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**Business Continuity Plan -
Final report on Stage One**

**Financial Institutions Reforms and
Expansion (FIRE) Project**

October 9, 1996

**Financial Institutions Reform and Expansion (FIRE) Project
US Agency for International Development (USAID/India)
Contract #386-0531-C-00-5010-00
Project #386-0531-3-30069**

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Price Waterhouse LLP



October 14, 1996

Mr. Satish Naralkar
Vice President
National Stock Exchange of India Limited
Mahindra Towers, "A" Wing, 1st Floor,
RBC, Worli,
Mumbai - 400 018.

Dear Mr. Naralkar,

Sub : Final Report for Stage One of the Business Continuity Plan

Further to our presentation of the status of the assignment on September 2, 1996, to the members of the Steering Committee, we submitted a draft report for the stage 1 of the Business Continuity Plan (BCP), with the exception of the operational risk assessment of the Telecom resources, on September 11.

We have not received any feedback from the NSE on the draft report, the only exception being the systems department. As the contents of the report were validated with the department heads earlier, we presume there are no changes.

As agreed at the Steering Committee meeting, operations relating to long term development in the Systems department and trading in Futures and Options were evaluated for criticality. These additional sections were validated with the respective department heads and have been incorporated in the final report.

We are currently working on the functions of the Telecom department and also evaluating the threats to the resources of the department. The analysis will be submitted separately by October 19, 1996.

To enable us to adhere to the scheduled dates and to ensure a smooth transition of the BCP to the NSE, we had requested the following from you in our letter dated September 10, 1996:

1. A full time resource for the project
2. Software tool to be used for the Plan
3. Location details of the backup site for the clearing house
4. Options for the Telecom connectivity - leased line/ VSAT/ ISDN

The status of the above requests is as follows:

1. A full time resource has been nominated.
2. We are given to understand the Software tool to be used for the plan is being developed at NSE using MS WORD and Lotus Notes.



3. We are yet to receive communication on the backup site for the clearing house.
4. We understand that the options for the Telecom connectivity are being discussed internally and that we would be intimated of the outcome at a later date.

We request you to kindly expedite the decisions on the 3 and 4 as the completion of Stage 2 is contingent on these factors. On the basis of the analysis of Stage 1, the team will present for Stage 2 strategic options for recovery with costs, for the consideration of the management. We will also include the costs for backing up vital records in this stage, the information about the accumulated volumes and likely additions to vital documents and records except for the accumulated volume of documents at the Clearing house.

For any further clarifications, please contact Mr. Bimal Bhavanani or me at telephone no 496 3599, fax no 496 3555.

Thank you.

Sincerely yours,

W. DENNIS GRUBB
Principal Consultant Capital Markets

cc. Mr. Ravi Narain
Deputy Managing Director
National Stock Exchange of India Limited
Mumbai

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I. INTRODUCTION

A. Background

The study on Business Continuity Planning (BCP) is being carried out, to minimise the impact of a disaster on NSE's normal business functions.

Business Continuity Planning is defined as the identification of critical business processes and resources required to maintain an acceptable level of business, protecting those resources and preparing procedures to ensure the survival of the organisation in times of business disruption.

The objectives of a disaster recovery and business continuity project are to :

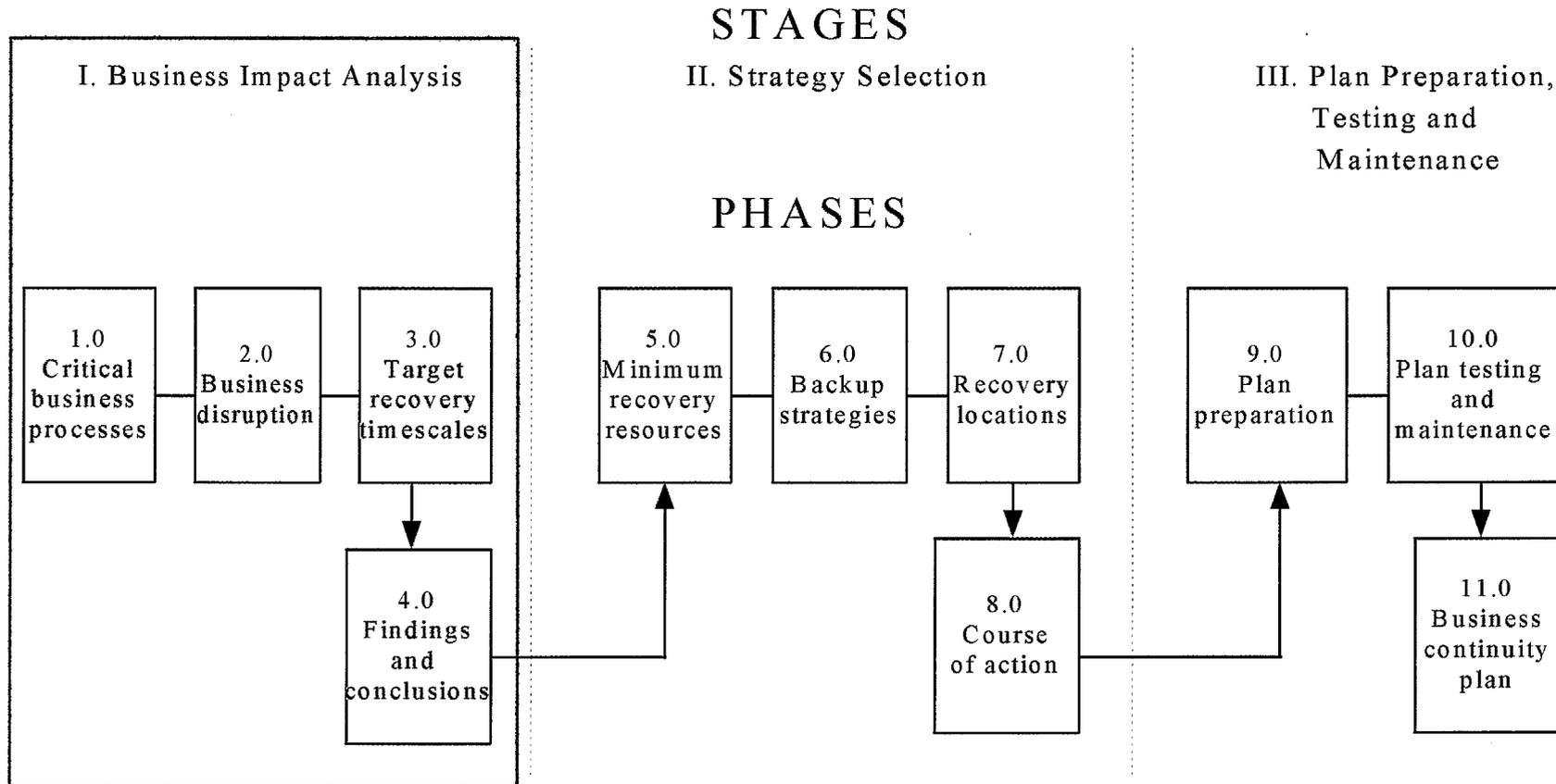
- Establish a framework for evaluating business processes which allow a focused approach to develop a Business Continuity Plan.
- Develop a pragmatic, cost effective and operable recovery plan which enables an organisation to complete the critical business processes in the event of a major disruption to its business operations.
- Minimise the impact of a disaster on an organisation.

In the absence of a BCP, the following risks could arise :

- Business interruption
- Financial loss
- Legal liability
- Going out of business

The stages in the lifecycle of a Business Continuity Plan are given in the accompanying chart.

National Stock Exchange Business Continuity Plan



B. Objectives of Stage One

The objectives of Stage One are to:

- Review the operations of NSE and identify the functions and activities within the functions
- Identify the resources (computer and non-computer) for each of the functions and assess the threats to them and the current risk mitigation measures
- Recommend further measures to reduce impact of the threats
- Establish the maximum recovery time-scales for all functions based on the impact on business
- Identify the likely disaster scenarios

C. Scope

The BCP study conducted for National Stock Exchange covers all the locations in Bombay and all the functional areas within the exchange. The top management of the exchange has been involved in the exercise from the beginning. A Steering Committee has been established to monitor the progress of the project and resolve issues.

D. Methodology

The BCP exercise has been split into three stages. Each stage has been further divided into phases defined in terms of tasks within the phase.

1 Business Impact Analysis

Business Impact Analysis is concerned with identifying those business processes which are critical to the business continuity of the organisation.

The steps comprising this stage are :

- Identification of business processes which are critical to organisation
- Identification of the key resources to each of the processes
- Identification of threats to the key business processes
- Identification of risk reduction measures
- Determination of recovery time scales for the business processes

2 *Strategy Selection*

Strategy selection is concerned with choosing the most appropriate backup and disaster recovery options from those available.

The steps comprising this stage are :

- Identification of minimum recovery resources for
 - * Computer based business processes
 - * Non computer based business processes
- Identification of backup strategies
- Identification of recovery locations

3 *Plan Preparation*

This stage involves preparation of a draft Business Continuity Plan and preparing specific disaster recovery procedures based on the strategies selected in Stage Two.

The steps comprising this stage are :

- Laying down procedures
- Document disaster prevention measures
- Check content and consistency of the BCP
- Plan testing and Maintenance

II. RECOVERY TIME-SCALE ANALYSIS**A. Establishing Criticality of the functions**

Each department has been studied in detail to understand the operations and the interfaces with other internal and external entities. The operations have been further divided into functions and sub divided into activities.

The criticality of the functions is derived through a series of interactive questionnaires and discussions with the department heads and designated officers. A summary of functions and respective recovery times is listed in Table II-A-1. The information collected was analysed by applying the interpretation matrix in Table II-A-2 to the Critical Functions Matrices given in Table II-A-3. The assumptions underlying the identification of critical functions and the recovery times are as follows:

1. Four time frames are considered for simplicity, viz., for an hour, for a day, for a week and for a month in the critical function matrix.
2. The Interpretation matrix derived from the critical function matrix addresses the need to differentiate the time frames as recovery within an hour, in the same working day, by the next working day, upto seven days and upto thirty days.
3. For each function, the criticality is based on the worst case scenario i.e. the disaster is assumed to have taken place on the most critical day of the week/ month/ year.
4. The business continuity plan will target to recover the functions within the recovery time as obtained from the Interpretation matrix.

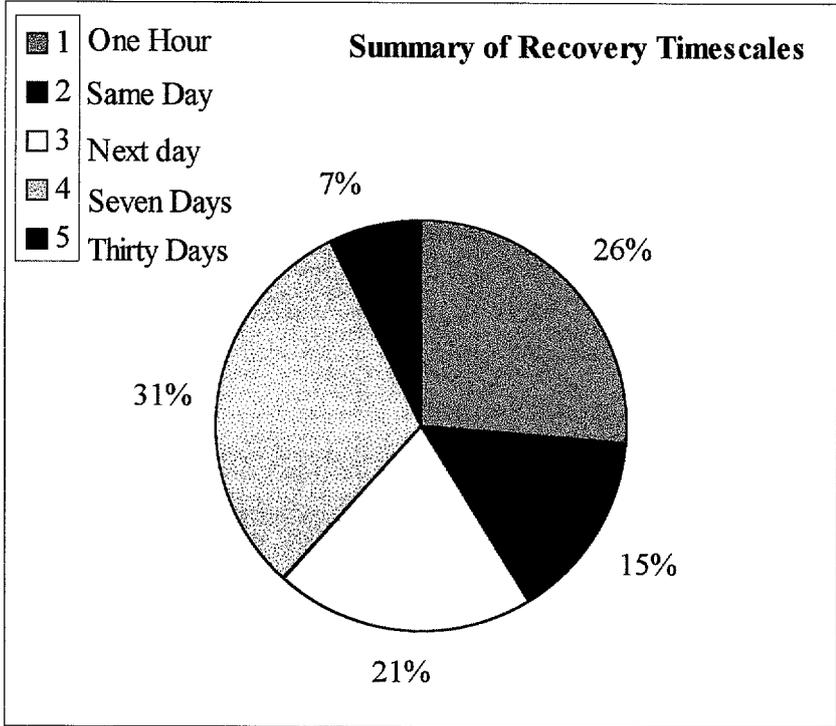


TABLE II-A-1 - Functions and Recovery times

Details	One Hour	Same Day	Next Day	Seven Days	Thirty Days
Department : Capital Markets	Refer Page 11				
System startup	√				
Monitoring and surveillance	√				
Liaison infofeed	√				
Computer to Computer linkage	√				
Day end activities		√			
Listing/ Suspension			√		
Corporate Actions Report			√		
Auctions			√		
Monitoring underwriting				√	
Off market operations				√	
Investor Grievance				√	
Department : Wholesale Debt Market	Refer Page 14				
Exchange functions and market monitoring	√				
Back office operations	√				
Admission of securities		√			
Maintaining masters		√			
Listing of securities				√	
Settlements				√	
Development testing					√
Department : Futures & Options	Refer Page 16				
System startup	√				
Monitoring and surveillance	√				
Liaison infofeed	√				
Computer to Computer linkage	√				
Day end activities		√			
Corporate Actions Report			√		
Monitoring underwriting				√	
Investor Grievance				√	

TABLE II-A-1 - Functions and Recovery times

Details	One Hour	Same Day	Next Day	Seven Days	Thirty Days
Department : NSCCL	Refer Page 19				
Master file maintenance		√			
Obligations processing		√			
Funds operations		√			
Auction processing			√		
Corporate Actions			√		
Physical settlement for regular markets and auctions deals			√		
Risk management			√		
Settlement scheduling				√	
Physical settlement for bad deliveries and company objection cases				√	
New Projects					√
Department : Finance & Accounts	Refer Page 22				
Funds/ receipts/ payments				√	
TDS				√	
Billing				√	
Fixed assets				√	
Branch accounts				√	
Taxation				√	
Payroll				√	
Department : Membership	Refer Page 24				
Continued eligibility			√		
Inspection of members				√	
Department : Investments	Refer Page 25				
Make Investments/ disinvestments			√		
Maintain securities			√		
Redemptions and lodgments of interest warrants			√		
Back office			√		
Department : Personnel	Refer Page 27				
Personnel database	√				

TABLE II-A-1 - Functions and Recovery times

Details	One Hour	Same Day	Next Day	Seven Days	Thirty Days
Department : Legal and Secretarial		Refer Page 29			
Convene meetings		√			
Court cases				√	
Draft regulations				√	
Legal advice				√	
Draft agreements				√	
Ensure compliance under various acts					√
File returns					√
Department : Systems		Refer Page 31			
Maintenance of membership database			√		
Maintenance of TCAM/ TCS	√				
Maintenance of NEAT	√				
Maintenance of listing database		√			
Development of listing database					√
Maintenance of LCSS/ NCSS		√			
Stratus Operations	√				
Help Desk	√				
System administration and Database administration	√				
Hardware maintenance	√				
Onsite hardware support	√				

Summary :

Recovery times	Number of functions to be recovered
One hour	18
Same working day	10
Next working day	14
Seven days	21
Thirty days	5

TABLE II-A-2 - Interpretation Matrix

Interpretation matrix for Recovery times for functions

Criticality Time period for suspension	Low	Medium	High	Very high
for an hour			Recovery in the same working day	Recovery within an hour
for a day			Recovery by the next working day	Recovery by the next working day
for a week		Recovery upto seven days	Recovery upto seven days	Recovery upto seven days
for a month		Recovery upto thirty days	Recovery upto thirty days	Recovery upto thirty days

TABLE II-A-3 - Critical Functions Matrices

Department : Capital Markets

Criticality Time period for suspension	Low	Medium	High	Very high
for an hour	<ul style="list-style-type: none"> • Listing/ Suspension • Investor Grievance • Off-Market operations • Monitoring Underwriting • Development of listing database • Auctions • Development testing • Corporate actions Report 		<ul style="list-style-type: none"> • Day end activities 	<ul style="list-style-type: none"> • System startup • Monitoring and Surveillance • Liaison infofeed • Computer to Computer linkage

TABLE II-A-3 - Critical Functions Matrices

Department : Capital Markets

Criticality Time period for suspension	Low	Medium	High	Very high
for a day	<ul style="list-style-type: none"> • Investor Grievance • Off-Market operations • Monitoring Underwriting • Development of listing database • Development testing 		<ul style="list-style-type: none"> • Auctions 	<ul style="list-style-type: none"> • System startup • Monitoring and surveillance • Liaison infofeed • Computer to Computer linkage • Day end activities • Listing/ Suspension • Corporate actions Report
for a week	<ul style="list-style-type: none"> • Development of listing database • Development testing 	<ul style="list-style-type: none"> • Investor Grievance 	<ul style="list-style-type: none"> • Off-Market operations 	<ul style="list-style-type: none"> • System startup • Monitoring and surveillance • Liaison infofeed • Computer to Computer linkage

TABLE II-A-3 - Critical Functions Matrices

Department : Capital Markets

Criticality	Low	Medium	High	Very high
Time period for suspension for a week (contd.)				<ul style="list-style-type: none"> • Day end activities • Listing/ Suspension • Corporate actions Report • Auctions • Monitoring Underwriting
for a month	<ul style="list-style-type: none"> • Development of listing database • Development testing 		<ul style="list-style-type: none"> • Off-Market operations • Investor Grievance 	<ul style="list-style-type: none"> • System startup • Monitoring and surveillance • Liaison infofeed • Computer to Computer linkage • Day end activities • Listing/ Suspension • Corporate actions Report • Auctions • Monitoring Underwriting

TABLE II-A-3 - Critical Functions Matrices

Department : Wholesale Debt Markets

Criticality	Low	Medium	High	Very high
Time period for suspension				
for an hour	<ul style="list-style-type: none"> • Development and testing • Settlements • Listing of securities 		<ul style="list-style-type: none"> • Admission of securities • Maintaining masters 	<ul style="list-style-type: none"> • Exchange functions and market monitoring • Back office
for a day	<ul style="list-style-type: none"> • Development and testing • Settlements • Listing of securities 		<ul style="list-style-type: none"> • Admission of securities • Maintaining masters 	<ul style="list-style-type: none"> • Exchange functions and market monitoring • Back office
for a week	<ul style="list-style-type: none"> • Development and testing 	<ul style="list-style-type: none"> • Settlements 	<ul style="list-style-type: none"> • Admission of securities • Listing of securities 	<ul style="list-style-type: none"> • Exchange functions and market monitoring • Back office • Maintaining masters
for a month			<ul style="list-style-type: none"> • Settlements • Development and testing 	<ul style="list-style-type: none"> • Exchange functions and market monitoring • Back office

TABLE II-A-3 - Critical Functions Matrices

Department : Wholesale Debt Markets

Criticality	Low	Medium	High	Very high
Time period for suspension for a month (contd.)				<ul style="list-style-type: none">• Maintaining masters• Admission of securities• Listing of securities

TABLE II-A-3 - Critical Functions Matrices

Department : Futures & Options

Criticality	Low	Medium	High	Very high
Time period for suspension				
for an hour	<ul style="list-style-type: none"> • Investor Grievance • Monitoring Underwriting • Corporate actions Report 		<ul style="list-style-type: none"> • Day end activities 	<ul style="list-style-type: none"> • System startup • Monitoring and Surveillance • Liaison infofeed • Computer to Computer linkage
for a day	<ul style="list-style-type: none"> • Investor Grievance • Monitoring Underwriting 			<ul style="list-style-type: none"> • System startup • Monitoring and Surveillance • Liaison infofeed • Computer to Computer linkage • Day end activities • Corporate actions Report

TABLE II-A-3 - Critical Functions Matrices

Department : Futures & Options

Criticality	Low	Medium	High	Very high
Time period for suspension				
for a week		<ul style="list-style-type: none"> Investor Grievance 		<ul style="list-style-type: none"> System startup Monitoring and Surveillance Liaison infofeed Computer to Computer linkage Day end activities Corporate actions Report Monitoring Underwriting
for a month			<ul style="list-style-type: none"> Investor Grievance 	<ul style="list-style-type: none"> System startup Monitoring and surveillance Liaison infofeed Computer to Computer linkage Day end activities Corporate actions Report

TABLE II-A-3 - Critical Functions Matrices

Department : Futures & Options

Criticality	Low	Medium	High	Very high
Time period for suspension for a month (contd)				<ul style="list-style-type: none">• Monitoring Underwriting

TABLE II-A-3- Critical Functions Matrices

Company : NSCCL

Criticality Time period for suspension	Low	Medium	High	Very high
for an hour	<ul style="list-style-type: none"> • Auction processing • Settlement scheduling • Risk management • Physical settlement for bad deliveries and company objection cases • Physical settlement for regular markets and auctions deals • New Projects 	<ul style="list-style-type: none"> • Corporate actions 	<ul style="list-style-type: none"> • Master file Maintenance • Obligations processing • Funds operations 	
for a day	<ul style="list-style-type: none"> • New Projects 	<ul style="list-style-type: none"> • Settlement scheduling • Physical settlement for bad deliveries and company objection cases 	<ul style="list-style-type: none"> • Risk management 	<ul style="list-style-type: none"> • Master file Maintenance • Obligations processing • Funds operations • Corporate actions • Auction processing

TABLE II-A-3- Critical Functions Matrices

Company : NSCCL

Criticality	Low	Medium	High	Very high
Time period for suspension for a day (contd)				<ul style="list-style-type: none"> Physical settlement for regular markets and auctions deals
for a week	<ul style="list-style-type: none"> New Projects 		<ul style="list-style-type: none"> Settlement scheduling Physical settlement for bad deliveries and company objection cases 	<ul style="list-style-type: none"> Master file Maintenance Obligations processing Funds operations Corporate actions Auction processing Physical settlement for regular markets and auctions deals Risk management

TABLE II-A-3- Critical Functions Matrices

Company : NSCCL

Criticality Time period for suspension	Low	Medium	High	Very high
for a month		<ul style="list-style-type: none"> • New Projects 		<ul style="list-style-type: none"> • Master file Maintenance • Obligations processing • Funds operations • Corporate actions • Auction processing • Physical settlement for regular markets and auctions deals • Risk management • Settlement scheduling • Physical settlement for bad deliveries and company objection cases

TABLE II-A-3 - Critical Functions Matrices

Department : Finance and Accounts

Criticality Time period for suspension	Low	Medium	High	Very high
for an hour	<ul style="list-style-type: none"> • Billing including penalty • Payroll/ TDS • Funds/ receipts/ payments/ fixed assets/ branch accounts • Taxation • Budgeting • PF trust • IPF trust • Statutory audit 			
for a day	<ul style="list-style-type: none"> • Billing including penalty • Payroll/ TDS • Funds/ receipts/ payments/ fixed assets/ branch accounts • Taxation 			

TABLE II-A-3 - Critical Functions Matrices

Department : Finance and Accounts

Criticality	Low	Medium	High	Very high
Time period for suspension				
for a day (contd.)	<ul style="list-style-type: none"> • Budgeting • PF trust • IPF trust • Statutory audit 			
for a week	<ul style="list-style-type: none"> • Budgeting • PF trust • IPF trust • Statutory audit 	<ul style="list-style-type: none"> • Payroll (lump sum payment) 	<ul style="list-style-type: none"> • Billing including penalty • Fixed assets/ branch accounts • Taxation 	<ul style="list-style-type: none"> • TDS • Funds/ receipts/ payments
for a month	<ul style="list-style-type: none"> • Budgeting • PF trust • IPF trust • Statutory audit 		<ul style="list-style-type: none"> • Fixed assets/ branch accounts • Taxation • Payroll 	<ul style="list-style-type: none"> • TDS • Funds/ receipts/ payments • Billing including penalty

TABLE II-A-3- Critical Functions Matrices

Department : Membership

Criticality	Low	Medium	High	Very high
Time period for suspension				
for an hour	<ul style="list-style-type: none"> • Admission of members • Inspection of members • Continued eligibility 			
for a day	<ul style="list-style-type: none"> • Admission of members • Inspection of members 		<ul style="list-style-type: none"> • Continued eligibility 	<ul style="list-style-type: none"> • <i>Insurance claim settlement</i>
for a week	<ul style="list-style-type: none"> • Admission of members 		<ul style="list-style-type: none"> • Inspection of members 	<ul style="list-style-type: none"> • <i>Insurance claim settlement</i> • Continued eligibility
for a month	<ul style="list-style-type: none"> • Admission of members 		<ul style="list-style-type: none"> • Inspection of members 	<ul style="list-style-type: none"> • <i>Insurance claim settlement</i> • Continued eligibility

TABLE II-A-3- Critical Functions Matrices

Department : Investments

Criticality	Low	Medium	High	Very high
Time period for suspension				
for an hour		<ul style="list-style-type: none"> • Make investments/ disinvestments • Maintain securities • Redemptions and lodgments of interest warrants • Back office 		
for a day				<ul style="list-style-type: none"> • Make investments/ disinvestments • Maintain securities • Redemptions and lodgments of interest warrants • Back office

TABLE II-A-3- Critical Functions Matrices

Department : Investments

Criticality	Low	Medium	High	Very high
Time period for suspension				
for a week				<ul style="list-style-type: none"> • Make investments/ disinvestments • Maintain securities • Redemptions and lodgments of interest warrants • Back office
for a month				<ul style="list-style-type: none"> • Make investments/ disinvestments • Maintain securities • Redemptions and lodgments of interest warrants • Back office

TABLE II-A-3- Critical Functions Matrices

Department : Personnel

Criticality Time period for suspension	Low	Medium	High	Very high
for an hour	<ul style="list-style-type: none"> • Recruitment • Training • Maintain leave records • Maintain resume database • Appraisals 			<ul style="list-style-type: none"> • <i>Personnel database</i>
for a day	<ul style="list-style-type: none"> • Recruitment • Training • Maintain leave records • Maintain resume database • Appraisals 			<ul style="list-style-type: none"> • <i>Personnel database</i>
for a week	<ul style="list-style-type: none"> • Recruitment 			<ul style="list-style-type: none"> • <i>Personnel database</i>

TABLE II-A-3- Critical Functions Matrices

Department : Personnel

Criticality	Low	Medium	High	Very high
Time period for suspension for a week (contd.)	<ul style="list-style-type: none"> • Training • Maintain leave records • Maintain resume database • Appraisals 			
for a month	<ul style="list-style-type: none"> • Recruitment • Training • Maintain leave records • Maintain resume database • Appraisals 			<ul style="list-style-type: none"> • <i>Personnel database</i>

TABLE II-A-3 - Critical Function Matrices
Department : Legal & Secretarial

Criticality	Low	Medium	High	Very high
Time period for suspension				
for an hour	<ul style="list-style-type: none"> • Court cases • Draft regulations • Legal advice • Draft agreements • Ensure compliance under various acts • File returns 		<ul style="list-style-type: none"> • Convene meetings 	
for a day	<ul style="list-style-type: none"> • Court cases • Draft regulations • Legal advice • Draft agreements • Ensure compliance under various acts • File returns 			<ul style="list-style-type: none"> • Convene meetings

TABLE II-A-3 - Critical Function Matrices

Department : Legal & Secretarial

Criticality	Low	Medium	High	Very high
Time period for suspension				
for a week	<ul style="list-style-type: none"> • Ensure compliance under various acts • File returns 	<ul style="list-style-type: none"> • Court cases • Draft regulations • Legal advice • Draft agreements 		<ul style="list-style-type: none"> • Convene meetings
for a month		<ul style="list-style-type: none"> • Ensure compliance under various acts • File returns 	<ul style="list-style-type: none"> • Draft regulations • Legal advice • Draft agreements 	<ul style="list-style-type: none"> • Convene meetings • Court cases

TABLE II-A-3 - Critical Function Matrices

Department : Systems

Criticality	Low	Medium	High	Very high
Time period for suspension				
For an hour	<ul style="list-style-type: none"> • Development of listing database 	<ul style="list-style-type: none"> • Maintenance of membership database 	<ul style="list-style-type: none"> • Maintenance of listing database • Maintenance of LCSS/NCSS 	<ul style="list-style-type: none"> • Maintenance of TCAM/TCS • Maintenance of NEAT • Stratus operations • Help desk • System administration and Database administration • Hardware maintenance • Onsite hardware support
For a day	<ul style="list-style-type: none"> • Development of listing database 		<ul style="list-style-type: none"> • Maintenance of membership database 	<ul style="list-style-type: none"> • Maintenance of TCAM/TCS • Maintenance of NEAT • Stratus operations • Help desk • System administration and Database administration

TABLE II-A-3 - Critical Function Matrices

Department : Systems

Criticality	Low	Medium	High	Very high
Time period for suspension				
For a day (Contd.)				<ul style="list-style-type: none"> • Hardware maintenance • Onsite hardware support • Maintenance of listing database • Maintenance of LCSS/NCSS
for a week	<ul style="list-style-type: none"> • Development of listing database 		<ul style="list-style-type: none"> • Maintenance of membership database 	<ul style="list-style-type: none"> • Maintenance of TCAM/TCS • Maintenance of NEAT • Stratus operations • Help desk • System administration and Database administration • Hardware maintenance • Onsite hardware support • Maintenance of listing database

TABLE II-A-3 - Critical Function Matrices

Department : Systems

Criticality	Low	Medium	High	Very high
Time period for suspension				
For a week (Contd.)				<ul style="list-style-type: none"> • Maintenance of LCSS/NCSS
for a month		<ul style="list-style-type: none"> • Development of listing database 	<ul style="list-style-type: none"> • Maintenance of membership database 	<ul style="list-style-type: none"> • Maintenance of TCAM/TCS • Maintenance of NEAT • Stratus operations • Help desk • System administration and Database administration • Hardware maintenance • Onsite hardware support • Maintenance of listing database • Maintenance of LCSS/NCSS

B. Resources required for the critical functions

The functions can be recovered, in the given time-frame, with the help of the requisite resources. The Business Continuity Plan must address the recovery of these resources within the recovery time-scale for the concerned function.

- Table II-B-1 - List of resources for the functions to be recovered within an hour.
- Table II-B-2 - List of resources for the functions to be recovered on the same day.
- Table II-B-3 - List of resources for the functions to be recovered by the next working day.
- Table II-B-4 - List of resources for the functions to be recovered within seven days.
- Table II-B-5 - List of resources for the functions to be recovered within thirty days.

TABLE II- B-1 - Recovery Within an Hour

Department : Capital Markets

Number of Functions/ Activities : Four

Function	Systems Resources	Telecom and Non system Resources
System startup	<ol style="list-style-type: none"> 1. Trading software - NEAT 2. Back office software 3. Stratus 4. HP/ DEC machine 5. PCs 6. MS Office 7. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Direct lines/ STD 4. Copier
Monitoring and surveillance	<ol style="list-style-type: none"> 1. Trading software - NEAT 2. Back office software 3. Surveillance software 4. Stratus 5. HP/ DEC machine 6. PCs 7. MS Office 8. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Direct lines/ STD 4. Copier
Computer to Computer linkage	<ol style="list-style-type: none"> 1. Stratus 2. Pentium server 3. PCs 4. Printers 5. EICON card 6. MS Office 	<ol style="list-style-type: none"> 1. Leased lines 2. Direct lines/ STD 3. VSATs
Liaison infofeed	<ol style="list-style-type: none"> 1. Stratus 2. Reuters terminal 3. LAN connection 4. HP machine 	<ol style="list-style-type: none"> 1. Leased lines 2. Modems

TABLE II- B-1 - Recovery Within an Hour**Department : Wholesale Debt Market****Number of Functions/ Activities : Two**

Function	Systems Resources	Telecom and Non system Resources
Exchange functions/ Activities and market monitoring	<ol style="list-style-type: none"> 1. Trading software - TCAM/ TCS 2. Stratus XAR - 330 3. PCs 4. MS Office 5. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Direct lines 4. Fax machine 5. Copier
Back office operations	<ol style="list-style-type: none"> 1. Back office software 2. HP machine 3. PCs 4. MS Office 5. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Direct lines 4. Fax machine 5. Copier

TABLE II- B-1 - Recovery Within an Hour**Department : Futures & Options****Number of Functions/ Activities : Four**

Function	Systems Resources	Telecom and Non system Resources
System startup	<ol style="list-style-type: none"> 1. Trading software - NEAT - CM 2. Trading software - NEAT - F&O 3. Index system 4. Back office software 5. Stratus 6. HP/ DEC machine 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Direct lines/ STD 4. Copier
Monitoring and surveillance	<ol style="list-style-type: none"> 1. Trading software - NEAT - CM 2. Trading software - NEAT - F&O 3. Index System 4. Back office software 5. Surveillance software 6. Stratus 7. HP/ DEC machine 8. PCs 9. MS Office 10. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Direct lines/ STD 4. Copier
Liaison infofeed	<ol style="list-style-type: none"> 1. Stratus 2. Reuters terminal 3. LAN connection 4. HP/ DEC machine 	<ol style="list-style-type: none"> 1. Leased lines 2. Modems
Computer to Computer linkage	<ol style="list-style-type: none"> 1. Stratus 2. PCs 3. Printers 4. MS Office 	<ol style="list-style-type: none"> 1. Leased lines 2. Direct lines/ STD 3. VSATs

TABLE II- B-1 - Recovery Within an Hour

Department : Personnel

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Personnel database	<ol style="list-style-type: none">1. Ramco software2. H R M P Server3. PCs4. MS Office5. Printers	<ol style="list-style-type: none">1. Direct lines/ STD2. Copier

TABLE II- B-1 - Recovery Within an Hour**Department : Systems****Number of Functions/ Activities : Seven**

Function	Systems Resources	Telecom and Non system Resources
Maintenance of TCAM/ TCS	<ol style="list-style-type: none"> 1. Stratus XAR 330 2. Source code 3. VOS & Appletree 4. Printer 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machines
Maintenance of NEAT	<ol style="list-style-type: none"> 1. Stratus Continuum 2. Pentium PC with Windows 3. Source code 4. VCH 5. Printer 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machines
Stratus Operations	<ol style="list-style-type: none"> 1. Stratus machines 2. VOS 3. Appletree 4. TCAM/ NEAT 5. Terminals 6. Printer 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machines
Helpdesk		<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machines
System administration and database administration	<ol style="list-style-type: none"> 1. Stratus machines 2. HP/ DEC machines 3. Terminals 4. Printer 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machines
Hardware maintenance		<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machines

TABLE II- B-1 - Recovery Within an Hour

Department : Systems (Continued)

Number of Functions/ Activities : Seven

Function	Systems Resources	Telecom and Non system Resources
Onsite hardware support		1. Direct lines/ STD 2. Copier 3. Fax machines

TABLE II- B-2 - Recovery on the same Working Day

Department : Capital Market

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Day end activities	<ol style="list-style-type: none">1. Back office software2. HP/ DEC machine3. PCs4. MS Office5. Printers6. Stratus7. Trading software - NEAT - CM8. LCSS/ NCSS	<ol style="list-style-type: none">1. Direct lines / STD2. VSATs3. Leased lines4. Fax machines

TABLE II- B-2 - Recovery on the same Working Day**Department : Wholesale Debt Market****Number of Functions/ Activities :Two**

Function	Systems Resources	Telecom and Non system Resources
Admission of securities	<ol style="list-style-type: none">1. FoxPro Listing Program2. PCs3. MS Office4. Printers	<ol style="list-style-type: none">1. Direct lines / STD2. Fax machine (Dedicated)
Maintaining Masters	<ol style="list-style-type: none">1. Trading software - TCAM/ TCS2. Stratus XAR - 3303. PCs4. MS Office5. Printers	<ol style="list-style-type: none">1. Direct lines2. Fax machines

TABLE II- B-2 - Recovery on the same Working Day

Department : Futures & Options

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Day end activities	<ol style="list-style-type: none">1. Back office software2. HP/ DEC machine3. PCs4. MS Office5. Printers6. Stratus7. Trading software - NEAT - F&O	<ol style="list-style-type: none">1. Direct lines / STD2. VSATs3. Leased lines4. Fax machines

TABLE II- B-2 - Recovery on the same Working Day**Department : NSCCL****Number of Functions/ Activities : Three**

Function	Systems Resources	Telecom and Non system Resources
Master file maintenance	<ol style="list-style-type: none"> 1. Clearing system 2. HP/ DEC 3. MS Office 4. PCs 5. Printers 	
Obligations processing	<ol style="list-style-type: none"> 1. Clearing System 2. HP / DEC 3. MS Office 4. PCs 5. Line Printers 	<ol style="list-style-type: none"> 1. Leased Lines 2. VSATs 3. Direct lines 4. Fax Machines 5. Copier
Funds operations	<ol style="list-style-type: none"> 1. Clearing System 2. ODBC (Querying) 3. Kermit 4. HP / DEC 5. MS Office 6. PCs 7. Printers 	<ol style="list-style-type: none"> 1. Leased Lines 2. Direct lines 3. Hotline with Canara bank 4. Fax Machine 5. Copier

TABLE II- B-2 - Recovery on the same Working Day

Department : Legal & Secretarial

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Convene Meetings	<ol style="list-style-type: none">1. PCs2. MS Office3. Printer	<ol style="list-style-type: none">1. Direct lines/ STD2. Copier3. Fax machines

TABLE II- B-2 - Recovery on the same Working Day

Department : Systems

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Maintenance of LCSS/ NCSS	1. Source code 2. Unix/ Oracle 3. DEC machine 4. Terminals 5. Printer	1. Direct lines/ STD 2. Copier 3. Fax machine

TABLE II- B-3- Recovery by the next Working Day**Department : Capital Market****Number of Functions/ Activities : Three**

Function	Systems Resources	Telecom and Non system Resources
Listing/ Suspension	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier
Corporate Actions	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier
Auctions	<ol style="list-style-type: none"> 1. Trading software - NEAT - CM 2. Clearing system 3. Stratus 4. HP/ DEC 5. PCs 6. MS Office 7. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATS 3. Direct lines/ STD 4. Copier

TABLE II- B-3- Recovery by the next Working Day

Department : Futures & Options

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Corporate Actions	<ol style="list-style-type: none">1. Listing database2. Capitaline/ Vital/ Big Chip/ CIMM3. HP machine (for live)4. DEC (for testing)5. LAN server6. Stratus7. PCs8. MS Office9. Printers	<ol style="list-style-type: none">1. Direct lines/ STD2. Fax Machine/ STD3. Copier

TABLE II- B-3- Recovery by the next Working Day**Department : NSCCL****Number of Functions/ Activities : Four**

Function	Systems Resources	Telecom and Non system Resources
Auction processing	<ol style="list-style-type: none"> 1. Clearing System 2. ODBC (Querying) 3. Kermit 4. HP / DEC 5. MS Office 6. FoxPro-Auctions processing 7. PCs 8. Line Printers 	<ol style="list-style-type: none"> 1. Leased Lines 2. VSATs 3. Hotline with Canara bank 4. Direct lines 5. Fax Machines 6. Copier
Corporate Actions	<ol style="list-style-type: none"> 1. Listing database 2. Clearing System 3. HP / DEC 4. PCs 5. MS Office 6. Printers 	<ol style="list-style-type: none"> 1. Direct lines 2. Fax machine 3. Copier
Physical settlement for regular markets and auctions deals	<ol style="list-style-type: none"> 1. Clearing System 2. HP / DEC 3. PCs 4. MS Office 5. Line Printer 	<ol style="list-style-type: none"> 1. Leased line 2. Direct lines 3. Fax machine 4. Copier
Risk management	<ol style="list-style-type: none"> 1. Clearing System 2. ODBC (Querying) 3. Kermit 4. HP / DEC 5. MS Office 6. PCs 	<ol style="list-style-type: none"> 1. Leased Lines 2. VSATs 3. Direct lines 4. Hotline with Canara bank 5. Fax Machine 6. Copier

TABLE II- B-3- Recovery by the next Working Day

Department : Membership

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Continued eligibility	<ol style="list-style-type: none">1. Oracle database2. Membership application program3. MS Office4. HP machine5. PCs6. LAN Netware server7. Network Connections8. Printers	<ol style="list-style-type: none">1. Direct lines/ STD2. Fax machine3. Storage space4. Copier

TABLE II- B-3- Recovery by the next Working Day

Department : Investments

Number of Functions/ Activities : Four

Function	Systems Resources	Telecom and Non system Resources
<ul style="list-style-type: none">• Make Investments/ dis-investments• Maintain securities• Redemptions and lodgments of interest warrants• Back office	<ol style="list-style-type: none">1. Investment data2. MS Office3. PCs4. Printer	<ol style="list-style-type: none">1. Direct lines2. Fax machine

TABLE II- B-3- Recovery by the next Working Day

Department : Systems

Number of Functions/ Activities : Two

Function	Systems Resources	Telecom and Non system Resources
Maintenance of membership database	<ol style="list-style-type: none">1. Source code2. HP machine3. Terminals4. Gupta SQL5. Unix/ Oracle6. Printer	<ol style="list-style-type: none">1. Direct lines/ STD2. Copier3. Fax machine
Maintenance of listing database	<ol style="list-style-type: none">1. Source code2. Developer 20003. Unix/ Oracle4. HP machine5. Pentium with Windows	<ol style="list-style-type: none">1. Direct lines/ STD2. Copier3. Fax machine

TABLE II- B-4- Recovery Within Seven Days

Department : Capital Markets

Number of functions/ activities : Three

Function	Systems Resources	Telecom and Non system Resources
Monitoring underwriting	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier
Off market operations	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier
Investor Grievance	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier

TABLE II- B-4- Recovery Within Seven Days**Department : Wholesale Debt Markets****Number of functions/ activities : Two**

Function	Systems Resources	Telecom and Non system Resources
Listing of securities	<ol style="list-style-type: none"> 1. MS Office 2. FoxPro listing program 3. PCs 4. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Copier 3. Fax machine
Settlements	<ol style="list-style-type: none"> 1. Clearing system 2. MS Office 3. HP machine/ DEC 4. PCs 5. Printers 	<ol style="list-style-type: none"> 1. Leased lines 2. VSATs 3. Dial-up lines 4. Direct lines/ STD 5. Copier 6. Fax machine

TABLE II- B-4- Recovery Within Seven Days

Department : Futures & Options

Number of functions/ activities : Two

Function	Systems Resources	Telecom and Non system Resources
Monitoring underwriting	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier
Investor Grievance	<ol style="list-style-type: none"> 1. Listing database 2. Capitaline/ Vital/ Big Chip/ CIMM 3. HP machine (for live) 4. DEC (for testing) 5. LAN server 6. Stratus 7. PCs 8. MS Office 9. Printers 	<ol style="list-style-type: none"> 1. Direct lines/ STD 2. Fax Machine/ STD 3. Copier

TABLE II- B-4- Recovery Within Seven Days

Department : NSCCL

Number of functions/ activities : Two

Function	Systems Resources	Telecom and Non system Resources
Settlement scheduling	<ol style="list-style-type: none">1. Clearing system2. MS office3. HP/ DEC4. PCs5. Printers	<ol style="list-style-type: none">1. Leased lines2. VSATs3. Direct lines/ STD4. Fax machine5. Copier
Physical settlement for bad deliveries and company objection cases	<ol style="list-style-type: none">1. Clearing System2. HP / DEC3. PCs4. MS Office5. Line Printer	<ol style="list-style-type: none">1. Leased line2. Direct lines3. Copier

TABLE II- B-4- Recovery Within Seven Days**Department : Finance and Accounts****Number of functions/ activities : Seven**

Function	Systems Resources	Telecom and Non system Resources
Funds/ receipts/ payments Fixed assets Branch accounts	<ol style="list-style-type: none"> 1. Tally software 2. MS office 3. PCs 4. Printers 	<ol style="list-style-type: none"> 1. Direct/ STD lines 2. Fax machine 3. Copier
Billing	<ol style="list-style-type: none"> 1. Billing software 2. MS office 3. Clearing system 4. Tally 5. HP machine/ DEC 6. LAN 7. PCs 8. Printers 	<ol style="list-style-type: none"> 1. Direct/ STD lines 2. Fax machine 3. Copier
TDS Payroll	<ol style="list-style-type: none"> 1. Ramco 2. MS Office 3. Vetan 4. HRMP server 5. PCs 6. Printers 	<ol style="list-style-type: none"> 1. Telephone lines/ STD 2. Fax machine 3. Copiers
Taxation	<ol style="list-style-type: none"> 1. MS Office 2. TDS certificate Dbase program 3. PCs 4. Printers 	<ol style="list-style-type: none"> 1. Direct lines 2. Fax machine 3. Copier

TABLE II- B-4- Recovery Within Seven Days

Department : Membership

Number of functions/ activities : One

Function	Systems Resources	Telecom and Non system Resources
Inspection of members	<ol style="list-style-type: none">1. Membership database2. DEC3. PCs4. MS Office5. Printers	<ol style="list-style-type: none">1. Direct lines/ STD2. Fax machine3. Copiers4. E Mail

TABLE II- B-4- Recovery Within Seven Days

Department : Legal and Secretarial

Number of functions/ activities : Four

Function	Systems Resources	Telecom and Non system Resources
<u>Legal</u> <ul style="list-style-type: none">• Court cases• Draft regulations• Legal advice• Draft agreements	<ol style="list-style-type: none">1. MS Office2. Jurix3. Bulls Eye4. PCs5. Printers	<ol style="list-style-type: none">1. Direct lines/ STD2. Copier3. Fax machines

TABLE II- B-4- Recovery Within Seven Days

Department : Systems

Number of Functions/ Activities : One

Function	Systems Resources	Telecom and Non system Resources
Development of listing database	<ol style="list-style-type: none">1. Source code2. HP machine3. Terminals4. Developer 20005. Unix/ Oracle6. Printer	<ol style="list-style-type: none">1. Direct lines/ STD2. Copier3. Fax machine

TABLE II- B-5- Recovery Within Thirty Days

Department : Wholesale Debt markets

Number of functions/ activities : One

Function	Systems Resources	Telecom and Non system Resources
Development and testing	<ol style="list-style-type: none">1. Trading software under development2. MS office3. Back office software under testing4. Stratus5. HP machine6. PCs7. Printers	<ol style="list-style-type: none">1. Copiers

TABLE II- B-5- Recovery Within Thirty Days

Department : NSCCL

Number of functions/ activities : One

Function	Systems Resources	Telecom and Non system Resources
New Projects	<ol style="list-style-type: none">1. Gupta SQL2. DEC3. Oracle4. MS Office5. PCs6. Printers	<ol style="list-style-type: none">1. Copiers

TABLE II- B-5- Recovery Within Thirty Days

Department : Legal and Secretarial

Number of functions/ activities : Two

Function	Systems Resources	Telecom and Non system Resources
<u>Secretarial</u> <ul style="list-style-type: none">• Ensure compliance under various acts• File returns with SEBI, ROC, MoF	<ol style="list-style-type: none">1. MS office2. PCs3. Printers	<ol style="list-style-type: none">1. Direct lines2. STD lines3. Copiers4. Fax Machine

III. OPERATIONAL RISK ASSESSMENT

Business is subject to several risks such as:

- Strategic risk
- Financial risk
- Operational risk

Operational risk can be on account of:

- Disaster
- Process/ Technology failure
- Human error
- Deliberate attack (Crime)

In the context of operational risk assessment, a threat is an event that damages or disrupts the resources which support the business functions. These resources have been presented in Section II. The threat analysis identifies threats to the resources for each function. These threats can be broadly categorised as those related to people, physical assets, technology, utilities and information. The analysis further identifies the existing countermeasures to assess the adequacy and the extent of threat coverage. The countermeasures can be both pre-event i.e. preventive controls and post-event i.e. detective controls and contingency measures. One of the critical countermeasures is the insurance coverage for assets which minimises monetary losses.

The threat analysis identifies gaps in the current countermeasures and provides recommendations to bridge the gaps.

A. Detailed Threat Analysis

Refer Table III-A-1

TABLE III- A-1- Threat Analysis

Department : All

Threat : Power failure

Background and Current risk reduction measures :

Mahindra Towers :

There are two UPS units taking over immediately in the event of a power failure. The UPSs have been configured to run in a parallel redundant mode. In case of failure of one of the UPSs the full load is transferred to the running UPS. Within 10 seconds of the UPS taking over, the diesel generators come on. This covers all the equipment, the computer room and the Stratus room. The UPSs are supplied by Tata Liebert and are currently under warranty support.

Kamla Mills :

Currently, there is a temporary rented diesel generator set. This set starts within 10 minutes in the event of a power failure. Within 3-4 months, there will be similar facility for backup in the event of a power failure as at Mahindra Towers.

TABLE III- A-1- Threat Analysis

Department : All

Threat : Fire

Background and Current risk reduction measures :

Mahindra Towers :

There are smoke detectors which are tested every month. On the first floor, there is a master control panel which is used to detect the location of fire at any of the floors. In the computer room, there are helon sprinklers and there are fire extinguishers on each floor. At regular intervals, a member from the staff is designated to check the fire extinguishers to find out if it is full or not. Most of the storage cabinets are wooden adding to the risk. There have not been any fire drills which can handicap recovery from fire with minimum damage.

Kamla Mills :

At present, the facilities at Kamla Mills where the clearing house is located is makeshift and hence the fire protection measures are not complete. There is only one exit for the clearing house and the clearing house gets very crowded on pay-in and pay-out days. Currently, there are fire extinguishers at the site. There are no smoke detectors. In 3-4 months, the facilities at the new building under construction for fire protection will come up similar to what is available at Mahindra Towers.

TABLE III- A-1- Threat Analysis

Department : All

Threat : Inadequacy of insurance

Background and Current risk reduction measures :

Three types of insurance covers have been taken :

1. Electronic equipment insurance - for all electronic equipment, for all risks except if caused by negligence
2. Fire insurance
3. Special contingency insurance - for movable equipment e.g. laptops

Within a month, there is a plan to appoint a consultant to review the coverage of the insurance and the insurance premia currently being paid.

Further Countermeasures :

The following risks should be considered for insurance :

- Loss or damage to physical securities on premises and in transit whether caused by employees or third person.
- Loss of data, programs, other vital records/ backups on electronic and magnetic media and the cost of reproduction
- Costs of recreating systems and program documentation for existing applications and for applications under development

TABLE III- A-1- Threat Analysis

Department : All

Threat : Failure of equipment such as fax machines, copiers, shredding machines

Background and Current risk reduction measures :

All the above equipment are under annual maintenance contracts and the vendors provide bimonthly servicing. Also, the vendors attend to any problems within 12 hours.

TABLE III- A-1- Threat Analysis

Department : All

Threat : Air conditioning unit failure

Background and Current risk reduction measures :

Mahindra Towers :

The air-conditioning is centralised for the whole building. The 4th floor server room and NMS room (which houses the COMNET) have window air-conditioners purchased from Carrier Aircon. There is no annual maintenance contract with this vendor. The RFT room (on the terrace, having the VSATs) and EPABX panel have window air-conditioners rented from Elmeck. Monthly checkups are carried out for these A/Cs.

Computer room at Mahindra Towers :

There are eight 7.5 tonne package air-conditioners. Out of the eight air-conditioners, four are supplied by Tata Liebert and the rest by Voltas. Those supplied by Tata Liebert are still under warranty and the others from Voltas are maintained under an Annual Maintenance contract. Four air-conditioners are installed for the old portion of the computer room area and the other four are installed for the extended computer room area. For both the areas three machines are used at any point in time and rotated every week. The services of both the companies are satisfactory and the response time for any complaint is 1-2 hours. In case of failure of two machines simultaneously in the same area, it is felt that the concerned vendor will provide replacement urgently as these machines are very popular therefore availability of spare machines with the vendor will not be a problem. The risk is that there is no such clause in the agreements binding the vendor to do so.

All air-conditioners have monthly checkups.

Kamla Mills :

Currently, the place has some temporary air-conditioners. Within 3-4 months, permanent ones will be installed from Bluestar.

TABLE III- A-1- Threat Analysis

Department : All

Threat : Failure of LAN server

Background and Current risk reduction measures :

The LAN server has the front end executables of the membership database. All other window based executables such as listing database are planned to be put on the LAN in the near future.

SFT (Software Fault Tolerance) has not been installed as a parallel backup to the LAN server. The machines are procured and about to be installed.

Unshielded twisted pair (UTP) cabling has been done for LAN which reduces the risk relating to data transfer due to cable failure.

For LAN cards failure, backup is available and the server is under warranty.

Further Countermeasures :

1. SFT 3.0 should be installed to prevent server failures. The cabling should be checked regularly to ensure that it is in working condition.
2. AMC/ warranty agreement should contain sufficient clause to ensure "uptime availability" to bring up the LAN at the earliest, in case of failure. _____

TABLE III- A-1- Threat Analysis

Department : Membership

Threat : Failure of membership database

Background and Current risk reduction measures :

Membership database contains information about all the accepted members. This is part of the system for capital market back-office functions residing on Newton (DEC). The database is in Oracle and the Gupta SQL is the front end tool. The operating system is DEC OSF 3.2C. This database is maintained by the membership department.

The information about addition of a new member or deletion of a member is communicated by way of a memo to Market Watch for Capital Markets. The Market Watch does the necessary updation of masters for the trading system on Stratus Continuum 1225.

The software solution for transferring data from the membership database to the trading system is being worked out currently.

Further Countermeasures :

1. The member details should be entered into membership database and then uploaded by a text file on the member master on the trading system.
2. The member master on the trading system and the membership database should be consistent and to ensure this, a report on member (broker) master should be taken from the trading system and the membership database and compared periodically to identify variations in data.

TABLE III- A-1- Threat Analysis

Department : Capital Markets

Threat : Failure of listing database

Background and Current risk reduction measures :

The listing database supports company admission and continued eligibility activity and monitoring of compliance with listing/ trading requirements, maintains the company database and securities database and supports determination of cum dates, ex dates, no delivery periods etc. for securities trading. Daily additions and modifications are given in a text file to the Trading system. The main modules supported by listing database are:

1. Security Master
2. Credit ratings
3. Corporate Actions
4. Distinctive numbers range valid for trading
5. Processing of listing applications
6. Capturing off market trades
7. Investor Grievance module
8. Monitoring underwriting exposures

The entire application has been developed in-house, using Forms 4.5.

The listing database is currently on the development machine of HP. Due to testing and other system resource consuming activities of the development team, the listing database users are getting slow response times.

The listing database is in client server environment. Backups are taken at the node level for the applications daily. Server level backups are taken weekly mostly on Mondays or Tuesdays and at any given point of time, the previous and the current versions are maintained as backups.

Further Countermeasures :

All production databases should be loaded onto production machines. While reorganising the databases it should be ensured that no production database resides on any development machine and vice versa.

TABLE III- A-1- Threat Analysis

Department : Capital Markets, Futures & Options

Threat : Failure of Stratus Continuum 1225 (Chanakya)

Background and Current risk reduction measures :

Stratus Continuum 1225 (Chanakya) holds the National Exchange for Automated Trading (NEAT), the on-line trading system for capital market operations. The trades are matched on this machine. In the future, the Futures and Options trading facility will also be provided through NEAT.

There is another Stratus machine with exactly the same configuration (Kautilya) available. This machine is used as the development machine and is also planned to be used as a backup machine in case of an unlikely event of complete failure of Chanakya.

All components of this machine are duplexed except for the X.25 cards and Ethernet Cards (communication cards). In case of failure of a single component except for the X.25 cards and Ethernet Cards (communication cards), the machine automatically shifts to the other equivalent component without the end user (trading member) even knowing about the failure.

In case of failure of both the equivalent components in the machine, the same can be replaced by removing the component from the development machine (Kautilya) and replacing the failed component in the production machine (Chanakya) with a break in operations.

All components are "Hot Pluggable" in the Stratus machines i.e. the defective component can be changed without shutting the machine off.

Cable connections between the switch bank and the production machine are having two extra lines as backup lines. There are enough cables in the warehouses available if there is a need to replace current cables or lay additional cables.

Apart from the above, there are two additional Stratus Continuum 1225 machines which are also used for development purposes.

Further Countermeasures :

1. Critical spares of all the hardware should be identified and maintained by NSE.
2. Back up lines (cabling) available from the switch bank to the production machine should be tested periodically

TABLE III- A-1- Threat Analysis

Department : Capital Markets, Futures & Options

Threat : Adequacy of backup measures on Stratus Continuum 1225 (Chanakya)

Background and Current risk reduction measures :

At the end of the day, the Pre-batch backup and Post-batch backup is taken on Digital Audio Tapes (DATs) for the day's transactions and a backup for the week (Monday to Saturday) upto that day is also taken on DATs. The DAT for the monthly backup is then loaded and the pre and post batch files are backed up in "pass1" and "pass2" i.e. two copies after the DAT is brought to End of Volume stage.

The backup DATs are kept on first floor and fourth floor of Mahindra Towers. The backups for the day, the current week and "pass1" (monthly backup) are kept on the first floor, while those for the previous days, weeks and "pass2" (monthly backup) is kept on the fourth floor.

The daily backups are recycled after a week. i.e. The Monday DAT is overwritten next Monday. For weekly backup, the DATs are recycled after five weeks. The monthly backup is kept permanently.

At the end of the month, a complete dumpdisk backup is taken which includes backup of all programs, the operating system and user directories which are not taken in the regular backups. All hardware, system and application error logs are backed every month end and are kept permanently.

There is a proposal to move the backups being kept at present on the fourth floor of Mahindra Towers as well as those of dumpdisks to Kamla Mills as soon as the air-conditioning facilities are ready there.

Further Countermeasures :

1. The personnel responsible for backing up data and storing it should be identified and granted full access passwords.
2. Documentation on backups should be maintained containing information such as tape number used, start/ end time of backup, backup process initiated by whom, problem if any, reviewed by whom etc. This will ensure that the backups have been properly prepared and stored.
3. The restoration procedures for various backups should be properly documented and the concerned personnel should follow these procedures.

TABLE III- A-1- Threat Analysis

Department : Capital Markets, Futures & Options

Threat : Adequacy of backup measures on Stratus Continuum 1225
(Development Machine) (Kautilya)

Background and Current risk reduction measures :

The daily consolidated user directories are backed up on Digital Audio Tapes (DATs) drives. Two copies are taken and one is kept on the fourth floor and the other on the first floor of Mahindra Towers.

The daily backup DATs are recycled after a week. i.e. The Monday DAT is overwritten next Monday.

Every Saturday, weekly backup is taken as complete dumpdisk of the machine and it is recycled after four weeks. Monthly dumpdisk is taken and is recycled after four months.

The backup DATs are kept on the first floor and fourth floor of NSE. All hardware, system and application error logs are backed every month end and are kept permanently.

Further Countermeasures :

1. The personnel responsible for backing up data and storing it should be identified and granted full access passwords.
2. Documentation on backups should be maintained containing information such as tape number used, start/ end time of backup, backup process initiated by whom, problem if any, reviewed by whom etc. This will ensure that the backups have been properly prepared and stored.
3. The restoration procedures for various backups should be properly documented and the concerned personnel should follow these procedures.
4. Of the two monthly backup copies, "pass1" and "pass2", one should be moved to an off-site location.

TABLE III- A-1- Threat Analysis

Department : Capital Markets, Futures & Options

Threat : Failure of National Exchange for Automated Trading (NEAT) System.

Background and Current risk reduction measures :

The NEAT system is a fully automated on-line trading system for an order driven market. Currently, it provides trading facilities for Capital Market securities. In the future, trading in Futures & Options will also be made available through NEAT. NEAT runs on a Stratus Continuum 1225 machine in NSE's computer centre. Its application software is based on a modified software package and is supported by Tata Consultancy Services (TCS).

There is no facility for backing up data on real time basis during the trading day. Every hour the trade data is backed up on the spare Stratus Continuum machine. In the event of failure during the day, the possibility of losing all trade and order data for a maximum of one hour.

The main modules are:

1. execution
2. relay process
3. control process module
4. enquiry

This is the main application system for NSE's operations and is high in terms of criticality.

The traders to whom data is downloaded through modems, face problems such as getting logged out automatically, login getting disabled and Market Watch not getting dynamically updated. This is due to the increase in data download volumes.

On a regular basis, a record is being maintained of the problems related to NEAT and new versions are released after taking the necessary corrective action.

TABLE III- A-1- Threat Analysis

Department : Wholesale Debt Markets

Threat : Failure of the FoxPro listing program

Background and Current risk reduction measures :

The listing database for WDM has been developed on FoxPro windows version 2.5. The following information is stored for each security - size, dates, coupon, trade type, market order, settlement period, redemption details etc.

A copy of these details entered is given to Market Watch of WDM for entry into the relevant masters maintained on Stratus.

A weekly floppy backup is taken. Also, information is maintained in parallel on Excel. Excel also has historical data of the securities which have matured and have been deleted from the FoxPro database. Backups of Excel are also maintained.

FoxPro data entry ensures completeness and correctness of information before giving the same for data entry on Stratus.

The data on Stratus and on FoxPro is not matched regularly for consistency.

Further Countermeasures :

Duplication of data entry should be avoided by directly entering data into the Stratus machine after getting complete information.

TABLE III- A-1- Threat Analysis

Department : Wholesale Debt Markets

Threat : Failure of Stratus XAR - 330

Background and Current risk reduction measures :

Stratus XAR - 330 runs the on-line trading system for Wholesale Debt Market operations (TCAM/TCS).

Two Stratus XAR - 330 machines with the same configuration are available at NSE. One of these machines is used as a development machine which may act as a backup in case of the unlikely event of complete failure of the main Stratus XAR - 330 machine.

All components of this machine are duplexed except for the X.25 cards (communication cards). In case of failure of a single component, the machine automatically shifts to the other equivalent component transparent to the user i.e. the end user (trading member) will not even know that the failure has occurred.

In case of failure of both the equivalent components in the machine, the same can be replaced by removing the component from the development machine and replacing the failed component in the production machine. In case of failure of both the components, the machine is shutdown automatically for replacement of the components. As a result, the trading system will be halted temporarily.

All components are "Hot Pluggable" in the Stratus machines i.e. the defective component can be changed without shutting the machine off.

Cable connections between the switch bank and the production machine have two additional lines.

Further Countermeasures :

Back up lines available from the switch bank to the production machine should be tested periodically.

TABLE III- A-1- Threat Analysis

Department : Wholesale Debt Markets

Threat : Adequacy of backup measures on Stratus XAR - 330

Background and Current risk reduction measures :

At the end of the day, the Pre-batch backup and Post-batch backup is taken on Spool Tapes for the day's transactions and a backup for the week (Monday to Saturday) upto that day is also taken on DATs. The DAT for the monthly backup is then loaded and the pre and post batch files are backed up in "pass1" and "pass2" i.e. two copies after the DAT is brought to End of Volume stage.

The backup DATs are kept on first floor and fourth floor of Mahindra Towers. The backups for the day, the current week and "pass1" (monthly backup) are kept on the first floor, while those for the previous days, weeks and "pass2" (monthly backup) is kept on the fourth floor.

The daily backups are recycled after a week. i.e. The Monday DAT is overwritten next Monday. For weekly backup, the DATs are recycled after five weeks. The monthly backup is kept permanently. At the end of the month, a complete dumpdisk backup is taken which includes backup of all programs, the operating system and user directories which are not taken in the regular backups. All hardware, system and application error logs are backed every month end and are kept permanently.

There is a proposal to move the backups being kept at present on the fourth floor of Mahindra Towers as well as those of dumpdisks to Kamla Mills as soon as the air-conditioning facilities are ready there.

Further Countermeasures :

1. The personnel responsible for backing up data and storing it should be identified and granted full access passwords.
2. Documentation on backups should be maintained containing information such as tape number used, start/ end time of backup, backup process initiated by whom, problem if any, reviewed by whom etc. This will ensure that the backups have been properly prepared and stored.
3. The restoration procedures for various backups should be properly documented and the concerned personnel should follow these procedures.

TABLE III- A-1- Threat Analysis

Department : Wholesale Debt Markets- Development Machine

Threat : Adequacy of backup measures on Stratus XAR - 330 (Development machine)

Background and Current risk reduction measures :

The daily consolidated user directories are backed up on Digital Audio Tapes (DATs) drives. Two copies are taken and one is kept on the fourth floor and the other on the first floor of Mahindra Towers.

The daily backup DATs are recycled after a week. i.e. The Monday DAT is overwritten next Monday.

Every Saturday, weekly backup is taken as complete dumpdisk of the machine and it is recycled after four weeks. Monthly dumpdisk is taken and is recycled after four months. The backup DATs are kept on the first floor and fourth floor of NSE.

All hardware, system and application error logs are backed every month end and are kept permanently.

Further Countermeasures :

Of the two monthly backup copies, "pass1" and "pass2", one should be moved to an off-site location.

TABLE III- A-1- Threat Analysis

Department : Wholesale Debt Markets

Threat : Failure of Trading software (TCAM/ TCS)

Background and Current risk reduction measures :

Since May 1996, version 11.8 of TCAM is running on Stratus XAR 330. Functionalities are added in a phased manner by updating the versions.

As such, the possibility of software failure is remote.

The backup of software is taken as part of the user directories daily and disk dumps weekly. The media for backups is spool tapes and DATs.

TABLE III- A-1- Threat Analysis

Department : Wholesale Debt Markets

Threat : Failure of backoffice software

Background and Current risk reduction measures :

This software runs on the HP machine. After market closure every day, data file is generated on Stratus and downloaded to HP. There are two modules on HP - backoffice module for MIS and reporting purpose and the clearing module for settlement confirmations. The exposure of each member is calculated and uploaded from HP to Stratus. The trade obligations of the WDM are downloaded to the members/ participants on whose behalf the securities were traded for their confirmation, from HP machine daily after the back office batch processing is over.

As such, the possibility of software failure is remote.

TABLE III- A-1- Threat Analysis

Department : NSCCL

Threat : Failure of Local/National Clearing and Settlement System (NCSS)

Background and Current risk reduction measures :

The Exchange requires its members to settle their trades in the Capital Markets segment on a well defined schedule that is announced well in advance. The Clearing House handles all securities traded in the Capital Markets segment of the NSE and assures cash settlement. The clearing process is automated but the settlement is physical. The clearing system generates appropriate notices and reports of member positions, obligations and deliveries statements as well as shortfall and bad delivery reports. The NSE is scheduled to commence nationwide clearing in the near future.

The clearing system is developed jointly in-house by the systems department of NSE and by TCS. It runs on DEC with Oracle database.

The Local Clearing and Settlement System (LCSS) will continue to be operational after National Clearing and Settlement System (NCSS) is released. Eventually, the modules of LCSS will be included in the NCSS and the LCSS will be phased out.

While loading data files of large size, (such as daily Stratus data file carrying data on trades done that day, to HP/ DEC), if there is any disruption, the entire file has to be reloaded from the beginning. This delays processing of obligations.

Further Countermeasures :

The application software should ensure that the data transfers between any two machines start from the point where the disruption occurred.

TABLE III- A-1- Threat Analysis

Department : NSCCL

Threat : Failure of connectivity between Bombay and regional clearing centres

Background and Current risk reduction measures :

Delhi is going to be the first among the regional clearing centres to start operations as part of nationwide clearing.

For transferring data, leased line (64 KBPS) is going to be considered to be the primary mode of connectivity and VSAT would be taken as the standby. There are two VSATs in Delhi. The data transfer is not required to be real time and continuous.

Two routers are available at Delhi, one of them acts as the backup for the other, since at any given point in time, only one needs to be utilised.

Two Ethernet cards are available in each machine at Delhi.

TABLE III- A-1- Threat Analysis

Department : NSCCL

Threat : Failure of hardware at regional clearing centres

Background and Current risk reduction measures :

The NSE is scheduled to introduce nationwide clearing, which will enable physical settlements to take place at the regional clearing centres and reduce load in Bombay as well as minimise the risk due to movement of securities to Bombay from other locations.

Similar configuration machines will be made available at all the regional clearing centres. There will be two such machines which will share the common hard disk. If one fails, the other machine can take over. The machines will also be connected to the hard disk through duplicate points of connection.

RAID (Redundant Array of Inexpensive Disks) - level 5 with hot spare disk will be made available. This will improve performance, provide data security and split data across 5 disks. If there is any problem in any one of these primary five disks, there is a spare disk, which will be automatically used.

The two machines will share the work between them - one will take care of the application and the other will serve as the database server. In case one of the two machines fail, the other will take over seamlessly.

TABLE III- A-1- Threat Analysis

Department : NSCCL

Threat : Constant upgrade of Oracle versions

Background and Current risk reduction measures :

Oracle releases new versions with enhanced features periodically.

The new version is loaded in the development machines and the users and systems personnel evaluate the performance, before loading the same on to the production system.

Further Countermeasures :

A set of system related performance standards such as duration of batch jobs, time for generating obligations etc. which are critical for NSE operations, should be developed. The features of the new versions should be tested against such performance standards.

TABLE III- A-1- Threat Analysis

Department : NSCCL

Threat : Failure of Turbo Laser DEC

Background and Current risk reduction measures :

The National Clearing and Settlement System (NCSS) has been developed for nationwide clearing and settlement for the Capital Markets segment. The NCSS will run on DEC with operating system DEC OSF 3.2 C.

The Local Clearing and Settlement System (LCSS) will continue to be operational after National Clearing and Settlement System (NCSS) is released. Eventually, the modules of LCSS will be included in the NCSS and the LCSS will be phased out.

In Bombay, there are three DEC machines of equal configuration - one will have LCSS, and second will have NCSS while the third will act as a backup in case of failure of NCSS machine. There is a fourth machine of lower configuration which is being used for development purpose.

TABLE III- A-1- Threat Analysis

Department : NSCCL

Threat : Adequacy of backup measures on HP and Turbo Laser DEC

Background and Current risk reduction measures :

All the databases are exported daily and backed up and kept for six months. Permanent backup is taken every Thursday. This is taken in two copies - one is kept in Kamla Mills and the other is kept in Mahindra Towers.

Every week on Saturday, Oracle backup of production databases is taken for all the machines individually. This backup is recycled on the third Saturday.

Archived Redo logs are backed up daily for all machines. This is also overwritten on the same day in the third week.

User directory backup is taken daily and recycled on the same day in the third week.

Before a version release, the complete RDMS is backed up and kept.

Whenever any change is effected in the operating system, pre change and post change backups are taken.

The application data downloaded from Stratus daily is kept on the HP machine and backed up every month and then purged, during month end or when it reaches 2 GB level.

The orders data is also backed up every month and purged from the machine.

The backup media used is Digital Audio Tapes (DATs) which are kept in locked fire-proof cupboards. A record is maintained of the persons who have taken the backup DAT for some purpose. It also has to be authorised by a member of the senior management. Periodic reviews of DATs are done.

Further Countermeasures :

Two copies of the daily backups are taken. Except the Thursday backup, all other backup DATs for the other days are kept on the fourth floor of the same building. They should also be kept off-site.

TABLE III- A-1- Threat Analysis

Department : Capital Markets, NSCCL

Threat : Changes in the database structures for shared databases such as listing, membership, may not be communicated uniformly across departments

Background and Current risk reduction measures :

Information is shared between the listing database, membership database and the trading and clearing systems.

If there is any change in the basic data structure of any of these databases which may affect the other(s), it is done after consulting the respective database administrators.

TABLE III- A-1- Threat Analysis

Department : NSCCL, Capital Markets, Futures & Options

Threat : Failure of HP machine

Background and Current risk reduction measures :

The HP-CLG1 and HP-CLG2 are the two machines which have clearing and settlement system, production database, history database, development database and listing database between them.

There is a proposal to move entire local clearing and settlement system (LCSS) and its databases to DEC shortly. Then the two HP machines other than the disaster site machine can function as a backup for each other.

The disaster site machine has the same configuration and is meant for the disaster site. In the unlikely event of failure of both the HP machines, this machine can be used as a backup until it is shifted to the disaster site.

TABLE III- A-1- Threat Analysis

Department : NSCCL, Capital Markets, Futures & Options

Threat : Failure of HP UNIX

Background and Current risk reduction measures :

The HP-UX is kept on a secondary media.

The operating system is backed up before and after doing any major upgrades and any changes/tuning to the parameters.

A periodic backup of the operating system is also taken.

Further Countermeasures :

1. Proper documentation of changes made to the parameters of the operating system should be maintained.
2. History of all problems with the operating system and the corrective measures taken should be recorded machine wise for future reference.

TABLE III- A-1- Threat Analysis

Department : Finance and Accounts

Threat : Failure of Billing software

Background and Current risk reduction measures :

The billing software is working on HP-CLG2 machine. The operating system is HP-UX and the DBMS is Oracle. This software has an interface with "Tally" and the NCSS. The trading information is downloaded from the NCSS and vouchers are generated by the system. These vouchers are then exported to "Tally" for generation of bills for individual members. After the processing of bills is complete the data is received from the accounts department and stored as history in the HP-CLG2 machine.

TABLE III- A-1- Threat Analysis

Department : Finance and Accounts

Threat : Backups for Tally software

Background and Current risk reduction measures :

Tally software is used for maintaining financial accounting records. It maintains the day books such as cash/ bank and journal. It prepares the trial balance, profit and loss account and balance sheet. This software is PC based and there is a dedicated person for data entry.

There are two PCs having write versions of Tally and there are read only versions of the Tally loaded on the other PCs at the user end. The users are only allowed to view data from their terminals. Every two to three days backups are taken on floppies and the same floppies are used for the subsequent backups. The primary purpose for the backups is for restoring the records on the read only versions of Tally for the user who is not connected through the LAN. The original floppies of the software are maintained and all these backups are stored in Mahindra Towers itself.

Further Countermeasures :

Day end backups of the accounting data should be maintained and stored off-site. The backup strategy for accounting records need to be worked out depending on the accounting and other regulatory requirements.

TABLE III- A-1- Threat Analysis

Department : Finance and Accounts

Threat : Failure of Ramco Payroll and Human Resource package

Background and Current risk reduction measures :

The Payroll software is being supplied by Ramco Systems and customised as per NSE requirements. The operating system is Windows NT.

At present, NSE uses the Foxbase software from which payroll data is downloaded on the Ramco system. This system will be operational two to three months after the parallel run is completed.

The data for HR is also collected and being entered into the Ramco system.

As the vendor is situated in Madras, the customisation is taking longer than usual.

TABLE III- A-1- Threat Analysis

Department : Finance and Accounts

Threat : Failure of HRMP server

Background and Current risk reduction measures :

The Ramco Payroll and Human Resource package is going to reside on a HP SQLnet Server.

It is not a fault tolerant system and if any critical component like memory card or hard disk fails, NSE will have to get support from the vendor.

There are three hard disks of 2 GB each and they are hot swappable as in the case of Stratus.

TABLE III- A-1- Threat Analysis

Department : Capital Markets, Futures & Options

Threat : Failure of EICON servers

Background and Current risk reduction measures :

The brokers are generally allowed to login from their workstations situated in their business premises. Sometimes due to some problem with the VSAT or Leased line they are not in a position to trade from their business premises. During such disruptions, they are given terminals within the NSE premises to trade.

On the fourth floor of Mahindra Towers, five EICON servers (WIPRO) each with capacity to support ten users are available. These are connected to the Stratus Continuum machine through the MUX panel exclusively available for the fourth floor connection. The MUX panel and the servers are connected by 2MB link.

The components of this set up is the MUX panel, the link between the panel and the servers and the servers. The average number of users that NSE supports is around 30. Even if one or two servers fail, the remaining three servers would be able to cater to the needs of the 30 users. The link has a backup line. The MUX panel also has redundancy built in and the probability of all the cards in the panel failing is remote.

TABLE III- A-1- Threat Analysis

Department : All

Threat : Failure of Internet servers

Background and Current risk reduction measures :

NSE is in the process of setting up one INTERNET server for its internal E-Mail usage and external bulletin boards publications. There will be two servers one "Web" server and another will be "Firewall" security server. NSE is in the process of obtaining 64 kbps leased line from MTNL. There is a proposal to integrate the two servers.

As this is going to be used for internal E Mail immediately, it is not so critical for the business. This will be critical when the members are routed through these servers.

TABLE III- A-1- Threat Analysis

Department : Systems

Threat : Failure of VOS and Appletree

Background and Current risk reduction measures :

Virtual Operating System (VOS) is the operating system for the Stratus machines. The database for the Stratus system is Appletree. These are proprietary software of Stratus. These software are supplied by Stratus on DATs which are kept in the computer room at Mahindra Towers.

Since this is supplied on DATs it is difficult to replicate on other DATs for installation purposes. The chances of failure of the system software and database are considered remote. In the event of failure of the system software or database, Stratus is liable to supply the same under the maintenance contract renewable on March 31, 1997.

TABLE III- A-1- Threat Analysis

Department : Systems

Threat : Failure of any development tool such as Developer 2000

Background and Current risk reduction measures :

Developer 2000 is the front end software for the development of applications in Oracle. This is a PC based software supplied on CDs by the vendor.

There are other such software tools which are used for development activities and are supplied by the vendor on different electronic media.

Further Countermeasures :

The front-end, back end, operating system or any such tools used for software development activities should be backed up and kept at Kamala Mills and Pune office of the NSE.

IV. STRATEGY SELECTION

The Stage Two is the Strategy selection stage. Broadly, the activities comprising this stage are:

Identification of minimum recovery resources for the functions.

This includes :

- Functions which need to be immediately moved to another location/ site/ branch on a temporary basis.
- Minimum Hardware, Application Software and System Software resource requirements under recovery conditions.
- Communications (VSATs/ telephones/ fax lines) required for operations under recovery conditions.
- Equipment resource requirements including items such as CPUs, disk drives, tape drives, servers, terminals, printers and other type of peripherals.
- Personnel involved in critical business processes and required for operations under recovery conditions. The composition of critical department teams would be required to be identified.
- Transport required for the critical processes under recovery conditions.

Researching of backup strategies

This includes :

- Determining the frequency of the computer backups
- Determining the security required over the backups
- Identifying onsite interim storage available
- Identifying appropriate off site storage available
- Determining the options for backing vital paper records and storage of the backups

Identification of recovery locations

This includes :

- Identifying appropriate locations for assembly of personnel in the event of a disaster
- Identifying command centre from which the recovery operations will be controlled.
- Identifying the recovery locations for affected departments

The Appendix A to this report details the location of departments and Appendix B gives the disaster scenarios to be considered for the Plan.

APPENDIX A : RECOVERY LOCATIONS AND DEPARTMENTS AT THESE LOCATIONS

Mahindra Towers

- Systems
- Telecom
- Capital Markets
- Futures & Options
- Wholesale Debt Markets
- Personnel
- Investments
- Administration (partial)

Kamla Mills

- NSCCL
- Membership
- Finance and Accounts
- Legal and Secretarial
- Administration(partial)
- Premises

Pune

- Hot site outside Bombay

Alternate site

- Standby for NSCCL

APPENDIX B : DISASTER SCENARIOS

Case 1 : Mahindra Towers not available

Departments affected :

- Systems
- Telecom
- Capital Markets
- Futures & Options
- Wholesale Debt Markets
- Personnel
- Investments
- Administration(partial)

Operate from Pune

- Capital Markets
- Futures & Options
- Wholesale Debt Markets
- Systems (partial)
- Telecom (partial)
- Administration (partial)

Operate from Kamla Mills

- Personnel
- Investments
- Systems (partial)
- Telecom (partial)
- Administration (partial)

Appendix B

Case 2 : Kamla Mills not available

Departments/ company affected :

- NSCCL
- Membership
- Finance and Accounts
- Legal and Secretarial
- Administration(partial)
- Premises

Operate from Mahindra Towers

- Membership
- Finance and Accounts
- Legal and Secretarial
- Systems (partial)
- Telecom (partial)
- Administration (partial)
- Premises

Operate from alternate site

- NSCCL - operations
 - clearing house
- Systems (partial)
- Telecom (partial)
- Administration (partial)

Appendix B

Case 3 : Both Mahindra Towers and Kamla Mills not available

Departments/ Company affected :

- Systems
- Telecom
- Capital Markets
- Futures & Options
- Wholesale Debt Markets
- Personnel
- Investments
- NSCCL
- Membership
- Finance and Accounts
- Legal and Secretarial
- Administration
- Premises

Operate from Pune

- All (except NSCCL - operations and clearing house, which may require an alternate site)

Operate from alternate site

- NSCCL - operations
 - clearing house
- Skeleton staff from Legal and Secretarial, Finance and Accounts

Appendix B

Case 4 : Entire Bombay not available

Departments/ Company affected :

- Systems
- Telecom
- Capital Markets
- Futures & Options
- Wholesale Debt Markets
- Personnel
- Investments
- NSCCL
- Membership
- Finance and Accounts
- Legal and Secretarial
- Administration
- Premises

Operate from Pune

- All