CHAPTER - 2
REVIEW OF LITERATURE

This chapter reviews the literature in the area of physical distribution. This has been done to identify the research gap in this area, and to gain from the studies already done. This review is organized to include the decision made in all the activity centres vis-a-vis, conceptual framework, transportation, customer service, packaging and material handling, organizational setup, operation research techniques etc. Studies related with different decision areas are arranged under these separate headings.

A. Studies on Conceptual Framework

The present section relates to the conceptual framework for the physical distribution system.

i) Study on Physical Distribution in the U.K.: -

Dr. James Cooper¹ in this paper throws light on the period of considerable change for physical distribution system in UK, mainly because it has been gaining importance as a vital part of the marketing process.

The paper begins with the study of characteristics of the UK Distribution industry, which includes.

a) The regulations under which this industry is governed.
b) The employment scenario in the industry.

c) Transport output, modal split and expenditure-which states that two measures are used to record freight transport output in U.K. "Goods lifted" measured in tonnes shows the volume of goods by weight transported with the U.K "Goods moved" measured in tonne-kilometers, also incorporates the distance over which goods are transported.

d) Comparison between own-account and haulage operation.

e) Size of road freight operations and vehicle capacity - the whole data has been very efficiently shown in tables and graphs.

f) Trend in warehousing - which studies the six category of warehousing namely- contract storage warehouse, haulage depot, distribution contractors warehouses, manufacturers warehouse, wholesalers/dealers warehouse and Retailers central warehouse. The results of various surveys were compared and overall conclusions were drawn.

g) Inventory holding - which studies the over-stocking in the UK companies.

The next section portrays the organization and control of distribution, which includes the following aspects:

a) Supply chain in which functional links between producers, wholesalers, retailers and final customers have been shown.

b) Distribution markets have been studied with the help of three approaches - logistics management, supply and demand analysis and business organization.

c) Business organization which has been divided into sections to examine the control of distribution in different business sectors - Manufacturer controlled, wholesalers controlled and retail chain controlled distribution.

Section IV deals with cost structure in UK distribution which studies:
Finally, some light has been thrown on forecasting distribution costs

Section-V deals with innovation in UK distribution and gives example of some inventory practices showing the progress of UK distribution industry in search of productivity gain. These example in corporate - specialists services, distribution system without depot, vehicle pre-loading, hub operations by parcel carriers and some other developments.

Lastly, there is a comprehensive discussion on UK freight industry in Europe, which studies the UK transport to the rest of the European countries; performance of UK international Hauliers and course of future developments in the UK distribution industry.

The study is quite comprehensive and covers the total logistics system in UK but is not specific for a particular product.

ii) Study on Implementation of Distribution Plan:-

This case study has been presented by John. J. Burbridge, Jr.² The purpose of this study has been first to take an in-depth look at the analysis that led to the study recommendations and then focus on the implementation process associated with those recommendations. The approaches used by organizations to arrive at the implementation decisions are explored in detail. A conceptual model illustrating the interactions between planning, the internal marketing of change

and implementation is also presented. As a result of this experience, specific guidelines for distribution managers are provided.

The study begins with a discussion on the Business Unit, which in this case has been the welding products division. The product line, manufacturing sites and locations have been studied. The recommendation areas have been discussed in detail. Next the implementation process associated with the recommendation has been discussed. Attention has been focussed at the causes of success or failure references to decision making and implementation concepts has been used to support the conclusions which are -

i) Implement a logistics information system
ii) Revise warehouse network
iii) Change divisional policies
iv) Reorganize distribution function

Finally, the impact of changes has been discussed and several guidelines, which have been derived from experience, are given for logistics and distribution managers.

One can gain useful insight from this article regarding the application of logistics for a particular product.

iii) Study on Organization for Physical Distribution: A Contingency Approach:

Hans Christian Pfohl and Werner Zollner\(^3\) has studied a project on organization of logistics: the contingency approach. This project aims to

investigate the relevance of contingency factors for logistics and how they influence the aggregation of logistical tasks within the organization has been explained.

The study begins by illustrating the basic concepts and meaning of logistics; which is followed by the concept and meaning of the contingency approach.

Next, the influence of the contingency factors on the organization for logistics has been discussed, which includes:

i) Environment relations of the organization - including the criteria of complexity and dynamics of environmental relations.

ii) Line of product of the organization

iii) Production technology of the organization

iv) Size of the organization

v) Demands made on the organization for logistics

vi) Logistics in supply and distribution.

vii) Logistics in production.

This section is followed by an illustration of organization for logistics which begins with the structural dimensions and objectives of the organization followed by - how logistics tasks are integrated in the functional structure of the organization; limited adaptation to the environment, the line-staff structure, operational adaptation to the environment. Strategies have been suggested for integrating logical tasks within divisional structure of the organization, which includes - operational adaptation and strategic adaptation to the environment.

Finally, the conclusion from the study and future prospect has been highlighted.
The organizational aspects of the physical distribution system have been discussed in detail.

iv) Study on Physical Distribution Concept:

Gavin.E. Staude has put forth the theoretical concept of the physical distribution as a philosophy of business. The author emphasizes that it is the job of physical distribution to create the time and place utilities; to ensure that the right product is on the right place at the right time. Physical distribution, he says, is the link between production and marketing and, as such, it is in a position to make a vital contribution to the effective performance of both the activities and to the profitability of the enterprise as a whole.

Further, the contribution of physical distribution within the marketing concept has been analyzed from the point of view of three fundamental tenets:

i) Consumer orientation

ii) Profit Direction

iii) Integration

The next part, deals with the formulation of physical distribution concept separate from the marketing concept; which states the reasons for differentiation and the basic features of physical distribution concept.

The paper ends with a discussion on the physical distribution concept as a philosophy of management. In fact, this paper is a pioneering work in the area of physical distribution.

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v) Study on Environment for Physical Distribution:

Karl B. Manrodt and Frank W. Davis Jr.\(^5\) discusses the impact of political legal environment, globalization, structural upheaval in organizations and technology on logistic management. Its traces development in distinct phases.

The first phase was of total cost concept when emphasis was placed on keeping the total cost of distribution minimum even if the individual cost was not optimum.

The system concept co-ordinates all the departments of an organization and worked towards a common goal of creating, integrated logistic support.

The third phase of customer service concept shifted effort towards the customer by giving the customer what he needed. This started a trend of lower inventory levels in logistics. However even this concept was limited by the fact that the service provided was measured in terms of what a company could do and not what the customer wanted.

The trend today however is on building a relationship with the customer, a logistic system that established a direct contact of the consumer with the employee and responded to their needs. Hence the service response logistic. Such a logistic demands that the organization first develop some level of capacity to meet the customer's request. As far as quality goes, delivering a good that meets customers' expectation is a measure of quality as each delivery is a unique event and cannot be compared with already set standards. Thus service response logistics is the most upcoming and a nascent concept in logistics.

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vi) Study on Public Distribution System:-

Sreemannarayana K.\(^6\) highlighted the deficiencies of Indian distribution system. The writer says that attempts like fair price shops and public distribution system (PDS) have also not borne any fruits. To overcome this problem a production-cum-distribution system has been adopted by the government, which caters especially to the weaker section of the society, rural areas and tribal areas.

Under this system the fair price shops will provide essential goods. For this purpose the total number of fair prices shops has also been increased. A co-ordinate effort of centre, state, the planning commission and the people, this scheme entrusts organizations like NAFED, NCDC, NCCF with different tasks. Sourcing of goods would preferably be done from the small sector through these organization and then sold to the fair price shops.

The success of this scheme is subject to fulfillment of condition like availability of finance, smooth co-ordination between producer and distributors, availability of buffer stock to stabilize prices, hiring experienced, and skilled co-operatives against fair price shops as distribution outlets.

vii) Study on Infrastructure for Physical Distribution:-

Acharya S.K.\(^7\) highlights the Herculean task faced by logistics professionally in India to substantiate the inadequate infrastructure with least investment and in minimum timeframe to achieve logistical excellence. According to him since 1970s, supply chain management is steadily stepping into the centre stage of management practices. Tracking flow of material and deriving all the


different benefits by coin-sizing the "time" function and improving productivity of transportation and distribution assets is the order of the day in the developed economies. All these philosophies and practices are already at the centre stage in developed countries. In India, logistics has been gaining its momentum in recent years. The country is, however, faced with a big challenge to improve an inadequate infrastructure with very little resources at its disposal. The hardware required to shrink the time and to multiply productive usage of assets is inadequate. He states that logistics professionals in India are facing a unique challenge to find a solution, which will demand least investment and substantial increase in efficiency. According to him, India may be an ideal candidate where all the different modes of transportation, independently and with connectivity, can be purchased to bring logistical excellence into the whole system.

viii) Conceptual Model for Supply Management:-

Panneerselvam R. discusses the concept and the use of integrated business logistics as a tool for effective supply management. In view of the globalized business environment, logistics play a major role in identifying vendors, routing raw material through warehouses in an optimal manner to different plants, deciding in-plant movement of materials, and even stocking finished goods and then delivering them to customers. In the first phase of this paper, the concept of Integrated Business Logistics is introduced. Then, the criticalities of the links between different components of Integrated Business Logistics are addressed. Lastly, a detail account of different techniques for managing the criticalities of the Integrated Business Logistics applied to the Supply Chain Management is presented. The paper provides base for identifying different research problems in

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the area of Integrated Business Logistics applied to the Supply Chain Management.

ix) Study on Logistics Concept:-

According to H.C. Chowdhary, business logistics is vital to the economy and to the individual firm. It is a key factor in encouraging domestic and international trade. He is of the view that efficiency and effective logistic system mean higher standard of living for all people. In the wake of changing business environment, managers have begun to see that new approaches to designing and managing the logistics chain are required. The focus of the present paper is to understand the importance of the logistics in organization and to provide some insight as to how logistics system can best be managed. Further the paper emphasizes the need for adopting the concept of integrated logistics management by the organization. He states that this concept recognizes that providing better customer services and trimming distribution cost requires team work both inside the company and among all the marketing channel organizations. The concept can be useful to maximize the performance of the entire distribution system. Lastly, the writer concludes that by adopting the approach of integrated management, the management can co-ordinate the activities of the entire supply chain to deliver maximum value to the customers.

x) Study on Conceptual Framework for Logistics:-

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To Mital K.M.\textsuperscript{10} logistics is concerned with flow of goods and services and their co-ordination in the chain. Logistics management involves integrated management of the flow of goods and services from raw materials purchase until the product delivery to the final customers. It consists of three broad groups of activities - purchasing, operating planning and distribution management. Logistics management covers a whole range of physical, managerial and information services pertaining to facility location, inventory control, storage, packaging, material handling and transportation. Flexibility is highly relevant in logistics management as it is important for surviving in present day turbulent economic environment following globalization and liberalization. Flexibility allows greater responsiveness to future events by taking advantage of additional information as it becomes available in future. Flexibility in logistics management offers ability to add capacity and capability in the original system in a modular fashion. The writer states that a flexible approach is necessary to face threats, avail opportunities and manage diverse operations more effectively. This paper attempts to highlight relevance of flexibility in logistics management.

xi) Study on Physical Distribution Concept as a Philosophy of Business:-

The article by William. C. Copacino and Donald. B. Rosenfield\textsuperscript{11} presents a framework for analysing and understanding logistics system and reviews the major methods of logistics system analysis.


The article begins with a process for developing a logistics strategy based on overall business goals and strategies. This process is conceptual in nature.

The actual approaches for conducting logistics analysis and answering the strategy and integrated planning questions are the subject of the remainder of this article. The author opines that a framework for analysis, can be developed from the following four sets of questions:

i) What are the trade-off in logistics system analysis?

ii) What characteristics about the process and product should be used in logistics system design and analysis?

iii) How can logistics system analysis be divided into component states or hierarchies to reduce the decision problems to manageable proportions, so that an appropriate analysis method can be applied?

iv) What are the different types of analysis available and how does one determine the appropriate analytical techniques to use?

In the end conclusions have been drawn. Thus, this considers the trade-off in the logistics system and how a system analysis can be done

xii) Study on Strategic Logistics:

D.J. Bowersox in focus on physical distribution and logistics management reports a study of US manufacturers to identify the logistics orientation of leading logistical organizations and criteria to guide the development of best logistics practices; finds that leading-edge companies have, inter alia, formal logistics mission statement, greater integration of production planning and customer services, better performance measurement, and wider computerization. The study

looks at bench marketing, nothing that a thorough understanding of competitors' strength/weaknesses is essential to success.

xiii) **Study on Problems of Distribution in Developing Countries:**

M. Clark\(^\text{13}\) briefly outlines distribution difficulties encountered in the pacific basin, ranging from primitive warehousing and poor communication, to inadequate transport and an overwhelmingly casual work force. The author suggests that these basic problems require basic solutions and warns not to underestimate the influence of culture on plan for change. A simple but timely reminder that "high-tech" solution may not always prove relevant.

B. **Studies on Transportation and Customer Service**

Transportation is an important part of physical distribution system.

i) **Study on Transportation and Customer Service:**

David J. Closs and Robert L. Cook\(^\text{14}\) attempts to develop a model that would help in improving customer service as well as reducing transportation costs. This paper studies the performance of freight consolidation strategies in multiple staged distribution system when small shipments are involved. Unlike the previous consolidation models, this one presented a dynamic simulation model capable of replacing complex distribution system operations. Taking the example of a firm, the effect of alternative consolidation strategies on a firm's distribution system performance was studied. Through this model the trade off between potential cost saving (low distribution and transportation cost) and system complexity (low cost results in lower delivery reliability and increased damaged potential) has been


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studied. This model finds its utility with distribution managers as also in carrier management in determining transport services prices. The advantage of this model lies in the fact that being a dynamic model it considers time flow and demand pattern factors which are crucial consideration in designing a consolidation strategy whereas static or deterministic models lack this quality.

ii) **Study on Transportation in North East Region:-**

Sharma N.N. 15 defines logistics as a problem not only of out bound distribution (factory to customer) but also of inbound distribution (Supplier to the factory). The activity concern with logistics constitutes 20 percent of the value of tangible goods produces. Transportation is one of the most important of such activities.

The North-Eastern India comprising of seven states is however very inadequate in transportation facilities. There are only three ways by which North-East is mainly connected with the rest of the India. They are; broad gauge, meter gauge; and road. Water as a means of transportation has been totally ignored. Further no other state except Assam has its independent railway system.

All this leaves a lot to be desired and acts as a bottleneck to successful logistic management in this area.

iii) **Study on Problem in Transportation in India:-**

Vijayaraghavan T.A.S16 highlights the role and importance of transportation as a key process in the integrated logistics management. The

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problems and issues faced by the policy makers, industries, shippers, suppliers, regulatory agencies and the end users are highlighted in detail. The present effort by our government and the possible fall out are discussed and at the end, the strategies for the industries to take advantage of the transportation as a powerful tool aligning with the information technology advantage are discussed.

iv) Study on Freight Distribution and Transportation System Planning:

Teodor Gavriel Crainic and Pierre J. Dejax\(^\text{17}\) explains that by freight transportation, we mean the operations performed by one or several carriers, using one or several transportation modes, to move freight of various commodities, from multiple clients (cities), between several locations.

In the first section the authors reviews the three stages of the planning process for the distribution activities of the industrial production firms. They then derive the main features of an interactive-graphic modelling system aimed particularly towards strategic and tactical planning. In the following section they carry the same analysis for inter-city freight transportation firms.

The third section is dedicated to the comparison of the two planning processes, of their objectives and specific context. They then derive the common features and specific differences that would characterize corresponding interactive - graphic modelling and planning tools. In the conclusion they summarize these analyses and discuss the pros and cons of the alternative of either developing common or specific tools for the planning of distribution and transportation systems.

Due to their own interests and experience their analysis is more focused towards the modelling of strategic and tactical planning systems rather than that of short term operational planning or real-time management systems. The authors believe, however that their conclusions are general and will contribute to the reflection in this fast developing area.

v) **The Study on the Impact of Logistics on Customer Service:-**

J. Robert\(^\text{18}\), describes logistics strategy at ICL, beginning with a look at forecasting; claims that inventory performance is the best in the industry, an indicator of good forecasting; discusses purchasing policy, with a look at European sourcing. Thus study emphasizes key requirements of ICL's manufacturing operation- customer service, quality, product cost, market responsiveness; stresses the need to reduce cycle time. The author examines the areas creating the biggest logistics challenge- configuration, customization, and hangaring; considers order fulfillment, warehousing, repair, information systems, and lastly and only briefly people.

vi) **The Study on the Quality Service Mission Statement:-**

Richard Lancioni,\(^\text{19}\) highlights that the problem many international companies encounter in developing quality service programmes in international markets is that they have difficulty getting their employees on all levels to understand what quality service is and how they themselves can be service oriented towards international customers. What is needed is a verbalizing of the service goals of the company and their communication to its employees and customers. This can be done most effectively through an international quality

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service mission statement. The statement is a definition of the firm's global service philosophy, pointed out:

- the service goals of the company;
- the quality service the company was to emphasize to its customers; and
- the direction a company wants to move with quality service.

vii) Study on Transportation in India: The Untapped Source of Profit for Business Enterprises:

According to N. Kathuria\textsuperscript{20} transportation of inputs from the suppliers to the company and from the company to the customers form a significant part of profit improvement potential. In the Indian Business context, road transportation is the most versatile and commonly used mode, given its wide reach to link every corner of the nation. However, this flexibility of the road transport system is grossly misused and it tends to make material transportation a highly inefficient and variable process. This paper examines the regions for this and its consequences, and looks at but companies can do to implement an effective transportation system that would add to their profit potential.

C. Studies on Physical Distribution Information System

i) Study on Information System for Physical Distribution:

Prabir K. Bagchi\textsuperscript{21} has highlighted the importance of a good International Logistics Information System (ILIS) in the current international business scenario.

\begin{footnotesize}
\begin{enumerate}
\item N. Kathuria, "Road Transportation in India: The Untapped Source of Profit for Business Enterprises". The Research Paper Presented in the International Conference on Supply Chain Management for Global Competitiveness in India during Nov. 20-21, 1998 at MDI, Gurgaon.
\end{enumerate}
\end{footnotesize}
Emphasizing the fact, that in international business we are dealing with markets characterized by different policies, rules, business practices and varied logistic and distribution system, we need to design an ILIS that would co-ordinate firm's activities right from R & D to sourcing of raw material and distributing finished products. Thus there is a need for international logistic system that will connect organizations in diverse location with multiple channel members.

The successful designing of an ILIS depends on creating a data base that keeps in mind the following things:

- a system/database that links all the countries i.e. a common data base and at the same time maintains national character.
- understands the differences in business norms and still finds a common base.
- It should be in agreement with business objectives & top management and be based on global logistics strategy.

The writer has given a brief idea about an ILIS model and the basic information that it should provide.

ii) Study on Information Technology as a Competitive Edge in Distribution:-

A. Dowlman\(^{22}\) presents a case study which shows how Wavin Building Products implemented computer systems throughout its business; examines the design of a new sales-order entry system to overcome accuracy and volume defects and increase capacity levels; explain how new sales forecasting, stock and production planning systems were introduced using

uniform data supported by regular monitoring techniques and multi-level tracking. He discusses the company's review and reorganization of the distribution functions; shows how the solution overcame the difficulties of stock balancing at multiple sites and involved the use of a trans-shipment point holding zero stocks; accesses the advantage of introducing a route and load planning system to give optimal costs and delivery.

**D. Studies on Warehousing Location**

i) **The Study on Multi-Criteria Warehouse Location** :-

Sang M. Lee and Richard L. Lucbbe emphasizes studying the best possible locations for warehouses that satisfy maximum goals.

The objective of this paper is to highlight through sensitivity analysis the superiorities of zeros-one goal programming approach to Eilou, approach based upon a loading heuristic.

The goals to be achieved as organized in a prioritized sequence and act as constraints, whereas the goal to be minimized as the objective function. Under sensibility analysis the R.H.S. value is also taken into consideration and represents the goal or target value that the management is trying to achieve.

The sensibility analysis is superior in terms that it provides a variety of solutions to management to choose from unlike the Eilou approach.

Further the sensitivity analysis is flexible enough to discuss further alternative solution, if any, if the goal's priority position is changed.

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ii) Study on Realignment of Fertilizer Distribution and Warehousing Under Total Decontrol Scenario:-

N. K.S. Mahapatra\textsuperscript{24} throw lights on distribution and warehousing aspect of fertilizer in India. The writer states that the cost of raw material for phosphatic fertilizer will be depended on international prices and that of nitrogenous fertilizer on Government policies. Therefore, the scope of reduction in production cost appears to be limited. The writer suggested that the more attention is required for producing the post-manufacturing cost, i.e. marketing related expenses. The writer said that distribution cost constitute 70-80 per cent of the total marketing cost, of which movement cost (primary + secondary) is the major item of expenditure. These expenses can be substantially reduced by re-defining the marketing area through segmentation. According to him to make the distribution system more effective and service oriented, stock should be placed nearest to the consuming centre. Realignment of the godowning system with more stock points for disbursal will help in making stocks readily available to customers, in addition to substantial saving in godowning cost as well as giving lead time for secondary movement.

E. Study on Packaging

Mishra T.K.\textsuperscript{25} has highlighted the importance of packaging as a marketing tool. A package that assures that the product reaches the consumer in a saleable condition is the minimum package and any cost above this can be said to be doing


the job of marketing. These costs have been justified on the grounds that they improve a company's image and enhance sales and profits.

In this competitive market a package should attract the consumer with its uniqueness and creative style. Innovation is the go word in packaging. Further the job of a package does not end here, it continues even after purchase. They should open easily, be easy to handle and satisfy the customers. These are perhaps some of the reasons why packaging has shifted from purchasing department to the marketing department.

F. Studies on Operation Research Techniques for Physical Distribution

Operation research techniques are useful for solving physical distribution problems.

i) Study on Linear Programming for Physical Distribution:

Kapoor Satish and Garg Indu\textsuperscript{26} throws light on the use of linear programming techniques used in physical distribution management while designing layout of plant and transportation schedule, techniques of linear programming are employed. Through transportation method (a form of linear programming) transportation costs can be minimized and at the same time the carrier requirement and travelling time can also be minimized. Further, through assignment method the optimum route of traveling salesman can also be determined. Also, as is generally the situation, when there are more than one centres where stop has to be made, the transportation cost can be minimised by determining the most economical transshipment method.

Another linear programming technique is the simplex method, which although different to use than transportation method, is definitely more adaptable. Its additional application lies in solving layout problems.

The mixed integer linear programming method finds realistic application in solving transshipment problem, choosing amongst alternative processes of production and also incorporates multiple communities into system design.

ii) Study on Composite Inventory Index:-

Dutta Abhijit 27 provides an experimental guideline to use a tool named, Composite Inventory Index (CII) to cope up with the three dimensional problem of inventory management, namely, Usage, Value and Movement. The areas covered by the paper are: Conceptualizing the CII as a tool for inventory management, working out a plan to use CII, using CII for a computerized inventory handling. The paper is divided into three sections. The first section deals with introducing the concepts, the second section deals with the working plan with the CII and the third and the last section deals with using the CII for a comprehensive inventory handling mechanism.

iii) Study on the use on Simulation Modelling in Supply Chain Management:-

F. Collinge28 uses a case study of a one man business which-since 1926- has grown to be a pan-European concern of today; this demonstrates the changes in complexity of the supply chain. The author discusses the role of


stock in the supply chain, and the importance of achieving the right balance at the various stages. Further, he explains, how simulation modelling can contribute to this problem, and concludes that as chains become more complex, the greater this contribution will be. The writer brings nothing remarkably new, but a simple introduction to the subject.

iv) **A Simulation Study of the Impact of Policy Alternative on Distribution Logistics in a Multi-echelon Distribution System :-**

Sai Giridhar and U.S. Rao in this paper has developed a simulation model based on the distribution pattern of Brook Bond using GPSS, to study the effective of reduction information lead-time, increase in the frequency of review of C.F.A agents stock and alternative retention and allocation policies on cost and service level of the company. The finding of the study suggest that by appropriate choice of tested policy alternative distribution system stocks could be reduced by approximately Rs. 15 crore, while maintaining the desired service level.

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