

**IMPACT OF SALES AND PRODUCTION BUDGETING ON  
PROFITABILITY OF PUBLIC ENTERPRISES  
'A CASE STUDY OF NEPAL ELECTRICITY AUTHORITY'**

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**A Thesis Submitted to  
Office of the Dean  
Faculty of Management  
Tribhuvan University**

*In partial fulfillment of the requirement for the degree of  
Master of Business studies  
November, 2008*

**RECOMMENDATION**

This is to certify that the thesis

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**IMPACT OF SALES AND PRODUCTION BUDGETING ON  
PROFITABILITY OF PUBLIC ENTERPRISES  
'A CASE STUDY OF NEPAL ELECTRICITY AUTHORITY'**

has been prepared as approved by this Department in the prescribed  
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*and found the thesis to be the original work of the student and written  
according to the prescribed format. We recommend the thesis to be  
accepted as partial fulfillment for the*

**Degree of Master of Business Studies (M.B.S)**

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## DECLARATION

I, hereby, declare that the work reported in this thesis entitled **“IMPACT OF SALES AND PRODUCTION BUDGETING ON PROFITABILITY OF PUBLIC ENTERPRISES (A case study of Nepal Electricity Authority)”** submitted to Shanker Dev Campus, Faculty of Management, Tribhuvan University, is my authentic work done in the form of partial fulfillment of the requirement for the Master Degree of Business Studies (M.B.S) under guidance and the supervision of Mr. Tek Bahadur Sijali, Associate Professor of Shanker Dev Campus and Mr. Shanker Raj Joshi Faculty Member of Shanker Dev Campus, Tribhuvan University.

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## **ACKNOWLEDGEMENT**

I wish to express my sincere thanks to my supervisor Mr. Tek Bahadur Sijali, Associate Professor and Mr. Shanker Raj Joshi of Shanker Dev Campus for their continuous encouragement, invaluable guidance, suggestions and help during the course of preparation of this Thesis. Thanks to all faculty member of Faculty of Management for their valuable instruction and suggestions.

My special thanks go to the family member of Nepal Electricity Authority for giving necessary information and suggestion during the study period.

I am indebted to all my friends who are actively involved and providing me a vital support and encouragement whenever I needed.

I am also beholden to my family member for their suggestion and encouragement in every difficult stage of life.

Lastly, I heartly beg sorry for my any mistake and assure to take responsibility for all comments.

Date: November, 2008

Sumitra Prajapati

Shanker Dev Campus

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## ABBREVIATIONS

AD	: Anno Domin
A/C	: Account
Authority	: Nepal Electricity Authority
B.S	: Bikram Sambat
CPP	: Comprehensive profit planning
C.V	: Co-efficient of Variation
FY	: Fiscal Year
Govt	: Government
GWH	: Giga Watt Hour
HMG	: His Majesty Government
i.e.	: That is
KTM	: Kathmandu
KW	: Kilo Watt
M.B.S	: Master of Business Studies
MW	: Mega Watt
NEA	: Nepal Electricity Authority
No.	: Number
PE	: Public Enterprise
PEs	: Public Enterprises

PPC	: Profit Planning and Control
r	: Correlation Coefficient
Rs	: Nepalese Rupees
S.D	: Standard Deviation
T.U	: Tribhuvan University

# 1. INTRODUCTION

## 1.1. Background of the Study

Nepal is a landlocked country situated in the lap of the Himalayas. It is located between 26<sup>0</sup> 22' to 30<sup>0</sup> 27' north longitude and 80<sup>0</sup> 4' to 88<sup>0</sup> 12' East longitude. The average length being 885 km east to west and average breadth is about 193 km north to south. It is an independent and developing country, that which lies between two powerful countries, India in the east, south, west and China in the north.

Nepal has an area of 147181 sq.km. This area is 0.3% of Asia and 0.03% of the world. It is covered by Terai in the south, Region by mountains in the middle and by evergreen snow-white Himalaya in the northern region. Terai occupies 17% of the total land, mountain 68% and Himalaya region 15%. Nepal is divided into five development regions: Eastern region, Central region, Western region, Mid Western region, and Far Western region. Geographically there are three regions: namely The Himalayan region, Hilly region and Terai region.

Nepal is one of the least developed countries of the world. More than 90% of total population is still in the rural areas and most of them are not yet getting minimum physical facilities that are necessary for human beings because of underdeveloped conditions in those areas and their poverty. Nepal at the end of Ninth five year plan, Nepal has more than 38% people living below poverty line, which will be reduced to 30% at the end of the Tenth five year plan.

Nepal has abundant natural resources, but is still backward in terms of socio-economic development because of the inability to exploit these resources. Among the various resources available in the nation, water resource is the greatest one. It is the second richest country in the world in water resources. The water resources of Nepal can be considered as an incomparable means for all-round development, if used wisely. From our rivers we can not only generate hydroelectricity but it can be a multi-purpose source of energy. Proper utilization of this huge potential natural resource could be one of the important means for the economic development of the country. Efficiently generating

hydroelectricity emphasizes tourism development, industrial development, provides job opportunities and improves the socio- economic condition of the country by reducing the investment in other petroleum products.

Nepal has mixed economy where contribution of private and public sector are co-existed in harmony. However Nepal government has been involving in some specific sectors like infrastructure, essential commodities producing, social welfare and industries. Basically, the public enterprises are established for the purpose of socio- economic development of the country. The economic development of the nation is possible only through the striving of the public enterprises as well. Social welfare is focused more than economic objective in Nepalese public utilities enterprises like Nepal Electricity Authority, Nepal Telecom. Nepal Drinking Water Corporation.

## **1.2. Public Enterprises**

### **1.2.1. Meaning of Public Enterprises**

Public enterprises are the state owned enterprise which are managed, controlled and owned by government to provide goods or services to the people at fair price. The ownership with the government should be 51% or more to make an entity PE. In Nepal public enterprises are established with the fund of HMG or with the help of financial assistance of international agencies or foreign countries. Therefore public enterprises are usually autonomously organized with the government providing the initial capital and being responsible for contribution overview of their activities finance and development. They are government creation with certain mission and objectives. However control by government at every aspect of public enterprises is undesirable. They should have certain degree of freedom as well.

Public enterprises are established not only for commercial purpose but also for public welfare. They are strong means of socio-economic development of nation. So they have to maintain proper balance between profit oriented and service oriented. Mainly the exploitation of consumers and workers, the necessity of infrastructure development, defense structure, the utilization of natural resources, unemployment condition of the nation compelled the government to establish public enterprises.

UN has define PE as “Those organization namely governmental enterprises and public corporation which are entirely or mainly owned and or controlled by the public authorities consisting of establishment which by virtue of their kind of activities, technology and made of operation are classified as industries”.

According to Friedman “An institution operating a service of an economic or social character on behalf of the government but as an independent legal entity largely autonomous in its management, though responsible to the public through government and parliament and subject to some direction by the government equipment on other hand with independent and separate fund of its own and the legal and commercial attributes of a commercial enterprises”.

Public enterprises are autonomous bodies which are owned and managed and controlled by the government and provide goods or services for a fair price. They conduct their business to protect the people from exploitation and to restrain monopolistic tendencies. Public enterprises in Nepal constitute a vital instrument for the socio-economic development of our country. It enjoys a strategic and crucial position in our mixed economy. They have been established in many sectors for the overall development of the country with different goal and objectives.

Public enterprises were established in developed countries in 18<sup>th</sup> century, in the developing countries after Second World War. In context of Nepal, Nepal Bank Ltd. was established in 1904 B.S in private sector but after 2010 B.S it became first public enterprises in Nepal. During the Second World War, some other PEs were established. However they could not make any substantial progress. Nepal started its planned economic development from 2013 B.S. Then the numbers of public enterprises have increased substantially in the various fields of national economy. There were 64 PEs in Nepal before privatization program of HMG and now there are 38 public enterprises. They are manufacturing or public enterprises. Both of them are interested to earn profit providing social responsibility. Nepal Electricity Authority is one of the greatest public enterprises in Nepal.

### **1.2.2. Role of Public Enterprises in Nepal**

Nepal is an independent and developing country, which lies between the world's two giant countries China in north and India in the east, west and south. Nepal is landlocked country. It has an area of 147181 sq. km. The average length being 885km east to west and average breadth is about 193km north to south. Nepal has more than 38% people living below poverty line and more than 90% of total population is still in the rural area depend on agriculture sector.

Nepal has adopted mixed economic policy for its economic prosperity. It creates the co-existence of private and public sector. The private sectors have a predominant role in market. Most of private organizations are profit oriented; they try to maximize profit by exploiting the people and by providing less quality goods and services. Neglect the nation and may not give contribution. In other hand public sectors are established for the purpose of socio economic development of the country. Therefore the co-existence of the both private and public sector is necessary and useful for achieving their own objectives of social and economic development.

Public enterprises in Nepal constitute vital instrument for the socio-economic development. It enjoys a strategic and crucial position in our mixed economy. Public enterprises were established in many sectors for the overall development of the nation with different in the production or supply of Cement, Brick and Tiles, Sugar Cigarettes, Petroleum Product and almost all the public utilities. Therefore public enterprises play a very important role in developing countries like Nepal. Mainly, the role of public enterprises has been in basic infrastructure, defense sector, industrial states, public utilities, commercial sector, trading and banking sectors. Public enterprises are important to accelerate the rate of economic growth, to provide better goods/services to the people at reasonable price, to develop the fundamental infrastructures, to generate the employment opportunities, to collect government revenue, to reduce economic inequalities, to increase foreign exchange reserve, to mobilize the national resources into productive uses, to establish welfare oriented society, to balance the regional development etc.

### **1.3. A brief Overview of Nepal Electricity Authority (NEA)**

Nepal Electricity Authority (NEA) is one of the full government undertaken public enterprises, was established on August 16, 1985 (Bhadra 1, 2042) under the Nepal Electricity Authority Act 1984, through the merger of the Department of Electricity of Ministry of water resources, Nepal Electricity Corporation and related Development Boards.

Nepal Electricity Authority is the largest public utility enterprise in Nepal. It has established its branch offices, distribution sector, power houses, grid houses in all over the kingdom is about 200. The main purpose of NEA is to generate transmit and distribute adequate, reliable and affordable power by planning, constructing, operating and maintaining all generation, transmission and distribution facilities in Nepal's power system both interconnected and isolated. Therefore NEA is playing vital role as the key player in the nation's power sector.

### **1.4. Focus of the Study**

Sales and production budgeting is an important tool of every business enterprises to achieve their goals by removing uncertainty and risk. Without proper planned sales revenue, planned production volume and controlled expenses, desired profit cannot be secured. Thus these budgets are used for the planning of profit, their follow up procedure and they are compared with the actual achievement using different means such as cost volume profit analysis, variance analysis, coefficient of variation etc.

This study is mainly focuses on the sales and production budgeting and its impact on profitability in Nepal Electricity Authority.

### **1.5. Statement of the Problem**

Nepal Electricity Authority, as the largest corporate body in the country with country's high capital investment, is a leading public enterprises functioning in public utility sector. It has been financed by government as well as foreign agencies. Without grant loan and donation from the government and donor foreign agencies, NEA could not able to operate

their activities.

NEA is large scale PE of the country and single government institution in the power sector. It has to play vital role than other PEs as manufacturing and non manufacturing industries depend upon the power supplied. For this sense as per the other PEs, it has no difficulty in selling its products and services as demand of electricity in the nation. It is facing very little or no market competitions, enjoying almost full monopoly over distribution of service in Nepal.

Government of Nepal has invested huge amount in NEA aiming to provide its service to common people and to generate sufficient amount of dividend to fulfill the national economic goal. However the government has not got the dividend as expected. NEA has not been able to generate the required fund to operate its activities as well. Despite of full support of government most of the PEs are running in losses at the minimum return which can not be justified. We can also divide NEA in the same category, which was in continuous losses from few years. The main cause of such PEs are the lack of integration of activities, less utilization of capacity, lack of motivate skilled manpower, paying huge amount of interest loan, investing large amount for repairing etc. So under this study budgeting system especially sales and production budget system will be studied with special emphasis on following question:

- 1) Is there a sales and production budgeting system in NEA?
- 2) How is sales and production plan formulated in NEA?
- 3) What are the major problems faced by NEA for sales and production budgeting?
- 4) What role has the sales and production planning played in profit planning and control?
- 5) Leakage of electricity is one of the problems.

## **1.6. Objective of the Study**

The main objective of the study is to analyze the sales and production budgeting along with analysis of supply system of electricity. Apart from above following are the other specific objectives.

- 1) To examine the practice and effectiveness of sales budgeting and production budgeting in NEA.
- 2) To identify the effect of sales and production budgeting on profitability of NEA
- 3) To evaluate the variance between budgeted and actual achievement of NEA.
- 4) Comparative study of sales and production budgeting of recent five FY 2060/61 to 2064/65 and previous five FY 2054/55 to 2058/59
- 5) To provide the valuable suggestion and recommendation to the NEA.

## **1.7. Significance of the Study**

Public enterprises play vital role in most of developing countries like Nepal. It is true that Nepal Electricity Authority is the largest public enterprise which was established in 1985 according to NEA Act 1984 to supply electricity reliable, efficient and accessible to all by undertaking the generation, transmission and distribution electricity networking in accordance with the prevailing law. Government of Nepal has spent a huge amount of money in NEA to provide its service to common people and to generate sufficient amount of dividend for nation development. However NEA has not been able to yield as expected dividend and provide electricity service to all people sufficiently due to lack of proper planning. In this context, profit planning or budgeting system especially sales and production budgeting system will be studied.

NEA should be managed or planned the profit to attain the organizational objective either short run or long run. For this purpose, first of all sales and production budgeting should be adopted. The sales and production planning process is an essential part of profit planning and control, which is an estimation of future sales revenue, sales volume and

production volume. It is a first planning from which other planning roll on. So it should be sensible and real.

Sales and production budgeting is very important and crucial tool for every enterprises because it lead an organization to ultimate success. It contributes to improve the profitability as well as overall financial performance of enterprises. Proper sales and production budget minimizing future risk and maximizing the output from the scarce resources and predicts the future. So sales and production budgeting is most important tool in the field of managerial decision making in every business enterprises. Mainly this study will important for the following groups and individual.

- 1) HMG Board of Directors and management body of NEA.
- 2) Further researcher to do further research in future.
- 3) For NEA to improve sales and production budget.
- 4) The university students who will be conducting studies in same area.
- 5) For major parties who are interested on sales and production planning of NEA.

### **1.8. Limitation of the Study**

This study is concerned with only sales and production budgeting and its relation with profit planning in NEA. The following factors have limited the scope of this study.

- 1) This study is mainly based in secondary data and few primary data.
- 2) This study covers only last five years period from FY 2060/061 to 2064/065.
- 3) This study concern only sales and production budgeting and it relation with profit planning in NEA.
- 4) This study is based on the annual report and various published unpublished document of NEA.
- 5) Being a student, time and resources are constraints.

## **1.9. Plan / Scheme of the Study**

This study will be designed into five main chapters. They are

- I. Introduction
- II. Review of literature
- III. Research Methodology
- IV. Data Presentation and Analysis
- V. Summary, Conclusion and Recommendations.

### **Chapter1: Introduction**

This is a first chapter of the thesis (research) which includes general introduction, a brief overview of NEA, focus of the study, statement of problem, significance of the study, and limitation of the study.

### **Chapter 2: Review of Literature**

This chapter is mainly concerned with conceptual framework and relevant studies of research. The conceptual framework includes concept and theory of profit planning and control, budgeting, sales and production budgeting. Then relevant studies include review of the previous related research studies.

### **Chapter 3: Research Methodology**

This chapter includes introduction, research design, sources and nature of data, period covered, research variables and research tools used for the study.

### **Chapter 4: Data Presentation and Analysis**

This chapter is concerned with the presentation and analysis of data that has been collected through various sources. Data are interpreted and analysis with the help of various analytical tools and techniques.

### **Chapter5: Summary, Conclusion and Recommendations**

It is a last stage of the thesis, which includes summary and conclusion of the study. And recommends some suggestion also included to solve the present problems regarding sales and production budgeting of NEA.

Besides these, bibliography, appendices and other related items or figures are also included at the end of the study.

## **2. REVIEW OF LITERATURE**

### **2.1. Profit Planning and Control**

#### **2.1.1. Concept of Profit**

Profit is the ultimate objectives of management to maximize profit over the long term consistent with its social responsibility. Every business enterprises are established to earn profit and later then, enterprises are operated by the profit to earn the profit, and therefore profit is the prime measure of enterprises success, continuity, self-survival, growth and the degree of their goal achievement. No business enterprises even public enterprises can self survive in the absence of profit for long time. That's why profit is the prime goal of every type of business enterprises.

Simply profit denotes the excess of outflows (i.e. goods, services, social benefits or revenue factors) over the inflows (people, capital, materials or cost factors). The excess of enterprises revenue earned over its cost spent for producing revenue within a definite accounting period is called profit. In other sense, profit means 'Return on investment'. In accounting point of view, profit is a measure of the performance towards the achievement of its goal.

An economist will say that profit is the reward for entrepreneurship for risk taking. A labor leader might say that it is a measure of how efficiency has produced and that provides a base for negotiating a wage increase. An investor will view it as a gauge of return on his or her money. An internal revenue agent might regard it as the base for determining income taxes. The accountant will define it simply as the excess of firm's revenue over the expenses of producing revenue in a given fiscal period.

Using accountant measuring stick, management thinks of profit as:

- A tangible expression of the goals it has set for the firm.
- A measure of the performance toward the achievement of its goals.
- A means of maintaining the health, growth and continuity of economy.

It is the ultimate objectives of management to maximize profit over the long term consistent with its social responsibility. (*Lynch & Williamson, 2003: 100*)

Profit is the ultimate goal of every business organization. They involve in business for making profit. Profit can not be achieved automatically. It should be managed well with better managerial skills. So the profit is a planned and controlled output of management. Continuity in proper managerial manipulation of outflows and inflows can secure the generation of profit. So the knowledge of management is essential to generate planned profit.

### **2.1.2. Concept of Planning**

Planning is the primary function of management. It means looking ahead and challenging out the future course of action. Planning is concerned with deciding in advance what to do, how to do it, when to do it and who is to do it. It provides the ends to be achieved. Thus planning is the process of setting goals and choosing the means to achieve those goals. It is also defined as the process of choosing among alternatives. It is thinking before doing. It is a preparatory step for the action that is to follow. Without plan manager cannot know how to organize people and resources effectively.

Planning is the process of developing enterprises objectives and selecting a future course of action to accomplish them. It includes.

- Establishing enterprise objectives.
- Developing premises about the environment in which they are to be accomplished.
- Selecting a course of action for accomplishing the objectives
- Initiating activities necessary to translate plans into action, and
- Current re-planning to correct current deficiencies.

(*Welsch, Hilton & Gordon, 2006: 5*)

Planning consist in setting goals for the firm, both immediate and long range, considering the various means by which such goals may be achieved and deciding which of any available alternative means would be best suited to the attainment of the goals sought under the conditions expected to prevail.(lynch &Williamson, 2003: 5)

### **2.1.3. Concept of Control**

Control is a process of measuring and evaluating actual performance and initiating corrective action. Planning and organizing establish the goals and standards with, which control is implemented. Basically control measures performance by company actual result with planned results and measuring variance above or below the plan.

(Welsch, Hilton & Gordon, 2006: 3)

Control is a function in the management process and one of the prime parts of profit planning and control. As with planning, controlling is performed continuously. Therefore, there is a control process that should be always operating in a enterprise. Controlling consists in checking the performance of activities against the plan, noting deviation from it, and deciding what corrective action if any ought to be taken. Hence controlling is the process of assuring efficient performance to attain the enterprises objectives. It involves:

- Establishing goals and standards
- Comparing measured performance against the establishing goals and standards
- Reinforcing successes and correcting shortcoming

### **2.1.4. Profit Planning and Control**

Profit planning and control is an important tool of management. It facilitates the manager to accomplish managerial goals in a systematic way. The management is efficient if it is able to accomplish the objective of the enterprise. It is effective when it accomplishes the objectives with minimum effort and cost. In order to attain long-range efficiency and effectiveness, management must chart out its course of action in advance. A systematic approach that facilitates effective management performance is profit planning and control

or budgeting. (*Pandey. I.M, 1994: 285*). In a way a budgetary control system has been described as a historical combination of a goal-setting machine for increasing an enterprises profit and “goal-achieving machine for facilitating organizational co-ordination and planning while achieving the budgeted targets”.

Profit planning and control means the planning of revenue (i.e. increase the revenue) and control the cost (i.e. control the inefficiency of cost). So the planning and control are emphasized in profit planning and control out of five functions of management. These provide base camp for PPC. Profit planning and control program helps the management perform its planning function by developing a strategic (long range) profit plan and a tactical (short range) profit plan. It also helps management perform its control function by providing realistic goals and standards that are implemented and then compared with actual results to measure performance.

Comprehensive profit planning is control is a new term in the literature of business, not a new concept in management. In other terms which can be used in same context, are comprehensive budgeting, managerial budgeting and simply budgeting. The profit planning and control can be defined as process/technique of management that enhances the efficiency of management.

Some definition given by various scholars are:

According to Lynch and Williamson “The concept of a comprehensive budget covers its use in planning, organizing and controlling all the financial and operating activities of the firm in the forth coming period.”

According to I.M. Pandey “A profit plan or budget is the formal expression of the enterprises plans and objectives stated in financial terms for a specified future period of time.”

According to Welsch, Hilton and Gordon “Comprehensive profit planning and control is defined as a systematic and formalized approach for performing significant phases of the management planning and control function.”

Profit planning and control involves:

- Developing and applications of board and long range objective.
- Specification of enterprise goals.
- Development of strategic profit plan in board terms.
- Specification of tactical short range profit plan detailed by assigned responsibilities (divisions, departments, projects).
- Establishment of a system of periodic performance reports detailed by assigned responsibility and
- Development of follow up procedures.

*(Welsch, Hilton & Gordon, 2006: 31)*

Hence profit planning and control represent an overall plan of operation, providing guidelines to management and acting as a single light for the management.

### **2.1.5. Purpose of Profit Planning and Control**

A comprehensive profit planning and controlling is a systematic and formalized approach for stating and communicating the firm's expectations and accomplishing management in such a way to maximize the use of a profit plan and to achieve the maximum benefit from the resources available to an organization over a particular span of time. It is an important tool of management control. The maximum objective of profit planning and control is to assist in systematic planning and in controlling the operations of the enterprise. A profit planning and control program can be one of the more effective communication networks in an enterprise. Therefore it is the best source of communication and an important tool in the hand of management. The purpose of budgeting or PPC may be summarized as follows.

1. To state the firm's expectations (goal) in formal terms clearly to avoid confusion and facilitate their attainability.

2. To communicate expectation to all concerned with the management to the firm so that they are understood supporters and implemented.
3. To provide a detailed plan of action for reducing uncertainty and for its proper direction of individual and group efforts to achieve goals.
4. To coordinate the activities and efforts in such a way that the use of resources is maximized.
5. To provide a means of measuring and controlling the performance of individuals and units and to supply information based on which the corrective action can be taken.

*(Goet, Gauttam and Bhattarai, 2005: 1.6)*

#### **2.1.6. Application of Time Factor in Profit Planning and Control**

Whether an individual or an entity is idle or busy, time passes at the same rate. We seldom, if ever, have time to do many things that we would like to do, nor do we have time to do many things as much as we would like. The problem of the manager in one hand is to accomplish the planned activities in a given time and on the other hand is to prepare the plan itself. Thus, the planning function often suffers. Two important timing issues require careful attention if the planning function is to be carried out effectively. Among these timing issues one relates to the concept of a planning horizon, and the other relates to the timing of planning activities.

##### **1. Planning Horizon**

Planning horizon refers to the period of time into the future for which management should plan. We can call it life span of the plan. For all enterprises, many planning horizons are needed to maintain the continuity of planning activities. The decision made by the manner for future activities reflects the managerial planning. In other words managerial decision, which reflects planning activities always effect on future activities only. It does not have any effects on present or past. Major decision should be made on adequate supporting study, analysis, evaluation and consolation.

## **2. Timing of Planning Activities**

For effective implementation of planning, management of an enterprise establish a definite time dimension types of activities related with planning would be given definite time for implantation followed by other activities. This is called planning activities. From the view point of time dimension a manager should maintain clear-cut distinction between historical and futuristic consideration. Because the result derived from historical activities should be considered as platform for deciding plan.

*(Welsch, Hilton & Gordon, 2006: 38)*

### **2.1.7. Fundamentals of Profit Planning and Control**

The concept of budgeting was originally established with function of an accountant. At its origin, the function of budgeting was assigned to the accountant. But in modern day, budgeting is given much more importance and is regarded as a way of management and in more importance sense is regarded as basic techniques of decision making and is given the name “profit planning and control program.”

#### **a) Managerial Involvement and Commitment**

Managerial involvement entails managerial supports, confidence, participation, and performance orientation. All level of management especially top level management should engage itself to comprehensive profit planning and control. Involvement in profit planning and control means to understand, to select, to devote us, to support by its entire department and to evaluate the performance of the profit planning and control. For a comprehensive profit planning and control programme each member of management, starting from the president, the direction should come from top and the implementation level should follow it into. Thus managerial involvement on comprehensive profit planning and control program is directly related to the confidence of management and its known ability to influence the future program and convincement with the idea of setting goal in advance. Managerial involvement also deals with the idea of direct participation of the lower staff on program.

## **b) Organizational Adaptation**

A comprehensive profit planning and control program must rest upon sound organizational structure for the enterprise and a clear-cut designation of lines of authorities and responsibilities. The purpose of organizational structure and the assignment of authority is to establish a framework within which enterprise objectives may be attained in a coordinated and effective way on a continuing basis. The scope and interrelation-ship of the responsibilities of each individual manager are specified. To increase management and operational efficiency, particularly all enterprises, except perhaps the very smallest ones, should be structurally disaggregated into organizational subunits. Thus the company as a whole is a responsibility center as in each division and department. Responsibility centers are further classified in respect to the extent of responsibility as follows.

- Cost center
- Profit center
- Investment center

## **c) Responsibility Accounting**

Every planning is done with the help of historical data supplied by accounting section and control is done by comparing actual data with projected or planned data. Therefore, for this reason accounting system of an enterprise should be built around the responsibility structure of organization or around function subunits. This is called responsibility accounting. A responsibility accounting system can be designed and implemented on a relevant basis regardless of the other features of the accounting systems, standard cost systems, direct costing systems, and so on.

## **d) Full Communication**

Communication can be defined as an interchange of thought or information to bring about a mutual understanding between two or more parties. Communication can be dialogue, message or understanding working together. Although most important thing for any organizational observation and control. Most of organization faces lot of problem due to bad communication system.

Good communication is needed for both the feed forward and feed back process which are most important for operation of any organization. Role of communication can be justified in all aspect of management. It is needed either for decision making or for supervision or for evaluation. For profit planning and control , effective communication means development of well-defined objective, specification of goals, development of profit plans and reporting and follow up activities related to performance evaluation for each responsibility center.

**e) Realistic Expectation**

Profit planning and control must be based on realistic approach or estimation. Management must use realistic assumption and must not take either irrational optimism or unnecessary conservatism. Perfection on setting goals or objectives of the future sales, production levels, costs, capital expenditure, cash flow and so on determine the success of profit planning and control program. So profit planning and control purpose, a realistic approach reared with time dimension and external internal environment that will prevail during the time span should be considered. This is called realistic expectation.

**f) Flexible Application**

Managerial budgeting program or any other management techniques should not be dominated by the management. Such techniques of management must be flexible. These are the techniques, which is not only the end of the management itself because the main end or aim of the management is to use the resources in the most effective way and earn high return against investment and for this purpose managerial budgeting or other techniques are to be used as mean only.

**g) Timeless**

Whether and individual or and any entity remains idle or busy, time passes at the same time. The problem of the manager in one hand is to accomplish the planned activities in a given time and on the other hand is to prepare plan itself. Phasing of the planning is of two types: (a) Timing of planning horizon and (b) Timing of planning activities.

## **h) Individual and Group Recognition**

Behavioral aspect of human being is of the field of study of the psychologist, educators and businessman, and finding was that there can be so many unknown misconception and speculations which has to be considered for an efficient management. A good and dynamic leadership can resolve this problem by integrating all the group efforts for betterment of the organization. This fact also has been well considered under profit planning and control approach and focuses have been given to resolve the behavioral problems.

## **i) Follow-Up**

The importance of follow up action on profit planning and control is much Follow-up action after a careful study is needed to

- Correct the action of substandard performance in a constructive manner.
- To recognize and transfer the knowledge of outstanding performance to others and based on study and evaluation to provide a sound basis for further profit planning and control.

### **2.1.8. Strategic and Tactical Profit Plans**

Mainly, two types of profit plans are developed to achieve organizational objectives. One is strategic (long-range) profit plan and other tactical (short-range) profit plan. Strategic profit plan is generally more than one year and tactical profit plan is detailed and encompasses a one-year time horizon the upcoming year. Some concepts about these are summarized as follows:

Strategy (long-range)	Tactical (short-range)
Profit plan	profit plan
- Board	Detailed
- Long-term	Short-term
- Board responsibilities	Responsibilities at all level
- Quantified	Quantified

The development of strategic and tactical profit plans each year is a process that involves managerial decision and ideally a high level of managerial participation.

The planning function should vary in scope and intensity with the level of management. Top management has much broader planning responsibility than lower management and yet each level of management should have definite planning responsibilities.

### **2.1.9. Advantage and Limitation of Profit Planning and Control**

The advantage of profit planning and control are as follows:

1. Profit planning and control show direction to the business.
2. It forces early consideration of basic policies.
3. It provides definite goals and objectives that serve as benchmarks for evaluating subsequent performance.
4. Profit planning helps one to distinguish between actual needs and wants. It enables the management to lay down and order or priorities and reflects some planning of long and short term requirements in a business.
5. Profit planning and control co-ordinates the activities of the entire organization by integrating the plans and objectives of the various parts.
6. It reduces cost by increasing the span of control because less supervision is needed.
7. It tends to remove the uncertainty that exists in many firms, especially among lower levels of management relative to basic policies and enterprise objectives.
8. It rewards high performance and seeks to correct unfavorable performance.
9. It pinpoints efficiency and inefficiency.
10. Its provides a tool through which managerial policies and goals are periodically evaluated, tested and established as guidelines for the entire organization.

11. Its also promotes understanding among members of management on their co-workers problem.
12. As decentralization of responsibility is a feature of profit planning each manager works critically in his own area of responsibility. Profit planning thus fixes the responsibility center for the management.

Profit planning and control is an important tool for management. However, each tool suffers some limitation and its use is fruitful within these limits. PPC is also not a limitless tool, so it is essential that the use of PPC must be having a full knowledge of its limitations.

The limitation\disadvantage of profit planning and control are as follows:

1. It is difficult, if not impossible, to estimate revenues and expenses in our company realistically.
2. Our management has no interest in all the estimates and schedules. Our strictly informal system is better and works well.
3. It is not realistic to write out and distribute our goals, policies, and guidelines to all the supervisors.
4. Budgeting places too great a demand on management time, especially to revise budgets constantly. Too much paper work is required.
5. It takes away management flexibility.
6. It creates all kinds of behavioral problems.
7. It places the management in a straitjacket.
8. It adds a level of complexity that is not needed.
9. It is too costly, aside from management time.
10. The managers, supervisors and other employees hate budgets.

### **2.1.10. Application of PPC to Various Types of Organizations**

Some people say that comprehensive profit planning and control is applicable only to large and complex organization. Also a not unusual comment is that “Comprehensive budgeting is a fine idea for most business, but ours is different,” or “it is impossible to project our revenues and expenses,” and so on. Sometimes specific industries are viewed as not amenable to profit planning and control. These views are common regarding non-manufacturing enterprises-service companies, financial institutions, hospital, certain retail business, construction companies and real-estate enterprises. To the contrary, profit planning and control can be adapted to any organization (profit or non-profit, service or manufacturing), regardless of size, special circumstances or critical problems is frequently a good reason for the adoption of certain profit planning and control procedures. In respect to size, when operations are extensive enough to require more than one or two supervisory personnel, there may be a need for profit planning and control applications. The smallest company certainly has different needs in this respect than a large one. As with accounting, a single profit planning and control system that is appropriate for all enterprises cannot be designed. A profit planning and control system must be tailored to fit the particular enterprises, and it must be continually adopted as the enterprise and its environmental change. (*Welsch, Hilton & Gordon, 2006:59*)

### **2.2. Budgeting**

A budget is a comprehensive and coordinated plan expressed in financial terms, for the operations and resources of an enterprise for some specified period of future. Budgets basically, are forecasted financial statements form, expression of management plans, they are targets that encompass all phase of operations sales, production and financial. A budget is a written plan for future consists many functional budgets, include a sales budget, a production budget, a purchase budget, a labor budgets, and cash budget once all of these budgets are completed, the master budget for the entire firm is prepared.

The process of preparing and using budgets to achieve management objective is called budgeting. In other words, the entire process of preparing the budgets is known as budgeting. Nowadays, profit planning and control is viewed in a comprehensive way.

Profit planning is a new modified or holistic term of traditional budgeting. Traditional budgeting is mainly viewed with mathematical model but comprehensive budgeting or PPC views mathematical as well as management model developed by organization or experts or scholars. Comprehensive PPC is new modified and broad term and form of traditional budgeting.

### **2.3. Sales Budgeting**

Sales budget is one of the operating budgets. It is a starting point in the budgeting procedure. It is a forecast of total sales of all the product or services expressed in term of physical quantities and values in respect of each product of a future budget period. The process of preparing and using sales budget to achieve sales objectives is called sales budgeting. In other sense, the entire process of preparing sales budget is known as sales budgeting. Sales budget deals with sales volume, sales revenue and sales expenses. It covers sales forecast, marketing plan, sales expenses or promotion expenses plan. All budgets are affected by sales budget and all budgets are affected by sales budget and all budgets expect sales budget are related with cost. Therefore sales budget is the foundation of all other budgets.

The sales planning process is an essential part of profit plan and control because it provides for the basic management decisions about marketing and based on these decisions, it is an organized approach for developing a comprehensive sales plan. If sales plan is not realistic and relevant, most if not all of the other parts of overall profit plan are also not realistic. Therefore, if the management believes that a realistic sales plan cannot be developed; there is little justification for PPC.

The sales plan is the foundation for periodic planning in the firm because practically all other enterprise's planning is built on it. A comprehensive sales plan includes two separate, but related plans- the strategic and the tactical sales plans. Both strategic and tactical sales plans must be developed in harmony with comprehensive profit plan. A comprehensive sales plan incorporates such management decision as objectives, goals, strategic and premises. These translate into planning decisions about planned volume of goods and services, prices, promotion, and selling efforts.

The primary purposes of sales plan are as follows:

- a. To reduce uncertainty about future revenues
- b. To incorporate management judgments and decisions into the planning process (i.e. in the marketing plans)
- c. To provide necessary information for developing other elements of a comprehensive profit plan, and
- d. To facilitate management's control of sales activities. (*Welsch, Hilton and Gordon, 2006:172*)

### **2.3.1. Sales Planning and Sales Forecasting**

Sales planning and forecasting are not the same. Although related, they have distinctly different purposes. A forecasting is not a plan, rather it is a statement and/or a quantified assessment of future conditions about a particular subject based on one or more explicit assumptions. A forecast should always state the assumption upon which it is based. A forecast should be viewed as only one input into the development of a sales plan. The management of a company may accept, modify, or reject the forecast. In contrast, a sales plan incorporates management decisions that are based on the forecast, other inputs, and management judgments about such related items as sales volume, prices, sales efforts, production, and financing. Therefore all sales budgets are sales forecasts but all sales forecast are not sales budgets

A sales forecast is converted to a sales plan when management has brought to bear management judgment, planned strategies, commitments of resources, and the managerial commitment to aggressive action to attain the sales goals. In contrast sales forecasting is technical staff function.

It is important to make a distinction between the sales forecast and the sales plan primarily because the internal technical staff should not be expected or permitted to make the fundamental management decisions and judgments implicit in every sales plan.

The short term sales forecast provide the basis for the current year's sales plan and finished goods inventory plan. At the same time the influence of the long-term sales

forecast is reflected to the capital expenditure plan and in the finished goods inventory plan. The long- term sales forecast issues at what might be called another and of the finished goods inventory plan.

More difference between sales forecast and sales budget are as follows:

- a. The sales forecast is merely the initial estimate of future sales, where as sales plan is the projection approved by the budget committee that describes expected sales in unit and rupees.
- b. Sales forecast is merely well educated estimate of future expected demand of a specific product whereas sales budget is the quantitative expression of business plan and policies to be pursued in future.
- c. A sales plan provide standard for comparison with the result actually achieved, thus it is an important control device of management, where as forecasting represents merely a probable events over which no control can be exercised.
- d. Sales plan begins where and when sales forecast end. Sales forecast is the input to sales plan, sales plan is the foundation to profit planning and control. (*Goet, Bhattarai and Gautam, 2005: 2.2*)

### **2.3.2. Strategic and Tactical Sales Plan**

A comprehensive sales plan includes two separate but related plans the strategic and the tactical sales plan. The strategic sales plan is long-term sales and it covers usual case to five or ten years and tactical sales plan is short term sales plan which covers one year period.

#### **1. Strategic Sales Plan**

Strategic sales plan as one of the first step in the overall planning process. It is long-range sales plan of an enterprise. Usually it is five or ten years. It is board and general. It is usually developed by year and annual amount. The long term sales plan uses board groupings of product (product lines) with separate consideration of major and new products and services. Long-term sales plans usually involve in depth analysis of future market potentials, which may be built up from a basic foundation such as population

changes, state of the economy, industry projections, and finally company objectives. Long term managerial strategies would affect such areas as long- term pricing policy, development of new products and innovations of present products, new directions in marketing efforts, expansion or changes in distribution channels, and cost patterns.

## **2. Tactical Sales Plan**

Tactical sales plan is short- range sales plan. It is developed for a short period of time usually by quarters and by months for the first quarter. The tactical sales plan includes a detailed plan for each major product and for grouping of minor products. Tactical sales plans are usually developed in terms of physical units and in sales rupees. Short term sales plans must also be structured by marketing responsibility for planning and control purpose. Short-term sales plans may involve the application of technical analysis, however, managerial judgment plays a large part in their determination. The amount of detail in a tactical sales plan is a function of the company's environment and characteristics. A short range sales plan should include considerable detail, whereas a long range sales plan should be in board terms.

### **2.3.3. Component of Comprehensive Sales Planning**

A comprehensive sales plan should satisfy the requirement of and be consistent with, the overall managerial budgeting program. The components of comprehensive sales planning are as follows:

(A) Component of the foundation for comprehensive sales planning:

1. External variable identified and evaluated
2. Broad enterprise objectives and goals formulated
3. Strategies for the company developed
4. Planning premises specified

(B) Component of comprehensive sales plan

1. Managerial policies and assumption
2. Marketing plan (sales and services revenues)

3. Advertising and promotion plan
4. Distribution (selling) expenses plan

*(Welsch, Hilton and Gordon, 2006:175)*

#### **2.3.4. Developing a Comprehensive Sales Plan**

For the development of comprehensive sales plan, Welsch, Hilton and Gordon suggested these steps for developing a comprehensive sales plan:

Step 1: Develop management guidelines specific to sales planning including the sales planning process and planning responsibilities.

Step 2: Prepare one (or more) sales (market) forecasts consistent with specified forecasting guidelines including assumption.

Step 3: Assemble all the other data will be relevant in developing a comprehensive sales plan.

Step 4: Base on above steps applies management evaluation and judgment to develop a comprehensive sales plan.

Step 5: Secure managerial commitment to attain the goals specified in the comprehensive sales plan.

#### **2.3.5. Consideration of Alternatives in Developing a Realistic Sales Plan**

Developing a realistic sales plan involves consideration of numerous policies and related alternatives and a final choice by executive management among many possible courses of action. Important decision must be made about such issues as new products, discontinuance of present products, pricing, expansion or contraction of sales areas, size of sales forces, new distribution channels, distribution cost limitations, and advertising and other promotional policies.

For illustrative purpose, we will consider two pervasive sales planning problems:

### **1) Price-Cost-Volume Consideration in Sales Planning**

Price-cost-volume strategy is a vital part of sales planning. In a competitive market, price and sales volume are mutually interdependent. Because sales volume and price are so closely tied together, a complicated problem is posed for the management of almost every company. Thus two related basic relationships involving the sales plan must be considered:

- i. Estimation of demand curve, i.e. the extent to sales volume varies at different offering process.
- ii. The unit cost curve, which varies with the level of productive output.

### **2) Product-Line Consideration in Sales Planning**

Determination of the number and variety of products that a company will plan sales is crucial in the development of a sales plan. Both the strategic and tactical sales plan includes tentative decisions about new product lines to be introduced, old product line to be dropped, innovation, and product mix while preparing sales plan. To develop sales plan, top management must make decisions about product line development and marketing activities.

#### **2.3.6. Method of Sales Projection**

There are various methods to project sales but here some major methods are of sales projections are briefly described as under:

##### **1) Personal judgmental method**

This method of sales projection is also known as participatory method. Under this method, sales projection will be made on the basis of personal observation without using mathematical formulas. This method includes:

- a) Sales force composites method
- b) Sales department composites method
- c) Chief executive composites method

## **2) Statistical or Mathematical Method**

Following are some of the types of statistical or mathematical method of sales forecasting.

- a) Economic rhythm method
- b) Cyclical sequence (Correlation method)
- c) Historical analogical method

### **3) Specific purpose method**

This method is meant for specific types of industry. Different combination of mathematical are used to compute the sales under this method.

- a) Industrial analysis method
- b) Product line analysis
- c) End use analysis

## **2.4. Production Plan or Budget**

### **2.4.1. Production Budgeting**

Production budget is the initial step in budgeting of manufacturing operations. The production budget is an estimation of planned quantity of goods to be manufactured during budget period. Production budget is based on estimated sales volume and desired inventory level. Production must be planned to allow sufficient time to manufacture the products before the estimated data of sales. It is prepared in the basis of sales budget, plan capacity, opening inventory of finished goods, required closing stock of finished goods and policy of management.

The production budget specifies the planned quantity of goods to be manufactured during the budget period. To develop the production budget, the first step is to establish policies for inventory levels. The next step is to plan the total quantity of each product that is to be manufactured during the budget period. The third step is to schedule this production by interim periods. A complete production plan should show budget data classified by (a) products to be manufactured, (b) interim time periods and (c) activities of each

responsibility center in the manufacturing process. In addition to the production budget, three other principle budgets are relevant to manufacturing:

- a) The direct material and purchased components budget, which specifies the planned material and components requirements.
- b) The labor budget, which shows the planned quantity and cost of direct labor, and
- c) The manufacturing expenses or factory overhead budget, which includes the plans for all factory costs other than direct material and direct labor.

The production plan is important tool of planning, co-ordination and control in a manufacturing organization. Development of a production plan requires the conversion of sales plan into production program. It interlinks the activities such as material planning, labor planning, overhead planning, etc. By preparing the production budget as a planning tool, it establishes the foundation for planning all aspects of such factory operations as raw material needs, and factory labor needs, supervisory needs, factory overhead, plant capacity, and factory service activities. The co-ordination between sales plans, inventory policies, and production requirements comes into focus and is resolved in the production plan. It is also an important factor in the overall coordination of such functional activities as cash flow planning, financing, research and development, engineering, and capital additions. It establishes the basis for control of production inventories, production cost and labor in the factory. Thus production budget can be represented in this way:

Production requirement = Sales volume + Finished goods inventory change

#### **2.4.2. Responsibility for Production Planning**

After receiving the complete marketing plan, the manufacturing executive translates it into a production program consistent with managerial policies and subject to certain constraints. Planning, scheduling, and dispatching of the actual production throughout the year are function of the production department, therefore, it is essential that the responsibility for the planning and control of these functions be performed by production executives. These executives have first hand knowledge of the plant and personnel

capacities, availability of materials, and the production situation. Although responsibility rests directly upon the production executives, top management policies must be considered in such matters as inventory levels, stability of production, and capital additions. Responsibility of preparing production plan goes to the various managers such as chief executive, sales manager, production manager, production supervisor, administrative manager, and financial manager.

With respect to production planning, the managers must plan an optimum coordination between sales, inventory, and production levels. An efficient and coordinated production plan is necessary for economical manufacturing. Lower production costs usually result from standardization of products and stable production levels.

### **2.4.3. General Consideration in Planning Production and Inventory Levels**

The production does not aim to set the precise amounts and timing of actual production during the budget period. Rather, the production plan represents the implications of planned sales volume fore planned production volume as a basis for planning the various aspects of the manufacturing function-plant capacity requirements, direct material and components requirements, timing of purchases, direct labor requirements and costs, and factory overhead. The following factor should be considered in production planning.

- a) Total production requirements (by product) for the budget period
- b) Inventory policies about levels of finished goods, work in process, and the cost of carrying inventory
- c) Plant capacity policies, such as the limits of permissible departures from a stable production level throughout the year
- d) Adequacy of manufacturing facilities (expansion or contraction of plant capacity)
- e) Availability of direct materials, purchased components, and labor.
- f) Length of the processing time
- g) Economic lots or runs
- h) Timing of production throughout the budget period, by product and by responsibility centers. (*Welsch, Hilton and Gordon, 2006:214*)

#### 2.4.4. Developing the Production Plan

Production managers must translate sales budget into unit production requirement for the budget period for each product while considering the management's inventory policies. Basically there are three major steps to be followed while developing a production plan:

1. Formulate policies relative to inventory levels, and /or production levels
2. Determine the total quantity of each product that is to be manufactured during the budget period
3. Schedule this production by interim periods.

Symbolically, the following formula is generally used to determine the production planned:

Required for sales unit	XXXX
Add planned ending inventory level of finished goods	<u>XXXX</u>
Total required	XXXX
Less: beginning inventory of finished goods	<u>XXXX</u>
Planned production for year	XXXX

When the budgeted production for the budget period has been determined, the next problem is prorating this production by interim period during the budget year. Interim production must be planned to (1) provide sufficient goods to meet interim sales requirements, (2) keep interim inventory levels within policy constraints and (3) manufacture the goods as economically as possible.

#### **2.4.5. Time Dimensions of Production Planning**

Planned levels of production are important long-range and short-range issues. To develop a long-range plan (say, five years in the future), broad estimates of production levels are necessary to plan plant capacity requirements (involving capital additions), factory cost structures, personnel requirements and cash flows. For long-range planning purpose, only major increases or decreases in inventories need to be taken into account.

Developing a tactical short-range profit plan requires a different approach because of the need for greater precision and detail. The short-range production plan should be in harmony with the time dimensions used in the short-range profit plan. Thus, the common pattern should be an annual production plan detailed by products and by months or quarters. Also the production activities should be planned by responsibility centers within the manufacturing division. (*Welsch, Hilton and Gordon, 2006: 214*)

#### **2.5. Review of Previous Research Studies**

There was not seen any research papers concerning the particular topic i.e. “Impact of sales and production budgeting on profitability of public enterprises: A case study of NEA” which focus the effect of sales and production budgeting on profitability. Sales and production budgeting is the prime tool of profit planning in all types of business organization. Without sales and production budget other plans of PPC can not be prepared. Some of the previous related researchers “major objectives and finding, are as follows:

##### **Mr. Damodar Niraula**

**Mr. Damodar Niraula** (2008) has made research on “*Impact of budgeting in profitability of Nepalese public enterprises (A case study of Nepal Electricity Authority)*” submitted to faculty of management, Shanker Dev Campus. In this study Mr. Damodar Niraula has pointed out following specific objectives, core finding..

### **Main objectives**

1. To analyze the various functional budget of NEA
2. To analyze the true picture of managerial budgeting adopted by NEA.
3. To analyze the variance between budgeted and actual achievements of the authority.
4. To point out the major shortcomings and recommend suggestive measures.

### **Major finding**

1. Actual and budgeted sales are found to be significant but the difference between budgeted and actual production is found to vague. In spite of the fact, there is perfect correlation between budgeted and actual sales and production respectively.
2. NEA is bearing a high fixed cost due to the technology that it is using till now, overstaffing and many more.
3. Actual sales are always less than actual production due to power loss.
4. It has not classified its overhead systematically, which creates difficulties in analyzing the expenses properly.
5. NEA has no sufficient cash surplus to pay for expenditure, it was to borrow loan to meet minimum cash balance and we can say that it is the result of poor cash plan. And for that, it is paying a huge amount of interest in every year and the trend is of adding on it rather than of paying back.

### **Mr. Badri Prasad Uprety**

**Mr. Badri Prasad Uprety** (2006) has submitted his research work entitled “*Sales budgeting as the tools of profit planning in public enterprises: A case study of Nepal Electricity Authority*”. This research of Mr.Badri was mainly centered with sales budgeting and its effect on profitability in NEA. The main objectives and finding of his study are as follows.

## **Main Objectives**

1. To analyze the sales budgeting and practices adopted by NEA.
2. To examine sales trend of NEA.
3. To analyze the relation between budgeted sales and its effect on profitability of NEA.
4. To provide recommendation and suitable suggestion to the NEA.

## **Major Finding**

1. NEA has a practice of preparing both strategic (long range) and tactical (short range) profit plan. But the strategic plan is limited only to the top level executives.
2. The NEA's sales achievement has neither touched nor crossed the target sales during the study period. The sales achievement during five fiscal year is about 93% of target sales in average and the sales is increasing every year.
3. There is a high degree of positive correlation between planned sales and actual sales i.e. 0.99 approximately, it means actual sales changes in the same direction and in about the same speed of the planned sales.
4. The C.V and S.D of actual sales are more than these of planned sales. It indicates that actual sales are more variable than the budgeted sales.
5. NEA has been suffering from loss since last half decade. It's loss is in increasing trend in the first two fiscal years, than decreased in third fiscal year and again, it is increasing in last two fiscal years taken for the study.
6. The actual profit of NEA has a very high degree of negative correlation with actual sales i.e. -0.86 approximately, therefore an increase in sales decrease in profit of authority. The reason may be due to inability and insufficiency of NEA to increase the efficiency of costs by considering forthcoming risks, power leakage, wastage etc.
7. The actual profit of NEA has also very opposite relation with its target profit due

to improper cost and profit budgeting system and policy.

8. NEA exports and imports electricity only from India and only to India. The export of electricity is less than the import of electricity and the export tariff rate is also less than the tariff rate of electricity.
9. NEA is paying more than 60% of its revenue only for purchase price of electricity from foreign invested power sectors, interest and royalty expenses.
10. Power loss in NEA is about one- fourth of its total power available. This power loss is about 10% more than normal acceptance.

### **Mr. Shashti Kumar Shrestha**

**Mr. Shashti Kumar Shrestha** (2006) had conducted a research on the topic “*A study on the role of sales planning in profit planning in Nepalese public enterprises: A case study of Nepal Electricity Authority.*” In this study Mr. Shashti Kumar Shrestha has pointed out following objectives and finding:

#### **Main objectives**

1. To analyze the variance of annual budgeted sales and actual sales.
2. To analyze the relationship between sales and production.
3. To analyze the interrelationship between sales and profit.
4. To study the trend of sales and problems of NEA.
5. To interpret the sales related ratios.
6. To analyze the relationship between sales revenue and total costs
7. To provide a package of recommendations and suggestion on the basis of findings for solving the problems connected with budgeting and profit planning.

## **Major Finding**

1. Actual sales are more variable than budgeted sales.
2. There is positive and a perfect correlation between budgeted sales and actual achievement of sales. The value of correlation between budgeted and actual sales is 0.9915.
3. Actual sales are less than the actual production. It indicates remarkable loss of power in NEA
4. There is perfect correlation between actual sales and actual production because the correlation between is 0.99.
5. Power loss is significantly high in NEA. This is due to theft, leakage, outage and unsystematic distribution channel. The average power loss is 23.91% of actual production which is out of normal loss. But the actual loss of the years is nearest to the average loss.
6. The profit of NEA has a very high degree of negative correlation with actual sales. So, an increase in sales has resulted in a decrease in the profit of authority.
7. The Net Profit Margin of NEA is very much poor. It has a negative margin during the study period.

## **Mr. Mahendra Rai**

**Mr. Mahendra Rai** (2004) had conducted a research on the topic of “*profit planning in public utilities sector of Nepal: A case study of Nepal Electricity Authority*”. The prime main objective is to analyze and examine the profit planning system of NEA and the specific objectives and core findings of this study are as follows:

### **Main objectives**

- 1) To examine profit planning system applied by Nepal Electricity Authority.
- 2) To analyze the financial performance of NEA by using various financial tools.
- 3) To observe the various functional budget of NEA associated with comprehensive profit planning.
- 4) To evaluate budgeted and actual achievement of NEA

### **Major finding**

- 1) Budgeted sales are more variable than actual sales.
- 2) Budgeted production is more fluctuating than actual production.
- 3) Actual sales and actual production are significantly in consistent.
- 4) NEA has been running at a loss.
- 5) NEA has been paying a large amount of interest on long term loan.
- 6) Power leakage is significantly high in NEA.

### **Mr. Geha Nath Koirala**

**Mr. Geha Nath Koirala** (2004) had conducted a research on the topic of “*Managerial budgeting as a tool of increasing efficiency of public enterprises*”. Some remarkable main objectives and finding pointed out by Geha Nath Koirala are as follows.

### **Main objectives**

The general objectives of this study are to evaluate the profitability in power center with the following specific objectives.

1. To analyze the various functional budget of NEA.
2. To, analyze the true picture of managerial budgeting adopted by NEA.
3. To analyze the variance between budget and actual achievements of the authority.
4. To, point out the major short comings and recommend suggestive measures.

## **Major Finding**

1. NEA has been suffering from loss for the FY2057/058 to 2061/62.
2. NEA has been paying huge amount of interest on long term loan.
3. There are perfect correlations between budgeted and actual sales and budgeted and actual production.
4. Actual sales are always less than actual production due to power loss which is a main problem of NEA, which affects its profit.
5. Overhead are not classified systematically which create differently to analysis expenses effectively.
6. NEA has no practice of cost segregation
7. NEA was unable to meet its BEP sales therefore it was at loss every year.
8. NEA liquidity ratio was not satisfactory and profitability ratios were not satisfactory.
9. NEA has high fixed cost which was the main cause of loss.

## **2.6. Research Gap**

All the research studies mentioned above are concerned with the study of profit planning system basically related to the planning of Nepalese public enterprises. The finding and conclusion of all studies are generally same. The conclusions of those researches are that there are no proper planning and control system in Nepalese public enterprises. Therefore this study paper is designated to highlight the “Impact of sales and production budgeting on profitability of public enterprises”. So this study is emphasizing the effect of sales and production budgeting on profitability of NEA. This study will also work to identify the various cause of suffering loss, to analyze them and recommended practical suggestion of NEA. Therefore this study may be different from the common studies.

### **3. RESEARCH METHODOLOGY**

#### **3.1. General Introduction**

Research methodology describes the method and process applied in the whole subject of the study. It refers the various sequential steps to be adopted by a researcher in studying a problem with certain objective in view. It is a systematic and well-organized way for solving the research problem. The main objective of this research is to present, analyze, examine and interpret the sales and production budgeting system, practice and their effect on profitability in utility concern public enterprises. It requires an appropriate research methodology.

#### **3.2. Research Design**

Research design is plan structure and strategy of investigation conceived so as to obtain answer to research question and to control variance. This plan is the overall framework for the collection and analysis of data. In this study, to show the relation of sales, production and profit planning and to fulfill the other objectives of this research, mainly following relevant research designs are adopted:-

- i. Descriptive research design
- ii. Analytical research design
- iii. Case study research design
- iv. Historical research design

#### **3.3. Nature of Sources of Data**

In this study, mainly secondary data and some primary data will be used to fulfill the objective of the study. The secondary data have been collected from the following main sources.

- i. Journals and Newspapers
- ii. Published and Unpublished articles
- iii. Previous studied made in this field
- iv. Annual reports of Nepal Electricity Authority
- v. Budget sheet of NEA
- vi. Profiles and magazines of NEA
- vii. Media

And some primary data have been collected from following sources.

1. Direct and indirect personal or oral interview
2. Questionnaires

### **3.4. Period Covered**

The study period covers the time period of five years from FY2060/061 to FY2064/065 B.S. for the purpose of analysis of short-range sales and production budgeting and its affect on profitability.

### **3.5. Research Variables**

The research variable of the study area mainly related with sales budget, production budget and profit of NEA. Budgeted and actual sales unit, budgeted and actual production unit and budgeted and actual profit are the research variables of this study.

### **3.6. Research Tools Used**

Data collection from various sources are arranged and presented in proper tables, figures, format, graphs etc. To analyze the collected data statistical and financial tools such as mean, standard deviation, correlation, multiple correlations, regression, multiple regressions, hypothesis testing, time series analysis and CVP analysis are used.

## **4. DATA PRESENTATION AND ANALYSIS**

### **4.1. Introduction**

The main purpose of this study is to analyze the budgeted sales and production, actual sales and production and their impact on profitability of public enterprises. Nepal Electricity Authority has been selected as sample corporation for this purpose. To accomplish these objectives, this chapter will analyze the various aspects of sales and production budget and their achievement and their impact on profitability of the Authority.

Profit is the ultimate goal of every business enterprises. Everybody involves in business for making profit. Profit can not be achieved automatically. Business should be managed with better managerial skills. So the profit is planned and controlled output of efficient management. Profit planning is the planning of revenue (i.e. increase the revenue), and planning of cost (i.e. increase the efficiency of cost). Generally two types of profit plan are formulated to achieve the organizational objectives. One is long range (strategic) profit plan and the other is short-range (tactical) profit plan. Profit planning and control is an overall plan of operations, providing guidelines to management and acting as signal light for the management. It uses in planning, organizing and controlling, all the financial and operating activities of the firm in the forth coming period or for a specified future period of time. PPC consists of three main budgets are as follows:

- Operational Budget: Budget related with revenue and expenses, such as sale budget, production budget, purchase budget, etc.
- Financial Budget: Budget related with financial statements, such as balance sheet, income statement, etc.
- Appropriation Budget: Budget related with advertising and publicity expenditure, research etc.

Among of all budgets, sales budget is one of the operation or revenue budget. It is the primary step in developing the overall budget procedure and it is the primary sources of cash and all other functional budgets are prepared on the basis of sales budget. Profit planning or budgeting starts with planning the sales budget, which is a formalized estimation of future sales revenue and sales volume. Sales budget should be in realistic ground. If sales budget is not realistic and relevant, most if not all of the other parts of overall profit plan are also not be realistic. Mainly, two type of sales budget are developed to achieve an enterprises sales objective. One is strategic (long-range) sales plan and the other is tactical (short-range) sales plan. But the main focus of the study is about the tactical sales plan of Authority due to the resources and time constraint.

Production budget is also an operational budget, which is the second step in formulation of profit planning. It is based on sales plan. It is an estimation of planned quantity of goods to be manufactured during budget period. After sales budget has been prepared, the production requirements for the forth-coming budget period are determined and organized in the form of a production budget.

The main objective of this study is to analyze budgeted sales and actual sales, budgeted production and actual production in unit, its variation and impact of sales and production on profitability of the authority. This study covers the period of five years from the fiscal year 2060/61 to 2064/65.

#### **4.2. Sales Budget of Nepal Electricity Authority**

Sales budget is related to operational budget. It is starting point for developing overall budget procedure, which displays the projected sales in units and rupees. It is prepared by product, time and territory. On the basis of sales budget, production budget is formulated. And all other functional budgets are prepared on the basis of production budget; therefore sales budget is the corner stone of the other budgets and a prime tool for profit planning in every type of enterprises. If sales budget is wrongly prepared all other budgets will be wrong. So sales budget needs the broad knowledge of various aspects related with that budget. NEA has long experience of preparing budgets since its establishment. First of all, NEA prepares strategic or corporate sales plan and then tactical sales plan. Strategic

sales plan is limited only in top level management and therefore this study only focuses tactical sales plan of the authority.

#### **4.2.1. Sales Budget and Achievement**

A comprehensive sales plan includes two separate but related plans- the strategic and the tactical sales plans. Strategic sales plan is generally for more than one year detailing by annual sales and tactical sales plan is used to plan sales for 12 months by quarter and by months for the first quarter. NEA has a practice of preparing both strategic and tactical sales plan. Strategic sales plan is limited only in top level management and this study only focuses tactical sales plan of the Authority. Sales budget is prepared by NEA on the basis of the nature of consumer. Consumers are domestic, commercial, non-commercial, industrial, and so on.

Following is the analysis of the NEA's previous sales performance and their achievement. Following table 4.1 shows the budgeted sales and the actual sales achievement in units as well as rupees from the fiscal year 2060/61 to 2064/65.

**Table 4.1**  
**Sales Budget and Achievement**  
**From FY 2060/61 to 2064/65**

Fiscal Year	Unit in million			Rs. In million		
	Budgeted	Actual	Achieveme	Budgeted	Actual	Achieveme
2060/61	1906.622	1800.814	94.45	12825.73	11992.604	93.50
2061/62	1988.85	1918.35	96.46	13275.38	12885.974	97.07
2062/63	2145.48	2028.51	94.55	14260.33	13672.711	95.88
2063/64	2362.342	2204.202	93.31	15638.12	14777.26	94.50
2064/65	2421.048	2321.35	95.88	16220.94	15403.29	94.96
Average	2164.868	2054.645	94.93	14444.10	13746.367	95.18

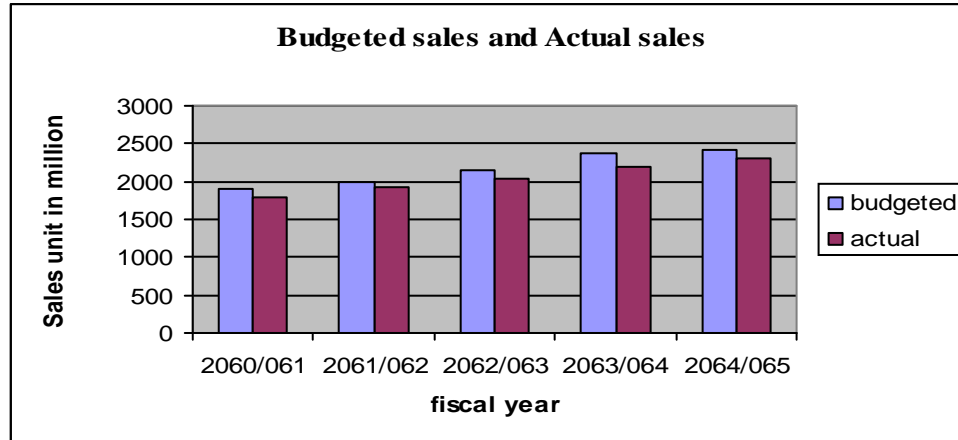
*Source: Annual report and Budget book of NEA*

The table no 4.1 shows the actual sales achievement of NEA is highly consistent with budgeted sales. In F/Y 2060/61 the budgeted sales of NEA was 1906.622 units in million and gradually increase up to 2421.048 units in million in FY 2064/65. On the other hand the actual sales was 1800.814 unit in million in FY2 060/061 which was 94.45% achievements. It also increase and reached to 2321.35 units million in FY 2064/065 and achievement is 95.88%. Average achievement is 94.93% for the total study period. It is concluded that actual sales units is lower than the budgeted or targeted sales units during the study period.

In the same way, budgeted sales revenue was Rs. 12825.732 million in FY 2060/061. It began to increase and reached to Rs.16220.944 million in FY 2064/065. In other hand the actual sales of electricity was Rs.11992.604 million in FY 2060/061 and it was the 93.50% achievement. The actual sales revenue began to increase and reached to Rs.15403.29 million in FY 2064/65 and the achievement is 94.96%. Average achievement is 95.18% for the total study period.. The highest achievement among the above mentioned data is 97.07% of FY 2061/062. It concluded that the actual sales revenue is less than budgeted sales revenue.

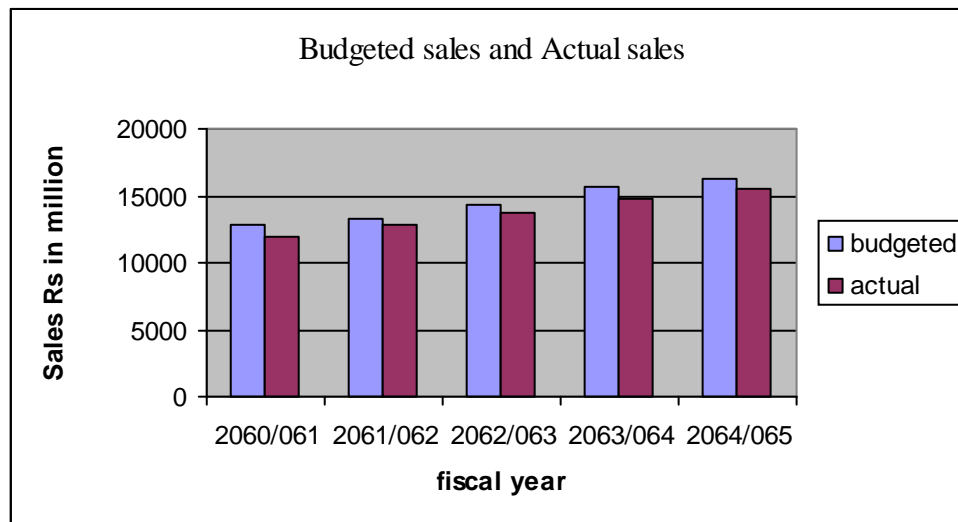
This table also shows that sales units achievements and sales revenue achievements are not always fully proportionate with each other due to changes in tariff rate, different voltage used, category-wise sales shares and so on. The budgeted sales and actual sales can be presented in the following graphical form.

**Figure 4.1**  
**Budgeted sales and Actual sales units of NEA**  
**From FY 2060/061 to 2064/065**



Sources: Table 4.1

**Figure 4.2**  
**Budgeted Sales and Actual Sales Revenue of NEA**  
**From FY 2060/061 to 2064/065**



Sources: Table 4.1

The above graphical presentation shows the gradual increment of budgeted sales as well as actual sales during the period. It also present actual sales are always less than budgeted sales.

Now, it is necessary to calculated the arithmetic mean, standard deviation and co-efficient of variation of the budgeted and actual sales figure of NEA in order to find out the nature of variability of sales budget and actual sales of NEA for five years from FY2060/61 to 2064/65. The detail calculations of these statistical tools are presented in appendix 1. The summarized results are presented below.

**Table 4.2**

**Relationship between Budgeted and Actual Sales Unit**

Statistical tools	Budgeted sales (x) Units in million	Actual sales (y) Units in million
Mean	2164.864	2054.645
S.D	201.332	188.248
C.V	9.299	9.162

*Sources: Appendix 1*

The above table 4.2 shows that the mean of actual sales is lower than budgeted sales (i.e. 2054.645 unit in million < 2164.864 unit million). The table shows budgeted sales are more variable than actual sales. The standard deviation and co- efficient of variation of budgeted sales is higher than actual sales. Higher coefficient of variation (CV) is the indication of more variable or less consistency and vice-versa. Therefore above result show those actual sales are more consistent and homogeneous than budgeted sales. And the budgeted sales of NEA are more variable than actual sales.

Another statistical tool to analyze the relationship between actual and budgeted sales is correlation of coefficient. It can be find with the help of Karl Pearson Coefficient of Correlation and is donated by (r). The coefficient of correlation measures the degree of association between budgeted and actual figure. If an actual sale is as like as budgeted, it is proved that there is positive correlation and vise versa. To find out of the value of (r),

the budgeted sales is to be assumed as independent (X) and actual sales as dependent variable (Y).

The calculated value of correlation ( $r_{ay}$ ) is 0.9915 percent (See Appendix-1). It proves that there is highly positive correlation between independent and dependent variable. It means that both the actual and budgeted sales are correlated with each other by more than 99 percent. The significant correlation indicates that the actual condition and the budgeted condition of NEA are signification. For this significance of (r) should be tested by the help of probable error. By the calculation we can find out the value of probable error 0.00506. It means that, only 0.5 percent of an error items are included, but the value of r is greater than the calculated probable error (PEr). Thus the value of r is significant and proved to be highly positive correlation

#### 4.2.2. Sales Trend Line by Regression Analysis

Another statistical tool is regression analysis, which determines the nature of relationship among budgeted and actual sales and makes the estimate from that on that base. It can help to estimate or forecast the future sales. For this purpose, actual sales figures is to be known as dependent variable and denoted by (Y), like wise budgeted sale is to be known as independent variable, which is denoted by (X). The regression line of actual sales on budgeted sales (Y on X) is as below: -

$$Y - \bar{Y} = r \frac{\dagger_y}{\dagger_x} (X - \bar{X})$$

We have the following value as calculated above

Statistical tool	Budgeted Sales(X) Unit in million	Actual sales (Y) Unit in million
Mean	2164.864	2054.645
S.D.( )	201.332	188.2489
$r_{xy}$	0.9915	

*Sources: Appendix 1*

$$Y-2054.645=0.9915x\frac{188.2489}{201.332}(X-2164.864)$$

$$Y=0.927X+47.665$$

This regression equation shows that actual sale is increasing trend but the increment in actual sales is less than that of budgeted sales. And 0.927 represent the change in value of dependent variable (Y), when the value of independent variable (X) changes by one unit.

By the help of regression equation, we can estimate the expected sales achievement with given value of budgeted sales (X). We have the budgeted sales (X) for the FY 2065/66 is 2629.706 unit in million. The expected sales achievement for the FY 2065/66 can be calculated by using above equation. Then,

The expected sales achievement,

$$Y=0.927X+47.665$$

$$=0.927x2629.706 +47.665$$

$$=2485.40$$

If the relationship between budgeted and actual sales remain same as previous year, the actual sales for the FY 2065/66 will be 2485.40 unit in million as stated by the above regression equation.

Like wise, another important tool is least square method. It is also known as time series analysis and an important tool for the study of trend of actual sales. A straight-line trend will show the relationship between year and actual sales of the relevant year. To fit this straight-line trend, the time factor should be considered as an independent factor and actual sales as a dependent factor for the time. The formula can be expressed in the following way:

$$Y_c = a + bX$$

Where, Y= actual sales

X= time

b = slope of trend line or annual rate of growth  
a = y-intercept

**Table 4.3**

**Fitting Straight Line Trend by Least Square Method**

Fiscal Year	Actual Sales Y	X	X <sup>2</sup>	XY
2060/061	1800.814	-2	4	-3601.63
2061/062	1918.35	-1	1	-1918.35
2062/063	2028.51	0	0	0
2063/064	2204.202	1	1	2204.202
2064/065	2321.35	2	4	4642.7
Total	Y=10273.226	X=0	X <sup>2</sup> =10	X Y=1326.924

*Sources: Annual report of NEA*

FY 2062/623 is assumed as the base year. Therefore the value of X or mid time is zero in the FY 2062/63 and negative before the base year and positive after the base year.

Substituting the value in straight line equation is

$$Y_c = a + bX$$

Where,

$$a = \frac{\sum Y}{n} = 10273.226 / 5 = 2054.64$$

$$b = \frac{\sum XY}{\sum X^2} = 1326.924 / 10 = 132.69$$

$$\therefore Y_c = 2054.64 + 132.69 X$$

The trend line shows the positive sales figure for future. The sales will be increase by 132.69 million units every year if the same sales trend of the past year continuous in the future.

By the help of this trend line equation, we can estimate the actual sales for FY 2065/66. The value of X in the base year is FY2062/63.

Then,

$$Y_c = 2054.64 + 132.69 \times 3$$

$$= 2452.71$$

By the result, if the trend does not change, the positive sales for the FY2065/66 will be 2452.71 million units.

#### 4.2.3. Comparative Analysis between Budgeted Sales and Actual Sales

In order to compare the nature of variability of budgeted and actual sales of different years, it is needed to calculate the arithmetic mean, standard deviation and co-efficient of variation of budgeted and actual figures of NEA for recent five years from FY 2060/061 to 2064/065 and previous five year from FY 2054/055 to 2058/059. The detail calculation of these statistical tools are presented appendix 1. The summarized of results from appendix 1 are as follows:

**Table 4.4**

**Comparative Mean, Standard Deviation and Coefficient of Variation of Budgeted Sales between FY 2054/055 to 2058/059 and FY 2060/061 to 2064/065**

Statistical tools	Budgeted sales (x) Units in million FY 2054/055 to 2058/059	Budgeted sales (x) Units in million FY 2060/061 to 2064/065	Increase or decrease in percentage
Mean	1309.800	2164.864	39.5
S.D	240.876	201.332	-19.64
C.V	18.39	9.299	-97.76

*Sources: Appendix 1 and previous thesis report*

**Table 4.5**

**Comparative Mean, Standard Deviation and Coefficient of Variation of Actual Sales  
between FY 2054/055 to 2058/059 and FY 2060/061 to 2064/065**

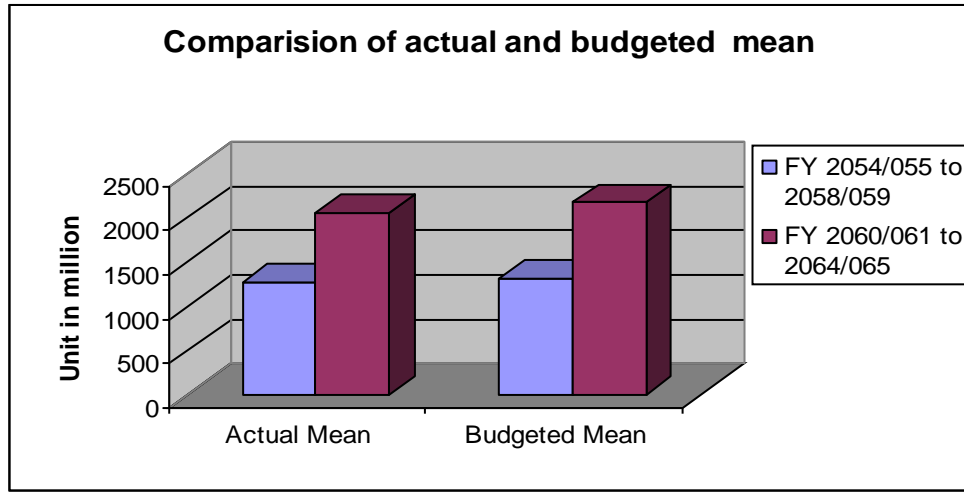
Statistical tools	Actual sales (y) Units in million FY 2054/055 to 2058/059	Actual sales (y) Units in million FY 2060/061 to 2064/065	Increase or decrease in percentage
Mean	1274.900	2054.645	37.95
S.D	201.676	188.248	-7.133
C.V	15.82	9.162	-72.67

*Sources: Appendix 1 and previous thesis report*

The above table 4.4 and 4.5 shows the comparison between budgeted sales and actual sales of the available data of recent five year and previous five. The results show that the mean of budgeted and actual sales is increased by 39.5% and 37.95% in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059 respectively. The standard deviation of budgeted and actual sales is decreased slightly in compare to previous five year. Whereas coefficient of variance (C.V) is decreased rapidly to 97.76% and 72.67% of budgeted and actual sales in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059 respectively. Which indicate less variability or more consistency of budgeted and actual sales of NEA in recent period. The consistency of data may be due to constant production or due to long load shedding and no change in household application or may be high price demand of electricity in period of FY 2060/61-2064/65 than in period of FY2054/55-2058/59 regarding the sales. This can also be shown in graphical form as below:

**Figure 4.3**

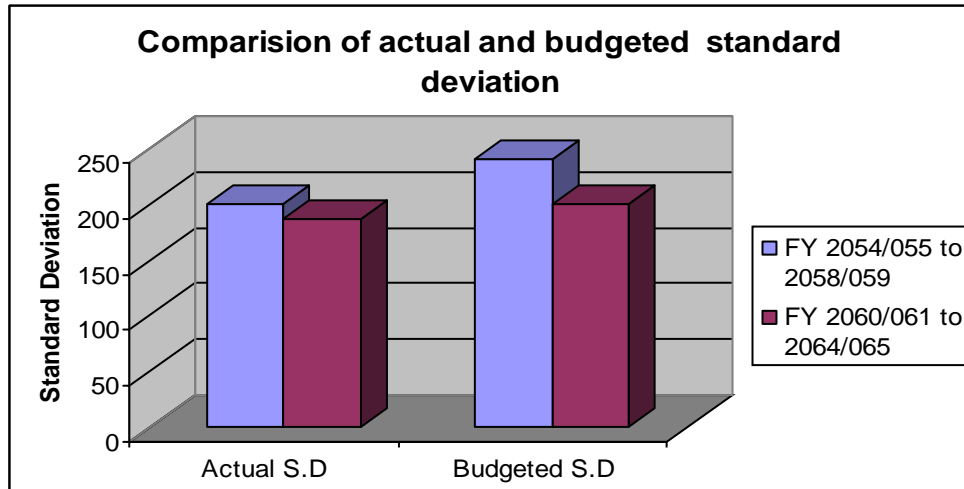
**Mean of Budgeted and Actual Sales Units of NEA**



*Sources: Table 4.4 and 4.5*

**Figure 4.4**

**Standard Deviation of Budgeted and Actual Sales Units of NEA**

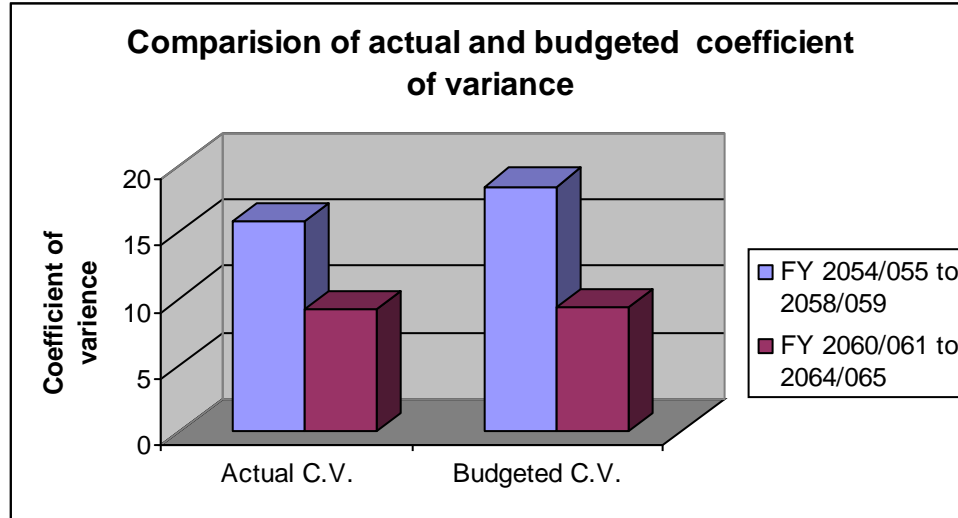


*Sources: Table 4.4 and 4.5*

**Figure 4.5**

**Coefficient of Variance of Budgeted and Actual Sales Units of NEA**

**From FY 2060/061 to 2064/065**



*Sources: Table 4.4 and 4.5*

Figure 4.3 shows that the actual and budgeted sales mean is appreciably increased in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059. But on the other hand in figure 4.4, the standard deviation is slightly decreased in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059 and standard deviation is more decreased in budgeted sales than actual sales. In the same way in figure 4.5, the coefficient of variation is rapidly decreased in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059. The CV for budgeted sales is increased than actual sales in FY 2054/055 to 2058/059 but on the other hand CV is nearly equal for actual and budgeted in FY 2060/061 to 2064/065.

#### **4.2.4. Category-Wise Sales of Electricity**

NEA has been supplying its electricity to its customers by classifying various categories.

NEA has classified its customers into twelve categories are as follows:

1. Domestic
2. Commercial
3. Non-Commercial
4. Industrial
5. Water- Supply
6. Irrigation
7. Street light
8. Temporary Supply
9. Transport
10. Temple
11. Community Supply
12. Bulk Supply (India)

While preparing sales plan to achieve target sales and target profit, the emphasis needs to be given to the sales of electricity for different categories of customers because NEA imposes different Tariff rate based on different categories and different voltage level. Generally, Tariff rate are high in low voltage level and low in High voltage level. In case of category, expensive Tariff rate is imposed in domestic, industrial, commercial, non-commercial, temporary supply categories and it is cheap in water supply, irrigation, community sales and bulk supply (India) categories. The Tariff rate in temporary supply's the highest of all categories i.e. Rs.13.50 per unit and in irrigation is the least of all i.e. Rs.3.45 per unit. Tariff rates are in 'Domestic' Rs.4.00 to Rs.9.90 per unit, in 'Industrial' Rs.5.45 per unit, in 'Commercial' Rs.7.40 to Rs.7.70 per unit and in 'Non-Commercial' Rs.7.80 to Rs.8.25 per unit. The summarizing sales shares (in GWH) of each category are tabulated as below:

**Table 4.6**  
**Category-Wise Electricity Sales (in GWH)**

Category	2060/61		2061/62		2062/63		2063/64		2064/65		Average	
	GWH	%	GWH	%	GWH	%	GWH	%	GWH	%	GWH	%
Domestic	676.4	37.6	758.2	38.6	805.7	39.6	911.5	40.4	952.2	41.1	852.0	39.6
Non-Commercial	83.0	4.6	100.5	5.1	95.3	4.7	101.2	4.5	107.0	4.6	101.2	4.7
Commercial	108.1	6.0	109.3	5.6	120.3	5.9	143.9	6.4	153.8	6.6	131.9	6.1
Industrial	689.8	38.3	764.0	38.9	785.6	38.6	877.3	38.8	892.3	38.5	832.7	38.6
Water supply & irrigation	31.7	1.8	50.0	2.5	45.5	2.2	49.4	2.2	44.1	1.9	45.9	2.1
Street light	55.2	3.1	54.9	2.8	63.2	3.1	69.5	3.1	70.7	3.0	65.1	3.0
Temporary supply	0.3	0.0	0.4	0.0	0.9	0.0	1.3	0.1	0.7	0.0	0.7	0.0
Transport	5.5	0.3	5.8	0.3	5.7	0.3	6.6	0.3	6.0	0.3	6.1	0.3
Temple	4.1	0.2	4.6	0.2	4.8	0.2	4.8	0.2	5.2	0.2	4.9	0.2
Community sales	5.6	0.3	6.0	0.3	9.2	0.5	14.6	0.6	21.6	0.9	11.7	0.5
Total (Internal sales)	1659.6	92.2	1853.7	94.4	1936.1	95.2	2179.9	96.5	2253.7	97.3	2052.2	95.3
Bulk Supply (India)	141.2	7.8	110.7	5.6	96.6	4.8	78.3	3.5	63.3	2.7	102.3	4.7
Grand Total	1800.8	100.0	1964.4	100.0	2032.6	100.0	2258.1	100.0	2317.0	100.0	2154.6	100.0

*Source: Annual report of NEA*

**Table 4.7****Category-Wise Electricity Sales Revenue (Rs. in million)**

Category	2060/61		2061/62		2062/63		2063/64		2064/65		Average	
	Million	%	Million	%	Million	%	Million	%	Million	%	Million	%
Domestic	4579.0	38.2	5079.9	37.9	5405.1	38.6	6125.3	39.1	6389.6	40.8	5546.5	39.8
Non-Commercial	816.0	6.8	947.1	7.1	881.7	6.3	940.7	6.0	988.7	6.3	920.1	6.6
Commercial	986.1	8.2	1015.5	7.6	1118.2	8.0	1309.3	8.4	1281.0	8.2	1148.4	8.2
Industrial	4380.2	36.5	4851.4	36.2	4978.7	35.5	5439.0	34.7	5514.7	35.2	5061.4	36.3
Water supply & irrigation	154.8	1.3	240.0	1.8	198.0	1.4	224.5	1.4	197.2	1.3	204.1	1.5
Street light	329.5	2.7	315.5	2.4	422.4	3.0	466.2	3.0	469.2	3.0	402.8	2.9
Temporary supply	3.5	0.0	5.5	0.0	11.2	0.1	17.3	0.1	9.7	0.1	9.5	0.1
Transport	28.9	0.2	30.5	0.2	29.8	0.2	32.6	0.2	30.7	0.2	30.7	0.2
Temple	20.8	0.2	23.1	0.2	24.4	0.2	24.7	0.2	26.8	0.2	24.1	0.2
Community sales	20.1	0.2	21.4	0.2	23.9	0.2	52.0	0.3	77.0	0.5	39.1	0.3
Total (Internal sales)	11318.9	94.4	12529.8	93.6	13093.4	93.5	14631.6	93.3	14984.5	95.7	13386.6	96.1
Bulk Supply (India)	673.7	5.6	573.4	4.3	579.3	4.1	489.0	3.1	381.1	2.4	542.8	3.9
Gross Revenue	11992.6	100.0	13103.2	97.9	13672.7	97.6	15120.7	96.5	15365.7	98.1	13929.3	100.0
Net income from other services			285.9	2.1	336.1	2.4	556.3	3.5	289.6	1.9		
Total Revenue	11992.6	100.0	13389.1	100.0	14008.8	100.0	15677.0	100.0	15655.3	100.0	13929.3	100.0

Source: Annual report of NEA

In the above table 4.6 shows summary of category-wise electricity sales (in GWH) and percentage in different period. According to table, the average sales share of domestic and industrial category is almost equal of about 39% which is the largest of all categories and the least is for temporary supply category. The demand of electricity for domestic supply is increasing on increase of year whereas for industrial category it remains constant in the passage of time. This may be due to population growth, political instability, insurgency etc. in our country. The sales shares of commercial, bulk supply (India), non commercial, street light, water supply and irrigation, community sales, transport and temple are third, forth, fifth, sixth, seventh, eighth, ninth respectively. The sales of domestic, commercial, water supply are increasing and sales of remaining others categories are fluctuating during the study period. Category-wise sales revenue (in Rs.) is more significant than category-wise sales unit (in GWH).

The above table 4.7 shows the sales revenue of each category for the study period. The table shows that total sales revenue is increasing during the study period. The share of domestic category's sales revenue is the highest of all i.e. 40% in average due to its higher sales units and higher tariff rate. The industrial sales revenue is in second position i.e. 36% in average. And the least is the temporary supply i.e. 0.1% in average and it is in fluctuating trend. The sales revenue from remaining other categories is generally in increasing trend. By the result of above analysis, it can be concluded that large sales share supply with high tariff rate can create the high revenue.

In conclusion, from the above study, the characteristics of sales figure (budgeted and actual) of NEA, the following points can be pointed out on conclusion.

1. NEA has followed tactical as well as strategic sales plan. It prepares the tactical (short-range) sales plan on the basis of the type of consumers but it does not prepare the strategic (long-range) sales plan in detail.
2. There is highly positive correlation between budgeted sales and actual sales.
3. The regression equation shows that there is positive relationship between budgeted and actual sales.
4. The straight line trend shows the positive figure of sales for future.

5. Actual sales are more consistency than budgeted sales.
6. In compared to FY 2054/55-2058/59 the actual and budgeted sales are more consistent and less variable in FY 2060/61-2064/65.
7. Category-wise sales analysis of NEA shows that the sales share (in GWH) of electricity of domestic, industrial, bulk supply(India) and commercial categories is high and sales share (in GWH) of community sales, temporary supply is low. The sales revenue of electricity (in Rs.) of domestic category is highest and the least is in the temporary supply category.
8. NEA's sales budget is prepared on scientific and systematic to more extent which is known from the result of the above analysis.

### **4.3. Production Budget of NEA**

Production budget is the second step for the development of profit plan. With out preparing the production budget, the overall profit plan will not assume to be completed. It is prepared on the basis of sales budget that mean the sales budget determines the volume of the production budget. In that respect, at first, sales budget needs to be much more realistic. NEA is a public utility concern. It generates the power as well as purchases it. For which they have to prepare purchase budget instead of preparing a production budget. In terms of hydropower production, such a company can not hold opening and closing inventory as all of we know that the power can not be stored at any cost. NEA prepares its production budget and estimate the future load forecast. It has the practice of preparing production budget for generation and for purchase for each fiscal year. Production budget of NEA is prepared by production directorate in co-ordination with planning directorate. In respect of the production, existing power projects and projects near about of completion are adjusted and government's policy is also considered by NEA while preparing its production budget.

#### 4.3.1. Budgeted and Actual Production Achievement

Following are the analysis showing production trend of NEA. Based upon historical trend future plan be prepared for production. So past trend of production is so important. Therefore, the following table shows the detailed budgeted production and actual production and achievement in percentage of NEA from FY 2060/061 to 2064/065:

**Table 4.8**  
**Budgeted and Actual Production Achievement**  
**from 2060/61 to 2064/65**

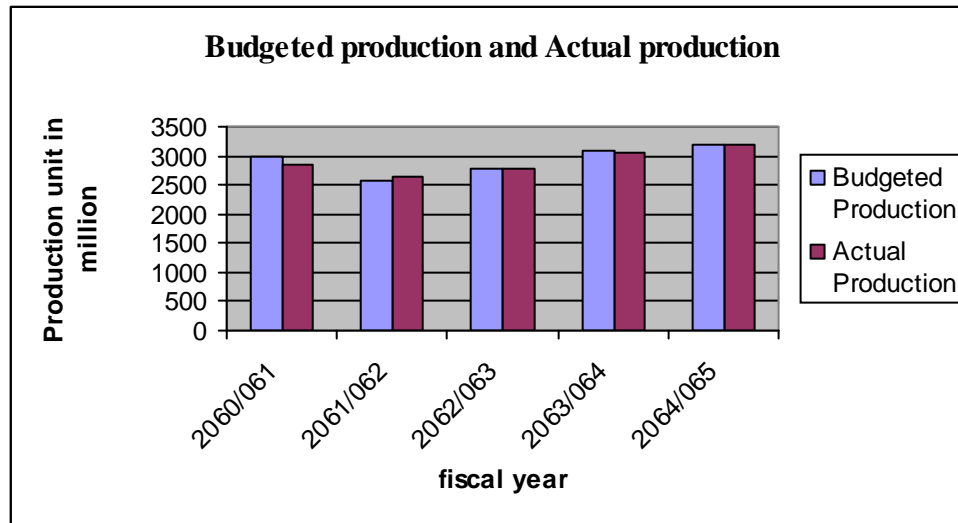
Fiscal Year	Budgeted Production	Actual Production	Achievement %
2060/061	2986.39	2837.978	95.03
2061/062	2565.806	2642.753	103.00
2062/063	2784.8	2780.923	99.86
2063/064	3094.6	3051.825	98.62
2064/065	3191.108	3181.645	99.70

*Sources: Annual report and Budget book of NEA*

The table no 4.8 shows the overall production budget and the actual achievement. This table shows that actual production is below in the first year and last three years. In the FY2061/62 actual production is more than budgeted production and achievement is 103% which is favorable for the authority. In the FY 2060/061, the budgeted production was 2986.39million units where as the actual production was 2837.978million units. In the FY 2060/0601 the whole achievement of NEA was 95.03%. Like wise in the FY 2062/63 budgeted production was 2784.8million units and the actual production was 2780.923million units, which was 99.86%. In FY 2063/064 and FY 2064/65, the actual achievement was only 98.62% and 99.70 respectively. The lower achievement is 95.03% in FY 2060/61 for the total study period either due to system error or over ambitious budget it-self and thus it can be taken seriously. Such a fluctuation shows an inefficiency of the entire company in the place of budgeting as well as performance. In spite of the

fact, the actual and the budgeted production volume of NEA is increasing continuously that can be taken as a positive part. The budgeted production and actual production can be presented in the following graphical form.

**Figure 4.6**  
**Budgeted Production and Actual Production Units of NEA**  
**from FY 2060/061 to 2064/065**



*Sources: Table 4.8*

The graphical presentation of the above data has shown the volume of actual and budgeted production, which is increasing continuously.

To find out the nature of variability of budgeted and actual production of different years, it is necessary to find out the different statistical calculations such as arithmetic mean, standard deviation and co-efficient of variance of actual and planned production figure of NEA for the period covered by the study i.e. five years. The detail results of those statistical tools are presented in Appendix 2. The summaries of those results are as follows: -

**Table 4.9**

**Relationship between Budgeted and Actual Production**

Statistical tools	Budgeted production (x) Units in million	Actual production (y) Units in million
Mean	2924.5408	2899.0248
S.D	224.5090	193.1693
C.V	7.67	6.66

*Sources: Appendix 2*

The table no 4.9 shows the average budgeted production and the average actual production of NEA. According to the above table, the average budgeted and the average actual production is 2924.5408 million units and 2899.0248 million units respectively. Standard deviation (S.D) of budgeted is higher than actual production. Co-efficient of variation of budgeted production is 7.67 percent and the actual production is 6.66 percent. Which means co-efficient of variation (CV) of budgeted production is higher than the C.V of actual production. It indicates that budgeted production is more variable than actual production. And actual production unit is less variable and more consistency than budgeted production.

The relation between dependent and independent variable is positive. The value of r is 0.9499 (App.2). It means that the budgeted and the actual production figure have the positive correlation of 94.99 percent. The obtained positive correlation has 0.02945 probable error (PEr) and it indicates a minor error between to two figures.

**4.3.2. Production Trend Line by Regression Analysis**

Another statistical tool is regression analysis, which determines the nature of relationship among budgeted and actual production and makes the estimate from that on that base. It can help to estimate or forecast the future production. For this purpose, actual production figures is to be known as dependent variable and denoted by (Y), like wise budgeted production is to be known as independent variable, which is denoted by (X). The regression line of actual production on budgeted sales (Y on X) is as below: -

$$Y - \bar{Y} = r \frac{\sigma_y}{\sigma_x} (X - \bar{X})$$

We have the following value as calculated above

Statistical tool	Budgeted production(X) Unit in million	Actual production (Y) Unit in million
Mean	2924.5408	2899.0248
S.D.( )	224.5090	193.1693
$r_{xy}$	0.949928	

Sources: Appendix2

$$Y - 2899.0248 = 0.949928 \times \frac{193.1693}{224.5090} (X - 2924.5408)$$

$$Y = 0.8173X + 508.797$$

In regression equation 0.8173 represent the change in value of dependent variable (Y), when the value of independent variable (X) changes by one unit.

By the help of regression equation, we can estimate the expected production achievement with given value of budgeted production (X). We have the budgeted production (X) for the FY 2065/66 is 3565.234 unit in million. The expected production achievement for the FY 2065/66 can be calculated by using above equation. Then,

The expected production achievement,

$$Y = 0.8173x + 508.797$$

$$= 0.8173 \times 3565.234 + 508.797$$

$$= 3422.66$$

If the relationship between budgeted and actual production remain same as previous year, the actual production for the FY 2065/66 will be 3422.66 unit in million as stated by the above regression equation.

Like wise, another important tool is least square method. It is also know as time series analysis and an important tool for the study of trend of actual sales. A straight-line trend will show the relationship between year and actual sales of the relevant year. To fit this straight-line trend, the time factor should be considered as an independent factor and sales as a dependent factor for the time. The formula can be expressed in the following way:

$$Y_c = a + bX$$

Where, Y= actual sales

X= time

b = slope of trend line or annual rate of growth

a = y-intercept

**Table 4.10**

**Fitting Straight –Line Trend by Least Square Method**

Fiscal Year	Actual Production Unit in million ‘Y’	X	X <sup>2</sup>	XY
2060/061	2837.978	-2	4	-5675.96
2061/062	2642.753	-1	1	-2642.75
2062/063	2780.923	0	0	0
2063/064	3051.825	1	1	3051.825
2064/065	3181.645	2	4	6363.29
Total	y=14495.124	X=0	X <sup>2</sup> =10	X Y= 1096.406

*Sources: Annual report of NEA*

FY 2062/63 is assumed as the base year. Therefore the value of X or mid time is zero in the FY 2062/63 and negative before the base year and positive after the base year.

Substituting the value in straight line equation is

$$Y_c = a + bX$$

Where,

$$a = \frac{\sum Y}{n} = 14495.124 / 5 = 2899.024$$

$$b = \frac{\sum XY}{\sum X^2} = 1096.406 / 10 = 109.6404$$

$$\therefore Y_c = 2899.024 + 109.6404X$$

The trend line shows the positive production figure for future. The production will be increase by 109.6404million unit every year if the same sales trend of the past year continuous in the future.

By the help of this trend line equation, we can estimate the actual production for FY 2065/66. The value of X in the base year is FY2062/63.

Then,

$$\begin{aligned} Y_c &= 2899.024 + 109.6404 \times 3 \\ &= 3227.9466 \end{aligned}$$

By the result, if the trend does not change, the positive production for the FY2065/66 will be 3227.9466 million units.

### 4.3.3. Comparative Analysis between Budgeted and Actual Production

In order to compare the nature of variability of budgeted and actual production of different years, it is needed to calculate the arithmetic mean, standard deviation and coefficient of variation of budgeted and actual figures of NEA for recent five years from FY 2060/061 to 2064/065 and previous five year from FY 2054/055 to 2058/059. The detail calculation of these statistical tools are presented appendix 2. The summarized of results from appendix 2 are as follows:

**Table 4.11**

**Comparative Mean, Standard Deviation and Coefficient of Variation of Budgeted Production between FY 2054/055 to 2058/059 and FY 2060/061 to 2064/065**

Statistical tools	Budgeted production (x) Units in million FY 2054/055 to 2058/059	Budgeted production (x) Units in million FY 2060/061 to 2064/065	Increase or decrease in percentage
Mean	1770.032	2924.5408	39.477
S.D	362.300	224.5090	-61.374
C.V	20.47	7.67	-166.68

*Sources: Appendix 2 and previous thesis report*

**Table 4.12**

**Comparative Mean, Standard Deviation and Coefficient of Variation of Actual Production between FY 2054/055 to 2058/059 and FY 2060/061 to 2064/065**

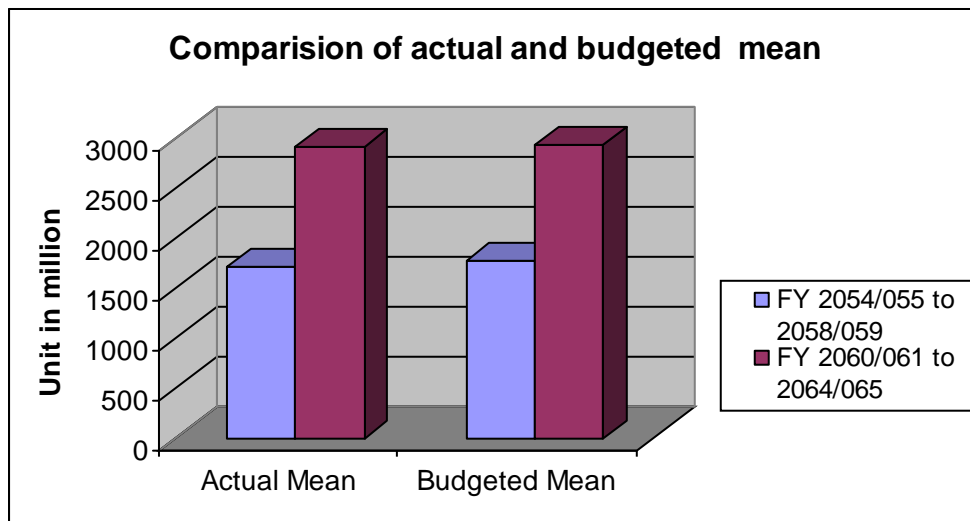
Statistical tools	Actual production (x) Units in million FY 2054/055 to 2058/059	Actual production (x) Units in million FY 2060/061 to 2064/065	Increase or decrease in percentage
Mean	1716.729	2899.0248	40.783
S.D	283.267	193.1693	-46.642
C.V	16.50	6.66	-147.75

*Sources: Appendix 2 and previous thesis report*

The above table 4.11 and 4.12 are the comparison between budgeted production and actual production of the available data of recent five year and previous five. Both average actual mean and budgeted mean are drastically increased to about 40% in period of FY 2060/61-2064/65 than in period of FY2054/55-2058/59. On the other hand, both standard deviation and coefficient of variation are decreased drastically to about 50% and 150% respectively in period of FY 2060/61-2064/65 than in period of FY2054/55-2058/59. The result from analysis indicate that there is increase in mean and decrease in S.D. and C.V. which resemble less variability and more consistency of the actual and budgeted production in recent five year. This may be due to political unrest, lack of commitment, insurgency, which resulted in no substantial change in production in period of FY 2060/61-2064/65 than in period of FY2054/55-2058/59. This can also be shown in graphical form as below:

**Figure 4.7**

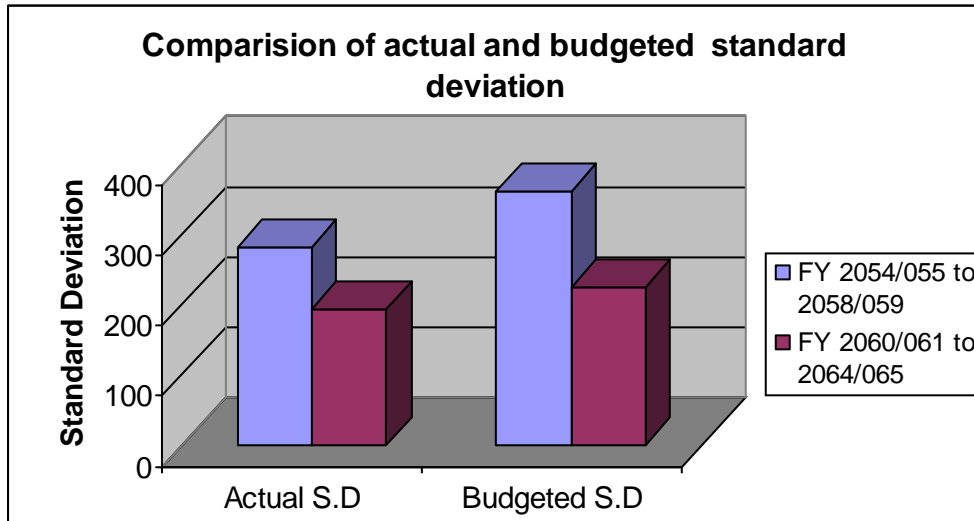
**Mean of Budgeted and Actual Production Units of NEA**



*Source: 4.11 and 4.12*

**Figure 4.8**

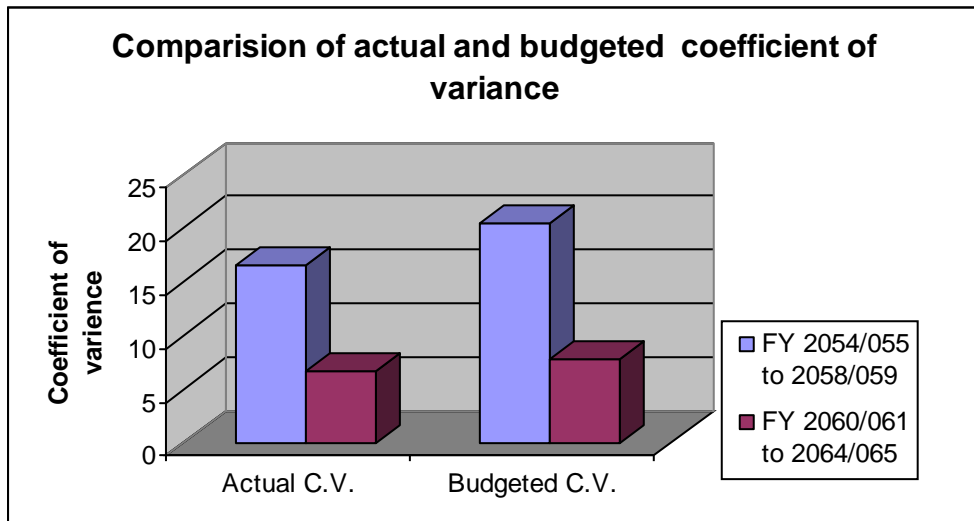
**Standard Deviation of Budgeted and Actual production Units of NEA**



*Source: 4.11 and 4.12*

**Figure 4.9**

**Co-efficient of Variation of Budgeted and Actual Sales Units of NEA**



*Source: 4.11 and 4.12*

Figure 4.7 shows that the actual and budgeted production mean is appreciably increased in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059. But on the other hand in figure 4.8, the standard deviation is slightly decreased in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059 and standard deviation is more decreased in budgeted production than actual production. In the same way in figure 4.9, the coefficient of variation is rapidly decreased in FY 2060/061 to 2064/065 compared to FY 2054/055 to 2058/059. The CV for budgeted production is increased than actual production in FY 2054/055 to 2058/059 but on the other hand CV is nearly equal for actual and budgeted production in FY 2060/061 to 2064/065.

#### **4.3.4. Actual Sales and Actual Production Unit of NEA**

Production budget always depends upon the sales budget. Production should be enough to meet the market demand to which we call sales. In this regard, whether the production volume meets the required sales volume or not should be studied seriously. Following is the comparative presentation table between actual sales and the production:

**Table 4.13**

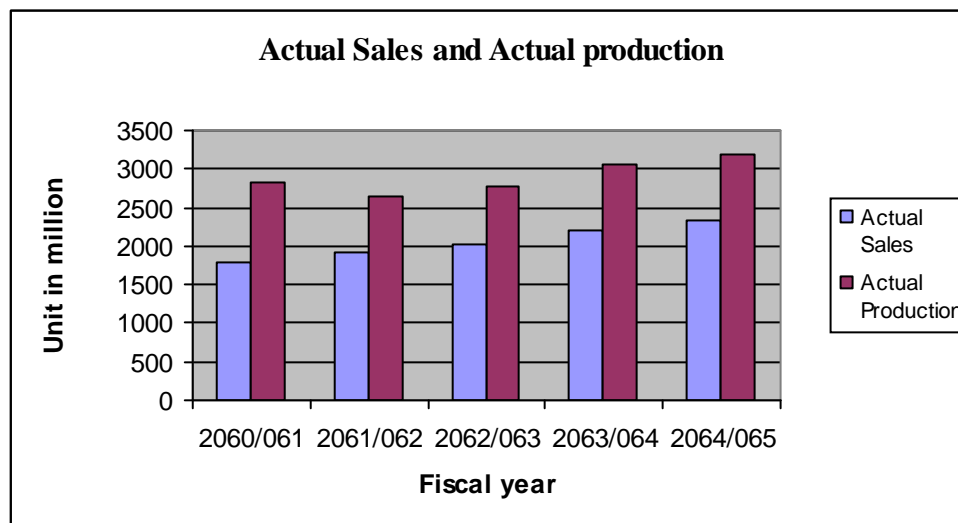
**Actual Sales and Actual Production unit of NEA  
from 2060/61 to 2064/65 (unit in million)**

Fiscal Year	Actual sales (X)	Actual production (Y)	Loss%
2060/061	1800.814	2837.978	36.54
2061/062	1918.35	2642.753	27.41
2062/063	2028.51	2780.923	27.05
2063/064	2204.202	3051.825	27.77
2064/065	2321.35	3181.645	27.03
total	10273.226	14495.124	29.12

*Sources: Annual report of NEA*

This table no 4.13 signifies the actual sales and actual production of NEA. In the FY 2060/61, the actual production was 2837.978 million units out of which actual sales were 1800.814 million units. In the same way in the FY 2061/062, the actual production was 2642.753 million units but actual sales were 1918.350 units. Like wise, in the FY 2062/063, actual production units and actual sales were 2780.923 million units and 2028.510 million units respectively. In the FY 2063/064 actual production was 3051.825 and actual sales were 2204.202 million units. In the last fiscal year of study period, the actual production was 3181.645 million units where as actual sales was only 2321.359 million units. According to the assumption, there must be actual production equal to actual sales but here we seemed to be vast difference due to the power leakage. The gap between actual production and actual sales is very large. There is the loss of power in every year. The trend of the power loss is remarkable in every year. In FY 2060/61, the power loss was 36.54% of production, 27.41% in the FY 2061/62, 27.05% in the FY 2062/63, 27.77% in the FY2063/64 and 27.03% in the FY 2064/65. The large gap between actual production and actual sales is the result of the loss and it is increasing trend.

**Figure 4.10**  
**Actual Sales and Actual Production**  
**from FY2060/61 to FY2064/65**



*Sources Table: 4.13*

This figure shows that the actual production is always greater than actual sales. Normally, production shall always be equal to sales. But within the period covered by the study, there is vast difference between the two figures due to the power leakage. On the other hand, actual sales and actual production is increasing every year.

In order to find out the nature of variability of actual production and actual sales of different years, we shall use different statistical tools such as arithmetic mean, standard deviation and co-efficient of variance of actual sales and actual production figure of NEA for the five year from FY 2060/61 to 2064/65. The detail calculations of these statistical tools are presented in Appendix 3. The summaries of those results are given below: -

**Table 4.14**  
**Relationship between Actual Sales and Actual Production**

Statistical tools	Actual sales (x) Units in million	Actual production (y) Units in million
Mean	2054.645	2899.0248
S.D	188.2489	193.1693
C.V	9.16	6.66

*Sources: Appendix 3*

The table no 4.14 shows the averages of actual sales and actual production. Average actual sales of the study period was 2054.645 and average actual production was 2899.0248 units in million. Greater scatterness of data from mean occurred on actual production than that of actual sales, as standard deviation of actual sales is less than actual production. Covariance of actual sales unites is 9.16 percent and actual production is 6.66 percent. It shows that actual sales are more variable since the co efficient of variation of actual sales is greater than that of actual production. The correlation value is 0.83455(Appendix 3) which means 83.45 percent of both variables are related positively. And the probable error item observed 9.15 percent (Appendix 3) of the total items. It signifies that there is good correlation between actual sales and actual production.

In conclusion, from the above study in relation to the production budget of NEA, we can trace out the following points: -

1. NEA prepares both short term and long term production plan and it is entirely based on sales budget. Long-term plan is always ruled by the government acts.
2. Small PER item denotes the positive correlation between budgeted and actual production.
3. The regression analysis shows the positive relationship between budget and actual production.
4. Actual sales are less than actual production. It indicates that there are power losses because of not having an efficient controlling system or an entity within the authority.
5. There is positive correlation between actual production and actual sales.
6. In compared to FY 2054/55-2058/59 the actual and budgeted production is more consistent and less variable in FY 2060/61-2064/65.

#### **4.4. Profit and Loss Account of NEA**

The profit and loss account of the company can be referred as a final account which summarized the incomes and gains earned and expenses incurred during the financial year. Therefore, profit and loss account is prepared to ascertain the operating results of a company in terms of net profit or loss. The profit and loss account determines net income or loss by matching incomes and expenses occurred during a particular financial year. NEA is also preparing profit and loss account at the end of every fiscal year. It shows the final conclusion of the operation of fiscal year.

#### 4.4.1. Profit and Loss of NEA

The following table shows profit and loss account of NEA for the FY 2060/061 to FY 2064/65.

**Table 4.15**  
**Profit and Loss of NEA**  
**from FY 2060/61 to 2064/65 (Rs. in million)**

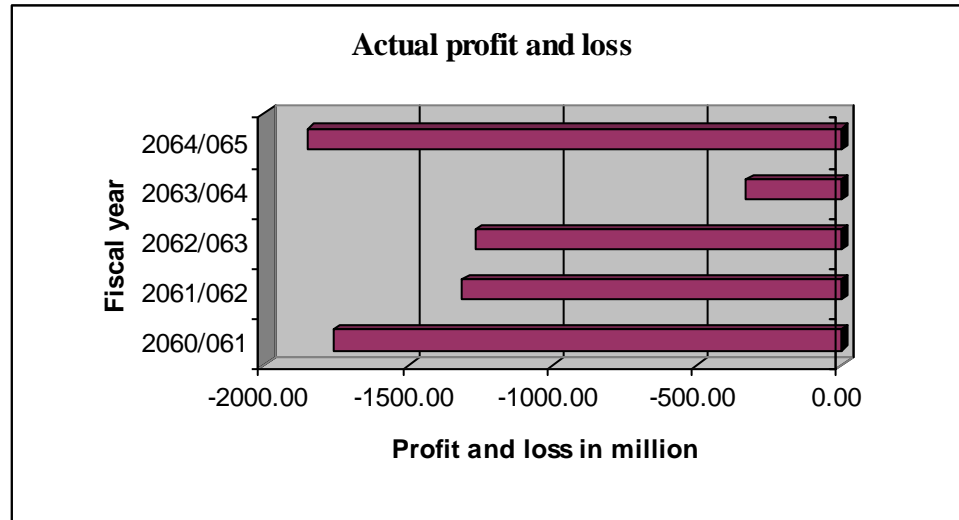
Fiscal Year	Net profit after tax
2060/061	-1760.30
2061/062	-1312.80
2062/063	-1267.80
2063/064	-329.26
2064/065	-1849.48

*Sources: Annual report of NEA*

The table no 4.15 shows the profit and loss account, which is negative for the total study period. It tells us the unfavorable economic condition of NEA. It was seemed to Rs. 1849.48 million losses in fiscal year 2064/065. As it is a public enterprise, it is facing the political interference from the day of its formation. As system of corruption has grown strongly and overall system such as record keeping, authority delegation is based on tradition or say till now on those sectors, no scientific system has been introduced. It's property such as vehicle and other electronic devices are using by the personnel for personal use and it can be called as misuse of property. All of the above stated and many other are the reasons for generating loss year after year despite of having totally monopoly market.

The net profit after tax from FY2060/61 to FY2064/65 is presented by following graphical form.

**Figure 4.11**  
**Actual Profit and Loss**  
**from FY2060/61 to FY 2064/65**



*Sources: Table 4.15*

The above graphical presentation shows the net profit after tax is always negative during the study period.

#### 4.4.2. Net Profit and Loss Trend Line by Analysis of Regression

In order to analyze the trend of net profit after tax and to estimate the possible future net profit and loss after tax, we can use statistical tool, least square method. This shows the relationship between time or year and net profit and loss of the relevant year. To fit the straight line trend, the time factor is considered as independent and profit and loss is considered as dependent factor upon time. Then, the straight line trend of net profit after tax 'Y' upon time 'X' is expressed by:

$$Y_c = a + bX$$

Where, Y= actual sales

X= time

b = slope of trend line or annual rate of growth

a = y-intercept

**Table 4.16**

**Fitting Straight Line Trend by Least Square Method**

Fiscal Year	Net Profit after tax 'Y'	X	X <sup>2</sup>	XY
2060/061	-1760.3	-2	4	3520.6
2061/062	-1312.8	-1	1	1312.8
2062/063	-1267.8	0	0	0
2063/064	-329.26	1	1	-329.26
2064/065	-1849.48	2	4	-3698.96
Total	Y= -6519.64	X=0	X <sup>2</sup> =10	X Y= 805.18

*Sources: Annual report of NEA*

FY 2062/63 is assumed as the base year. Therefore the value of X or mid time is zero in the FY 2062/63 and negative before the base year and positive after the base year.

Substituting the value in straight line equation is

$$Y_c = a + bX$$

Where,

$$a = \frac{\sum Y}{n} = -6519.64 / 5 = -1303.928$$

$$b = \frac{\sum XY}{\sum X^2} = 805.18 / 10 = 80.518$$

$$\therefore Y_c = -1303.928 + 80.518X$$

The trend line shows that the profit after tax will be increase by 80.518 million every year if the same trend of the past year continuous in the future. Otherwise it is not possible.

By the help of this trend line equation, we can estimate the net profit after tax for FY 2065/66. The value of X in the base year is FY2062/63.

Then,

$$Y_c = -1303.928 + 80.518x3$$

$$=-1062.374$$

By the result, if the trend does not change, the net profit after tax for FY2065/66 will be

-1062.374.

#### **4.4.3. Relation between Actual Sales and Actual Profit**

Profit is the excess of revenue over its costs. To increase the profit means to increase the revenue or reduce the cost by not cutting down the cost rather to increase the efficiency of costs. To earn maximum profit with optimum resource utilization is the main objective of any organization. An appropriate systematic and scientific planned sales and profit helps to predict the actual sales and profit and assists to avoid the forthcoming risks and obstacles. In spite of so, actually actual profit can be only obtained from actual sales. So profit is generally highly depends upon the sales turnover. The actual sales and actual profit (loss) of NEA is tabulated and analyzed as hereunder:

**Table 4.17**  
**Actual Sales and Actual Profit**  
**from FY2060/61 to FY2064/65**

Fiscal Year	Actual sales unit in million (X)	Actual profit Rs. in million (Y)
2060/061	1800.814	-1760.30
2061/062	1918.35	-1312.80
2062/063	2028.51	-1267.80
2063/064	2204.202	-329.26
2064/065	2321.35	-1849.48
total	10273.226	-6519.64

*Sources: Annual report of NEA*

The above table shows relation between actual sales and actual profit from FY 2060/61 to FY 2064/65. This table shows that the relation of actual sales unit and profit is not satisfactory at all. Actual sales unit are increasing during the whole study period but the authority has felt in loss during for these all period. In first three year, actual loss is increased and in forth fiscal year, actual loss in decreased and after that loss has began to increase. As a whole, actual sales and actual profit is in opposite relation, it means the correlation coefficient between actual sales and actual profit of NEA of the study period is  $r_{xy} = 0.029016$  (approximately) in Appendix 4. Therefore there is very less correlation coefficient between actual sales and actual profit of the NEA.

The significant of correlation 'r' is tested by the help of probable error (PEr) of 'r' and  $6 \times 0.28582 = 1.71492$ . Since coefficient of correlation 'r' is less than  $6 \times PE$  (i.e.  $0.029016 < 1.71492$ ). Thus the calculated correlation coefficient between actual sales and profit of the authority is very much unreliable or not significant at all. So, NEA needs to effort very hard to make it reliable.

Another statistical tool, coefficient of variation, is used to know about the variability or consistency between two variables here actual sales and actual profit as mentioned in Appendix 4 The summarized result are presented below.

**Table 4.18**  
**Relationship between Actual Sales and Profit**

Statistical tools	Actual sales (x) Units in million	Actual profit (y) Rs in million
Mean	2054.645	-1303.928
S.D	188.248	539.863
C.V	9.162	(41.4028)

*Sources: Appendix 4*

The above table no 4.18 shows mean, standard deviation and coefficient of variation (CV) of actual sales and actual profit. Here average mean of actual sales and actual profit are 2054.645 unit million and -1303.928 million respectively. Then standard deviation of actual sales and profit are 188.248 and 539.863 respectively. Coefficient of variation (CV) of actual sales is 9.162% and CV of actual profit is 41.40%. Higher CV is said to be higher variable or less consistent and less CV is more consistent or less variable. Therefore, CV of actual loss is more variable than CV of actual sales due to higher fluctuation of actual profit and loss than that of actual sales of every study years.

Next statistical tool, a regression analysis, can also be fitted to show the degree of relationship between actual sales and profit/loss of the authority that helps to forecast the possible profit/loss from the actual sales. Here, profit/loss is assumed as dependent on actual sales. For this purpose, actual profit and loss figures is to be known as dependent variable and denoted by (Y), like wise actual sales is to be known as independent variable, which is denoted by (X). The regression line of actual profit and loss on actual sales (Y on X) is as below: -

We have,

$$Y - \bar{Y} = r \frac{\dagger_y}{\dagger_x} (X - \bar{X})$$

We have the following value as calculated above

Statistical tool	Actual sales(X) Unit in million	Actual profit (Y) Rs. in million
Mean	2054.645	-1303.928
S.D.( )	188.248	539.863
$r_{xy}$	0.0229016	

*Sources: Appendix 4*

$$Y - (-1303.928) = 0.0229016 \times \frac{539.863}{188.248} (X - 2054.645)$$

$$Y + 1303.928 = 0.02917 \times \frac{539.863}{188.248} (X - 2054.645)$$

$$Y = 0.08365X - 1475.808$$

In regression equation 0.08365 represent the change in value of dependent variable (Y), when the value of independent variable (X) changes by one unit.

By the help of regression equation, we can estimate the expected profit with given value of actual sales (X). We have the actual sales (X) for the FY 2065/66 is 2485.40 unit in million. The expected profit for the FY 2065/66 can be calculated by using above equation. Then,

The expected profit achievement,

$$Y = 0.08365X - 1475.808$$

$$= 0.08365 \times 2485.40 - 1475.808$$

$$= -1267.9042$$

If the relationship between actual sales and actual profit remain same as previous year, the actual profit for the FY 2065/66 will be -1267.9042 Rs. in million as stated by the above regression equation.

#### **4.4.4. Relation between Actual Production and Actual Profit**

Profit is the ultimate goal of every business enterprises. Profit is the difference of revenue and cost. Profit plan thus refer to the planning of revenue (i.e. increase the revenues) and planning of cost (i.e. increase the efficiency of cost). And production budget is and estimate of the quantity of goods to be manufactured during the budget period. An appropriate systematic and scientific planned production and profit helps to predict the actual production and profit and assists to avoid the forthcoming risks. In spite of so, profit can be only obtained from actual production. Therefore to analyze the relationship between actual production and actual profit should be more emphasized here:

**Table 4.19**

**Actual Production and Actual Profit  
from FY2060/61 to2064/65**

Fiscal Year	Actual Production (X)	Actual Profit (Y)
2060/061	2837.98	-1760.30
2061/062	2642.75	-1312.80
2062/063	2780.92	-1267.80
2063/064	3051.83	-329.26
2064/065	3181.65	-1849.48
total	14495.12	-6519.64

*Sources: Annual report of NEA*

The above table shows relation between actual production and actual profit from FY 2060/61 to FY 2064/65. This table shows that the relation of actual production unit and profit is not satisfactory at all. Actual production unit are increasing during the whole study period but the authority has felt in loss during for these all period. In first three year, actual loss is increased and in forth fiscal year, actual loss in decreased and after that loss has began to increase. As a whole, actual production and actual profit is in opposite relation, it means the correlation coefficient between actual production and actual profit of NEA of the study period is  $r_{xy} = 0.039530$  (approximately) in Appendix 5. Therefore there is very less correlation coefficient between actual production and actual profit of the NEA.

The significant of correlation 'r' is tested by the help of probable error (PEr) of 'r' and  $6 \times 0.301174 = 1.807044$ . Since coefficient of correlation 'r' is less than  $6 \times PE$  (i.e.  $0.039530 < 1.807044$ ). Thus the calculated correlation coefficient between actual production and profit of the authority is very much unreliable or not significant at all. So, NEA needs to effort very hard to make it reliable.

Another statistical tool, coefficient of variation, is used to know about the variability or consistency between two variables here actual production and actual profit as mentioned in Appendix 5 The summarized result are presented below.

**Table 4.20**  
**Relationship between Actual Production and Profit**

Statistical tools	Actual Production (x) Units in million	Actual Profit (y) Rs in million
Mean	2899.024	-1303.928
S.D	193.1693	539.8636
C.V	6.66%	-41.4%

*Sources: Appendix 5*

The above table no 4.18 shows mean, standard deviation and coefficient of variation (CV) of actual sales and actual profit. Here average mean of actual production and actual profit are 2054.645 unit million and -1303.928 million respectively. Then standard deviation of actual production and profit are 193.1693 and 539.8636 respectively. Coefficient of variation (CV) of actual production is 6.66% and CV of actual profit is 41.4%. Higher CV is said to be higher variable or less consistent and less CV is more consistent or less variable. Therefore, CV of actual loss is more variable than CV of actual production due to higher fluctuation of actual profit and loss than that of actual production of every study years.

Next statistical tool, a regression analysis, can also be fitted to show the degree of relationship between actual production and profit/loss of the authority that helps to forecast the possible profit/loss from the actual production. Here, profit/loss is assumed as dependent on actual sales. For this purpose, actual profit and loss figures is to be known as dependent variable and denoted by (Y), like wise actual production is to be known as independent variable, which is denoted by (X). The regression line of actual profit and loss on actual production (Y on X) is as below: -

We have,

$$Y - \bar{Y} = r \frac{\uparrow_y}{\uparrow_x} (X - \bar{X})$$

We have the following value as calculated above

Statistical tool	Actual production(X) Unit in million	Actual profit (Y) Rs. in million
Mean	2899.024	-1303.928
S.D.( )	193.1693	539.863
$r_{xy}$	0.039530	

*Sources: Appendix 5*

$$Y - (-1303.928) = 0.039530 \times \frac{539.863}{193.1693} (X - 2899.024)$$

$$Y + 1303.928 = 0.039530 \times \frac{539.863}{193.1693} (X - 2899.024)$$

$$Y = 0.110477X - 1624.203$$

In regression equation 0.110477 represent the change in value of dependent variable (Y), when the value of independent variable (X) changes by one unit.

By the help of regression equation, we can estimate the expected profit with given value of actual production (X). We have the actual production (X) for the FY 2065/66 is 3422.66 unit in million. The expected profit for the FY 2065/66 can be calculated by using above equation. Then,

The expected profit achievement,

$$Y = 0.110477X - 1624.203$$

$$= 0.110477 \times 3422.66 - 1624.203$$

$$= -1246.0777$$

If the relationship between actual production and actual profit remain same as previous year, the actual profit for the FY 2065/66 will be -1246.0777 Rs. in million as stated by the above regression equation

#### **4.4.5. Multiple Correlations between Actual Sales, Production and Profit**

The study of the relationship among three or more variables at a time is called multiple correlations. In other word, in multiple correlations all the given variables are studied at one time by taking one variable as dependent and all the remaining variable as independent. The three variables we are considering in this report are actual sales (X1), actual production (X2), and actual profit (X3).

**Table: 4.21**

**Relation between Actual Sales, Production and Profit  
from FY 2060/61-2064/65**

Fiscal Year	Actual Sales (X1)	Actual Production (X2)	Actual Profit (X3)
2060/061	1800.814	2837.978	-1760.30
2061/062	1918.35	2642.753	-1312.80
2062/063	2028.51	2780.923	-1267.80
2063/064	2204.202	3051.825	-329.26
2064/065	2321.35	3181.645	-1849.48
total	10273.226	14495.124	-6519.64

*Source: Annual report of NEA*

The coefficient of multiple correlations (i.e. multiple correlation coefficients) between the three variables X1, X2 and X3 when X1 is dependent variable and X2 and X3 are independent variables is denoted by R1.23 which is calculated by following formula:

$$R_{1.23} = \sqrt{\frac{(r_{12} * r_{12} + r_{13} * r_{13} - 2 * r_{12} * r_{13} * r_{23})}{(1 - r_{23} * r_{23})}}$$

$$= 0.85730689 [:: \text{Appendix 6}]$$

$$(R_{1.23})^2 = 0.734975104$$

$$= 73.49\%$$

It shows that 73.49% of the total variation in the dependent variable actual sales (X1) has been explained by the two independent variables actual production (X2) and actual profit (X3) and remaining is due to effect of other factors.

The coefficient of multiple correlations (i.e. multiple correlation coefficients) between the three variables X1, X2 and X3 when X2 is dependent variable and X1 and X3 are independent variables is denoted by R2.13 which is calculated by following formula:

$$R2.13 = \sqrt{\frac{(r12 * r12 + r23 * r23 - 2 * r12 * r13 * r23)}{(1 - r13 * r13)}}$$

$$= 0.848965611$$

$$(R2.13)^2 = 0.720742608 \text{ [}\because \text{Appendix 6]}$$

$$= 72.07\%$$

It shows that 72.07% of the total variation in the dependent variable actual production (X2) has been explained by the two independent variables actual sales (X1) and actual profit (X3) and remaining is due to effect of other factors.

The coefficient of multiple correlations (i.e. multiple correlation coefficients) between the three variables X1, X2 and X3 when X3 is dependent variable and X1 and X2 are independent variables is denoted by R3.12 which is calculated by following formula:

$$R3.12 = \sqrt{\frac{(r23 * r23 + r13 * r13 - 2 * r12 * r13 * r23)}{(1 - r12 * r12)}}$$

$$= 0.3580054$$

$$(R3.12)^2 = 0.128167866 \text{ [}\because \text{Appendix 6]}$$

$$= 12.81\%$$

It shows that 12.81% of the total variation in the dependent variable actual profit (X3) has been explained by the two independent variables actual sales (X1) and actual production (X2) and remaining is due to effect of other factors.

#### 4.4.6. Multiple Regressions Analysis between Actual Sales, Production and Profit

Multiple regressions analysis is a logical extension of the simple linear analysis. In multiple regressions analysis, instead of a single independent variable two or more independent variables are used to estimate the unknown values of a dependent variable. The multiple regressions equations describe the average relationship between one dependent variable and two or more independent variables and this relationship is very much useful for estimating or predicting the dependent variables.

Thus a multiple regression equation of actual profit (X3) on actual sales (X1) and actual production (X2) is an equation for estimating a dependent variable X3 from two independent variable X1 and X2.

$$X_3 = a_1 + b_1 X_1 + b_2 X_2$$

Where,

$a_1 = X_3$ - intercept = the value of X3 when two independent variables X1 and X2 are zero

$b_1$  = the partial regression coefficient of X3 on X1 when X2 is held constant

$b_2$  = the partial regression coefficient of X3 on X2 when X1 is held constant

Here,  $b_1$  and  $b_2$  are known as coefficient of net regression which implies that the regression of dependent variable on the particular independent variable is measured while holding the value (s) of the other variable (s) constant.

The values of the constants  $a_1$ ,  $b_1$ , and  $b_2$  can be obtained by solving three normal equation simultaneously obtained by the method of least squares.

$$X_3 = na_1 + b_1 \sum X_1 + b_2 \sum X_2$$

$$\sum X_1 X_3 = a_1 \sum X_1 + b_1 \sum X_1^2 + b_2 \sum X_1 X_2$$

$$\sum X_2 X_3 = a_1 \sum X_2 + b_1 \sum X_1 X_2 + b_2 \sum X_2^2$$

Then,

$$-6519.64 = 5 * a_1 + 10273.226 * b_1 + 14495.124 * b_2$$

$$-13279173.69 = 10273.226 * a_1 + 21285022.88 * b_1 + 29934076.24 * b_2$$

$$-18879985.69 = 14495.124 * a_1 + 29934076.24 * b_1 + 42208296.02 * b_2$$

By solving these three equations, we get

$$a_1 = -1062.7407$$

$$b_1 = 1.852208739$$

$$b_2 = -1.39592428$$

∴ The required estimated the best line of fit dependent variable X3 on X1 and X2 is

$$X_3 = -1062.7407 + 1.852208739 * X_1 + -1.39592428 * X_2$$

The estimate of actual profit when the given value of actual sales  $X_1 = 2485.40$  and actual production  $X_2 = 3422.66$  in FY 2065 / 66 is

$$\begin{aligned} X_3 &= -1062.7407 + 1.852208739 * 2485.40 + -1.39592428 * 3422.66 \\ &= -1236.973 \end{aligned}$$

#### **4.4.7. Test of Regression Coefficient of Multiple Regression Model**

The ANOVA method or F-ratio is used to determine whether there is a significance relationship between the dependent variable and the set of explanatory variables (independent variables) by assuming the multiple regression model.

Set up the null hypothesis and alternative hypothesis as follows:

**Null Hypothesis H<sub>0</sub>:**  $b_1 = b_2 = 0$ . That is, the regression model of X3 on X1 and X2 is not significant. In other words, there is no linear relationship between the dependent variable and the independent variables.

**Alternative Hypothesis H1:**  $b_1 \neq b_2 \neq 0$  (at least one  $b_1 \neq 0$ ). That is the regression model is significant. In other words, there is linear relationship between the dependent variable and at least one of the independent variables.

Compute the test statistics: Under  $H_0$ , the F- statistic is equal to the regression mean square (MSR) divided by the error mean square (MSE). Thus,

$$F = \frac{MSR}{MSE} = \frac{\text{Explained variance}}{\text{Unexplained variance}}$$

$$\text{Where, Explained variance} = \frac{\text{Explained variation}}{\text{Its degree of freedom}}$$

$$\text{and Unexplained variance} = \frac{\text{Unexplained variation}}{\text{Its degree of freedom}}$$

Explained variance is known as ‘variance due to regression’ and the unexplained variance is also known as the ‘residual variance’.

F = test statistics from a F- distribution with k and (n-k) degree of freedoms.

Here the number of degree of freedom for number of explanatory variables is (k-1), where k is the number of constant in the regression equation. This degree of freedom (n-k) is also known as the degree of freedom in the numerator of the F- ratio. Similarly, the degree of freedom for the unexplained variation are (n-k), where n is the number of variables or sample size.

The degree of freedom (n-k) is also known the degree of freedom in the denominator of the F- ratio.

$$\text{Hence, } F = \frac{\text{Explained variance}}{\text{Unexplained variance}}$$

$$\frac{\frac{\text{Explained variance}}{\text{Its degree of freedom}}}{\frac{\text{Unexplained variance}}{\text{Its degree of freedom}}} = \frac{\frac{\sum (X_3^{\wedge} - X_3')^2}{(k-1)}}{\frac{\sum (X_3 - X_3')^2}{(n-k)}}$$

Construct ANOVA table for testing the significance of a set of regression coefficients in a multiple regression model with k=2 explanatory variables as follows:

**Table 4.22**  
**ANOVA Table**

Source of Variance	Sum of squares (SS)	Degree of freedom (d.f.)	Mean sum of square (M.S)	F-ratio= MSR/MSE
Explained (Regression)	SSR=186774.423	(k-1)=2	MSR = $\frac{SSR}{k-1}$ =93387.21148	F = $\frac{MSR}{MSE}$ With d.f. (k-1, n-k)
Unexplained (Error)	SSE=1270489.619	(n-k)=2	MSE = $\frac{SSE}{n-k}$ =635244.8096	
Total	SST=1457264.042	(n-1)=4		0.147009799

Sources: Appendix 7

Here, total variation, SST =  $\sum (X_3^{\wedge} - X_3')^2$

Explained variation, SSR =  $\sum (X_3^{\wedge} - X_3')^2$

Unexplained variation SSE = SST - SSR

Here, calculated F(2,2) = 0.147

The tabulated value of F at 5% level of significance for two tailed test with d.f. (2,2) is

$$F_{0.05}(2,2) = 19$$

**Decision:** Since calculated value of F is less than the tabulated value of F, it is not significant and hence H<sub>0</sub> is accepted, which means that regression equation of dependent variable X<sub>3</sub> on two independent variable X<sub>1</sub> and X<sub>2</sub> is not significant. In other word there is not linearship between the dependent variable X<sub>3</sub> and two independent variable X<sub>1</sub> and X<sub>2</sub>.

Also, R- squared value:

$$(R3.12)^2 = \frac{\text{Explained variation}}{\text{Total variation}} = \frac{SSR}{SST} = 0.1281$$

A number from 0 to 1 that reveals how closely the estimated values for the trendline correspond to actual data. A trendline is most reliable when its R-square value is at or near 1. Also known as coefficient of determination. The R-squared value 0.1281 reveals that variation in the dependent variable, actual profit (X3) has been affected very little by the two independent variables actual sales (X1) and actual production (X2).

Likewise, testing hypothesis has also shown similar results by the F-ratio or ANOVA test that there is no significant relationship between dependent variable and set of independent variables.

In conclusion, from the above study in relation to the profit budget of NEA, we can trace out the following points: -

1. NEA prepares both tactical (short term) and strategic (long term) profit plan and it is entirely based on sales and production budget. But the strategic plan is limited only to the top level executives.
2. NEA has been suffering from loss since last half decade. Its loss is in increasing trend in the first three fiscal years, then decreased in fourth fiscal year and again, it is increasing in last fiscal years taken for the study period.
3. The straight line trend shows the negative figure of profit for future.
4. The very low correlation coefficient between actual sales and actual profit and actual production and actual profit of the NEA shows that less relationship between the variables.
5. The regression analysis of actual sales and profit and actual production and profit shows the negative figure of expected profit achievement.

6. Actual profit of NEA is more variable and less consistent than actual sales and actual production.
7. The multiple correlation coefficient shows that the actual profit is less affected by the actual sales and actual production as  $(R_{3.12})^2 = 0.128$ .
8. The multiple regression equation of actual profit (X3) on actual sales (X1) and actual production (X2) is decreasing in trend.
9. Null hypothesis H0 is accepted, which means that regression equation of dependent variable actual profit (X3) on two independent variable actual sales (X1) and actual production (X2) is not significant. In other word there is not linearship between the dependent variable X3 and two independent variable X1 and X2.

#### **4.5. Analysis of Power Loss of NEA**

Power loss of NEA has become a very serious problem from the very beginning. This problem is one of the various causes for the decreasing profit or increasing losses. Power loss in NEA has two types: one is technical power loss (leakage) and another is non technical power loss. Technical loss arises due to inappropriate and unsystematic installation of power points, plants, stations, transmission and distribution lines etc. and non- technical losses are created due to theft, meter damaging etc. Normally, power loss is considered up to 15% in developing countries where as the system loss of NEA is abnormally about to 25% of total gross generation. Hence technical power loss is about to 10% of total gross generation and reminding 15% is non technical loss. The major reasons of power loss in NEA are undeveloped, unsystematic and damaged distribution system, theft, and misuses, which have increased the volume of power loss. The following table shows the power loss scenario of NEA.

**Table 4.23**  
**Analysis of Power Loss of NEA**  
**from FY 2060/61 to 2064/65 (unit in million)**

FY	Total power available	Power loss	% of loss in total power available
2060/061	2837.98	678.28	23.90
2061/062	2642.75	656.20	24.83
2062/063	2780.92	698.57	25.12
2063/064	3051.83	761.13	24.94
2064/065	3181.65	828.50	26.04

*Sources: Annual report of NEA*

This table shows that power loss and percentage of loss in total power available of NEA. Power loss percentage is increasing trend during the whole study period except FY 2060/61. In FY 2060/61 total power loss is 678.28 million unit and in FY 2064/65 its reach 828.50 million unit. By this analysis, it can be observed that the power loss is in climbing trend which has been losing it's a huge amount of operating profit for every year due to wastage of power. It concludes that NEA is not successful to distribution power.

#### **4.6. Cost Volume and Profit Analysis in Profit Planning**

##### **4.6.1. Identification of Cost Behavior**

While accounting to the cost behavior, cost can be broadly classified into two ways. First is fixed cost and second is variable cost. If any cost remains constant in total at any level of activity within the relevant range, it is called the fixed costs. On the other hand variable costs change in direct proportion and in the same direction as the change in activity level. Variable expenses are activity based because they are incurred as a direct result of production. Those expenses that are neither fixed nor variable because they possess some characteristics of both fixed and variable are known as semi variable.

Classification of costs into fixed and variable play an important role in management budgeting. It helps to determine the volume of operations desired to maintain the profitability. NEA has no practice of classifying its cost clearly. The classification of costs in fixed and variable has been found as below

**Table 4.24**

**Classification of Expenses into Fixed and Variable for the FY 2063/64, Rs. in Million**

<b>Expenses</b>	<b>Cost behavior</b>	<b>Fixed Cost</b>	<b>Variable cost</b>
Generation	VC		8958.50
Transmission	VC		276.10
Other income	VC		878.70
Distribution Expenses	VC		1938.20
Administrative Expenses	VC		564.10
Interest	FC	2599.70	
Depreciation	FC	1880.00	
Profit, Loss on Foreign Exchange	FC	-470.00	
Loss on Fixed Asset	FC	60.00	
Deferred Revenue Expenditure Written off	FC	150.00	
Provision for Tax	FC	0.00	
<b>Total</b>		<b>4219.70</b>	<b>12615.60</b>

*Sources: Annual Report of NEA*

#### **4.6.2. Cost Volume and Profit Analysis**

Cost volume profit analysis is the analytical study of relationship between cost, volume and profit. It analyses the short term static relationship between cost, volume and profit. It is a device used to determine the usefulness of the profit planning process of the firm. In fact, the entire field of profit planning has become associated with the CVP inter-relationship. However, it should be noted that the formal profit planning and control also involves the use of budgets and other forecasts. As a starting point in the profit planning, CVP analysis helps to determine the minimum sales volume to avoid losses and the sales

volume at which the profit goal of the firm will be achieved. As an ultimate objective, it helps management in seeking the most profitable combination of costs and volume. A dynamic management, therefore, uses CVP analysis to predict and evaluate the implications of its short-run decision about fixed costs, variable costs, volume and selling price for its profit plans on a continuous basis. Thus it assume that under constant underlying condition, CVP analysis can be used for the analysis of breakeven volume – breakeven analysis and contribution margin analysis- profit planning. Generally CVP analysis provides answers to question such as:

1. What minimum level of sales need be achieved to avoid losses?
2. What should be the sales level to earn a target profit?
3. What will be the effect of changes in prices, costs and volume on profits?
4. How will profits be affected when sales mix is changed?
5. What will be new break-even point under (3) and (4) above?
6. What will be the impact of plant expansion on cost-volume profit relationship?

For CVP analysis of NEA, the data of FY 2063/64 are as follows:

Sales Volume = 2204.202 unit in million

Sales Revenue = 14777.26 Rs in million

Total Variable Cost = 12615.6 Rs in million

Total Fixed Cost = 4219.7 Rs in million

**a. Variable Cost Volume Ratio (VC Ratio)**

$$\text{VC Ratio} = \frac{\text{Total Variable cost}}{\text{Total Sales Revenue}}$$

$$= \frac{12615.6}{14777.26}$$

$$= 0.85 \quad = 85\%$$

It means variable costs are 85% of sales or a rupee of sales include Rs. 0.85 variable cost.

**b. Profit Volume Ratio (P/V Ratio)**

$$\text{P/V Ratio} = (1 - \text{VC Ratio})$$

$$= (1 - 0.85)$$

$$= 0.15$$

$$= 15\%$$

It means 15% of sales is available to cover fixed costs and generate profits or a rupee of sales include Rs. 0.15 for the fixed cost that was associated in the production process and the portion of profit or loss

**c. Selling Price/ Per Unit (SPPU) and Variable Cost/ Per Unit (VCPU)**

$$\text{SPPU} = \frac{\text{Sales Revenue}}{\text{Total Sales Unit}}$$

$$= \frac{14777.26}{2204.20}$$

$$= 6.70 \text{ per unit}$$

$$\text{VCPU} = \frac{\text{Total Variable Cost}}{\text{Total Sales Unit}}$$

$$= \frac{12615.6}{2204.20}$$

$$= 5.72 \text{ per unit}$$

**d. Contribution Margin Per Unit (CMPU)**

$$\begin{aligned}\text{CMPU} &= \text{SPPU} - \text{VCPU} \\ &= 6.70 - 5.72 \\ &= 0.98 \text{ per unit}\end{aligned}$$

**e. Break Even Point (BEP)**

$$\begin{aligned}\text{BEP in Rs.} &= \frac{\text{Total Fixed Cost}}{P / V \text{ Ratio}} \\ &= \frac{4219.7}{0.15} \\ &= 28131.33 \text{ Rs. in million}\end{aligned}$$

$$\begin{aligned}\text{BEP in Unit} &= \frac{\text{Fixed Cost}}{\text{CMPU}} \\ &= \frac{4219.7}{0.98} \\ &= 4301.42 \text{ Unit in million}\end{aligned}$$

It means that NEA will be in breakeven point, when its sales volume reached to 4301.42 units in million or Rs. 28131.33 million. But the current practice shows that the total sales volume and sales revenue is in the below point of BEP volume. That is why we can say that NEA is suffering loss in every fiscal year.

$$\begin{aligned}\text{BEP in \%} &= \frac{\text{BEP}}{\text{Sales}} \\ &= \frac{28131.33}{14777.26} = 1.90 \%\end{aligned}$$

**f. Margin of Safety (MOS)**

$$\begin{aligned}\text{MOS} &= \text{Actual Sales Volume} - \text{BE Sales Volume} \\ &= 2204.20 - 4301.42 \\ &= -2097.21\end{aligned}$$

The negative MOS shows that the NEA has less chance to earn profit as BE sales is far behind from the actual sales.

**g. Margin of Safety Ratio**

$$\begin{aligned}\text{Margin of Safety Ratio} &= \frac{\text{Margin of Safety}}{\text{Actual Sales Volume}} \\ &= \frac{-2097.21}{2204.20} \\ &= -0.95 \\ &= -95\%\end{aligned}$$

Hence Margin of safety ratio is -95%, which is negative ratio. It means NEA has low contribution ratio.

**h. Profit and Loss**

$$\begin{aligned}\text{Profit / Loss} &= \text{Sales} - \text{Variable Cost} - \text{Fixed Cost} \\ &= 14777.26 - 12615.60 - 4219.70 \\ &= -2058.04 \text{ Rs. in million}\end{aligned}$$

$$\begin{aligned}\text{Profit per Unit} &= \frac{\text{Profit}}{\text{Total Sales Unit}} \\ &= \frac{-2058.04}{2204.20} = -0.93\end{aligned}$$

#### **4.7. Major Findings**

The major finding of the study on the basis of collection and analysis of data are presented as below.

1. NEA has a practice of preparing both strategic and tactical managerial budgeting but tactical short range plan is prepared for external purpose and strategic plan is prepared for internal purpose.
2. There is high degree of correlation between budgeted and actual sales i.e. 0.99 approximately.
3. The coefficient of variation and standard deviation of actual sales are less than budgeted sales. It indicates that budgeted sales are more variable than actual sales.
4. The NEA sales achievement has neither touched nor crossed the target sales during the study period. The sales achievement during fiscal five year is increasing every year.
5. The tariff rate of electricity is imposed on the basis of different category and voltage level.
6. Tariff rate of electricity is high in domestic, industrial, commercial, non-commercial and temporary supply but it is cheap in water supply, irrigation, community sales, transportations and bulk supply (India) categories.
7. Category wise sales analysis of NEA shows that the sales share in (GWH) of electricity of domestic, industrial, bulk supply (India) and commercial categories is high and sales share in (GWH) of community sales, temporary supply is low. The sales revenue of electricity in (Rs.) of domestic categories is the highest and the least is in the temporary supply category.
8. The regression equation shows that there is positive relation between budgeted and actual sales. In the same way there is positive relation between budgeted and actual production.

9. In compared to FY 2054/55 to FY 2058/59 the actual and budgeted sales and production are more consistent and less variable in FY 2060/61 to FY 2064/65.
10. There is positive correlation between budgeted and actual production but budgeted production is more variable than actual production.
11. The trend line of actual sales and production is increasing but on the other hand trend line of actual profit is decreasing.
12. Actual sales are less than actual production. It indicates that there are power losses in NEA.
13. There is positive correlation between actual production and actual sales as correlation coefficient is 0.83. Actual sales are more variable than actual production.
14. NEA has been suffering from loss since last half decade. Its loss is in increasing trend in the first three fiscal years, than decreased in forth fiscal year and again, it is increasing in last fiscal years taken for the study period.
15. Actual profit of NEA has a very low degree of correlation with actual sales and actual production as correlation coefficient is 0.029 and 0.39 respectively.
16. Higher standard deviation and coefficient of variation of actual profit than actual sales and actual production indicate higher variability and less consistency of actual profit.
17. The regression analysis of actual sales and profit, and actual production and profit shows the negative figure of expected profit achievement.
18. The multiple correlation coefficients show that the actual profit is less affected by the actual sales and actual production.
19. The multiple regression equation of actual profit (X3) on actual sales (X1) and actual production (X2) is decreasing in trend.

20. Null hypothesis  $H_0$  is accepted, which means that regression equation of dependent variable actual profit ( $X_3$ ) on two independent variable actual sales ( $X_1$ ) and actual production ( $X_2$ ) is not significant. In other word there is not linearship between the dependent variable  $X_3$  and two independent variable  $X_1$  and  $X_2$ .
21. Power loss is significantly high in NEA due to theft, leakage, outage and unsystematic distribution channel. The average power loss is about 25% of actual production which is out of normal loss. But the actual loss of the year is nearest to the average loss.
22. NEA was unable to meet its BEP sales therefore it was at loss every year.
23. NEA has a low contribution ratio and negative Margin of safety.

## **5. SUMMARY, CONCLUSION AND RECOMMENDATION**

### **5.1 Summary**

Public enterprises play a vital role in the developing countries. The role of public enterprises differs from country to country basically due to political philosophy of existing government. They come into existence either by the way of deliberating policy of the government to bring certain activities under strict government control by creating new institution or by nationalizing them from private sector. In Nepal, the purpose of establishing Public enterprises was to make control over economy and to generate revenue to the government by providing basic goods services that are neglected by the private sector, to the citizens. They are found to be success in their goals basically up to the government launched the policy of free economy. So, the role of PEs in developing countries like Nepal is the most important for socio-economic development of people, enterprises and the nation. No nation the world is without public enterprises.

Profit planning and control is the important tool of business operation. It helps to achieve objectives and goals to the enterprise. Profit is the excess of revenue over its cost. To increase the profit means, to increase the revenue or reduce the cost. Profit is the essential part of every business organization. In absence of profit, organization cannot achieve its objectives within the time span. To maximize the profit with the use of optimum resources is the basic objectives of any enterprises. Profit planning and control is the only latest management technique, which can be used to achieve the targeted objectives and to run management efficiently. It is the systematic and continuous process to attain the objectives of the enterprises for certain period of time. Organization cannot achieve its objectives effectively, efficiently and economically in absence of profit planning. Profit plans can be divided into two categories. One is strategic or long term profit plan which covers the period 5 to 10 or more years. And another is tactical or short-term profit plan which covers the one fiscal year.

Profit planning and control consists of three main budgets i.e. Operational budget, financial budget, and Appropriation budget. Operational budget includes sales budget, production budget, purchase budget etc. Financial budget includes cash budget, capital

expenditure budget budgeted balance sheet, budgeted income statement, etc. Appropriation budget related with advertising and publicity expenditure, research etc.

Out of three main budgets, sales and production budgets are related with operational budget. Profit planning or budgeting techniques start with planning the sales and production budgeting, that is an estimation of the future sales and production volume. All budgets are affected by sales budget and all budgets expect sales budgets are related with cost. Therefore sales budget is the foundation of all other budgets. On the basis of sales budget, production budget or planning is made. And all their functional budgets are prepared on the basis of the production budget. Therefore sales and production planning process is an essential part of profit planning and control in every type of business enterprises including public enterprises.

Nepal Electricity Authority is the largest public utility enterprise and also a full government owned enterprises with monopoly market in Nepal, was formed on 1<sup>st</sup> Bhadra 2042 B.S. The main purpose of NEA is to provide electricity service to its customers at an affordable price. It is also responsible for making, generation, transmission and distribution of electricity throughout the kingdom of Nepal. Now a days NEA has been suffering from loss since last half decade due to the various problems like unscientific and inappropriate budgeting practices, system, policies, over load of high purchase price, interest, repair and maintenance expenses, power loss and wastage, improper utilization of assets, and other expenses. So NEA must consider about past trends and experiences, present condition, future possibilities and obstacles to plan the forthcoming sales, production, cost and profit. Without proper plan, targeted sales revenue, targeted production volume, and desired profit of NEA can not be secured. Therefore, sales and production budgets are prepared by considering all relevant factors.

The present study has mainly focused on sales and production budgeting system, practice, trend and these affect on profitability in public enterprises with fully reference to NEA. The study has tried to analyze the relationship between sales and profit, production and profit, sales and production and sales, production and profit. This study has also tried to analyze the category-wise sales share, comparative study between previous five year and recent five year, power loss and wastage and cost volume profit analysis.

The study has been organized in five main chapters consisting of introduction, review of literature, research methodology, data presentation and analysis, and summary, conclusion and recommendation.

## **5.2 Conclusion**

Conclusions those have derived from this study are enumerated as hereunder:

1. NEA prepared two types of managerial budgeting, which are tactical and strategic. Tactical plan prepared for external purpose but strategic plan is confined only top level management or internal purpose.
2. NEA's sales achievement has never touched and succeeded the planned sales during the study period. However, all the sales achievements are very near to target sales.
3. NEA's both actual and target sales and production are in increasing trend in unit during the study period. So, such trend is considered as favorable for the enterprises.
4. In compared to FY 2054/55-2058/59 the actual and budgeted sales are more consistent and less variable in FY 2060/61-2064/65
5. Category-wise sales analysis of NEA shows that the sales share (in GWH) of electricity of domestic, industrial, bulk supply(India) and commercial categories is high and sales share (in GWH) of community sales, temporary supply is low. The sales revenue of electricity (in Rs.) of domestic category is highest and the least is in the temporary supply category.
6. The statistical tool shows that there is perfect correlation between budgeted and actual sales as well as actual production with budgeted production. And C.V. and S.D of actual sales and production are less than these of budgeted sales and production. It indicates that budgeted sales and production is more variable and less consistent than actual sales and production. The next statistical tools regression equation and least square line of sales and production will be positive

and high in future if the present sales and production trend continues in the future.

7. NEA has vast gap between actual sales and actual production. It indicates that NEA is suffering from huge power loss annually.
8. In compared to FY 2054/55-2058/59 the actual and budgeted production is more consistent and less variable in FY 2060/61-2064/65.
9. NEA prepares both tactical (short-range) and strategic (long range) profit plan but strategic plan is confined only to top level executives.
10. Actual profit of NEA has a very low degree of correlation with actual sales and actual production as correlation coefficient is 0.029 and 0.39 respectively.
11. Higher standard deviation and coefficient of variation of actual profit than actual sales and actual production indicate higher variability and less consistency of actual profit.
12. The regression analysis of actual sales and profit and actual production and profit shows the negative figure of expected profit achievement.
13. The multiple correlation coefficient shows that the actual profit is less affected by the actual sales and actual production.
14. The multiple regression equation of actual profit (X3) on actual sales (X1) and actual production (X2) is decreasing in trend.
15. Null hypothesis  $H_0$  is accepted, which means that regression equation of dependent variable actual profit (X3) on two independent variable actual sales (X1) and actual production (X2) is not significant. In other word there is not linearship between the dependent variable X3 and two independent variable X1 and X2.
16. NEA has been drastically running under a huge loss annually.

17. The sales share of electricity (in Rs. and units) for high income generating categories like industrial, domestic is high and it is least in community sales and temporary supply.
18. Tariff rate is expensive in temporary supply, domestic industrial, commercial, non- commercial and cheap in water supply, irrigation, community sales and bulk supply in India categories.
19. Power loss in NEA is about one-fourth of its total power available which is about 15% more than the normal acceptance.
20. NEA's total sales volume and sales revenue is in the below point in BEP volume, which shows that NEA is suffering loss in every fiscal year.
21. NEA is not considering CVP analysis as a tool for developing the sales plan and pricing strategy.
22. The communication system of NEA is not effective. The goals and objectives of NEA are not so far in far informed to the lower level staffs. So, there is not contribution of lower level staffs in the process of planning, decision making process. There is a lack of proper co-ordination among various directorates and departments. It also fails to maintain its periodic performance report systematically.

### **5.3. Recommendation**

Based on research study on topic of "Impact of sales and production budgeting on profitability of public enterprises: A case study of NEA" the following suggestions are recommended in this part to develop the mechanism of sales and production budgeting as a part of profit planning, to improve the budgeting system and practices of revenue and cost, also may help to the NEA to get ride of long series of losses and also assist to generate reasonable profit.

1. NEA should be prepared sales budget on the realistic ground. Sales forecasting should be made after analyzing all variable that affect the sales of NEA. NEA

should consider demand determinants such as family income, price of electricity, cost of alternative power, cost of auto generation of electricity and reliability of NEA service. And there should be effective management in generation and distribution of electricity to meet target sales.

2. NEA should try to increase the sales volume and should reduce the power purchase. It can be done reducing power leakage and wastage, establishing new plants and increasing the capacity utilization.
3. Power leakage and loss of electricity should be properly controlled. For this purpose, meter reading and joining system, transmission and distribution line should be refurbished and modernized. Good incentives and motivational factors should be given to the technicians and staffs, also awareness about loss and leakage reduction should be launched and economical and punishable measures also can be induced to reduce the losses which may increase profits by controlling the losses.
4. NEA should prepare monthly sales budget which help to estimated sales revenue rightly a year budget.
5. NEA should maximize its operating profit so as to survive in the future. Because authority operating under huge loss annually can not be afforded by government.
6. NEA should effort to supply more electricity to the high revenue or more profit generating categories such as domestic, industrial, temporary supply, commercial and non-commercial. Tariff rate for water supply and irrigation, transport service, street light, bulk supply to India, temples should be revised in such a way by which NEA could cover operating cost at least.
7. NEA is enjoying monopoly market in power sector in Nepal. It is a good sign for the authority as the sale of electricity is increasing every year in satisfied manner. In this context, NEA could have sufficient profit but unfortunately, it is suffering from huge loss due to over cost on unnecessary heads. So it needs to work hard to maintain the unnecessary cost.
8. NEA should be considered cost volume profit relationship while developing the

sales plan and strategy. To maintain BEP, NEA should be control its high fixed cost and variable cost and increase its sales revenue.

9. NEA has both the Margin of safety and P/V ratio are low, so management of NEA should think of the possibilities of increasing the selling price, provided it does not adversely affect the sales volume or reducing variable costs by bringing improvement in the manufacturing process
10. Load shedding is a big issue in Nepal. The authority should try to avoid load shedding which help to increase its profit.
11. NEA should have proper co-ordination between budget formulation implementation and evaluation of achievement.
12. NEA should be implemented managerial budgeting efficiently and strictly to increase the sales and manage the costs to minimum level with a view to increased the profit.
13. Finally NEA should practice the approach of PPC scientifically and systematically only after considering, evaluating and analyzing relevant variables, factors, environments like PPC's all aspects, internal strength and weakness, external threats and opportunities, and only then sales and production budgeting becomes a reliable tool of profit planning and control in all public enterprises including NEA

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## APPENDIXES

### Appendix 1

#### Calculation of Mean, Standard Deviation, Co-efficient of Variation and Correlation Co-efficient of Budgeted Sales and Actual Sales in Units

Fiscal Year	Unit in million		U=X- X'	V=Y- Y'	U <sup>2</sup>	V <sup>2</sup>	UV
	Budgeted (X)	Actual (Y)					
2060/061	1906.622	1800.814	-258.25	-253.83	66691.20	64430.28	65550.99
2061/062	1988.85	1918.35	-176.02	-136.30	30982.48	18576.38	23990.46
2062/063	2145.48	2028.51	-19.39	-26.14	375.91	683.05	506.72
2063/064	2362.342	2204.202	197.47	149.56	38995.82	22367.24	29533.52
2064/065	2421.048	2321.35	256.18	266.70	65627.99	71131.45	68324.33
Total	X= 10824.342	Y= 10273.226	U= 0.00	V= 0.00	U <sup>2</sup> = 202673.40	V <sup>2</sup> = 177188.40	UV= 187906.03

Suppose, X is the budgeted sales and Y is the actual sales

We have,

$$\text{Mean } \bar{X} = \frac{\sum X}{n}$$

$$\text{Standard deviation ( )} = \sqrt{\frac{1}{n} \sum (X - \bar{X})^2}$$

$$\text{Co-efficient of Variation (C.V)} = \frac{\dagger}{\bar{X}} \times 100\%$$

Let, 'X' be the budgeted sales and 'Y' be the actual sales.

For budgeted sales (X)

$$\begin{aligned}\text{Mean } \bar{X} &= \frac{\sum X}{n} \\ &= \frac{10824.342}{5} \\ &= 2164.868 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{S.D ( )} &= \sqrt{\frac{1}{n} \sum (X - \bar{X})^2} \\ &= \sqrt{\frac{1}{5} \times 202673.4005} \\ &= 201.332 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{X}} \times 100\% \\ &= \frac{201.332}{2164.868} \times 100\% \\ &= 9.29\%\end{aligned}$$

For actual sales (Y)

$$\begin{aligned}\text{Mean } \bar{Y} &= \frac{\sum Y}{n} = \frac{10273.226}{5} \\ &= 2054.6452 \text{ units in million}\end{aligned}$$

$$\text{Standard deviation ( )} = \sqrt{\frac{1}{n} \sum (Y - \bar{Y})^2}$$

$$= \sqrt{\frac{1}{5} \times 177188.3951}$$

$$= 188.2489 \text{ units in million}$$

$$\text{Co-efficient of variation (C.V)} = \frac{\dagger}{Y} \times 100\%$$

$$= \frac{188.2489}{2054.6452}$$

$$= 9.165\%$$

Calculation of correlation co-efficient (r) between 'X' and 'Y' variable is given by:

$$r_{xy} = \frac{\sum uv}{\sum u.^2 \sum v^2}$$

$$= \frac{187906.025}{202673.4003 \times 177188.3951}$$

$$= 0.99157299$$

$$r_{xy} = 0.9915$$

$$\text{Probable Error of (PEr)} = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$$

$$= 0.6745 \times \frac{1-0.9915^2}{\sqrt{5}}$$

$$= 0.0050625$$

## Appendix 2

### Calculation of Mean, Standard Deviation, Co-efficient of Variation and Correlation Co-efficient of Budgeted Production and Actual Production in Units

Fiscal Year	Budgeted Production (X)	Actual Production (Y)	U=X-X'	V= Y-Y'	U <sup>2</sup>	V <sup>2</sup>	UV
2060/061	2986.39	2837.98	61.85	-61.05	3825.32	3726.71	-3775.70
2061/062	2565.81	2642.75	-358.73	-256.27	128690.66	65675.24	91933.61
2062/063	2784.80	2780.92	-139.74	-118.10	19527.49	13948.04	16503.64
2063/064	3094.60	3051.83	170.06	152.80	28920.13	23347.90	25985.08
2064/065	3191.11	3181.65	266.57	282.62	71058.07	79874.18	75337.28
Total	X= 14622.70	Y= 14495.12	U= 0.00	V= 0.00	U <sup>2</sup> = 252021.68	V <sup>2</sup> = 186572.06	UV= 205983.91

Suppose, X is the budgeted production and Y is the actual production

We have,

$$\text{Mean } \bar{X} = \frac{\sum X}{n}$$

$$\text{Standard deviation ( )} = \sqrt{\frac{1}{n} \sum (X - \bar{X})^2}$$

$$\text{Co- efficient of Variation (C.V)} = \frac{\dagger}{\bar{X}} \times 100\%$$

Let, 'X' be the budgeted production and 'Y' be the actual production

For budgeted production (X)

$$\begin{aligned}\text{Mean } \bar{X} &= \frac{\sum X}{n} \\ &= \frac{14622.70}{5} \\ &= 2924.54 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{S.D ( )} &= \sqrt{\frac{1}{n} \sum (X - \bar{X})^2} \\ &= \sqrt{\frac{1}{5} \times 252021.68} \\ &= 224.509 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{X}} \times 100\% \\ &= \frac{224.509}{2924.540} \times 100\% \\ &= 7.67\%\end{aligned}$$

For actual production (Y)

$$\begin{aligned}\text{Mean } \bar{Y} &= \frac{\sum Y}{n} = \frac{14495.12}{5} \\ &= 2899.024 \text{ units in million}\end{aligned}$$

$$\begin{aligned} \text{Standard deviation ( )} &= \sqrt{\frac{1}{n} \sum (Y - \bar{Y})^2} \\ &= \sqrt{\frac{1}{5} \times 186572.06} \\ &= 193.16 \text{ units in million} \end{aligned}$$

$$\begin{aligned} \text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{Y}} \times 100\% \\ &= \frac{193.16}{2899.024} \\ &= 6.66\% \end{aligned}$$

Calculation of correlation co-efficient (r) between 'X' and 'Y' variable is given by:

$$\begin{aligned} r_{xy} &= \frac{\sum uv}{\sum u.^2 \sum v.^2} \\ &= \frac{205983.91}{252021.68 \times 186572.06} \\ &= 0.9499 \end{aligned}$$

$$r_{xy} = 0.9499$$

$$\begin{aligned} \text{Probable Error of (PEr)} &= 0.6745 \times \frac{1 - r^2}{\sqrt{n}} \\ &= 0.6745 \times \frac{1 - 0.9499^2}{\sqrt{5}} \\ &= 0.0294 \end{aligned}$$

### Appendix 3

#### Calculation of Mean, Standard Deviation, Co-efficient of Variation and Correlation Co-efficient of Actual Sales and Actual Production in Units

Fiscal Year	Actual sales (X)	Actual production (Y)	U=X-X'	V=Y-Y'	U <sup>2</sup>	V <sup>2</sup>	UV
2060/061	1800.81	2837.98	-253.83	-61.05	64430.28	3726.71	15495.58
2061/062	1918.35	2642.75	-136.30	-256.27	18576.38	65675.24	34928.62
2062/063	2028.51	2780.92	-26.14	-118.10	683.05	13948.04	3086.61
2063/064	2204.20	3051.83	149.56	152.80	22367.24	23347.90	22852.31
2064/065	2321.35	3181.65	266.70	282.62	71131.45	79874.18	75376.16
total	X= 10273.23	Y= 14495.12	U= 0.00	V= 0.00	U <sup>2</sup> = 177188.40	V <sup>2</sup> = 186572.06	UV= 151739.29

Suppose, X is the actual sales and Y is the actual production

We have,

$$\text{Mean } \bar{X} = \frac{\sum X}{n}$$

$$\text{Standard deviation ( )} = \sqrt{\frac{1}{n} \sum (X - \bar{X})^2}$$

$$\text{Co- efficient of Variation (C.V)} = \frac{\dagger}{\bar{X}} \times 100\%$$

Let, 'X' be the actual sales and 'Y' be the actual production

For actual sales (X)

$$\text{Mean } \bar{X} = \frac{\sum X}{n}$$

$$= \frac{10273.23}{5}$$

$$= 2054.645 \text{ units in million}$$

$$\text{S.D ( )} = \sqrt{\frac{1}{n} \sum (X - \bar{X})^2}$$

$$= \sqrt{\frac{1}{5} \times 177188.40}$$

$$= 188.248 \text{ units in million}$$

$$\text{Co-efficient of variation (C.V)} = \frac{\dagger}{\bar{X}} \times 100\%$$

$$= \frac{188.248}{2054.645} \times 100\%$$

$$= 9.16\%$$

For actual production (Y)

$$\text{Mean } \bar{Y} = \frac{\sum Y}{n} = \frac{14495.12}{5}$$

$$= 2899.024 \text{ units in million}$$

$$\begin{aligned} \text{Standard deviation ( )} &= \sqrt{\frac{1}{n} \sum (Y - \bar{Y})^2} \\ &= \sqrt{\frac{1}{5} \times 186572.06} \\ &= 193.16 \text{ units in million} \end{aligned}$$

$$\begin{aligned} \text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{Y}} \times 100\% \\ &= \frac{193.16}{2899.024} \\ &= 6.66\% \end{aligned}$$

Calculation of correlation co-efficient (r) between 'X' and 'Y' variable is given by:

$$\begin{aligned} r_{xy} &= \frac{\sum uv}{\sum u.^2 \sum v.^2} \\ &= \frac{151739.29}{177188.40 \times 186572.06} \\ &= 0.8345 \end{aligned}$$

$$r_{xy} = 0.8345$$

$$\begin{aligned} \text{Probable Error of (PEr)} &= 0.6745 \times \frac{1 - r^2}{\sqrt{n}} \\ &= 0.6745 \times \frac{1 - 0.8345^2}{\sqrt{5}} \\ &= 0.0915 \end{aligned}$$

## Appendix 4

### Calculation of Mean, Standard Deviation, Co-efficient of Variation and Correlation Co-efficient of Actual Sales and Actual Profit in Units

Fiscal Year	Actual sales (X)	Actual profit (Y)	U=X-X'	V=Y-Y'	U <sup>2</sup>	V <sup>2</sup>	UV
2060/061	1800.814	-1760.30	-253.83	-456.37	64430.28	208275.40	115841.45
2061/062	1918.35	-1312.80	-136.30	-8.87	18576.38	78.71	1209.21
2062/063	2028.51	-1267.80	-26.14	36.13	683.05	1305.23	-944.21
2063/064	2204.202	-329.26	149.56	974.67	22367.24	949977.71	145768.23
2064/065	2321.35	-1849.48	266.70	-545.55	71131.45	297626.98	-145501.34
total	X= 10273.226	Y= -6519.64	U= 0.00	V= 0.00	U <sup>2</sup> = 177188.40	V <sup>2</sup> = 1457264.04	UV= 116373.34

Suppose, X is the actual sales and Y is the actual profit

We have,

$$\text{Mean } \bar{X} = \frac{\sum X}{n}$$

$$\text{Standard deviation ( )} = \sqrt{\frac{1}{n} \sum (X - \bar{X})^2}$$

$$\text{Co-efficient of Variation (C.V)} = \frac{\dagger}{\bar{X}} \times 100\%$$

Let, 'X' be the actual sales and 'Y' be the actual profit

For actual sales (X)

$$\begin{aligned}\text{Mean } \bar{X} &= \frac{\sum X}{n} \\ &= \frac{10273.23}{5} \\ &= 2054.645 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{S.D ( )} &= \sqrt{\frac{1}{n} \sum (X - \bar{X})^2} \\ &= \sqrt{\frac{1}{5} \times 177188.40} \\ &= 188.248 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{X}} \times 100\% \\ &= \frac{188.248}{2054.645} \times 100\% \\ &= 9.16\%\end{aligned}$$

For actual profit (Y)

$$\begin{aligned}\text{Mean } \bar{Y} &= \frac{\sum Y}{n} = \frac{-6519.64}{5} \\ &= -1303.9284 \text{ units in million}\end{aligned}$$

$$\begin{aligned} \text{Standard deviation ( )} &= \sqrt{\frac{1}{n} \sum (Y - \bar{Y})^2} \\ &= \sqrt{\frac{1}{5} \times 1457264.04} \\ &= 539.863 \text{ units in million} \end{aligned}$$

$$\begin{aligned} \text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{Y}} \times 100\% \\ &= \frac{539.863}{-1303.928} \\ &= -41.40\% \end{aligned}$$

Calculation of correlation co-efficient (r) between 'X' and 'Y' variable is given by:

$$\begin{aligned} r_{xy} &= \frac{\sum uv}{\sum u.^2 \sum v^2} \\ &= \frac{116373.34}{177188.40 \times 1457264.04} \\ &= 0.229 \end{aligned}$$

$$r_{xy} = 0.229$$

$$\begin{aligned} \text{Probable Error of (PEr)} &= 0.6745 \times \frac{1 - r^2}{\sqrt{n}} \\ &= 0.6745 \times \frac{1 - 0.229^2}{\sqrt{5}} \\ &= 0.2858 \end{aligned}$$

## Appendix 5

### Calculation of Mean, Standard Deviation, Co-efficient of Variation and Correlation Co-efficient of Actual Production and Actual Profit in Units

Fiscal Year	Actual production (X)	Actual profit (Y)	U=X-X'	V=Y-Y'	U <sup>2</sup>	V <sup>2</sup>	UV
2060/061	2837.98	-1760.30	-61.05	-456.37	3726.71	208275.40	27860.05
2061/062	2642.75	-1312.80	-256.27	-8.87	65675.24	78.71	2273.64
2062/063	2780.92	-1267.80	-118.10	36.13	13948.04	1305.23	-4266.78
2063/064	3051.83	-329.26	152.80	974.67	23347.90	949977.71	148929.47
2064/065	3181.65	-1849.48	282.62	-545.55	79874.18	297626.98	-154184.02
total	X= 14495.12	Y= -6519.64	U= 0.00	V= 0.00	U <sup>2</sup> = 186572.06	V <sup>2</sup> = 1457264.04	UV= 20612.36

Suppose, X is the actual production and Y is the actual profit

We have,

$$\text{Mean } \bar{X} = \frac{\sum X}{n}$$

$$\text{Standard deviation ( )} = \sqrt{\frac{1}{n} \sum (X - \bar{X})^2}$$

$$\text{Co-efficient of Variation (C.V)} = \frac{\dagger}{\bar{X}} \times 100\%$$

Let, 'X' be the actual production and 'Y' be the actual profit

For actual production (X)

$$\begin{aligned}\text{Mean } \bar{X} &= \frac{\sum X}{n} \\ &= \frac{14495.12}{5} \\ &= 2899.024 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{S.D ( )} &= \sqrt{\frac{1}{n} \sum (X - \bar{X})^2} \\ &= \sqrt{\frac{1}{5} \times 186572.06} \\ &= 193.169 \text{ units in million}\end{aligned}$$

$$\begin{aligned}\text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{X}} \times 100\% \\ &= \frac{193.169}{2899.024} \times 100\% \\ &= 6.66\%\end{aligned}$$

For actual profit (Y)

$$\begin{aligned}\text{Mean } \bar{Y} &= \frac{\sum Y}{n} = \frac{-6519.64}{5} \\ &= -1303.928 \text{ units in million}\end{aligned}$$

$$\begin{aligned} \text{Standard deviation ( )} &= \sqrt{\frac{1}{n} \sum (Y - \bar{Y})^2} \\ &= \sqrt{\frac{1}{5} \times 1457264.04} \\ &= 539.863 \text{ units in million} \end{aligned}$$

$$\begin{aligned} \text{Co-efficient of variation (C.V)} &= \frac{\dagger}{\bar{Y}} \times 100\% \\ &= \frac{539.863}{-1303.928} \\ &= -41.40\% \end{aligned}$$

Calculation of correlation co-efficient (r) between 'X' and 'Y' variable is given by:

$$\begin{aligned} r_{xy} &= \frac{\sum uv}{\sum u.^2 \sum v^2} \\ &= \frac{20612.36}{186572.06 \times 1457264.04} \\ &= 0.0395 \end{aligned}$$

$$r_{xy} = 0.0395$$

$$\begin{aligned} \text{Probable Error of (PEr)} &= 0.6745 \times \frac{1 - r^2}{\sqrt{n}} \\ &= 0.6745 \times \frac{1 - 0.0395^2}{\sqrt{5}} \\ &= 0.30117 \end{aligned}$$

## Appendix 6

### Multiple Correlations between Actual Sales, Production and Profit

Fiscal Year	Actual sales unit in million (X1)	Actual production unit in million(X2)	Actual Profit Rs. in million (X3)	X1= X1-X1'	x2= X2-X2'	x3= X3-X3'	x1 <sup>2</sup>	x2 <sup>2</sup>	x3 <sup>2</sup>	x1x	x2x3	x3x1
2060/061	1800.814	2837.978	-1760.30	-253.8	-61.0	-456.4	64430.3	3726.7	208275.4	15495.6	27860.1	115841.5
2061/062	1918.35	2642.753	-1312.80	-136.3	-256.3	-8.9	18576.4	65675.2	78.7	34928.6	2273.6	1209.2
2062/063	2028.51	2780.923	-1267.80	-26.1	-118.1	36.1	683.0	13948.0	1305.2	3086.6	-4266.8	-944.2
2063/064	2204.202	3051.825	-329.26	149.6	152.8	974.7	22367.2	23347.9	949977.7	22852.3	148929.5	145768.2
2064/065	2321.35	3181.645	-1849.48	266.7	282.6	-545.6	71131.5	79874.2	297627.0	75376.2	-154184.0	-145501.3
Total	X1= 10273.226	X2= 14495.124	X3= -6519.64	x1= 0.0	x2= 0.0	x3= 0.0	x1 <sup>2</sup> = 177188.4	x2 <sup>2</sup> = 186572.1	x3 <sup>2</sup> = 1457264.0	x1x2= 151739.3	x2x3= 20612.4	x3x1= 116373.3

Suppose X1,X2 and X3 be the three variable which resemble actual sales, production and profit respectively.

r12=Correlation coefficient between actual sales (X1) and actual production (X2)

$$r_{12} = \frac{\sum x_1 x_2}{\sqrt{\sum x_1^2} \sqrt{\sum x_2^2}}$$

$$= \frac{151739.3}{177188.4 \times 186572.1}$$

=0.834559094r13=Correlation coefficient between actual sales (X1) and actual

profit (X3)

$$r_{13} = \frac{\sum x_1 x_3}{\sqrt{\sum x_1^2} \sqrt{\sum x_3^2}}$$

$$= \frac{116373.3}{177188.4 \times 1457264.0}$$

=0.229016483

r23=Correlation coefficient between) actual production (X2) and actual profit (X3)

$$r_{23} = \frac{\sum x_2 x_3}{\sqrt{\sum x_2^2} \sqrt{\sum x_3^2}}$$

$$= \frac{20612.4}{186572.1 \times 1457264.0}$$

=0.039530775

The coefficient of multiple correlations between the three variables X1, X2, and X3 when X1 is dependent variable and X2 and X3 are independent variables is denoted by R1.23 which is calculated by following formula.

$$\begin{aligned}
R1.23 &= \sqrt{\frac{r12^2 + r13^2 - 2.r12.r13.r23}{1 - r23^2}} \\
&= \sqrt{\frac{0.696488881 + 0.052448552 - 2 \times 0.00755543}{1 - 0.00156268}} \\
&= 0.85730689
\end{aligned}$$

$$(R1.23)^2 = 0.734975104 = 73.49\%$$

The coefficient of multiple correlations between the three variables X1, X2, and X3 when X2 is dependent variable and X1 and X3 are independent variables is denoted by R1.23 which is calculated by following formula.

$$\begin{aligned}
R2.13 &= \sqrt{\frac{r12^2 + r23^2 - 2.r12.r13.r23}{1 - r13^2}} \\
&= \sqrt{\frac{0.696488881 + 0.00156268 - 2 \times 0.00755543}{1 - 0.05244855}} \\
&= 0.848965611
\end{aligned}$$

$$(R2.13)^2 = 0.720742608 = 72.07\%$$

The coefficient of multiple correlations between the three variables X1, X2, and X3 when X3 is dependent variable and X1 and X2 are independent variables is denoted by R1.23 which is calculated by following formula.

$$\begin{aligned}
R3.12 &= \sqrt{\frac{r23^2 + r13^2 - 2.r12.r13.r23}{1 - r12^2}} \\
&= \sqrt{\frac{0.00156268 + 0.05244855 - 2 \times 0.00755543}{1 - 0.696488881}} \\
&= 0.3580054
\end{aligned}$$

$$(R3.12)^2 = 0.128167866 = 12.81\%$$

## Appendix 7

### Multiple Regressions of Profit(X3) on Sales (X1) and Production (X2)

Fiscal Year	Actual Sales X1	Actual Production X2	Actual Profit X3	X1 <sup>2</sup>	X2 <sup>2</sup>	X3 <sup>2</sup>	X1X2	X1X3	X2X3
2060/061	1800.81	2837.98	-1760.30	3242931.06	8054119.13	3098656.09	5110670.51	-3169972.88	-4995692.67
2061/062	1918.35	2642.75	-1312.80	3680066.72	6984143.42	1723443.84	5069725.22	-2518409.88	-3469406.14
2062/063	2028.51	2780.92	-1267.80	4114852.82	7733532.73	1607316.84	5641130.11	-2571744.98	-3525654.18
2063/064	2204.20	3051.83	-329.26	4858506.46	9313635.83	108412.15	6726838.77	-725755.55	-1004843.90
2064/065	2321.35	3181.65	-1849.48	5388665.82	10122864.91	3420576.27	7385711.62	-4293290.40	-5884388.79
Total	X1= 10273.23	X2= 14495.12	X3= -6519.64	X1 <sup>2</sup> = 21285022.88	X2 <sup>2</sup> = 42208296.02	X3 <sup>2</sup> = 9958405.19	X1X2= 29934076.24	X2X3= -13279173.69	X3X1= -18879985.69

The multiple regression equation of the dependent variable X3 on independent variables X1 and X2 is given by

$$X3 = a1 + b1X1 + b2X2$$

Where,

a1 = X3-intercept = the value of X3 when two independent variables X1 and X2 are zero

b1 = the partial regression coefficient of X3 on X1 when X2 is held constant

b2 = the partial regression coefficient of X3 on X2 when X1 is held constant

Here, b1 and b2 are known as coefficient of net regression which implies that the regression of dependent variable on the particular independent variable is measured while holding the value (s) of the other variable (s) constant.

The values of the constants a1, b1, and b2 can be obtained by solving three normal equation simultaneously obtained by the method of least squares.

$$\sum X3 = na1 + b1 \sum X1 + b2 \sum X2$$

$$\sum X1X3 = a1 \sum X1 + b1 \sum X1^2 + b2 \sum X1X2$$

$$\sum X2X3 = a1 \sum X2 + b1 \sum X1X2 + b2 \sum X2^2$$

Then,

$$-6519.64 = 5 * a1 + 10273.226 * b1 + 14495.124 * b2$$

$$-13279173.69 = 10273.226 * a1 + 21285022.88 * b1 + 29934076.24 * b2$$

$$-18879985.69 = 14495.124 * a1 + 29934076.24 * b1 + 42208296.02 * b2$$

By solving these three equations, we get

$$a1 = -1062.7407$$

$$b1 = 1.852208739$$

$$b2 = -1.39592428$$

∴ The required estimated the best line of fit dependent variable X3 on X1 and X2 is

$$X3 = -1062.7407 + 1.852208739 * X1 + -1.39592428 * X2$$

The estimate of actual profit when the given value of actual sales X1 = 2485.40 and actual production X2 = 3422.66 in FY 2065 / 66 is

$$X3 = -1062.7407 + 1.852208739 * 2485.40 + -1.39592428 * 3422.66$$

## Appendix 8

### Test of Regression Coefficient of Multiple Regression Model

Fiscal Year	Actual Sales X1	Actual Production X2	Actual Profit X3	$X3-X3'$	$(X3-X3')^2$	$X3^{\wedge}$	$X3^{\wedge}-X3'$	$(X3^{\wedge}-X3')^2$	$(X3-X3^{\wedge})^2$
2060/061	1800.81	2837.98	-1760.30	-456.37	208275.40	-1688.86	-384.93	148172.38	5103.72
2061/062	1918.35	2642.75	-1312.80	-8.87	78.71	-1198.64	105.29	11085.75	13032.70
2062/063	2028.51	2780.92	-1267.80	36.13	1305.23	-1187.47	116.45	13561.38	6452.16
2063/064	2204.20	3051.83	-329.26	974.67	949977.71	-1240.22	63.71	4059.33	829839.19
2064/065	2321.35	3181.65	-1849.48	-545.55	297626.98	-1204.45	99.48	9895.59	416061.85
total	X1= 10273.23	X2= 14495.12	X3= -6519.64	$(X3-X3')^2$ = 0.00	$(X3-X3')^2$ = 1457264.04	X3^= -6519.64	$(X3^{\wedge}-X3')$ = 0.00	$(X3^{\wedge}-X3')^2$ = 186774.42	$(X3-X3^{\wedge})^2$ = 1270489.62

The F- statistic is equal to the regression mean square (MSR) divided by the error mean square (MSE). Thus,

$$F = \frac{MSR}{MSE} = \frac{\text{Explained variance}}{\text{Unexplained variance}}$$

$$\text{Where, Explained variance} = \frac{\text{Explained variation}}{\text{Its degree of freedom}}$$

$$\text{And unexplained variance} = \frac{\text{Unexplained variation}}{\text{Its degree of freedom}}$$

Explained variance is known as ‘variance due to regression’ and the unexplained variance is also known as the ‘residual variance’.

F = test statistics from a F- distribution with k and (n-k) degree of freedoms.

Where, k is the number of constant in the regression equation and n is the number of variables or sample size.

Here, n=5 and k=3

$$\text{Hence, } F = \frac{\text{Explained variance}}{\text{Unexplained variance}}$$

$$= \frac{\frac{\text{Explained variance}}{\text{Its degree of freedom}}}{\frac{\text{Unexplained variance}}{\text{ts degree of freedom}}} = \frac{\frac{\sum (X^3 - X^3')^2}{(k-1)}}{\frac{\sum (X^3 - X^3')^2}{(n-k)}} = \frac{\frac{186774.423}{(3-1)}}{\frac{1270489.619}{(5-3)}}$$

∴ Here, calculated F(2,2) = 0.147

The tabulated value of F at 5% level of significance for two tailed test with d.f. (2,2) is

F<sub>0.05(2,2)</sub> = 19 [∵ From Table (H2) , Critical value of the F- distribution at a 5 percent level of significance.

## **Appendix 9**

### **Some Relevant Data or Information**