is found increasing whereas of CHPCL is decreasing. BEP ratio of BPC is also higher than CHPCL. Hence, CHPCL is more efficient in terms of operating BEP.

8) The cash breakeven point of BPC is increasing whereas of CHPCL is decreasing due to increase in non cash expenses of CHPCL. CHPCL can cover it cash expenses only by selling small portion of sales volume. This shows that CHPCL is more efficient in terms of cash cost coverage.

9) Due to net other income, BEP of both the company is reduced. But BEP of BPC is reduced to great extent because of huge net other income. This shows that BPC can easily cover its fixed cost even if there is major break down in the operation with other income.

10) The breakeven price of CHPCL is found decreasing whereas of BPC is increasing. Similarly, the profit per unit of BPC is fluctuating but far less than CHPCL, where its PPU is increasing. This shows that CHPCL can achieve more competitive edge in terms of pricing.

11) The margin of safety under operating BEP of CHPCL is far greater than BPC and is in increasing trend. The MOS Ratio of BPC is nearest to 50% whereas of CHPCL is more than 50%. This illustrate that CHPCL has more units to generate profit and is more efficient.

12) The MOS under cash BEP of BPC and CHPCL is far greater than MOS under operating BEP due to high non cash expenses. But MOS of CHPCL is about double of the BPC due to high non cash expenses than BPC.

13) The net other income of both company has sufficiently increases the MOS of both company. But MOS of BPC is highly increased than CHPCL. This shows that both companies may still have MOS even if there is hindrance in generation with other income but not in comparison to BPC.

14) Required sales to meet the operating profit of CHPCL shows that BPC requires to generate and sales huge quantity to reach its profit level. Required quantity cannot be achieved even if the company is at the full utilization. But required sales are highly decreased if net profit is to be achieving due to high net other income.

15) The study concluded that the operating profit of BPC is more sensitive towards sales than CHPCL i.e. more than double. But the net profit of CHPCL is more sensitive towards sales. Hence, considering the same sales level BPC is more efficient in terms of operating leverage whereas CHPCL is more efficient for leveraging net profit.

16) The sensitivity analysis effect on Break even and Margin of safety proves that if selling price increases BEP decreases whereas MOS increases for both companies & vice versa. Similarly, if variable and fixed cost decreases BEP decreases and MOS increase for both company & Vice versa. Sales volume has positive effect on BEP and MOS analysis depending upon BEP ratio and MOS ratio.

5.3 Recommendations

If there is one sector that can solve all the burning problem of the country – unemployment, poor economy, poor relation with neighbor, it could be hydropower development in which Nepal has a huge potential. Currently, the only reason Nepal is sinking into poverty is political instability and poor governance. Nepal is unable to identify its potential that is why it is facing the present situation. Instead it was trying to move up in the field of garment, vegetable oil, carpet export, which all led to its failure. Any country for its development should focus on the sector in which it has immense potential. Like the Gulf country can never hope to develop water resources but petroleum.

Hydropower is Nepal's finest resources in terms of social, infrastructural, economic and overall development of the country. It is a real solution to unemployment and poverty in the country. 1 MW power plants nearly employs 3500 people. Nepal has more capability, bigger market and its HP is internationally more salable. Nepal has more opportunities but they have no materialized due to failure in execution. The local people and other stakeholders are equally responsible for aggravating the energy crisis in the country along with the government. HP being a commercially viable sector, the government should just focus on making encouraging policies. If the policies are good, the HP sector will automatically flood.

The immediate step that needs to be undertaken are to revise the present policy and issue the policy which are more encouraging for private sector investment for hydropower sector because this sector will be limited with the rise of other renewable energy sources like solar power. Nepal Electricity Authority (NEA) which has three mandates to build transmission lines, distribute electricity to the consumer and generate electricity is not fulfilling its mandate which is the hindrance in development of Hydropower sector. Hence its responsibility should be divided regarding transmission, distribution and generation. Although there are many hydropower company in operation but this sector is not developed as it should be due to various policy problem which needs to be revised.

In regard of hydropower industry Chilime hydropower and Butwal Power Company are two giant companies on which study is focused. The study performs the Cost Volume

Profit analysis in these two companies and draws the various conclusions as discussed above. On the basis of conclusion following suggestion and recommendation are outlined.

1) The first and most important recommendation regarding this study is to apply CVP analysis as profit planning tool by every hydropower company to accelerate profit.

2) The company should prepare direct costing which is based on those cost that are closely and directly connected to the operation volume. This method is more than a cost calculation; it is short term earning calculation method, which makes these cost a useful company management tools.

3) The average load factor of both companies is 30% of the installed capacity thus the companys' capacities were unutilized. Both the companies should utilize their maximum capacity.

4) The internal consumption and transit loss of BPC is higher than CHPCL. BPC should have control over such loses in order to reduce the difference of sales with CHPCL. This also helps to achieve the targeted sales to NEA.

5) The average selling price of CHPCL is far greater than BPC. This shows that PPA is more in favor of CHPCL. The PPA procedure should be transparent and time bound. So that developers should not have to wait for the conclusion of PPA process for months.

6) The average selling price of BPC with NEA is greater than local consumer. So, BPC should focus on selling to NEA.

7) As per the comparative analysis of Cost, BPC has increasing cost trend which should be reduced to achieve higher profit in upcoming years, especially fixed cost which are in huge amount and increasing. Although the total cost of CHPCL is far greater than BPC it is decreasing. Effective cost control techniques should be practiced by both companies.

8) BPC make huge amount of income from other sources which reduce the gap of profit with CHPCL to great extent. Thus, CHPCL should focus on increasing other income whereas BPC should focus on generation and sales business.

9) BPC supplies excess energy to grid which should be reduced as it increases the sales of the company.

10) BEP analysis shows that BEP of BPC is not satisfactory as it is in increasing trend but CHPCL is decreasing. It is highly recommended to BPC to operate at the BEP level of 4,64,13,553 KWh (fiscal year 2062/63) which is the lowest and operating profit is higher at this point. Similarly, CHPCL should maintain the BEP level of 3,01,55,101.89 KWh (fiscal year 2065/65) which is lowest & the operating profit is highest at this point. BEP ratio of BPC should be reduced which is more than 50% and is increasing as it increases the risk level.

11) Considering the breakeven point including other income BPC should maintain the BPE level of 78,37,028.052 KWh (fiscal year 2064/65) where the net profit is maximum whereas CHPCL should maintain the level of 2,16,05,150.88AKWh (fiscal year 2064/65) being net profit maximum for forth coming year period.

12) The BEP price of CHPCL is more satisfactory than BPC as it is decreasing whereas of BPC is increasing. Low BEP price increases profit per unit of the company. BPC should focus on reducing BEP price as it affects the pricing strategy. BEP price highly reliance on fixed cost per unit which should be emphasized on minimizing.

13) Operating margin of safety of BPC is not satisfactory as the MOS ratio is less than 50% which is the reason for low operating profit. Thus, the BEP ratio should be reduced to increase the MOS ratio which increases the operating profit.

14) MOS under other income and expenses of both companies is satisfactory as MOS ratio is more than 50%. Since the MOS ratio of BPC is greater than CHPCL, it is recommended to BPC to focus on other income source which helps to achieve the profit level of CHPCL without increasing the installed capacity.

15) As the portion of fixed cost is very high in Hydropower Company, CHPCL can leverage the operating profit more than present situation by revising the cost structure. Similarly, BPC can leverage the net profit by changing cost structure.

16) Both company has many project in pipeline which should be bring in operation as fast as possible because in the next 10-15 years, the value of hydropower will be lessen with rise of other renewable energy sources like solar power, nuclear plant etc.

17) Both the companies suffer largely from repair and maintenance problem which cause frequent break down of machine and reduces the average load factor. Such problem should be reduced by hiring expertise from right country.

18) These companies are also recommended to focus on Storage type project which reduces the power shortage during the dry season as Nepal suffers high load shedding during this season. There is only one dry season project which cannot meet the demand. This increases the sales and boosts the profit.

19) Hydropower Policy should be frequently revised which provides more flexibility to private investors. The electricity should be brought under the open market system and the model of single buyer be eliminated. Free economic policy and free market policy of electricity tariff which gets fixed in the stock exchange as per demand are major reasons that India took more ahead in the energy sector besides HP development started later than Nepal.

20) NEA's three mandate- generation unit, transmission unit and distribution unit should be divided or should undergo complete reform. Government should create autonomous organization for planning and operation of national and regional transmission grids to facilitate wheeling of energy.

21) Nepal Rastra Bank should amend its policies to render hydropower sector to be priority sector with preferential treatment in terms of interest, pay-back periods etc. It should create environment for incremental domestic capital market and foreign capital for hydropower development. Securities should be provided at nominal cost.

22) Government should create opportunities and condition for enhancing the technical and management capabilities related to hydropower in banks and also in private developers.

Appendix I

Fixed cost of BPC from 206061 to 2065/66

Particular	Behavior	Fixed				
		2060/61	2061/62	2062/63	2063/64	2065/66
1.Power plant expense						
Staff cost	Fixed	16190548	19986482	21342878	24186350	31340768
Office overhead	Fixed	2287510	2767108	2967788	4129333	5107738
Vehicle operation & main.	Fixed	915185	664871	336325	651017	665892
Env., Community, & mitigation	Fixed	289890	283536	1018530	3485636	840342
Mitigation(JDMP)	Fixed					879210
Power plant operation & Ins.	Semi	4035744	4053500	3721246	5151418	3160099
Power plant maintenance	Semi	6423659	8894198	5781639	4994078	7371812
Deferred expenses-mitigation	Fixed	2880566	6789126	5561309	2474860	2341804
Royalty	Fixed	7373347	7445910	9364934	19810133	20685386
T/L repair & maintenance	Fixed		83302	61752	61902	131365
Expenses W/O	Fixed			199921	1299815	0
2. Distribution expenses						
Staff cost	Fixed	16216634	18156684	15526518	16160844	25492106
Office overhead	Fixed	2185803	1818644	1865460	2505965	3394193
Vehicle operation & maint.	Fixed	896897	1276693	1200156	1352441	142285
Env., community, & mitigation	Fixed	13014	22038	35535	44585	0
T/L maintenance	Fixed	65946	66781	63716	78720	84102
D/L network operation	Fixed	4364097	6597373	8253693	5656949	10766434
D/L network & maintenance	Fixed	2700018	909407	2781148	3025514	2958152
Royalty	Fixed		726770	1131489	3877503	4`47841
Expense W/O	Fixed		144923	266939	600732	162862
3.Administrative expenses						

Staff cost	Fixed	13150770	14697810	17554481	20532857	29033972
Office overhead	Fixed	25220881	26503093	18883485	19437449	30288030
Expenses W/O	Fixed				98034	597778
4. Depreciation	Fixed	46130228	47413212	49958880	51923817	55102939
5. Interest on loan	Fixed				5266265	7245699
Total	Semi	151340737	169301461	167877822	196806217.00	237792968.00

Appendix II

Variable of BPC from 206061 to 2064/65

Particular	Behavior	Fixed				
		2060/61	2061/62	2062/63	2063/64	2064/65
Electricity purchase	Variable	727097	577054	1035648	1556842	2968709
Power plant operation & Ins.	Variable	2690496	2702333	2480831	3434279	2106732
Power plant maintenance	Variable	4282440	5929466	3854426	3329386	4914541
Total		7700033	9208853	7370905	8320507	9989982

Appendix III

Other income and Expenses of BPC from 2060/61 to 2065/66

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/
Consultany services	8211853	8831193	11498493	9534939	18893719	28108
Electricity Services	3479053	3529011	5353062	3634632	6150567	8040
Interest Income	4949727	8455366	13639148	15364708	16495059	11272
Foreign currency exchange gain			7482601		18217263	30809
Dividend Received	131677373	40004906	88036169	97981800	156894170	104842
Gain on sale of Asset & Scrap Material	1377688	371096			142834	607
Financial Support for training & tecnology transfer		13418431		2794454	3867516	4316
Depreciation being reserve portion of grant aid	6183568	6535812	6833272	6964097	5276103	5866
KHP-I Preperation fee in share	92753196					

Income in share from Khudi Hydropower Ltd	600000					
Other income	1831760	1654812	2448905	1461610	1981773	6636
Total	251064218	82800627	135291650	137736240	227919004	200499
Other expenses:						
Consultancy services expenses	10946010	14902885	13692189	8774442	16743019	16743
Foreign currency exchange loss	2621169	10222053		25740098		
Loss on sale of asset	375913		6090660			
KHP Back End, Force Majeure & Bonus payment	100074562					
Total	114017654	25124938	19782849	34514540	16743019	16743
Net other income	137046564	57675689	115508801	103221700	211175985	183756

Appendix IV

Fixed Cost of CHPCL from 2060/61 to 2064/65

Particular	Behavior	2060/61	2061/62	2062/63	2063/64	2064/
1.Cost of Energy sold						
Staff cost	Fixed	6564017.8	9356105.8	9460674.3	11042780.0	134415
Fuel & Mobil	Variable					
Machine & equipment main.	Semi-variable	463452.9	442920.0	565075.3	1524136.4	7321
T/L repair & maintenance	Fixed		2096860.8	17931.0	39278.0	14788
D/L network maintenance	Fixed	149130.3	335215.5	74482.4	46236.7	588
Royalty	Fixed	12122421.7	14784258.0	17075676.5	19096554.1	183249
Office overhead	Fixed	10349669.6	5901817.9	13304992.9	21198929.6	276044
2. Administrative Exp.						
Staff cost	Fixed	5579714.5	3856230.1	2225119.7	3447211.5	54394
Office overhead	Fixed	5982681.2	10947628.0	18745878.7	13582096.5	100776
Royalty	Fixed	2210000.0	2210000.0	2210000.0	2210000.0	22100
Expenses W/O	Fixed	15781454.2	18066941.1	55490700.7	1289877.3	12898
3. Depreciation	Fixed	92998893.0	103613763.8	102819635.3	103786564.1	1037400
4. Interest expenses	Fixed	162695289.8	127139906.6	81563356.3	45025223.0	51300

Total		314896725.0	298751647.3	303553523.1	222288887.2	1895278

Appendix V

Variable Cost of CHPCL from 2060/61 to 2064/65

Particular	Behavior	2060/61	2061/62	2062/63	2063/64	2064/65
Fuel & Mobil	Variable	80285.0	167038.3	149900.8	124754.4	155323.5
Machine & equipment main.	Variable	308968.6	295280.0	376716.9	1016091.2	488131.9
Total		389253.6	462318.3	526617.7	1140845.6	643455.4

Appendix VI

Other income and Expenses of CHPCL from 2060/61 to 2065/66

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66
Other income:						
Other income	307295.57		2579187.97	715444.58	14669916.34	1359747
Gain on sale of asset	729838.27	339649.74				50760753
Total	1037133.84	339649.74	2579187.97	715444.58	14669916.34	52120501
Other expense:						
Loss on sale of asset		6496.59			1553611.97	0
Net other income	1037133.84	333153.15	2579187.97	715444.58	13116304.37	52120501

Appendix VII

Cash Break even point of BPC from 2060/61 to 2065/66

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	
Defferd expenses-miti. work	2880566	6789126	5561309	2474860	2341804	
Power plant expenes w/o			199921	1299815		
Distribution expenses W/O		144923	266939	600732	162862	
Administrative expenses W/O				98034	597778	
Deprecitation	46130228	47413212	49958880	51923817	55102939	6
Total fixed cost(TFC)	151340727	169301465.2	167877821.2	196806215.6	243220809	26
Cash fixed cost	102329933	114954204.2	111890772.2	140408957.6	185015426	19
Cash BEP in KWh	32259365.5	34144475.06	30934689.58	36489762.62	45248214.92	4

Cash BEP in Rupees	105190375	118326387.9	114240120.3	143544984.9	189504794.6	2

Appendix VIII

Cash Break even point of CHPCLfrom 2060/61 to 2065/66

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/66
Administrative W/O	15781454.2	19480048	55490700	1289877	1289877	128987
Depreciation	92998893	1036137637	102819635	103786564	103740007	10356787
Total fixed cost	314896725	2987516472	303553523	222288888	189527887	18382550
Cash fixed cost	206116378	175657835	145243187	117212446	84498002	7896775
Cash BEP in KWh	39548780.2	33418532	24772844	18779832	13721440	1295402
Cash BEP in Rupees	206251679	175775252	145336638	117360673	84560577	7901515

Sensitivity Analysis

Appendix IX

1) If Average selling price of BPC is equal to CHPCL

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2
AV SP of CHPCL	5.2151	5.2598	5.8668	6.2493	6.1626	
Sales Volume	86839377	93243490	97056352	96812869	100689723	9
Sales Revenue	452876035	490442108.7	569410205.9	605012662.2	620510487	5

Variable cost	7702652.74	9212456.812	7366577.117	8316225.447	9988420.5	1
Fixed cost	151340727.4	169301465.2	167877821.2	196806215.6	243220809	26
New Operating profit	293832654.9	311928186.7	394165807.6	399890221.2	367301257	30
Old Operating profit	124126630	144623567	183170391	175722788	168476701	15
Difference	169706024.9	167304619.7	210995416.6	224167433.2	198824556	15
% Change	136.7200776	115.6828193	115.1907879	127.5687893	118.01309	
CMPU	5.1264	5.161	5.7909	6.1634	6.0634	
New BEP	29521833.53	32804004.11	28989936.14	31931436.48	40112941	4
Old BEP	47709948.43	50287066.03	46413553	51146395.44	59483188	6
Difference	18188114.9	17483061.92	17423616.86	19214958.96	19370247	1
% Change	38.12226904	34.76651812	37.53993334	37.56854964	32.564238	
New MOS	57317543.47	60439485.89	68066415.86	64881432.52	60576782	5
Old MOS	39129428.57	42956423.97	50642799	45666473.56	41206535	3
Difference	18188114.9	17483061.92	17423616.86	19214958.96	19370247	1
% Change	46.48193333	40.69952828	34.40492469	42.07673039	47.007707	

2) If Both company is able to utilize their installed capacity

i) If BPC is able to utilize its installed capacity

Particular	**2060/61**	**2061/62**	**2062/63**	**2063/64**	**2064/65**	**2**
Installed capacity	149796000	149796000	149796000	149796000	149796000	14
Internal Consumption	3202468	3236057	3588739	4320328	5291209	
Sales Volume	146593532	146559943	146207261	145475672	144504791	14
AV SP of BPC	3.2608	3.4655	3.6929	3.9339	4.188	
Sales Revenue	478012189.1	507903482.5	539928794.1	572286746.1	605186065	646

Variable cost	13002846.29	14480122.37	11097131.11	12496360.22	14334875	
Fixed cost	151340727.4	169301465.2	167877821.2	196806215.6	243220809	26
New Operating Profit	313668615.5	324121894.9	360953841.8	362984170.3	347630380	36
Old Operating Profit	124126630	144623567	183170391	175722788	168476701	15
Difference	189541985.5	179498327.9	177783450.8	187261382.3	179153679	202
% Change	152.7005007	124.1141618	97.05905516	106.5663619	106.33736	
New BEP(Old BEP)	47709948.43	50287066.03	46413553	51146395.44	59483188	
New MOS	98883583.57	96272876.97	99793708	94329276.56	85021603	8
Old MOS	39129428.57	42956423.97	50642799	45666473.56	41206535	3
Difference	59754155	53316453	49150909	48662803	43815068	4
% Change	152.7089896	124.1175314	97.05409253	106.5613331	106.33039	138

ii) If CHPCL is able to utilize its installed capacity

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065
Installed capacity	197625600	197625600	197625600	197625600	197625600	197
Internal Consumption	2028730	2156660	2348660	2119940	1619000	
Sales Volume	195596870	195468940	195276940	195505660	196006600	197
AV SP of CHPCL	5.2151	5.2598	5.8668	6.2493	6.1626	
Sales Revenue	1020057237	1028127531	1145650752	1221773521	1.208E+09	1204
Variable cost	665029.358	684141.29	742052.372	1544494.714	901630.36	
Fixed cost	314896724.9	298751647.2	303553523	222288888.3	189527888	183

New Operating Profit	704495482.5	728691742.1	841355176.2	997940138	1.017E+09	1019
Old Operating Profit	278249811.9	392812607.4	515334699	680111058.5	679843184	698
Difference	426245670.6	335879134.7	326020477.2	317829079.5	337637571	320
% Change	153.1881253	85.50620026	63.26383181	46.73193819	49.664037	
New BEP(Old BEP)	60421114.97	56836871.41	51774436.81	35615228.68	30777007	30
New MOS	135175755	138632068.6	143502503.2	159890431.3	165229593	167
Old MOS	53388855.03	74731128.59	87895363.19	108967841.3	110398993	114
Difference	81786900	63900940	55607140	50922590.02	54830600	52
% Change	153.1909608	85.50779468	63.26515755	46.73175995	49.665852	

3) If variable cost of BPC is reduced to the level of CHPCL

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	2065/6
AV SP of BPC	3.2608	3.4655	3.6929	3.9339	4.188	4
VC/ Unit of CHPCL	0.0034	0.0035	0.0038	0.0079	0.0046	0.0
Sales Volume	86839377	93243490	97056352	96812869	100689723	96338
Sales Revenue	283165840.5	323135314.6	358419402.3	380852145.4	421688560	4306346
Variable cost	295253.8818	326352.215	368814.1376	764821.6651	463172.73	452
Fixed cost	151340727.4	169301465.2	167877821.2	196806215.6	243220809	266226
New Operating profit	131529859.2	153507497.2	190172767	183281108.1	178004578	1639553
Old Operating profit	124126630	144623567	183170391	175722788	168476701	151420
Difference	7403229.24	8883930.18	7002375.963	7558320.094	9527877.2	12535

% Change	5.964255406	6.142795648	3.822875479	4.301274855	5.6553085	8.278478
CMPU	3.2574	3.462	3.6891	3.926	4.1834	
New BEP	46460590.47	48902791.8	45506443.63	50128939.28	58139506	5955849
Old BEP	47709948.43	50287066.03	46413553	51146395.44	59483188	61342
Difference	1249357.959	1384274.233	907109.3688	1017456.163	1343682.5	178401
% Change	2.618652923	2.75274408	1.954406224	1.989301797	2.2589281	
New MOS	40378786.53	44340698.2	51549908.37	46683929.72	42550217	3678035
Old MOS	39129428.57	42956423.97	50642799	45666473.56	41206535	34925
Difference	1249357.959	1384274.233	907109.3688	1017456.163	1343682.5	185476
% Change	3.192885776	3.22250808	1.791191219	2.228015619	3.2608481	

4) If fixed cost of CHPCL is reduced to level of BPC based on Insatalled capacity

Particular	2060/61	2061/62	2062/63	2063/64	2064/65	20
AV SP of CHPCL	5.2151	5.2598	5.8668	6.2493	6.1626	
VC/ Unit of CHPCL	0.0034	0.0035	0.0038	0.0079	0.0046	
Fixed cost of BPC	151340727.4	169301465.2	167877821.2	196806215.6	243220809	26
Installed capacity of BPC	149796000	149796000	149796000	149796000	149796000	14
Installed capacity of CHPCL	197625600	197625600	197625600	197625600	197625600	19
FC of CHPCL based on Installed capacity of BPC	199663556.1	223359126	221480915	259646095	320880787	351
Sales Volume	113809970	131568000	139669800	144583070	141176000	14
New Operating profit	393479864.5	468201752.4	597403122.4	642754678.1	548481021	53
Old Operating profit	278249811.9	392812607.4	515334699	680111058.5	679843184	69
Difference	115230052.6	75389144.98	82068423.41	-37356380.37	-1.31E+08	-16

% Change	41.41244582	19.19213986	15.92526635	-5.492688275	-19.32242	
CMPU	5.2117	5.2563	5.863	6 .2414	6.1581	
New BEP	38310638.78	42493603.11	37776038.72	41600617.64	52107109	576
Old BEP	60421114.97	56836871.41	51774436.81	35615228.68	30777007	3
Difference	22110476.19	14343268.3	13998398.09	-5985388.965	-21330102	275
% Change	36.59395593	25.23585121	27.03727739	-16.80570134	-69.30531	
New MOS	75499331.22	89074396.89	101893761.3	102982452.4	89068891	871
Old MOS	53388855.03	74731128.59	87895363.19	108967841.3	110398993	11
Difference	22110476.19	14343268.3	13998398.09	-5985388.945	-21330102	275
% Change	41.41402953	19.19316431	15.92620769	-5.492803081	-19.32092	24.0