WTM/GM/EFD/03/2018-19

BEFORE THE SECURITIES AND EXCHANGE BOARD OF INDIA

ORDER

Under Sections 11, 11(4) and 11B of the Securities and Exchange Board of India Act, 1992, read with Securities and Exchange Board of India (Prohibition of Fraudulent and Unfair Trade Practices relating to the Securities Market) Regulations, 2003 and Section 12A of the Securities Contracts (Regulation) Act, 1956 read with Regulation 49 of Securities Contracts (Regulation) (Stock Exchanges and Clearing Corporations) Regulations, 2012.

In the case of NSE Co-location: -

S. No	Noticees	PAN
1	National Stock Exchange of India Limited (NSE)	AAACN1797L
2	Ravi Narain	AAYPN8382Q
3	Chitra Ramkrishna	ABVPR7353M
4	Anand Subramanian	AARPA8290K
5	R. Nandakumar	AEJPR5959N
6	Mayur Sindhwad	BQCPS9399P
7	Ravi Varanasi	AACPV0930C
8	Ravi Apte	ADLPA5449B
9	Umesh Jain	AANPJ7802N
10	Mahesh Soparkar	AAJPS7041Q
11	Deviprasad Singh	AAZPS9535R
12	Sankarson Banerjee	AAFPB1541G
13	G. Shenoy	AAQPS7487R
14	Suprabhat Lala	ABEPL5061D
15	Nagendra Kumar SRVS	AACPN7675E
16	N. Murlidaran	ACKPN1590J
17	Jagdish Joshi	AFDPJ3122J

1.0 Background

1.1 Securities and Exchange Board of India (hereinafter referred to as 'SEBI') received certain complaints dated January 08, 2015 August 10, 2015 and October 03, 2015 from one Mr. Ken Fong, against National Stock Exchange of India Ltd (hereafter referred to as "**NSE**") in respect of its Co-location facilities, which inter alia alleged as under:

a) Tick-by-Tick ("**TBT**") data feed, which provides information regarding

every change in the order book, was disseminated over Transmission Control Protocol/ Internet Protocol ("**TCP/IP**"). Under this protocol, the information is delivered one-by-one unlike broadcast, where everyone gets the price information at the same time (assuming they were at the same distance from the server). TBT data feed was disseminated sequentially in the sequence trading members ("**TM**") connected/ logged-in to the server.

b) The first one to connect to the lowest load server would get advantage in terms of receiving the data faster than others.

c) Some people had figured out that the way to game the system lay in being the first one to connect to the server and preferably a server which was the fastest. A server could be the fastest due to lesser load or it could be hardware of the server which was slightly powerful.

d) NSE was the second largest shareholder of Omnesys Technologies Pvt. Ltd. ("**Omnesys**") and Omnesys had the knowledge that connecting faster would put the server ahead in the queue.

e) One TM namely, OPG Securities Pvt. Ltd. ("**OPG**") used the NSE system to its advantage by (a) hiring Mr. Nagbhusan Bhat, who was working with Omnesys to figure out which server was working better; (b) having certain arrangements with NSE's datacenter staff named Jagdish Joshi who would inform the TM(s) the time when the servers would start, and therefore could be the first to connect; (c) switching on to the fastest servers or accessing least crowded servers with the help of NSE staff members. It was alleged that OPG indulged in front-running in collaboration with NSE employees.

f) In addition to the above, the back-up servers that were installed for the purpose of business continuity, whose access should ideally be permitted in case the primary servers went down, were allowed to be accessed by OPG as load on such server was low.

g) Once NSE started Multicast TBT ("**MTBT**") at its co-location facility, the market share of OPG fell off the chart.

1.2 After the receipt of the aforesaid complaints, through various correspondences, NSE was advised to look into the matter. In response to the same, NSE made its submissions on the allegations stated in the complaint. To do a preliminary fact finding of the veracity of the complaints pertaining to co-location at NSE, a Cross Functional Team ("**CFT**") of SEBI officials was constituted. The CFT carried out preliminary examination of the allegations mentioned in the complaint and CFT submitted its report dated November 30, 2015.

1.3 The CFT report was submitted to the Technical Advisory Committee of SEBI ("**TAC**") and TAC recommended that for a detailed analysis of the allegations in the aforesaid complaints, an 'Expert Committee' under Professor Om Damani (Associate Professor, Dept. of Computer Science and Engineering, IIT Bombay) be constituted. The recommendation of TAC was accepted by SEBI and the 'Expert Committee', submitted its report to SEBI on March 02, 2016. Pursuant to the submission of the report by the 'Expert Committee' (hereinafter referred to as '**TAC Report**'), the report was forwarded to NSE and its response was sought. SEBI and TAC also met NSE's Board on July 07, 2016 to discuss the findings of the Expert Committee as contained in the report.

1.4 The major findings of the TAC Report with respect to the complaints dated January 08, 2015 and August 10, 2015 are stated below:

a) NSE TBT architecture was prone to market abuse thereby compromising market fairness and integrity, in that it provided quicker order dissemination to those who managed to login early. That is, if one entity is ahead of the other while logging in the morning, it gets information ahead of the other throughout the day. Further, it is not important to be absolutely the first one to login. It simply gives you probabilistic advantage to log-in as early as possible.

b) OPG tried to exploit this architecture by not only logging in 1st on select servers but it even tried to crowd out others by occupying 2nd, and 3rd positions on those servers.

c) OPG was always consistently logging in first on servers with better hardware in terms of Memory / Front Side Bus (FSB) speeds.

d) It also appears plausible that OPG and some other brokers were given preferential access to backup servers of NSE TBT system.

e) OPG gained materially from the exploitation of TBT architecture, in that, once MTBT was introduced, OPG's success in getting Unique Multi-Leg Option ("**UMLO**") trades executed reduced dramatically, while it did not fundamentally change for other brokers. Thus, OPG's earlier success in UMLO trades can be causally attributed to its exploitation of the weaknesses in the TBT architecture.

1.5 The findings of Expert Committee along with the TAC Report was forwarded to NSE. NSE in response, vide letter dated May 12, 2016, refuted the findings of the Expert Committee and, inter alia, submitted that:

a) The Primary Data Centre ("**PDC**") disseminates TBT data to the Dissemination Servers ("**DS**") in the sequence of each DS' connection to PDC daily and the sequence varies depending upon the time taken by the TBT application to start in each DSs. DSs distribute data to the ports in a sequential manner, but without waiting for all IPs within a Port to receive the data before disseminating data to the next Port. Members receive data through pre-allotted ports in the sequence of their daily connect and it cannot be manually tweaked. Due to variability at the DS, Port and log in level, even if a trading member logs in early, it may not receive data ahead of the others.

b) DSs connect to the PDC randomly. The time difference in receipt of data by one dissemination server relative to other DSs was miniscule (below 10 microseconds). Therefore no TM would receive any material advantage by virtue of connecting to one particular dissemination server over another.

c) Even considering for the sake of argument that a person is indeed first in the queue on a particular Port to receive information, it is not possible for a trading member to know its position or anyone else's position in the queue. In any case, data analysis reveals that there was no clamour by trading members for first logins.

d) The probabilistic advantage, if any, is available to all members who log in early and in a level playing field as provided by NSE any member could aspire for such an advantage.

e) None of the brokers, including OPG, was conferred with any unique advantage by NSE, allowing it to consistently login first on any Port on any server. Trading members are open to use technology efficiently to maximize their use of the NSE TBT data dissemination architecture. There is nothing inherently wrong with trading members competing to login first. Consistent early log-in by members in a level playing field is neither per se unfair, nor does it amount to market abuse. Any member could log-in early on its allotted server and Port.

f) No correlation could be drawn between alleged early access to data and a member's ability to successfully execute UMLOs.

g) NSE denies the finding in the TAC Report that NSE has not responded to the CFT's request for all relevant public communications, or has not co-operated in any manner for that matter.

1.6 The response of NSE was placed before TAC in the meeting held on August 11, 2016 and based on the deliberation with TAC committee on the response of NSE, the following instructions were communicated to NSE Board by SEBI, vide letter dated September 09, 2016:

a) NSE's Board shall immediately initiate an independent examination (including forensic investigation by an external agency) of all the concerns highlighted in the SEBI expert committee report, including lack of processes which allowed this to happen and collusion, if any, and fix accountability for the aforesaid breaches covering NSE and stock brokers, vendors and outsourced entities involved in the issue.

b) NSE's Board shall complete the said investigation and submit a comprehensive report to SEBI within a period of three months from the date of *the letter.*

1.7 As instructed, the NSE Board appointed Deloitte Touche Tohmatsu India LLP ("**Deloitte**") to conduct the forensic investigation. The 'Project Borse' report of Deloitte was submitted by NSE on December 23, 2016, inter alia, making the following observations:

a) Review of TBT system architecture indicated data was disseminated to members in a sequential manner whereby the member who connected first to the Point of Presence ("**POP**") server received the ticks (market feed) before the members who connected later. Hence, the system architecture of the TCP based TBT system was prone to manipulation;

b) Due to the sequential dissemination of information, ticks were disseminated faster to members connected on less crowded servers, thereby giving an advantage to such members.

c) In order to ensure that the norms of 'fair access' were not breached, it was possible for NSE to negate the advantage of connecting first by implementing a 'randomizer' which would randomly pick a connection to begin dissemination of data, rather than starting with the first connection each time. However, though NSE developed a randomizer in 2011 that was implemented only for Bucket POP servers. This was not replicated on the broader TBT systems.

1.8 Subsequently, vide letter dated February 28, 2017, NSE Board was, *inter alia*, advised to undertake a forensic audit in Cash Market ("**CM**") segment, Currency Derivatives ("**CD**") segment and Interest Rate Futures ("**IRF**") segment for the period 2010-15 and undertake necessary examination to estimate the benefits/ profits to the TMs through the alleged mechanism. NSE appointed M/s. Ernest & Young LLP (hereinafter referred to as '**EY**') to carry out forensic audit of CM, CD and IRF segments. EY submitted its reports dated May 18, 2018 for CM segment and CD/ IRF segment. NSE Board had also appointed Indian School of Business ("**ISB**") to undertake examination to estimate the benefits/ profits to the TMs who logged in first. ISB submitted its report on November 14, 2017.

1.9 After taking into consideration the EY report, TAC recommended that:

a) The architecture of NSE with respect to dissemination of TBT through TCP/IP was prone to manipulation / market abuse.

b) Some trading members were given preferential access to backup servers at NSE.

c) Brokers having an access to backup servers were having a potential access advantage over other trading members.

d) Trading members having multiple IPs have a potential access advantage over other trading members.

e) As the IPs were manually allocated and given the fact that the servers were not equally loaded and configured, selective manual distribution/ allocation of IPs could present potential access advantage over other trading members.

f) TAC agreed with the conclusion of EY that randomization was not implemented in TCP/IP TBT architecture and in absence of a randomizer, dissemination on each Port of a TBT server was sequential based on login time of a member. Therefore, such sequential dissemination could result in a potential advantage to preferred trading members.

g) TAC mentioned that from the email evidences and observations in EY report regarding reprimanding selected members for making connections to Secondary Server and not all, it can be concluded that preferential treatment was given to few brokers in terms of selective information.

1.10 The following Reports formed the basis for SEBI's investigation and the Show Cause Notices ("**SCN**s") issued in the instant matter –

TABLE I: TABLE OF REPORTS		
S.N.	**DATE**	**REPORT**
1	November 30, 2015	CFT Report
2	March 2, 2016	TAC Expert Committee Report
3	December 2016	Deloitte Report Project Borse – Forensic Review of Co–location Facility
4	November 2017	Indian School of Business ("ISB") Report – Profits earned by Co–located Trading Members Final Report
5	May 18, 2018	E&Y Report Project Kairos – Cash Market
6	June 2018	E&Y Report Project Kairos – Currency Derivatives and Interest Rate Futures
7	July 2018	Deloitte Report Project Regler – First/Early Connect and Connection to Secondary Server

1.11 Based on the complaints received, the findings in the TAC Report and Deloitte Report 2016, a Show Cause Notice (SCN) dated May 22, 2017 (**2017 SCN**) was issued to 15 Noticees. The said 2017 SCN mainly contained allegations with respect to - (i) the issue of preferential access given to certain trading members (**TMs**) while disseminating the TBT data feed (Ref: Paras 10.A to 10.G) and (ii) the issue of access to Non-ISPs for laying of Dark fiber within the exchange premises (Ref: para 10. H).

1.12 The 2017 SCN also contained other sub-issues, such as, the issue of non-cooperation by NSE and its Officers (Ref: para 10. I); the issue of weak / inadequate electronic record retention policy (Ref: Para 10.J); and the issue of NSE management being in the denial mode and not acting on the complaints forwarded to the exchange (Ref: para 10.K). Accordingly, citing Section 4 of the Securities Contract (Regulation) Act, 1956 ("**SCRA 1956**"), which deals with the "Grant of Recognition to Stock Exchanges" and the Object Clause (1) of the Memorandum of Association ("**MoA**") of NSE, relying on which the recognition was granted by SEBI to NSE, read with the obligations of exchanges under Regulations 41 (2), 47 and 48(1) of the Securities Contracts (Regulations) (Stock Exchanges and Clearing Corporations) Regulations, 2012 ("**SECC Regulations 2012**"), it was alleged in the 2017 SCN that NSE failed to ensure trading in a transparent, fair and

open manner and thereby failed to fulfil the objects envisaged in its MoA and the conditions of recognition.

1.13 Subsequently, after a detailed investigation was done for the period 2009-16, issues (i) and (ii) cited in the foregoing paragraph 1.11, were split into different SCNs in 2018. One set of SCNs issued on July 03, 2018 ("**2018 SCN**") detailed the allegations pertaining to Issue (i) stated above and was issued to 8 Noticees (including 6 out of the said 15 Noticees to whom the 2017 SCNs were issued, along with 2 additional Noticees). Subsequently, Supplementary SCNs were issued on July 31, 2018 (**2018 SSCN**), to cover a factual aspect of "Inconsistency in response of NSE" which was missed out to be mentioned in the earlier SCN issued on July 03, 2018, and was issued to the said 8 Noticees. The details of the names of Noticees in 2017 and 2018 are shown in the table hereunder:

Table II: Details of SCNs

S. N.	Noticees	Date of 2017 SCN	Date of 2018 SCN	Date of Supplementary SCN
1	National Stock Exchange of India Limited (NSE)	May 22, 2017	July 3, 2018	July 31, 2018
2	Ravi Narain	May 22, 2017	July 3, 2018	July 31, 2018
3	Chitra Ramkrishna	May 22, 2017	July 3, 2018	July 31, 2018
4	Anand Subramanian	May 22, 2017	July 3, 2018	July 31, 2018
5	R. Nandakumar	May 22, 2017	Not issued	Not issued
6	Mayur Sindhwad	May 22, 2017	Not issued	Not issued
7	Ravi Varanasi	May 22, 2017	Not issued	Not issued
8	Ravi Apte	May 22, 2017	July 3, 2018	July 31, 2018
9	Umesh Jain	May 22, 2017	July 3, 2018	July 31, 2018
10	Mahesh Soparkar	Not issued	July 3, 2018	July 31, 2018
11	Deviprasad Singh	Not issued	July 3, 2018	July 31, 2018
12	Sankarson Banerjee	May 22, 2017	Not issued	Not issued
13	G. Shenoy	May 22, 2017	Not issued	Not issued
14	Suprabhat Lala	May 22, 2017	Not issued	Not issued
15	Nagendra Kumar SRVS	May 22, 2017	Not issued	Not issued
16	N. Murlidaran	May 22, 2017	Not issued	Not issued
17	Jagdish Joshi	May 22, 2017	Not issued	Not issued

(i) Noticee no. 10 & 11 were added in 2018 SCN;
(ii) Noticees 5, 6, 7, 12 to 17 were covered only in 2017 SCN.

1.14 In this context, it is clarified that this order primarily deals with the adjudication of Issue (i) of 2017 SCN as elaborated in 2018 SCNs, relating to the requirement of the stock exchange to ensure equal, unrestricted, transparent and fair access to all persons and the sub-issues contained in paras 10.I to 10.K of the 2017 SCN, to the extent it relates to Issue (i) above. This order is being passed after granting hearing to all the 15 Noticees who were show-caused in 2017. A summary of the issues under the 3 sets of SCNs is brought out in paragraph No. 2.

2.0 Summary of Allegations contained in the 2017 SCN, 2018 SCN and Supplementary SCN of 2018

2.1 The 2017 SCN *inter alia* alleged the following:

a) TCP/IP based TBT architecture was allegedly prone to manipulation which compromised market fairness and integrity. NSE did not consider the principles of fair and equitable access while taking a decision regarding the system architecture;

b) NSE allegedly failed to implement a 'randomizer' in its TBT architecture. Although, NSE had developed a randomizer in 2011 and implemented it for the Bucket POP servers, this was not implemented on TBT servers;

c) NSE allegedly failed to implement a load balancer and did not adhere to its policy for allocation of IPs, and more than 30 IPs were allocated on some ports in breach of the NSE's policies. This put members who were on more crowded ports at a disadvantage and provided an unfair advantage to members on less crowded ports;

d) NSE allegedly did not have defined policies and procedures with regard to Secondary Server access, and the guidelines were not issued as a circular. By selectively reprimanding some brokers connecting to the Secondary Servers (and not others), and allowing some brokers to continue connecting regularly to the

Secondary Servers, NSE allegedly showed differential treatment to brokers;

e) NSE allegedly failed to maintain backups or records for:

(i) The configuration file (which captured parameters like IP address, Port number and vendor file, and sequence in which ports would receive TBT data); or

(ii) Requests for change of the configuration file by members.

f) There were allegedly no policies and procedures for allocation/ mapping of the IPs of members to the dissemination servers, nor was there a Standard Operating Procedure ("**SOP**") to deal with requests for change in IP mapping to a particular server. Such requests were left to the discretion of the NSE's Project Support and Management ("**PSM**") Team, which has shown differential treatment / responses to members for such requests;

g) The Noticee has allegedly violated the provisions of Section 4 of the Securities Contracts (Regulation), Act 1956 ("**SCRA**"), by failing to fulfil its main object of ensuring fair dealing;

h) The Noticee has allegedly failed to comply with Regulation 48 of the Securities Contracts (Regulation) (Stock Exchanges and Clearing Corporations) Regulations, 2012 ("**SECC Regulations**") in view of its alleged failure to cooperate with SEBI, the SEBI External Committee appointed by SEBI, and the forensic auditor appointed by the Noticee on SEBI's direction, and to provide requisite information as sought by SEBI; and

i) The Noticee has allegedly failed to comply with Regulation 41(2) of the SECC Regulations by giving preferential access to certain trading members.

j) The SCN alleged that OPG Securities gained an advantage in the following ways:

(i) OPG Securities was allegedly consistently the first member (or among the first three members) to connect to the TBT servers;

(ii) OPG Securities would allegedly regularly connect to the Secondary Server, and the Noticee took no action to prevent this despite having knowledge of this (and its advantages); and

(iii) OPG Securities had allegedly mapped multiple IPs to a single server such that it would often get the first 2 or even 3 connections, to that server, and 'crowd out' other members. The SCNs allege that this could not have been possible without active connivance and knowledge of the Noticee employees and preferential treatment of OPG Securities by the Noticee.

k) The management of the NSE was allegedly in denial mode and has not acted on the complaints forwarded to it.

l) The 2017 SCN also alleges that the NSE has not cooperated with SEBI, the SEBI External Committee as well as the forensic auditor appointed by it (i.e., Deloitte), as NSE also failed to provide requisite information as sought by SEBI and Deloitte.

2.2 Besides, reiterating and elaborating the above allegations, the 2018 SCN contained the following allegations against NSE and its employees:

a) NSE failed to comply with Regulation 42(2) of the SECC Regulations and Clause 3 of SEBI circular CIR/MRD/DP/07/2015 dated May 13, 2015 by failing to ensure fair, transparent and equitable access to all trading members in respect of the co-location facility;

b) NSE failed to comply with clause 4(i) of SEBI circular CIR/MRD/DP/09/2012 dated March 30, 2012 by failing to have adequate controls and policies in respect of the Co-location facility, thereby making the system prone to manipulation; and

c) NSE and its employees allegedly violated Sections 12A(a), (b) and (c) of the SEBI Act, Regulations 3(a), 3(b), 3(c), 3(d) and 4(1) of the PFUTP Regulations, by colluding with OPG to provide

preferential access to OPG, and thereby indulged in fraudulent and unfair trade practices.

2.3 The supplementary SCN issued to NSE and seven of its employees in 2018 contained the following allegations :

a) that NSE gave inconsistent replies to Deloitte with respect to the identification of Primary and Secondary Servers and the data relating to the same, which later on NSE corrected, when the same was pointed out by Deloitte; and

b) that in view of absence of proper documentation and recording, NSE and its officials had given the varied response, stated above.

3.0 Summary of Replies of NSE and other Noticees

3.1 In response to the SCNs, NSE vide reply dated November 20, 2018 *inter alia* submitted that:

a) The 2017 SCN ought to be subsumed and superseded by the 2018 SCN, this reply is being filed on behalf of the Noticee jointly to the 2017 SCN and 2018 SCN and addresses the facts, allegations and contentions raised in both the SCNs;

b) Anonymous and pseudonymous complaints must not be given credence. Further, a show cause notice cannot be issued on the basis of such complaints alone, without there being adequate independent findings supported by evidence;

c) TCP/IP-based TBT architecture by NSE was a bona fide choice made in good faith, keeping in mind the legitimate considerations of market safety, reliability and integrity, and with a view not to burden the market participants with the complex infrastructure requirements of Multicast TBT.

d) The allegation of collusion by NSE's employees to provide preferential access to OPG and/ or fraudulent or unfair trade

practices by NSE, falls squarely and clearly in the realm of surmise and conjecture. The conjecture lies in the allegation that certain acts *"could only have been possible"* with the connivance of NSE employees.[8] However, such allegations are not supported by the findings of any of the forensic experts let alone by means of other any independent evidence — which fact is also recorded in the 2018 Investigation Report;

e) The SCNs have not objectively quantified either in terms of time or in terms of money, any advantage allegedly gained by any broker by connecting first to the system. The SCNs do not adduce any facts or evidence that demonstrate that this so-called advantage in fact translated to profits for any broker. In fact, the reports submitted by EY and ISB clearly belie any inferential conclusion that connecting first would give brokers any specific advantage;

f) The 2017 SCN was issued prematurely without investigation;

g) Until the issuance of the 2017 SCN, SEBI had not issued any summons or examined any employee of the Noticee or any other person in relation to the allegations set out in the 2017 SCN. In its letter dated October 15, 2018, SEBI has admitted that at the time of issuing the 2017 SCN, it had not even put together an investigation report. When the Noticee submitted the 2017 Consent Application, the same was returned on February 26, 2018 on the ground that *"investigation is pending apparently for the same cause of action".*

h) The decision to run parallel proceedings for the same cause of action is not consistent with applicable legal principles, and indeed, SEBI's own approach in other cases. Continuation of parallel proceedings under the SCNs would result in double jeopardy;

i) The SCNs of 2017 and 2018 are substantially similar except that the charge of non-cooperation made in the 2017 SCN has not been included in the 2018 SCN, and charges under the PFUTP Regulations have been introduced in the 2018 SCN;

j) SCNs are silent on the nature of the measures contemplated;

k) SCNs are now infructuous - It is well settled that the powers under these provisions are remedial in nature and are intended largely to prevent any further detrimental act from occurring or to remedy a situation, rather than to inflict punishment. Various measures have already been taken, both on its own and pursuant to directions issued by SEBI. These include concrete measures to enhance the Noticee's systems; bolstering of its processes; finessing its policies; implementing checks and balances; increasing the scope of the functions of its independent systems;

l) Noticee has taken disciplinary action against OPG along with other trading members, with regard to the issue of access to Secondary Server *vide* action taken by the Disciplinary Action Committee ("**DAC**") by its order dated September 04, 2017;

m) The choice of TCP/IP architecture for TBT was made in good faith and was fair and equitable;

n) The SCNs have selectively relied on the reports of external agencies, and have not considered findings that are material to the issues raised;

o) The Noticee's TBT architecture was not 'prone to manipulation / market abuse' as alleged by SEBI and the Noticee did not give 'preferential access' to certain brokers. Lack of automation, randomizers and load balancers did not make the TCP/IP architecture 'prone to manipulation';

p) No brokers were given Preferential Access and the Noticee has acted in a fair and equitable manner. The allegations that the Noticee has colluded with brokers and / or violated the provisions of the PFUTP Regulations/ Section 12A of the SEBI Act, are without merit.

4.0 Details of Hearing and Cross-examination

4.1 Noticees submitted their replies and attended the hearings and cross examination as provided in the table below:

Table III

S. N.	Noticees	Date	Represented by
1	NSE	September 21, 2018, January 16, 22, 23, 29 & 30, 2019	Shri Somasekhar Sundaresan, Advocate
2	NSE Employees (i) Ravi Narain, (ii) Ravindra Apte, (iii) Mahesh Soparkar, (iv) Deviprasad Singh	February 5, 2019	Shri Pesi Modi, Senior Counsel
3	NSE Employees (i) Sankarson Banarjee, (ii) Mayur Sindhwad, (iii) Suprabhat Lala, (iv) G. Shenoy, (v) R. Nandkumar, (vi) N Murlidaran, (vii) Jagdish Joshi, (viii) Nagendra Kumar, (ix) Ravi Varanasi	February 7, 2019	Shri V R Dhond, Senior Counsel
4	Umesh Jain	February 13, 2019	Shri Kumar Desai, Advocate
5	Chitra Ramkrishna	February 13, 2019	Shri Piyush Raheja, Advocate

4.2 Considering the request by the Noticees, they were allowed an opportunity of cross-examination of the following expert witnesses as follows:

Table IV

Date	Expert witness	Concerned Report
February 26, 2019	Mr. Amit Rahane	E&Y Report
February 27, 2019	Prof. Thirumalai	ISB Report
	Prof. Om Damani	TAC Report
February 28, 2019	Shri Jayant Saran	Deloitte Report

5.0 Preliminary Issues and Issues on Merit

5.1 Preliminary Issues:

Issue I: Whether the Principles of Natural Justice (PNJ) with respect to inspection of documents and cross examination have been complied with in the instant proceedings?

Issue II: In view of the various remedial measures already undertaken by NSE, whether the proceedings initiated by SEBI in exercise of its powers under Section 12A of the SCRA read with Regulation 49 of the SECC Regulations and Sections 11(1), 11(2) (a), 11(2) (j) and 11B of the SEBI Act, will survive at this point of time?

Issue III: Whether the SCNs in the instant case are good in law if the proposed directions against the Noticees are not indicated?

5.2 Issues on Merit:

Issue I: Whether the TCP-IP architecture for TBT data feed provided fair and equitable access to all the TMs;

Issue II: Whether access to Secondary Server had advantage of receiving information early and what was the mechanism in NSE to monitor the Secondary Server misuse?

*Issue III: Whether NSE can be held liable for PFUTP violation under PFUTP Regulations, in the given circumstances**?***

Issue IV: If yes, (i) whether there was any role of employees of NSE in the violation and (ii) whether there was any non-cooperation on the part of NSE and its employees?

6.0 Consideration of Preliminary Issues

6.1 *Issue I: Compliance with Principles of Natural Justice*

6.1.1 After the issuance of the SCNs, many of the Noticees, including NSE and Chitra Ramkrishna, requested for inspection of documents and cross examination of witnesses. NSE vide letter dated September 4, 2018 requested for more than 60 documents, which included all complaint letters received by SEBI in relation to the investigation referred to in the SCNs and all correspondence between SEBI and any other government department/ authority/ agency (including the Ministry of Finance, Ministry of Home Affairs, CBI, SFIO etc.) in relation to the investigation or the underlying cause of actions referred to in the SCNs. Similarly, Noticee No. 3 (Chitra Ramkrishna) *inter alia* sought SEBI inspection reports for the period from 2009 to 2015 and System Audit Report of NSE for the period from 2009 to 2015. She also sought cross examination of 21 witnesses/ experts. Subsequently, during the stage of initial hearing, NSE, through AZB & Partners and those NSE employees, who were represented by Manilal Kher Ambalal & Co. (MKA), raised the issue of non-furnishing of requested documents and allowing cross examination of witnesses, before getting into the substantive merits of the matter.

6.1.2 I have examined all the requests for documents, item by item, and have satisfied myself that all the documents that are relevant for defence were provided to the Noticees. I note that in its last letter dated January 17, 2019, NSE requested for 18 more documents. In response to the same, SEBI vide letter dated January 22, 2019 forwarded all the requested documents, except the report of Accel trading submitted by OPG to SEBI and the reply of Anand Subramanian (Noticee No. 4). The report of Accel Trading was not provided stating that the same was prepared at the instance of OPG, post the issuance of SCN to OPG and therefore was not a material relied upon by SEBI as the basis for initiation of the subject proceedings. As regards the reply of Anand Subramanian, it is stated that despite SEBI seeking the Noticee's consent to share his reply with co-Noticees, he had not given his consent for the same. As regards SEBI's Inspection Report and System Audit Report for the relevant period (2009 to 2015), as sought by Chitra Ramkrishna, it is stated that the

proceedings did not emanate from observations in these reports nor did the reports contain any material relevant for the issues of instant adjudication. Such request was not made with the intention of defending the case on merits but was merely intended to dilate/ protract the proceedings. In light of the above, it is observed that all the inspection requests have been duly considered and all necessary documents have been furnished, in full compliance of the mandates of principles of natural justice, to enable the Noticees to defend themselves. The plea of inadequate or incomplete inspection no longer survives. It may also be relevant to point out that at the request of the Noticees, it was agreed to conduct the quasi-judicial proceedings jointly for all the Noticees. Further, upon the request of the Noticees, an opportunity of cross-examination of the relevant experts was granted to the Noticees and the same was commonly availed by all the Noticees. Amongst the Noticees, Anand Subramanian did not appear or depute a representative for the hearing, as indicated at Table III above.

6.2 ***Issue II: Implementation of Remedial measures by NSE and maintainability of SCNs***

6.2.1 One of the preliminary objections raised by NSE pertains to maintainability of 11B proceedings against it. In its reply dated November 20, 2018, it has contended that the SCNs have been issued under Section 12A of the SCRA read with Sections 11(1), 11(2)(a), 11(2)(j) and 11B of the SEBI Act, and Regulation 49 of the SECC Regulations and that it is well settled that the powers under these provisions are remedial in nature and are intended largely to prevent any further detrimental act from occurring or to remedy a situation, rather than to inflict punishment. It has further contended that SEBI has not proposed any additional measure(s) that need to be implemented by the Noticee. The abovementioned provisions do not enable SEBI to impose penalties for violation of provisions of the SEBI Act or the Regulations framed thereunder and the SEBI Act confers on SEBI only an executive power under Section 11B, read with Section 11, to prevent an immediate adverse situation from arising or spreading, which cannot be used by SEBI to adjudicate matters or impose penalties. Since the Noticee has already addressed the issues raised in the SCNs and has also complied

with all the directions issued by SEBI and since SEBI has not informed the Noticee of any further actions that SEBI believes are required in the matter, no further orders may be passed against the Noticee under the abovementioned provisions, rendering the SCNs infructuous. To buttress the contention that powers under Section 11 and 11B are merely executive in nature which are for immediate preventive action and cannot be used to impose penalties, the Noticee has relied upon the observations of the Hon'ble Securities Appellate Tribunal (SAT) in the cases of Sterlite Industries, Anand Rathi, Roopram Sharma etc.

6.2.2 I have considered the abovementioned preliminary objection raised by NSE regarding the maintainability of the current proceedings under sections 11 and 11B of the SEBI Act. I note that though the Noticees have contended that sections 11 and 11B are only executive in nature by citing the abovementioned cases, the subsequent judicial pronouncements have clearly recognized the wide scope of enforcement directions under section 11B for preventive as well as remedial purposes, whether pending or after causing to make an enquiry. In this regard, it is relevant to refer to the case of ***Karvy Stock Broking Ltd. v. SEBI 2007 73 SCL 261 SAT***, wherein the Hon'ble SAT *inter alia* stated the following:

> *"Parliament by Act 9 of 1995 introduced Section 11B with effect from 25.1.1995. This section enables the Board to issue directions to any intermediary of the securities market or any other person associated therewith if it thinks it is necessary in the interests of investors or orderly development of securities market or to prevent the affairs of any intermediary or any other person referred to in Section 12 from being conducted in a manner detrimental to the interests of investors or securities market or to secure the proper management of any such intermediary.* ***For regulating the securities market and with a view to protect the same, the Board started issuing interim orders/directions under this newly added provision to keep the erring intermediaries or other delinquents associated therewith out of the market. The exercise of this power was challenged in different courts and even though the same was upheld****, Parliament thought that the provisions of the Act were inadequate and in its wisdom amended Section 11 by introducing Sub section (4) therein with effect from 29.10.2002 and gave specific power to the Board to pass interim as well as final orders in the interests of investors or the securities market."* (Emphasis supplied)

6.2.3 Further, the Hon'ble SAT in the case of ***Libord Finance Ltd. v. SEBI 2008 86 SCL 72 SAT***, has clearly observed that the preventive and remedial measures under Section 11/ 11B may also have penal consequences. In the said case, it observed that –

> *"When such directions are issued, the object is not to punish the delinquent but to protect and safeguard the market and the interest of the investors which is the primary duty cast on the Board under the Act.* ***The directions may result in penal consequences to the entity to whom those are issued but that would be only incidental.*** *The purpose or the basis of the order or the directions would nevertheless be to protect the securities market and the interest of the investors."* (Emphasis supplied)

6.2.4 Thus, any direction under section 11B would satisfy the test of a remedial measure, if it is intended to restore confidence in the integrity of the securities market. Any interpretation seeking to restrict the powers of SEBI under section 11B as being executive in nature, is contrary to the plain reading of the provision and the well settled legal position that recognizes SEBI's powers to pass enforcement orders under section 11B. In any case, I note that the SCN in the instant case is also issued in exercise of SEBI's powers under section 11(4) of the SEBI Act, and for exercising powers under section 11(4), it may not be necessary to specify the nature of directions, the only condition being that SEBI exercises such powers for the purpose of protecting the interest of investors. The decision of the Hon'ble Supreme Court in the case of ***SEBI v. Pan Asia Advisors (AIR 2015 SC 2782)*** further reinforces the above position in the following words:

> *"Under Section 11(4)(a) and (b) apart from and without prejudice to the provisions contained in Sub-section (1), (2) (2A) and (3) as well as Section 11B, SEBI can by an order, for reasons to be recorded in writing, in the interest of investors of securities market either by way of interim measure or by way of a final order after an enquiry, suspend the trading of any security in any recognized stock exchange, restrain persons from accessing the securities market and prohibiting any person associated with securities market to buy, sell or deal in securities. On a careful reading of Section 11(4)(b), we find that the power invested with SEBI for passing*

such orders of restraint, the same can even be exercised against "any person". Under Section 11B, SEBI has been invested with powers in the interest of investors or orderly development of the securities market or to prevent the affairs of any intermediary or other persons referred to in Section 11 in themselves conducting in a manner detrimental to the interest of investors of securities market and also to secure proper management of any such intermediary or person. ... The paramount duty cast upon the Board, as stated earlier, is protection of interests of investors in securities and securities market. In exercise of its powers, it can pass orders of restraint to carry out the said purpose by restraining any person. Section 12A of the SEBI Act, 1992 creates a clear prohibition of manipulating and deceptive devices, insider trading and acquisition of securities. Section 12A(a), (b) and (c) are relevant, wherein, it is stipulated that no person should directly or indirectly indulge in such manipulative and deceptive devices either directly or indirectly in connection with the issue, purchase or sale of any securities, listed or proposed to be listed wherein manipulative or deceptive device or contravention of the Act, Rules or Regulations are made or employ any device or scheme or artifice to defraud in connection with any issue or dealing in securities or engage in any act, practice or course of business which would operate as fraud or deceit on any person in connection with any issue dealing with security which are prohibited. By virtue of such clear cut prohibition set out in Section 12A of the Act, in exercise of powers under Section 11 referred to above, as well as 11B of the SEBI Act, it must be stated that ***the Board is fully empowered to pass appropriate orders to protect the interest of investors in securities and securities market and such orders can be passed by means of interim measure or final order*** *as against all those specified in the above referred to provisions, as well as against any person."* (Emphasis supplied)

6.2.5 The abovementioned judicial pronouncements clearly recognize SEBI's wide powers under Section 11/11B of the SEBI Act, 1992 to take appropriate preventive and remedial measures to protect the interest of investors and the securities market, irrespective of whether they have penal consequences. However, the NSE has additionally contended that it has already taken appropriate measures in respect of the alleged violations to rectify the defects, which renders the instant enforcement proceedings infructuous. In this regard, I note that the adoption of remedial measures by the Noticee does not obviate the need for pursuing enforcement proceedings by the regulator, as the purpose of such

proceedings is not only to enforce remedial measures but also to prevent such violations from happening in future, by issuing suitable directions which act as a deterrent. Accordingly, I find that the instant proceedings are maintainable.

6.3 ***Issue III: The Need to indicate all directions in SCN***

6.3.1 NSE in its preliminary submission has also objected to the SCNs on the ground that the SCNs are silent on the measures proposed to be taken against the Noticee. The SCNs merely direct the Noticee to show cause why "suitable directions" under Section 11(4) read with Section 11B of the SEBI Act, should not be issued against it. Sections 11 and 11B of the SEBI Act empower SEBI to pass such orders or directions that SEBI believes are in the interests of the securities market and investors and these sections have in fact been used by SEBI to issue an extremely wide range of directions, purporting to act in the interests of investors and the securities market. Therefore, principles of natural justice make it incumbent for SEBI to state the specific measures that are contemplated against the Noticee, so that the Noticee is able to present its case on the suitability of the directions/ measures proposed. NSE further contended that the law is well settled that a statutory authority is bound to set out the exact nature of the measures that it proposes to take in a show cause notice, failing which, the proceedings would be liable to be quashed as being in violation of the principles of natural justice. Thus, SEBI must clarify the exact measures it is contemplating, to enable the Noticee to make effective submissions, failing which these proceedings would violate natural justice and are therefore infirm. During the hearing, some of the Noticees insisted on getting an opportunity of being heard on the directions, at a later stage.

6.3.2 I have considered the abovementioned contentions of the Noticee. I note that the SCN has been issued under Sections 11, 11(4) and 11B. Under the said provisions, a variety of measures can be taken against an entity,

depending upon their suitability in the context of facts and circumstances of each case. The choice of the most appropriate measures is entirely driven by the quality of evidence adduced / submissions made during the quasi-Judicial proceedings and the extent to which the charges stand proved or otherwise. In the circumstances, opting for the most appropriate measure becomes feasible only after adjudging the matter, and not at the time of issuance of the SCN. Moreover, this provides ample leeway to the Competent Authority to choose the most appropriate measure without any bias or limitations contained in the SCN, depending upon the gravity of the facts and circumstances of each case, once the violation is established. As regards the plea for a hearing on proposed directions, it is stated that such a separate hearing would lead to further delay in concluding the enforcement proceedings and may lead to litigation at different stages, leading to further uncertainties. Hence, I do not find merit in the said submissions.

7.0 Introduction to NSE TCP/IP TBT System Architecture

7.1 Before proceeding to take up the issues on merit, a detailed layout of the NSE trading architecture along with the related technology terms, as it existed then, would be required as a prelude to consider the issues on merit.

7.1.1 Algorithmic trading is a method of executing a large order using automated pre–programmed trading instructions, relying on complex mathematical formulas and high speed computers, accounting for variables such as time, price, and volume to send small slices of the order out to the market over time. High Frequency Trade ("**HFT**") is a type of algorithmic trading characterized by high speeds, high turnover rates, and high order–to–trade ratios that leverages high–frequency financial data and electronic trading tools. The key factors that drive HFT are highly sophisticated algorithms, instantaneous access to order books/ trades, co–location and very short–term investment horizons.

7.1.2 NSE has two price feed streams – one is the limited depth Broadcast (UDP stream), which is available on VSAT network and leased line networks and the other is TBT, which reflects every change in the order book. Due to the large size of the price information, TBT is available in co-location. TBT information was earlier disseminated over TCP/IP wherein the information is delivered one–by–one. An alternative to TCP/IP was Multicast Protocol wherein TBT data is broadcasted to recipients at a common point using a broadcast address (like radio broadcasts wherein listeners tune into the frequency of the station).

7.1.3 Vide a Circular dated August 31, 2009, NSE informed its TMs that it was providing a co–location facility (a service offered by NSE to its TMs to locate their trading systems within its premises) for their Direct Market Access ("**DMA**") and ALGO IT infrastructure in order to enable them to get faster access to information regarding price feeds and market movements thereby helping in swift execution of trades by TMs.

7.1.4 Further, vide Circular dated December 03, 2009, NSE offered a new category of connectivity viz., Category 'T' for market data TBT, which included all events resulting in changes in the order book such as order entry, modification, cancellation, trades, etc. A TM's application for allocation of rack space for a particular market segment in the co–location facility, if approved by NSE, would result in such TM being allowed to place its Servers in the premises (data centre) of the Exchange. Such TM would be provided with a registration enablement e–mail/ allotment letter containing log–in details, primary POP Server and secondary POP Server IP addresses, Rack no., TBT IP address (these are explained in the subsequent paragraphs of this Order), etc.

7.1.5 NSE's TBT data feed was disseminated to TMs only through the TCP/IP protocol until April 06, 2014, when the alternative of Multicast was introduced initially to replace the TCP feeds. Eventually, both systems were provided to TMs in parallel. Dates of TBT rollout in various market segments under TCP/IP and Multicast Protocol transmission are as under.

Table V:		
Segment	**TCP/IP TBT Introduction Dates**	**Multicast Protocol TBT Introduction Dates**
Futures & Options	June 1, 2010	April 7, 2014
Cash Market	July 2010	November 10, 2014
Currency Derivatives	March 16, 2011	April 7, 2014

7.1.6 The year–wise statistics of TMs availing of co–location, TBT IP and MTBT (page 12 of CFT Report) are as under –

TABLE VI						
NO. OF TMS AS ON	**31.03.2010**	**31.03.2011**	**31.03.2012**	**31.03.2013**	**31.03.2014**	**31.03.2015**
AVAILING CO–LOCATION FACILITY	25	80	79	95	98	115
HAVING TBT IP	NA	45	65	72	85	72
AVAILING MTBT FACILITY	NA	NA	NA	NA	NA	77

7.1.7 NSE co–location had commenced in 3 phases (with full allocation in Phase I and almost full allocation in Phase II and III) as under –

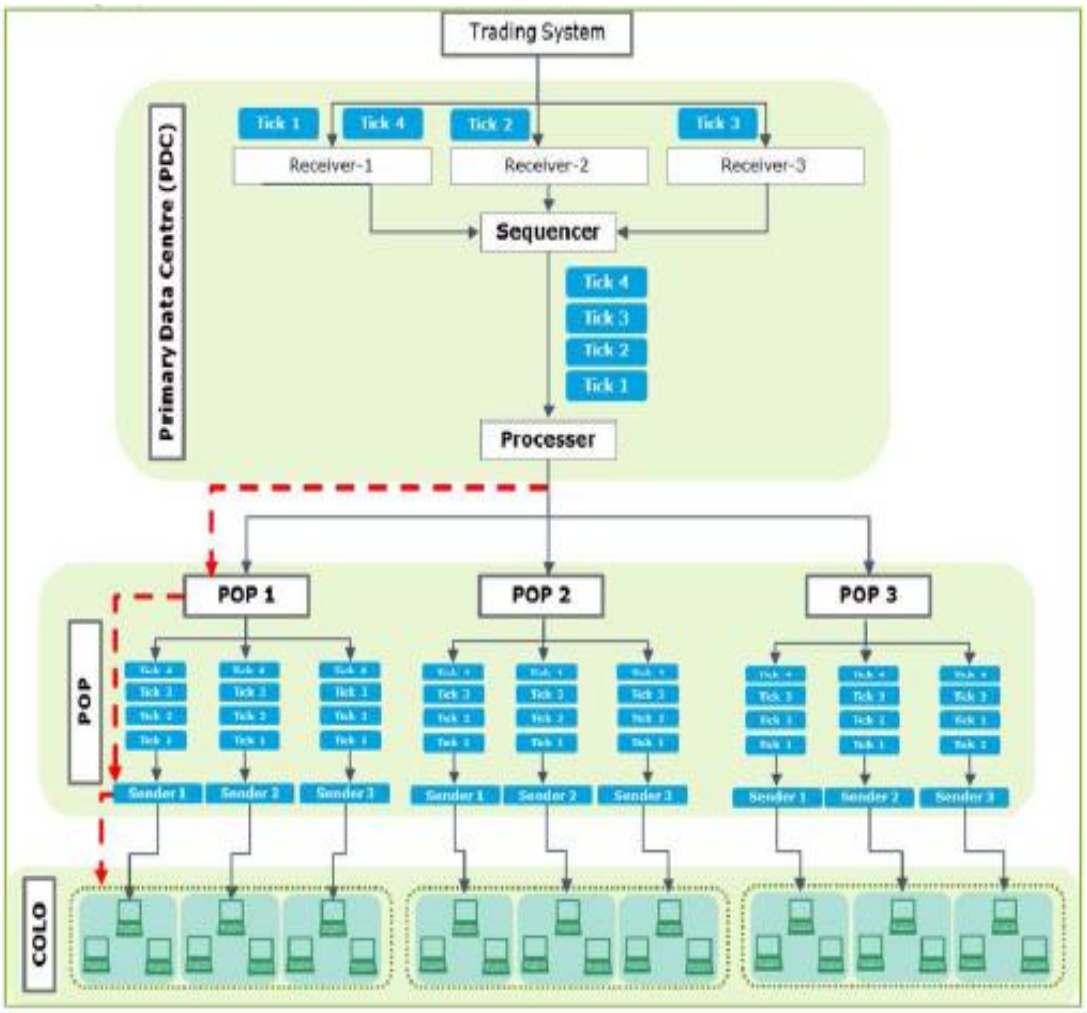
TABLE VII					
PARTICULARS	**PHASE I F. Y. 2009–10**	**PHASE II F. Y. 2010–11**		**PHASE III F. Y. 2014–15**	
	FULL	**FULL**	**HALF**	**FULL**	**HALF**
CAPACITY	49	53	68	11	82
ALLOCATED	49	52	64	9	73

7.1.8 The TCP/IP based TBT Dissemination Server System ("**TCP/IP TBT System**") architecture as understood from the Reports mentioned at paragraph 1.10 of this Order to the extent relevant for the purpose of adjudication of the issues in the instant proceedings, is explained as under:

A. In the TCP/IP TBT System, the data information was disseminated by NSE through TBT mode where each '*tick*' constitutes an information packet of any market event (new order, cancel order, modify order or trade) with a uniquely identified '*tick sequence*

number'. Every '*tick'* of a scrip/ instrument i.e. any new order/ modification/ cancellation/ trade will affect the order book of that scrip/ instrument as multiple '*ticks'* processed together form the state of the market book.

B. A graphical representation of the TBT data dissemination system at NSE is placed below *[Refer pages 12 and 78 of the Deloitte Project Borse Report and as also confirmed by NSE to Deloitte vide e–mail dated October 26, 2016]*:



7.1.9 *Data Flow* – PDC *to POP Server*

A. Data flowed from the Communication Gateway to the Matching Engine (which matches data based on price–time priority), which in

turn sent the data to the Trading System/ Post Trade ("**PT**"). The PT disseminated order/ trade data to the PDC.

B. The PDC processed the data received from the PT and transmitted it to the POP Server. The PDC had three components i.e. Receiver, Sequencer and Processor. The functions of these components are described hereunder:

(i) **PDC Receiver** – Received the data from the PT and transmitted it to the Sequencer.

(ii) **PDC Sequencer** – Arranged the data from multiple PDC Receivers in sequence and transmitted it to the PDC Processor for further processing.

(iii) **PDC Processor** – Created TCP Server sockets and listened for any connection requests from the POP Servers. No authentication was performed before the POP Receiver's connection request was accepted. The PDC Processor batched and compressed the data received from the PDC Sequencer.

(iv) Thereafter, the batched and compressed data received from the PDC Sequencer was disseminated to the POP Servers in the order of array/ dissemination sequence for the day. An array is formed at the PDC based on the login time of the respective POP Server i.e. POP Server which logs in first to a PDC on a trading day will be ranked first and the other POP Servers second and third, etc. The data is sent in a sequence in which each POP Server would login on a given day. The order in this array may change from day to day, depending upon the log in sequence of the POP servers.

(v) In its review of the TCP/IP TBT architecture, E&Y have also confirmed the aforementioned at pages 23–24 of Project Kairos Report (CM segment) and pages 24–25 of Project Kairos Report (CD and IRF segments).

(vi) The TAC Report has stated that every *'tick'* is distributed by PDC to POP Servers in round–robin fashion where data is first sent to all Primary POP Servers and thereafter to the Secondary POP Server (see page 10 of the TAC Report).

(vii) The dissemination sequence to POP Receiver does not change even if a POP gets disconnected on that trading day and reconnects.

7.1.10 Data Flow – POP Server to TM

The POP Server is a disseminating server that had two components i.e. Receiver and Sender, which functioned in the following manner:

(i) **POP Receiver** – Received the data from the PDC and sent it to the POP Sender.

(ii) **POP Sender** – Transmitted the data received from the POP Receiver to the *co–location* TM connected to each Port of that POP Sender. There were three POP Sender processes (Ports) on each POP Server in the F&O and CM segments. The CD segment had only two POP Sender processes (Ports). Each POP Sender was assigned a list of *co–location* TMs who could connect to it. *Each port / POP sender was configured with parameters such as – POP server IP address; a port number to which a TM will connect and the TM's IP address, User ID, Password, organization and status active or disabled). Accordingly, those TMs whose IP address is mapped to a port/ POP sender will be able to connect to that particular POP Sender.*

(iii) An array/ dissemination sequence is also maintained by each Port (an array is formed at the Port based on the login time of each TM on such Port i.e. earliest login TM is ranked first with the next TMs being ranked second and third, etc.). The login time referred here is the order in which the TM connects to the POP Server. The data is

sent in a sequence in which the co–location user/ TMs were present in the array.

(iv) E&Y have stated that the Ports of a POP Server would start in the sequence of Port 10980, 10981 and 10982 (pages 23–24 of Project Kairos Report CM segment) and Port 10970 and 10971 (pages 24–25 of Project Kairos Report CD and IRF segments). However, the order of receipt of data at each Port was not defined in the source code.

(v) On page 10 of the TAC Report, it has been stated that the Primary and Secondary POP Servers, in turn, deliver the *'tick'* to all clients connected to such POP Servers in first–cum–first–serve fashion ("**FCFS**") and the FCFS order is fixed by the order of login on the POP Server and stays fixed throughout the day. No Port level dissemination of data has been analysed in the aforementioned Report.

(vi) In response to certain queries raised by SEBI vide e–mail dated April 18, 2018, Deloitte (vide e–mail dated May 3, 2018) stated that based on the Source Code analysis and the network diagram, the data from a POP server will be disseminated first to Port 1, then to Port 2 and then to Port 3. However, as stated in the 'Technical Document' (prepared by Deloitte on the basis of their understanding of the TBT Source Code and confirmed by NSE vide e–mail dated October 26, 2016), there is no version or backup maintained for the configuration files. Also, there are no change requests for the modifications in the configuration files maintained. Hence, it cannot be ascertained whether for period of their review (2010–2015) data was first sent to Port 10980, 10981 and then to 10982. Deloitte have also confirmed that their analysis was limited to ascertaining whether the *data* was disseminated sequentially, broadcasted or multicast. The subsequent flow of data at Port level was not analyzed.

(vii) NSE's reply dated May 12, 2016 (to the findings of the CFT Report/ TAC Report) states that "*a POP Server disseminated data to the Ports in a sequential manner but without waiting for a Port to in turn*

complete its dissemination to all the TMs IPs under it. Within a Port, the data is disseminated in the order of the TM's login every day…"

(viii) The TM's rank in the dissemination sequence in the port does not change even if a TM gets disconnected on that trading day and reconnects.

7.1.11 The details of Primary POP Servers during the period 2009–2016 (forwarded to SEBI vide NSE's e–mail dated May 24, 2018) are provided below –

TABLE VIII

SEGMENT	SERVER	PERIOD FOR WHICH SERVER WAS PRIMARY	SERVER IP
FUTURES & OPTIONS	TBTLV8	14.06.2010 – 27.01.2012	–
	TBTCLV3	19.01.2011 – 01.02.2012	–
	TBTLV14	05.08.2011 – 02.02.2012	–
	TBTLV19	09.01.2012 – 23.01.2012	–
	TBTLV22	23.01.2012 – 30.01.2012	–
	TBTCOLO21	30.01.2012 – 02.12.2016	172.28.124.21
	TBTCOLO23	02.02.2012 – 01.04.2016	172.28.124.23
	TBTCOLO24	03.02.2012 – 01.04.2016	172.28.124.24
	TBTCOLO26	31.01.2012 – 01.04.2016	172.28.124.26
CASH MARKET	TBTLV5	01.06.2010 – 30.01.2012	192.168.7.101
	TBTLV15	08.08.2011 – 01.01.2012	192.168.7.66
	TBTCOLO11	31.01.2012 – 02.12.2016	172.28.127.11
	TBTCOLO12	29.03.2012 – 24.08.2012	172.28.127.12
	TBTCOLO13	01.02.2012 – 01.04.2016	172.28.127.13
CURRENCY DERIVATIVES	TBTLV5	01.05.2011 – 01.01.2012	192.168.7.101
	TBTLV15	01.09.2011 – 01.01.2012	192.168.7.66
	TBTCOLO11	31.01.2012 – 02.12.2016	172.28.127.11
	TBTCOLO12	29.03.2012 – 24.08.2012	172.28.127.12
	TBTCOLO13	01.02.2012 – 01.04.2016	172.28.127.13

7.1.12 It is pertinent to note that the term Secondary Server is a nomenclature used for an additional/ alternate/ backup POP Server provided by NSE. Further, NSE vide its *Colocation Guidelines* (revised on April 16, 2012)

stated that: *"Members should always check the secondary TBT parameters are working fine with their application; in case of non–availability of data from TBT primary source they can move to secondary source."* However, the purpose of such connection was for handling exigencies at TM's end so that they do not suffer issues in case of primary POP Server failure.

7.1.13 The details of Secondary/ backup POP Server during the period 2009–2016 (forwarded to SEBI vide NSE's e–mail dated May 24, 2018) are provided below –

TABLE IX

SEGMENT	SERVER	PERIOD FOR WHICH SERVER WAS SECONDARY	SERVER IP
FUTURES & OPTIONS	**TBTLV9**	JUNE 2010–DECEMBER 2010*****	–
	TBTLV17	OCTOBER 2011– JANUARY 2012	–
	TBTCOLO27	FEBRUARY 2012–DECEMBER 2016	172.28.124.27
*****NO POP SERVER WAS DESIGNATED AS A SECONDARY SERVER BETWEEN JANUARY TO OCTOBER 2011			
CASH MARKET	**TBTLV6**	JUNE 2010– SEPTEMBER 2011	192.168.7.
	TBTLV18	OCTOBER 2011– JANUARY 2012	192.168.7.110
	TBTCOLO17	FEBRUARY 2012–DECEMBER 2016	172.28.127.17
CURRENCY DERIVATIVES	**TBTLV6**	MAY 2011–SEPTEMBER 2011	–
	TBTLV18	SEPTEMBER 2011–JANUARY 2012	–
	TBTCOLO17	FEBRUARY 2012–DECEMBER 2016	172.28.124.17

7.1.14 There were three POP Sender (Ports) on each POP Servers for the F&O segment and CM segment i.e. (i) Sender Port 1, (ii) Sender Port 2 and (iii) Sender Port 3, while the POP Servers for the CD segment had two POP Sender (Ports) i.e. (i) Sender Port 1 and (ii) Sender Port 2. The Sender Ports were identified by specific Port number i.e. for F&O Segment, Ports 10990, 10991 & 10992; for CM segment Ports 10980, 10981 & 10982; and for CD segment Ports 10970 & 10971. TMs' TBT IPs were mapped to a specific Port assigned to them.

7.1.15 From page 7 of the NSE reply dated May 12, 2016, it is observed that: *"TMs desirous of receiving TBT data for their co–location Servers had*

the option of taking as many IPs for the purpose subject to the limit of 10% per co–location rack of the respective TM. … Subsequently, NSE vide Circular dated March 5, 2013 revised the number of maximum permissible IP connections to receive market data to 15 per rack and there was no limit of rack per TM. Thus, it was and continues to be open for any TM to avail as many IP connections as it might deem appropriate for its level of business." Further, from page 8 of the said reply, it is noted that *"the basis for allotting new IP connections for POP Servers to TMs was FCFS basis. Therefore, any TM who applied for an IP connection was simply accommodated on the next available POP Server…"*

7.1.16 In its Project Borse Report, Deloitte had also stated as under:

"We were given to understand that since 2011, each POP server had three sender processes, and based on advice from the Development team, it was recommended that each POP sender process be allocated a maximum of 30 IP connects to maintain latency and throughput, i.e. 90 IPs per server. New IPs taken by TMs would be allocated in sequential fashion – i.e. one server at a time, distributing the IPs one to each POP sender process on the server, and then moving on to the next server. If a new server was introduced, any new IPs taken after that would first be distributed sequentially along the POP sender processes of that server till the load was equitable with the existing POP servers. We understand that there was no documented process for allocation of TMs to POP servers."

7.1.17 As observed from page 32 of the E&Y Report – May 18, 2018, the process of TBT IP allocation was explained by NSE as under:

a) On request of a TM and on completion of commercial process and on receipt of payment from a TM, a TBT IP was assigned to a TM.

b) A Port of a POP Server was prescribed a limit of 30 connections.

c) For configuring a new TM TBT IP, the IT Operations Team would have to manually access the *'Vendor database'* files sequentially (beginning with Port 10980 of Primary 1) and configure in the *'flat*

file' for the Port which has an availability. Availability was decided based on the number of connections made on that Port on that trading day. Member TBT IP was given access on that Port that had less than 30 connections.

d) However, no backup was taken of actual configuration file across Ports and POPs across the review period.

e) Each TBT IP was then configured on the same Port of the Secondary POP Server as well. A sequential methodology was followed for configuration of TBT IPs in respective POP Servers. The sequential process was a manual process to manage load balancing across various POP Servers.

7.1.18 From one of the registration enablement e–mails forwarded by NSE to OPG on March 24, 2014, it is observed that the said TM was *inter alia* provided with the following TBT details for co–location data centre such as –

- Rack no.: F9
- TBT IP address (TM IP address): 10.230.39.12
- User ID and password along with relevant segment i.e. Cash Market and
- Information regarding POP Server and Port –

Table X		
Server Name	**Server IP**	**Port**
TBT Primary POP Server IP Address	172.28.124.17	10980
TBT Secondary POP Server IP Address	172.28.124.17	10980
TBT Primary Offline POP Server IP Address*****	172.28.124.17	10980
TBT Secondary Offline POP Server IP Address*****	172.28.124.17	10980
*****In the event of any disconnection, a TM may connect to these POP Servers for recovering lost data.		

7.1.19 As stated at above paragraph, a TM would be provided with a registration enablement e–mail/allotment letter containing log–in details, primary POP Server and secondary POP Server IP addresses, Rack no., TBT IP address (these are explained in the subsequent paragraphs of this Order).

7.1.20 It is an admitted position that many TMs used multiple IPs to receive the TBT data. It is also important to acknowledge that not every TM TBT IP can be the first to login and connect to a POP Server or be the first to login and connect to the POP Server that logged in first to the PDC on a given day. I observe that NSE's TCP/IP TBT System had N+1 Servers i.e. N number of Primary POP Servers + 1 Secondary/backup POP Server and the Secondary POP Server was always on active – active mode (running alongside Primary POP Servers). Any TM connecting first to the Sender Port 1 of the POP Server (Primary and Secondary), which in turn was first to connect to the PDC on a given day would be the first in queue for dissemination. From the explanation provided by the Forensic Auditors regarding the TCP/IP TBT System architecture, I observe that the length of the queue i.e. number of connections to a particular Port would bring significant variability in terms of which Port would disseminate data faster. As observed by E&Y in its near production simulation of the TCP/IP TBT System architecture, during the course of the day, the Port with the shortest queue would have ultimate advantage of disseminating data ahead of other Ports.

7.1.21 Additionally, it may also be noted that the Secondary POP Server on account of being a fail–safe/ fall back POP Server whose purpose was to ensure continuity of data dissemination in the event of Primary POP Server failure would invariably be lesser loaded i.e. have lesser TMs logging in and getting connected to it. In such a scenario, even in the event of the Secondary POP Server having established a connection subsequent to any or all of the primary POP Servers to the PDC, there would still exist a probability that any TM connected through one of the Ports of such Secondary Server which connected later to the PDC would receive the data ahead of other TMs connected to the primary POP Servers which connected earlier to the PDC.

7.1.22 For example, if there are three POP Servers comprising of two primary POP Servers (say POP Server 1 and POP Server 2) along with a backup/ Secondary Server (say POP Server 3), where primary POP Server 2 (having Port A with 25 TM IPs connected i.e. A1 to A25, Port B with 25 TM IPs connected i.e. B1 to B25 and Port C with 25 TM IPs connected i.e. C1 to C25, where Port A is the first Port to connect to such POP Server) is the first to connect to PDC followed by primary POP Server 1 (having Port A with 15 TM IPs connected i.e. – A1 to A15, Port B with 15 TM IPs connected i.e. B1 to B15 and Port C with 15 TM IPs connected i.e. C1 to C15, where Port B is the first Port to connect to such POP Server) and Secondary POP Server 3 (having Port A with 5 TM IPs connected i.e. A1 to A5, Port B with 5 TM IPs connected i.e. B1 to B5 and Port C with 5 TM IPs connected i.e. C1 to C5, where Port C is the first Port to connect to such POP Server), it would be highly probable for the TM connecting to Port C having first connect to Secondary POP Server 3 to be disseminated data comparatively earlier than some of the TMs connected to Port A of primary POP Server 2 and Port B of primary POP Server 1 on account of (i) Port C of POP Server 3 being lesser loaded and (ii) since the *TCP/IP TBT System* serviced the receiver queues in parallel where each queue was built sequentially, one packet at a time. In other words, the data which was almost simultaneously disseminated at all Ports of POP Server 2 will first have to be completely disseminated to all the TMs in Port A of POP Server 2 which had first connection to the PDC i.e. A1 to A25, before the next data packet is disseminated to all the TMs in the said Port whereas at the same time Port B connected to POP Server 1 (having second connect to PDC) and Port C connected POP Server 3 (having third connect to PDC), having lesser TMs connected will, although not disseminated data first, stand to receive the data comparatively earlier for the aforementioned reasons. Given the lesser density of connections at the Secondary POP Server, it may even so happen that a TM connected to Port B or A of POP Server 3 may receive data ahead of some TMs connected to POP Server 1 and POP Server 2.

8.0 Issues on Merit:

Having given a detailed description of the NSE-TCP/IP – TBT system architecture, I now proceed to discuss the issues outlined in para 5.2.

8.1 *Issue I: Whether the TCP-IP architecture for TBT data feed provided fair and equitable access to all the TMs*

This issue is further sub-divided into the following headings:

(i) First Connect / Early Login;
(ii) IP allocation and Load balancer;
(iii) Absence of randomizer

Each of the above 3 headings is taken up for consideration, in the sequence of SCN allegations first, followed by the response of the Noticees and then the related findings.

8.1.1 First connect / Early login:

8.1.1.1 The allegations of first connect / early login advantage against NSE is based on analysis of login made by OPG, in the SCN. I propose to deal with OPG securities and its role vide a separate order. Hence, I limit the scope of analysis in this order to the general characteristics of NSE TBT Data feed, to examine whether the SCN allegations are justified.

8.1.1.2 Referring to the Deloitte 2016 (Project Borse) report, SCN alleged that:

a) Review of TBT system architecture indicated data was disseminated to members in a sequential manner whereby the member who connected first to the POP server received the ticks (market feed) before the members who connected later.

b) A member who was aware of the sequential nature of dissemination of TBT data could derive an advantage by an early login into the system.

c) On an overall review of the TBT architecture, and performance of forensic code analysis and test bed simulation procedures, it appears that in the absence of (i) automation, (ii) random function at POP

servers, and (iii) load balancers, the tick-by-tick system was prone to manipulation.

8.1.1.3 In this context, the SCN also referred to the following observations of TAC report

> *"NSE tick-by-tick (TBT) architecture was prone to market abuse thereby compromising market fairness and integrity, in that it provided quicker order dissemination to those who managed to login early. That is, if one entity is ahead of the other while logging in the morning, it gets information ahead of the other throughout the day. Further, it is not important to be absolutely the first one to login. It simply gives you probabilistic advantage to log-in as early as possible"*

8.1.1.4 Similarly, EY in its report has mentioned *"POP receiver receives a batch from PDC and disseminates it to the respective queue of each port sequentially……. An array (dissemination sequence) is maintained by each port which is created based on the time of login by a member on that port, i.e. earliest login is ranked first. Dissemination from a port to members is sequential based on their login ranks on a port."*

8.1.1.5 Trading members seeking IP connections were allotted specific ports and IP addresses by NSE on the Dissemination Servers. Trading members can only access the server through their respectively assigned IP address and Port. As TBT data is disseminated in a sequential manner, it is alleged that members allocated to servers with fewer occupants would have an advantage.

8.1.1.6 Based on the findings made in the TAC Report, Deloitte Report and EY Report, SCN alleged that dissemination from a Port to members is sequential based on their login ranks on a Port. Accordingly, it is alleged that a member connecting first to a specific Port will receive TBT data first before all other members connecting to that Port on that server.

8.1.1.7 It is noted from the SCN that, the expression "first connect" or "early login" has been analysed from two levels, number of first connects across the POP servers and number of first connects on the POP server which has connected first to the PDC, during the relevant period.

8.1.1.8 Response of NSE:

a) In response to the allegation of advantage to first login, NSE submitted that the Deloitte Report and consequently SEBI TAC and SEBI, have concluded that the Noticee's TCP based TBT system was prone to manipulation on the premise that the sequential dissemination of TBT data in the TCP/IP architecture offered an advantage or benefit to members who logged in first / early. However, it should be noted that none of these agencies or their reports have identified what 'advantage' was conferred to the member logging in first, or provided any proof that members benefited from logging in first. In fact, even the SEBI External Committee Report (which was relied on by SEBI TAC) admits that early login only gives a "probabilistic advantage"— it includes no analysis of whether there was an actual advantage or not. The SEBI External Committee Report states also that "Also note that early login gives the information advantage but does not guarantee success by itself".

b) NSE submitted that sequential dissemination / first or early login could not have conferred a benefit to trading members for the following reasons:

(i) The order in which the POP Servers connected to the PDC was random, and varied from day to day — therefore, no member could be sure of receiving TBT data earlier than others (even if they connected first to their POP Server on a particular day), since they could not be certain whether their particular POP Server has connected first or not on a particular day.

(ii) Moreover, each POP Server has three ports, and therefore members could not be sure that they were on the particular Port on that POP server, which was being disseminated the data first.

(iii) When the POP servers send data to the ports in a sequential manner, they do not wait for either: (a) receipt of data by the Port; or (b) for the Port to complete dissemination to all the IP connections for the Port. As a result of the interplay of the

hardware and software at the Port level (and the sequencing of instructions therein), the Noticee or its employees could not predict the sequence in which the data would be received by the ports (and in turns, the IPs).

(iv) Further, it was impossible for trading members to know their position in the queue on their Port on any particular day, and no member can therefore take advantage of the situation. In fact, even the Noticee did not know sequence of connects by members since there were no tools available to monitor sequence of logins.

(v) In the TCP/ IP protocol, it is not possible to predict the order in which the packets will be received by the ultimate recipient. Every network device between source and ultimate recipient will add some randomness to it. All members had at least two network hops / devices from the Noticee's infrastructure, and one or more further hops / devices (depending upon their internal network design). Each hop introduces a network device that adds randomness. For example, factors such as the operating system scheduling, the TCP stack, the network card on the server, and the network itself (consisting of switch and firewall) of the Noticee as well as the member, etc. would impact the delivery of packets, and therefore there is no guarantee that the packet sent first to the recipient will also be received first — viz., first dissemination does not necessarily translate into first receipt.

(vi) The findings of *inter alia* EY and ISB clearly show that first / early login did not give any advantage to members, both as a technological matter and as a financial and factual matter.

c) NSE also relied on the ISB Report which states that:

(i) During the Unicast regime, on average, first login is associated with lower rupee profits.

(ii) On average for the Deloitte sample during the Unicast period, profits from proprietary trades when members login first are

about a third of profits from proprietary trades on days when the member did not login first. Looking at medians, it is about a sixth of profits from proprietary trades on days when the member did not login first. For client trades by the Deloitte sample during the Unicast period, average profits on days the member logged in first are about a ninth of when they did not login first. The difference is much starker when we look at medians - about a eleventh... For proprietary trades of the Benchmark sample, average profits on days of first login are one-fifteenth of average profits on days when the member did not login first... None of the 13 members' profits from proprietary trades on days of first login is greater than those on days when the member did not login first, the exception being Phillip capital (India) Pvt. Ltd who makes lower losses from proprietary trades on days of first login than on days they did not login first. We obtain similar results for client trades, the exception being that Crimson Financial Services Ltd. has slightly greater profits on days of first login than on days they did not login first.

(iii) This finding goes against the claim that the early login advantage was unfair or was exploited with the knowledge of early login. Such an outcome would have resulted in higher early-login rupee profits for the members alleged to have tried to make unfair profits. This inference is based on the assumption that capital would have flowed to members who could earn higher profits than other members. The fact that members make lower rupee profits while logging in early indicates that the opportunities to make large profits were not taken advantage of. The members and the market in general were not aware about the early login status of specific members and hence, more capital was not invested despite the possibility of higher profits.

d) According to NSE, the ports are configured in a specific pre-determined sequence. Within a server, one of the ports could receive data before the other two ports, as there are variable at the receiving end such as the load in a queue and the hardware and software interplay at the Port level. Hence the sequence of receipt of data is not predictable by NSE employees.

8.1.1.9 Consideration & Findings: First Connect / Early Login

a) The very essential characteristic of TCP-IP dissemination is that the delivery of data packet can be done only to one recipient at a time. In the scenario of Co-located brokers carrying out Algo trading, variance in time, in terms of milli-seconds and micro seconds, in the receipt of data is immensely significant. The data dissemination architecture in NSE needs to be evaluated in this background.

b) As seen from the submission of NSE, the sequence of dissemination of data from PDC to the POP servers was not pre-determined. The sequence of POP server for receiving data from PDC was determined by the login sequence of the POP server, on a given day. Thus the flow of data from PDC to the layer of POP servers is asserted to be following a random sequence. There is no dispute on the fact of random login sequence of POP servers to the PDC in the Expert Reports and SEBI Investigation Report too. I, however, would like to take note of the fact that such randomness was not on the basis of a system characteristic or a built-in-design, but was a matter of chance based on unpredictable circumstances.

c) As regards data dissemination at Port level, NSE stated that there are three POP senders or ports for each POP server. The data dissemination from POP Receiver part of the server to all the three POP senders/ports does not wait for completion of circulation of data to all the IPs arrayed on one Port but goes from one Port to the other and the third one immediately. The order sequence of the sender ports in a server was sequential as per an order specified in the “config” file of the application. The time difference between the first Port to the second and then the third Port is very little.

d) As far as receipt of data is concerned, NSE has further stated that members did not know whether they were on the Port which was first to queue on that POP server or not. Due to the interplay between the hardware and software at Port level, there was variability in the order of receipt of data at the Port level and even the Port that was disseminated data first did not necessarily receive all the data first.

e) As explained in the TBT Architecture, at each POP sender / Port level there is an array of IPs formed in the sequence of login time. Though, NSE states that the order (sequence) of ports in a POP server can be pre-defined (by specifying in the '*config file*'), it contends that the same gets altered depending on the variability of the array size.

f) As stated by NSE, every morning, a software script (*Epsilon*) is used to start the TBT application parallelly on all the servers automatically. However, dissemination servers connect with the PDC randomly depending upon the time sequence in which the TBT application processes get started in each server. Thus the POP servers get connected to the PDC in a random manner. All the Reports have confirmed the same with the exception of TAC. TAC has observed that "Information is first sent to all non-back up servers and then in the end delivered to the backup server." I find that the aforementioned observation of the (TAC) Expert Committee is at variance to the architecture accepted and adopted by the Forensic Auditors. In light of the aforesaid and having regard to the Technical Document made available by NSE, I am inclined to accept the process of dissemination of data as explained by the Forensic Auditors and NSE, with respect to data flow from PDC to POP server level. I am also inclined to accept that there was some randomness in the sequence of the POP servers connecting to the PDC as brought out in para 8.1.1.9 (b) earlier.

g) At the same time, in view of the discussion in earlier paragraphs, the dissemination of information at the sender Port level (of a particular POP server), was in a pre-defined sequence, i.e. first to Port 1, then to Port 2 and then to Port 3. I note that having set a pre-defined sequence at Port level, the TM who logs in first to Port 1 of the POP server that logs-in first to the PDC would be disseminated the data first at the start of the trading day. At the same time as seen before, the sequence of IPs in a Port would continue to remain the same throughout the day. This would show that the login rank of TMs / IPs would also remain the same at a specific throughout the day. As the

very characteristic of TCP/IP dissemination being that the dissemination of information in a sequence (as per login time) takes place one after the other, it is obvious that equal access of information is not possible to all the TMs logged into the TBT data feed system at a given point of time. In other words, in the absence of any mechanism to shuffle the order-rankings of TMs in front of a Port (which is based on the log-in time of respective TMs), the information dissemination order from a Port would remain static throughout the day depending upon the ranks established on the strength of log-in timings. Thus, the system did confer an advantage on early loggers in a Port compared to others.

8.1.2 **IP allocation and Absence of Load Balancer:**

8.1.2.1 In the SCNs, it is alleged that there were no laid down policies and procedures for allocation/ mapping of IPs to dissemination servers. Also, there were no standard operating procedure (SOP) to deal with request for change in IP mapped to a particular server. Therefore, the IP shift requests from one server to another was left at the discretion of the PSM team, which has shown differentiated treatment/ response for different TMs for such requests.

8.1.2.2 In the 2016 Deloitte report it is alleged that "*In the course of our review, we also saw indications of preferential treatment to few members. During our discussions with the NSE team, we were made to understand that a method of allocation of new IPs across ports on existing servers was followed. It was stated by the NSE IT team that when the new servers were introduced in 2012, none of the IPs mapped to the existing servers were migrated to these. However, we reviewed certain emails which indicated that some IPs of a few members who had multiple connections were distributed to TBTCOLO 26 when it was introduced in January 2012."*

8.1.2.3 The said report also states that: "*we noted that in some cases such distribution of IPs across servers for some members with multiple IPs was not done. In some cases multiple IPs of the same member were*

mapped to the same port. It appears that different members were treated differently and that there was no uniform approach applied across members.

We also came across an instance in February 2012 where OPG requested to move four of their IPs to a different server citing performance degradation. It appears that this request was executed despite the absence of requisite documentation and approvals requested by the PSM team to evidence legitimacy of the request. The IPs were transferred to a specific server on Jagdish Joshi (erstwhile Project Manager, COLO)'s request, and he stated that this would ensure that OPG's IPs were distributed equally across all servers and would minimize their risk. We noted other emails during the same period where Jagdish Joshi did not seem to demonstrate the same responsiveness toward other members raising similar issues and concerns.

…….

We observed that there may have been some communication to certain members that there was an advantage in connecting early to the POP servers. Following are the relevant emails that we came across in this regard:

In an email dated 13 February 2013 from AB Financial Services to the COLO Support Team, the member discussed issues that they were facing and requested to move certain IPs to other servers. They also stated "Secondly as per you suggestion to connect TBT server as early as possible, we would connect to TBT Server by 7:50 AM onwards and give you the feedback".

Vide email dated 9 May 2013, Akhil of IKM Investors wrote to Arunjyoti Mukherjee of the NSE team stating that "As already told by exchange that early TBT login will be given preference in trading feeds, we have few queries regarding this process..

"The email was internally directed to Jagdish Joshi, who responded on the same day stating "There is nothing like early login in TBT, it connects randomly.

We have not seen any emails prior to these communications whereby any information related to early login was provided to members. We are unable to comment on whether any such communication may have been made orally, and by whom."

8.1.2.4 Deloitte in its report submitted in December, 2016 for the F&O segment has provided data regarding allocation of IPs across TBT Servers 21, 23, 24 and 26 on March 15, 2012, March 19, 2012, June 14, 2012, September 10, 2013 and March 3, 2014. Further, it also provides data regarding the number of IPs connected to TBT Servers 21, 23, 24 and 26 as well as secondary/ fall back Server 27 on February 29, 2012, March 01, 2012, March 15, 2012 and March 19, 2012. Based on the above, the following Table has been prepared:

Table XI: Client allocation and connection sample data (Deloitte)

TBT Server	Port	Client Allotted					Client Connected			
		Mar 15, 2012	**Mar 19, 2012**	**Jun 14, 2012**	**Sep 10, 2013**	**Mar 03, 2014**	**Feb 29, 2012**	**Mar 01, 2012**	**Mar 15, 2012**	**Mar 19, 2012**
Colo21	10990	29	29	28	41	46	25	26	28	29
	10991	32	32	30	42	46	4	3	8	9
	10992	29	29	24	43	47	24	24	23	19
	Sub-total	**90**	**90**	**82**	**126**	**139**	**53**	**53**	**59**	**57**
Colo23	10990	36	36	34	44	47	27	29	28	29
	10991	28	28	28	43	48	28	26	27	27
	10992	35	35	35	44	48	27	28	29	29
	Sub-total	**99**	**99**	**97**	**131**	**143**	**82**	**83**	**84**	**85**
Colo24	10990	23	23	27	43	48	20	22	21	24
	10991	24	24	27	48	48	22	22	23	22
	10992	32	32	31	40	47	26	26	26	27
	Sub-total	**79**	**79**	**85**	**131**	**143**	**68**	**70**	**70**	**73**
Colo26	10990	27	27	33	43	48	19	19	16	18
	10991	31	31	32	42	48	13	14	15	16
	10992	29	29	30	40	47	17	17	19	22
	Sub-total	**87**	**87**	**95**	**125**	**143**	**49**	**50**	**50**	**56**
Colo27 [Secondary Server]	10990	NA	NA	NA	NA	NA	4	2	6	2
	10991	NA	NA	NA	NA	NA	0	0	3	2
	10992	NA	NA	NA	NA	NA	2	2	4	1
	Sub-total	NA	NA	NA	NA	NA	**6**	**4**	**13**	**5**

(Source: Based on the data provided in Annexure -30 of Deloitte Report)

8.1.2.5 From the aforesaid data, the following observations were made in the SCN:

a) There were significant variations in terms of number of IPs allotted to each Port within a particular POP Server.

b) There were significant variations in terms of total number of IPs allotted to each POP Server.

c) The variations in IP allocation numbers are more pronounced on the days for the year 2012.

d) In terms of number of IPs actually connected, the variation is even more pronounced.

e) Though there was a limit of 30 connections for each Port of POP Server, the actual number of IPs allocated exceeded 30.

f) It is observed that the manual load balancing of members across servers did not seem to have been performed equitably.

8.1.2.6 Deloitte has further observed that e-mails were sent on periodic basis to COLO Support from PSM team informing COLO Support about the number of members allocated to the particular server / sender and the number of members connected to a particular server / sender. This implies that COLO Support was aware about the load of each server, in terms of number of members allocated to the particular server/ sender and the number of members connected to that server/ sender.

8.1.2.7 Deloitte has also noted that an email from Hozefa Poonawala dated January 04, 2012 sent to Mamatha Rangaprasad, where she raised the issues and risks related to the absence of load balancers. No follow up action with regards to this email was observed.

8.1.2.8 EY in its report for CM segment has made the following observations regarding allocation of TBT IP:

a) A Port of a POP server was prescribed a limit of 30 connections.

b) For configuring a new member IP for TBT access, the operator used to manually configure an IP to a Port based on availability. Availability was decided based on number of active connections

made on that Port on that particular day.

c) Member TBT IP was given access on the Port that had less than 30 connections.

d) Each TBT IP was then configured on the same Port of Secondary Server as well.

e) On multiple trading days, connections on the ports of the primary servers of CM segment had exceeded 30. Based on the login logs, it is observed that on 275 trading days, all the six ports of primary servers had more than 30 connections (maximum of 53 connections were noted on one of the Port of primary server).

Table XII: Number of days where total connections on a Port exceeded 30

Year	Primary 1			Primary 2			Secondary		
	10980	**10981**	**10982**	**10980**	**10981**	**10982**	**10980**	**10981**	**10982**
2012	-	-	14	33	-	-	-	-	-
2013	114	67	234	233	85	124	-	-	-
2014	209	215	209	218	211	211	-	-	-
2015	-	-	-	-	-	-	-	-	-
Total days	323	282	457	484	296	335	-	-	-

(Source: Table 20 of EY Report for CM segment)

8.1.2.9 A detailed analysis of the server-wise load for the period 2012 – 14 for the F&O segment is placed in the Table below.

Table XIII: Data regarding server-wise load for the period 2012-14

Server	Year	2012		2013		2014	
	Port	Total No of IPs connected	Average IPs per Day	Total No of IPs connected	Average IPs per Day	Total No of IPs connected	Average IPs per Day
TBTCOLO21	**10990**	4830	19	5066	20	4822	20
	10991	2693	11	3211	13	3801	16
	10992	4423	18	5292	21	3910	16
	10999 (*)	293	1	41	0	354	1
TBTCOLO23	**10990**	5019	20	3604	14	3504	14
	10991	4654	19	4730	19	4512	18
	10992	4626	18	4012	16	4043	17
TBTCOLO24	**10990**	4706	19	6023	24	5287	22
	10991	3918	16	4637	19	4290	18
	10992	5262	21	5280	21	4940	20

TBTCOLO26	**10990**	3788	15	3303	13	4230	17
	10991	3645	15	3204	13	4334	18
	10992	3796	15	4730	19	4296	18
	10999 (*)	0	0	24	0	240	1
TBTCOLO27 (Secondary Server)	**Not Provided**	561	2				
	10990	519	2	966	4	1602	7
	10991	288	1	1217	5	1221	5
	10992	377	2	1371	5	943	4

(*) For some period, there was an additional Port

(Source: Based on data provided by NSE, vide e-mail dated May 29, 2018 w.r.t. F&O all connects)

8.1.2.10 From the above Table, it is observed that there were significant variations in terms of number of connections across different servers and ports. This clearly indicates that the load on the Ports on a particular server and the load across servers varied significantly. It may be noted that in absence of a dynamic load balancer, such variation of load at each Port would have resulted in varied time lag for distribution of data under sequential data distribution process.

8.1.2.11 The load on each server, in terms of number of members allocated/ connected to a particular server was known to both COLO Support team and PSM team. It is observed that the number of IPs allotted to each Port was exceeding 30, i.e. limit prescribed by NSE itself. Further, the number of IPs connected to each Port also variedly significantly.

8.1.2.12 Deloitte in its report submitted in December, 2016 for the F & O segment has made the following observations with regard to the issue of load balancer:

"The absence of load balancers appear to have created advantages for certain members due to manual intervention. In addition, the absence of randomizers on the TBT dissemination servers seems to create an inherent advantage in receiving ticks to members connecting first. We noted that while there were potential discussions or opportunities to implement both, these were not pursued by NSE IT. We have not received clear responses as to why these were not pursued. In the course of our discussions with members of NSE's IT team, we were informed that there were no load balancers utilised in the TBT operations. Load balancing was done manually where members were

allocated to servers based on existing load.

We were given to understand that since 2011, each POP server had three sender processes, and based on advice from the Development team, it was recommended that each POP sender process be allocated a maximum of 30 IP connects to maintain latency and throughput, i.e. 90 IPs per server. New IPs taken by members would be allocated in sequential fashion – i.e. one server at a time, distributing the IPs one to each POP sender process on the server, and then moving on to the next server. If a new server was introduced, any new IPs taken after that would first be distributed sequentially along the POP sender processes of that server till the load was equitable with the existing POP servers. We understand that there was no documented process for allocation of members to POP servers."

8.1.2.13 In the SCN it is also mentioned that Smrati Kaushik had forwarded an email dated January 03, 2012 to Umesh Agroya, Hozefa Poonawala and Rajanish Nagwekar [with CC to Mahesh Soparkar, Mamatha Rangaprasad, Balakrishnan M and Swaminathan Narayan], wherein the following was mentioned:

"*With increasing number of connections for TBT and the given criticality, we are open to two main risks –*

In event of any issues like hardware failure or any other issue owing to which the server is not available, member has to change the IP to come to Fall-back server, this increases the downtime and most of the members find it inconvenient.

Operational risk – Currently user distribution is manual, and to balance the load on the servers continually team has to keep shifting the IPs.

Implementation of Load balancer is one option, if there are some other options please check the feasibility. The solution is required on priority basis."

8.1.2.14 Hozefa Poonawala, who was part of the Bucket POP development team, had suggested implementation of a load balancer in an email dated January 04, 2012 to Mamatha Rangaprasad. The said email was also copied to Rajanish Nagwekar, Smrati Kaushik and Balakrishnan M. From the said email, it is observed that 'Load Balancer' was, inter alia,

suggested as a solution for addressing 'Operational risk' with respect to balancing the load on the servers.

8.1.2.15 Mamatha Rangaprasad in her statement dated August 01, 2017 stated, "*typically, a load balancer is used to balance the actual connects on the servers. The reference made in the email dated January 4, 2012 was for a different purpose. The load* balancer *in this case was proposed to handle hardware failure of any one of the servers to which the members connected. As per the TBT system, a set of members would be connected to each server. If any of the server fails, the member connected to this server had to manually change the IP and connect to the fall back server. The solution of load balancer was suggested to avoid manual reconnection and auto connect these members to other server*."

8.1.2.16 In the email, it was alluded to the fact that IPs were being shifted to distribute load on servers. Load balancer was proposed as a solution for issues like hardware failure and balancing of loads. It may be stated that the nature of the TCP-IP technology was such that members allocated to servers with fewer occupants would also have an inherent advantage without a load balancer.

8.1.2.17 From the copies of relevant agendas and minutes of meeting of NSE Tech board, as provided by NSE vide e-mails dated June 14, 2018, it is observed that in the 28th meeting of NSE Tech held on August 07, 2012, the board took note that dynamic load balancing was configured in the IP Trading network. However, it is noted that the 'load balancer' had not been implemented in the TBT architecture.

8.1.2.18 On the issue of email dated January 04, 2012 regarding the suggestion for implementation of 'load balancer', N. Muralidharan, MD & CEO of NSEIT (former CEO of NSE Tech), in his statement dated July 28, 2017 stated that "*this issue was not escalated to me. Further, from the details shown to me, it may be observed that the issue highlighted here is, the increase in downtime as a result of any hardware failure or any other issues, this looks to be an automation issue*". He, further, in his statement recorded on April 20, 2018 submitted that "*a dynamic load balancer was not envisaged at that point and theoretically it may be on account of following considerations:*

a. *The minimization of devices (i.e. any extra devices like a load balancer) was a critical factor which would have also ensured fewer failure points.*

b. *Also, it was on outbound (Push), generally a device is not put in an outbound mechanism. This would have created an additional hop*."

8.1.2.19 Response of NSE:

a) In response to the said allegation NSE submitted that "when the Noticee received requests from members for changing their IP mapping or shifting their IPs to a different Port / server, the Noticee would make efforts to accommodate such requests, unless there were feasibility issues such as non-availability of ports on a particular server etc. — no preferential treatment was shown to any broker. In case members complained of issues with server performance (such as latency, packet drops etc,), they were requested to provide evidence of the same - the Noticee requested such information because these issues could also affect other members, and therefore it was critical for the Noticee to be aware of any potential issue / problem and address the same at the earliest.

b) It had been alleged in the 2017 SCN that the Noticee had allegedly disabled IPs of another member (Open Futures) to accommodate OPG Securities. However, upon investigation, SEBI itself has come to the conclusion that this allegation is untrue.

c) SEBI has also examined the observations made by Deloitte that the Noticee was less responsive to server change requests from brokers other than OPG Securities (such as Barclays, Pace and Adroit). However, after examining the email trail and analyzing the requests which had been processed by the Noticee, SEBI in the 2018 Investigation Report itself concludes that "From the above, considering the above responses and observations made by the auditors, it may not be possible to draw any specific adverse inference..." Therefore, allegations that the Noticee displayed differential conduct to different members are completely unsubstantiated, untrue and incorrect.

d) NSE submitted that the decision not to implement a load balancer was taken in good faith by the Noticee after due deliberation and consideration, and keeping in view the additional risks that a load balancer might have created. The SCNs proceed on an incorrect understanding of the context of the emails from Smrati Kaushik and Hoozefa Poonawala in which the implementation of load balancers were proposed. During the year 2011, the Noticee had experienced hardware (server) failures, due to inter alia, environmental factors which were causing corrosion of hardware components. Therefore, during this period, there was a chance of server failure, and every time a server failed, then:

   (i) Members had to manually change their IPs from the primary server to the Secondary Server, which they -found inconvenient; and

   (ii) TBT operations team had to manually shift all the users of failed server to new server.

e) Accordingly, in order to avoid outages due to hardware failure and improve / automate operations, implementation of a load balancer was suggested. This issue (and the proposed solution) along with other TBT-related issues were compiled into a slide by Hoozefa Poonawala the next day, so as to facilitate a discussion within the relevant employees of the Noticee.

f) According to NSE, dynamic load balancer is essentially an additional hardware/ physical equipment that must be installed as part of the TBT system, and which would automatically reallocate IPs in the event of a server failure. However, after discussions among the team, it was decided not to implement a load balancer for the following objective and bona fide reasons:

   (i) deployment of a load balancer would have introduced an increase in latency because the additional hardware device would add an extra step through which the data would need to flow — this would mean that the very purpose of the Co-location service i.e. to minimize latency, would stand eroded;

(ii) load balancer itself would present one more potential single point of failure i.e., a failure of the hardware load balancer would affect the entire TBT service throughout the day; and

(iii) TBT service was an outbound (push) mechanism, and it is not conventional to deploy a hardware device like a load balancer on an outbound mechanism.

g) As regards the process of TBT IP allocation to TMs, Deloitte had observed that there was no documented process (Ref. para 8.1.2.12 of the order).

h) However, in its reply to SEBI dated May 12, 2016, NSE had stated: *"the basis for allotting new IP connections for POP Servers to TMs was FCFS basis. Therefore, any TM who applied for an IP connection was simply accommodated on the next available POP Server…"*

i) Further, the relevant extract concerning the process of TBT IP allocation as explained by NSE is reproduced from the E&Y Project Kairos Report – May 18, 2018 as under:

(i) On request of a TM and on completion of commercial process and on receipt of payment from a TM, a TBT IP was assigned to a TM.

(ii) A Port of a POP Server was prescribed a limit of 30 connections.

(iii) For configuring a new TM TBT IP, the IT Operations Team would have to manually access the *'Vendor database'* files sequentially (beginning with Port 10980 of Primary 1) and configure in the *'flat file'* for the Port which has an availability. Availability was decided based on the number of connections made on that Port on that trading day. Member TBT IP was given access on that Port that had less than 30 connections.

(iv) A sequential methodology was followed for configuration of TBT IPs in respective POP Servers. The sequential process was a manual process to manage load balancing across various POP Servers.

(v) Each TBT IP was also configured on the same Port of the Secondary POP Server as well.

(vi) However, no backup was taken of actual configuration across Ports and POPs across the review period.

8.1.2.20 Consideration & Findings: IP allocation and Absence of Load Balancer

a) Upon a consideration of the aforementioned, it would follow from the recommendation made by the NSE Development Team that where TBT IP allocations were to be made by NSE, it was first required to consider such allocations within the limitation of 30 connections prescribed per Port of a POP Server i.e. a total of 90 connections per POP Server and thereafter, allocate TBT IP to the TMs in a sequential fashion i.e. one POP Server at a time, distributing the IPs one to each POP Sender process on the POP Server, and then moving on to the next POP Server to manage load balancing across various POP Servers. Further, where a new POP Server was introduced by NSE, any new IPs to be allocated would first be distributed sequentially along the POP Sender processes of that Server till the load was equitable with the existing POP Servers.

b) Upon a consideration of Table XI, I find that although there was a limit of 30 connections for each Port of POP Server, the actual number of TBT IPs allocated by NSE exceeded 30 connections per Port of a POP Server i.e. a total of 90 connections per POP Server. Further, I also note that there were significant variations in terms of (i) number of TBT IPs allotted to each Port within a particular POP Server and (ii) total number of TBT IPs allotted to each POP Server, which clearly demonstrate that the TBT IP allocation process undertaken by NSE was not in line with the recommendation made by its Development Team.

c) As stated above, the allocation of TMs IPs were done to the POP servers manually. Thus, the IPs connected ahead would receive data packets before those IPs that are connected later in time in the same array. The load variation in the Port level dissemination

queues clearly would therefore significantly impact the data dissemination time in other Ports of the same POP Server and across other POP Servers.

d) The load on each POP Server in terms of number of TMs allocated/connected to a particular Server was known to both COLO Support and PSM team as brought out in Deloitte Report. Further, it is reiterated that though there was a prescribed limit of 30 connections for each Port of POP Server, the actual number of IPs allocated exceeded 30. It is noted that the TBT IP mapping was static in nature i.e. an IP mapped to a particular POP Server/Port, could only connect to that specific POP Server/Port.

e) To sum up, a 'Load Balancer' is a hardware/software that distributes network/ traffic load across a number of POP Servers based on specific algorithm like least connections, least response time, round robin etc. The implementation of a *'Load balancer'* by NSE would have resulted in the TBT IPs being mapped onto the *'Load balancer',* which would then distribute the connections across the POP Servers. In such a system, the *'Load balancer'* would therefore ensure equitable load distribution of connections across all POP Servers, which in turn would have effectively eliminated the varied time lag (in receipt of data packets) experienced by TMs on account of having connected to more loaded POP Servers vis–a–vis other TMs who connected on lesser loaded POP Servers.

f) Upon a consideration of Tables XI, XII and XIII, I find that there were significant variations in terms of TBT IP connections across POP Servers with TBTCOLO27 being the least crowded Server. This clearly indicated that the load on the Port on a particular Server varied significantly vis–a–vis the load across Ports and across Servers and in the absence of a *'Load balancer'*, such variation of load at each Port would have resulted in a varied time lag for distribution of data under sequential data dissemination process.

8.1.3 **Absence of Randomizer:**

8.1.3.1 Forensic analysis and test bed simulation of the TBT source code was performed for TBT and Bucket POP by Deloitte. The Forensic Audit Report inter alia mentions that randomization removes the advantage of connecting first as a randomizer would randomly pick a connection to begin dissemination of data rather than starting with first connection each time. In this regard, in the 2017 SCN it was alleged that:

a) NSE had developed a 'rand.()' function in 2011 and it was implemented for Bucket POP servers in 2012. However, the same was not implemented for normal TBT segment servers. NSE has no clear reason for implementing randomizer for one set of servers and not for others. In this regard, forensic audit in its report also mentioned that NSE IT team was unable to explain the reason for implementation of the randomizer only in Bucket POP and not in TBT.

b) Absence of randomizers on the TBT dissemination servers created an inherent advantage in receiving TBT data by members connecting first. Hence, it was observed that *".....in absence of (a) automation, (b) random function at POP servers, and (c) load balancers, the tick-by-tick system was prone to manipulation*."

c) The forensic audit report also mentions that information regarding development of the randomizer and its implementation in Bucket POP was not disclosed to forensic auditor by the NSE team until it was identified during forensic analysis of the source-code. A review by the forensic auditor of internal emails of NSE indicated that the team was generally aware of the randomizer development / implementation and that there were references to this in various communications within the team.

8.1.3.2 The 2018 SCN reiterated the same allegation with respect to the absence of randomizer in the normal TBT segment. In the TBT architecture, TM who logged in first to the first Port of a POP server which has connected first to PDC on a trading day, would get the data first throughout the day. Therefore, in the 2018 SCN, it was alleged that when the nature of data (entire TBT data) disseminated to all TMs is same, it was all the more

necessary for the exchange to have randomization. This would have ensured that even if one TM consistently logged in first, there was no guarantee that he would have been disseminated the data first.

8.1.3.3 Response of NSE

a) In reply to the allegation in the SCN, NSE submitted that TBT service was architected with a view that it would send data to any subscriber that would wish to receive the same. As a result of this, it had a two stage process where the PDC would receive the feed from the trading system, sequence the same and stamp them with unique numbers, transform the message into relevant format, compress the message and then send it to dissemination servers / POP servers. These POP servers would accept connections from subscribers over TCP/IP and just send the pre-formatted tick received from PDC to all the subscribers that were connected in a sequential fashion. Since the POP servers were doing no additional or member specific work (i.e., no processing of the data), the time that they would spend in sending out the feed to various subscribers was minimal. The time difference between consecutive 'sends' was negligible compared to the variability introduced by various layers in the path of dissemination (and did not give any advantage), and sequential dissemination was not considered an issue, and therefore, randomization was not introduced in TBT data dissemination.

b) On the other hand, the Bucket POP application is a separate service, wherein the members can define a bucket of scripts/contracts for which they would like to receive the TBT feed — this bucket would be member specific, and would be a selective feed. Due to this, the POP server had to filter every tick (to see whether or not it was requested by the relevant member), then transform the same into final format and disseminate. As mentioned by the Noticee's employees, there is differential or unequal load in respect of each member in Bucket POP. Standard sequential dissemination would have resulted in unpredictable behavior for each member as time taken for processing will be dependent on the filtering criteria specified by member. Due to variability in the requirement of each

member, it would have been possible for one or more members to occupy the server for a longer period of time than others. In order to avoid such eventuality, randomization was introduced in Bucket POP, where the randomizer randomly pick a member bucket every time a tick is received.

c) Therefore, implementation of the randomizer in the Bucket POP service was done only because it was a bespoke service where the data was filtered by member requests, which applied an unequal load on the POP server for dissemination to each member —on the other hand, in the regular TBT service, the load on the POP server was much lower, and also equal for all members (and one member could not occupy the server for a longer period of time than others). Further, as already submitted above, there is no inherent advantage in being first or early to connect, since this did not guarantee first receipt of TBT data. For these reasons, NSE submitted that there was no requirement to implement a randomizer in the TBT service.

8.1.3.4 Consideration and Findings: Absence of Randomizer

(i) A 'Randomizer' is a function, which is Sender Port specific and which would randomly pick a connection to begin dissemination of data, rather than starting with the first connection each time.

(ii) The NSE's TBT data feed system envisaged, two levels of sequencing of data distribution from the servers to the IPs of TMs -

a) At the stage of dissemination to the Ports of a POP server; and

b) At each Port level, where an IP sequence is formed vertically depending on the login time.

(iii) As stated earlier, a TM who logged in first to the first Sender Port of a POP Server which has connected first to PDC on a trading day would be disseminated data first on that Port throughout the day. Since, in the TCP/IP TBT system the nature of data disseminated to all the TMs was the same, randomization in respect of primary and Secondary POP Servers would have ensured that even where one TM consistently logged in first in the Port of a POP Server which

connected first to the PDC, there would be no guarantee that such TM would have been disseminated and received data first. Clearly, the employment of randomizer in normal data feed dissemination would have upset the pre-determined sequence of IPs based on early logins and would have brought in much needed element of unpredictability in the sequence of data packet dissemination.

(iv) It is a matter of fact that all the subscribers of TBT data feed (normal segment) received the entire TBT data. In case of Bucket POP service each subscriber has differentiated and pre-identified data requirement. Though the data dissemination flow in both the normal TBT and the Bucket POP TBT is the same, in the Bucket POP, the POP server does a filter of every *tick* (to see whether or not it was requested by the relevant member) and then disseminated the same. Thus, NSE is stating that being a member specific data dissemination, in Bucket POP service, a randomizer was necessary as the time taken for processing each members request will vary and is dependent on the filtering criteria specified by members. NSE has explicitly stated that it would have been possible for one or more members to occupy the server for a longer period of time than others in the bucket POP TBT services.

(v) In both Bucket POP and Normal TBT data feed, the dissemination pattern is sequential at Port level, depending on login time, throughout the day. The only difference in the waiting period of IPs in the Bucket POP service and normal TBT data feed, is that the time difference will be more in the former, as the filtering time of the ticks is also to be accounted before passing the same information to the next member in the queue. In the context of Normal TBT segment, NSE has admitted that the sequential dissemination was not an issue. I, however, disagree with NSE as a pre-determined sequential dissemination is an issue as it brings in an element of differential latency for different TMs. In my view, sequential dissemination being the pattern in both the normal TBT segment and the Bucket POP service segment (i.e. the data flows to the second person only after it is disseminated to the first in queue), the duration of the waiting period is immaterial and irrelevant. I do not find any justification in NSE having limited the randomizer to the Bucket POP

service. Thus the actual reason for introducing a randomizer in Bucket POP service does not appear to be the waiting period of a member in the sequence.

(vi) In view of the above, I conclude that the TCP-IP architecture of TBT data feed, as adopted by NSE was inadequate as the inherent early login advantage was not sought to be addressed by introduction of randomizer, as pointed out by the various reports. Moreover, even the adoption / implementation of TBT Data feed architecture, was not in accordance with the standards stipulated by NSE's Development Team, specifically with respect to the procedure of IP allotment and the allocation of IPs within the limit.

8.2 ***Issue II: Access to Secondary Server and mechanism in NSE to monitor the Secondary Server misuse***

8.2.1 NSE issued Colocation Guidelines on August 8, 2011. With regard to the Secondary Server, the following was mentioned in the Guidelines (as revised on April 16, 2012):

"*Members should always check the secondary TBT parameters are working fine with their application in case of non-availability of data from TBT primary source they can move to secondary source*."

8.2.2 Vide, email dated June 20, 2018, NSE has, inter alia, clarified that the Colocation Guidelines was sent as a welcome email to all new Members in Co-location. The said guidelines was never issued as a circular.

8.2.3 Deloitte, in its report submitted in December, 2016 has, *inter alia*, made the following observations about connectivity to Secondary Server:

a) A Secondary Server was in place since 2010, as a contingency measure for members, in case the primary server failed for any reason.

b) The Secondary Server was also an active server, and there was no system whereby the Secondary Server would start up only when the

primary server failed, or to ensure that members connected to Secondary Servers only when the primary server failed or was down.

c) When a member took up a new TBT connection, the activation email sent by the membership team carried information regarding the primary server and Port, Secondary Server and Port, and offline server and Port for the member's IP.

d) There was no documented policy with respect to connecting to the fallback servers, and since members were provided with the Secondary Server parameters when they signed up, they could log in to the Secondary Server anytime.

e) There was no monitoring mechanism to identify members connecting to Secondary Servers to validate whether they had a legitimate reason to do so.

f) Due to the sequential dissemination of information, ticks were disseminated faster to members connected on less crowded servers, thereby giving an advantage to such members.

8.2.4 From the number of connections/ load on Secondary Server, it may be observed that the average number of IPs connected to Secondary Server was very low. As Secondary Server was always active and running without any time lag (as was the case for normal POPs), any TM connecting to Secondary Server on a regular basis would have advantage over TMs logged in normal POP servers on account of lesser load. A detailed analysis of the server-wise load for the period 2012 – 14 for the F&O segment is in the Table at paragraph 8.1.2.9.

8.2.5 EY in its Report of CM has stated *"Based on the simulations performed in near-production environment and subsequent ranking of batches disseminated indicated that approximately 95-96% of all the batches were disseminated first to members connected first to ports of Secondary Server. Further, analysis of batches received by members indicated that 99.97% of ticks were received first by members connected on ports of secondary server."*

8.2.6 EY in its Report of CD has stated *"Based on the simulations performed in near-production environment and subsequent ranking of batches disseminated indicated that approximately 80% - 85% of all the batches were disseminated first to members connected first to ports of primary server (POP13). It should be noted that total number of member IP connections (load) on POP13 was approximately 47% as compared to approximate load of 40% - 46% and 7% - 14% on other primary POP and secondary POP respectively. However, analysis of batches received by members indicated that 92% of ticks were received first by members connected on ports of secondary server."*

8.2.7 Deloitte and EY have made the following observations regarding connection to Secondary Server:

a) During few months in 2012, the connection to Secondary Servers were monitored by NSE.

b) Email dated February 10, 2012, whereby Bhavya Gandhi of the PSM team wrote to the COLO Support team with Avadhut Gharat, Balakrishnan Pillai, Smrati Kaushik and the PSM IICS team in copy, providing a list of 24 IPs of nine members, stating that they were connecting to the fallback servers, and requesting COLO Support to ask the members to connect to the primary servers. This indicates that there was a mechanism to monitor connections to the fallback server.

c) In the email dated February 10, 2012 sent by Universal Stock Brokers Private Limited to COLO Support, it was mentioned that '*From our experience we have observed that main server (IP 24) is slower than the secondary server (IP 27) therefore we have been connecting to secondary server. Hope that you will keep on allowing us to connect to the secondary/primary server as per our need and wish.'*

d) The mail was forwarded by the COLO Support Team to the PSM team. Jagdish Joshi and Avdhut Gharat were also copied in the same email. In the email dated February 10, 2012, Bhavya Gandhi responded to the COLO Support Team stating '*The members are*

supposed to connect to Primary servers only. Connection to Secondary (Fallback) server is to be made only when intimated by the exchange'.

e) In the email dated May 18, 2012, the COLO Support informed PRB Securities not to connect to Secondary Server without intimation by the exchange.

f) In another email dated June 7, 2012, COLO Support informed Share India Securities that connecting to Secondary Server is an 'Offence' and due to which its' Port might get blocked in the future.

g) Bhavya Gandhi, vide email dated February 14, 2012, informed the COLO Support team and other members marked on the initial email stating that six members were still connecting to the Secondary Server. He went on to say that "*Kindly ask the clients to switch back to their respective primary servers as this is a serious problem*". The COLO Support team sent out follow-up emails to the members requesting them to connect to the primary servers.

h) Vide email dated March 15, 2012, Bhavya Gandhi informed the COLO Support team with PSM IICS team, Avadhut, Jagdish, Balakrishnan, Swaminathan and Smrati Kaushik on copy, listing out members who were still connecting to fallback servers again, and reiterating that members are not supposed to connect to fallback servers unless intimated by the Exchange. He also stated "*They need to justify why they are AGAIN connecting to fallback servers, since there is no problem with any of the primary servers and no intimation from Exchange regarding the same*". He sent a follow up to this email on the same date, highlighting the names of OPG Securities, SMC Global Securities and Universal Stock Brokers as '*repeat offenders'*.

i) From a series of tickets in the CRM database, it is observed that warnings were sent out to 9 members on June 7, 2012, stating *"It has been observed that in spite of informing you several times still you are connecting to TBT fallback server. Which is considered as an offense and due to which your ports might get blocked in the future. Request you to connect to the TBT primary server only"*.

These tickets were eventually closed after Bhavya Gandhi of the PSM team confirmed to the COLO Support team that the concerned members had moved to the primary servers.

j) OPG, vide email dated August 8, 2012, wrote to Jagdish Joshi requesting to connect to the secondary TBT server for a few days for some analysis. The COLO Support team provided a confirmation to the member on August 10, 2012 that the member was enabled on the Secondary Server for one week.

k) Vide email dated May 18, 2012, COLO-Support wrote to A.P.T Portfolio Pvt. informing "*Request you to connect to primary Server with the given TBT parameters. Also requesting you, not to connect on Fallback server without exchange intimation*."

l) From the details provided by NSE, vide email dated May 24, 2018, it is observed that in the F & O segment, during the period 2010-16, altogether 93 TMs had connected to the Secondary Server, with 25 TMs having connection to Secondary Server more than 100 days. OPG Securities, having the highest number of connection on 670 days, out of 1531 trading days.

8.2.8 EY, in its Report has made the following observations regarding accessing Secondary Server in the CM segment:

a) On five trading days in 2012 (May 04, 2012, May 18, 2012, June 07, 2012, June 11, 2012 and June 13, 2012), NSE monitored connections to Secondary Server (for CM segment) and also communicated to members that they should not be connecting without intimation by (on emails sent on 7 June 2012 and thereafter).

b) 67 of the 108 TMs (62%) connected to Secondary Server at least once since February 2012, when Secondary Server was operationalized (a total of 939 trading days). From the given data it is observed that 17 TMs had connected to Secondary Server more than 100 days in the CM segment.

c) Fifty three (53) members connected to Secondary Server at least once in the period February 02, 2012 (operationalization of

Secondary Server) to June 13, 2012 (last day NSE sent out reprimanding emails for this segment with respect to Secondary Server connections). Of these 53 members, there were 20 members who connected to Secondary Server on the above mentioned five days when NSE sent reprimanding emails. Of these 20 members, 16 members were warned at least once and the balance 4 members were not warned.

d) Further, on each of the five days when NSE reprimanded the members for connecting to Secondary Server, there were certain members who were not reprimanded (even though they had connected to the Secondary Server on those respective days).

e) Out of these 16 members who were reprimanded by NSE, 11 members connected to Secondary Server at least once after they were reprimanded by NSE.

f) There were 14 members who made their first connection to NSE TCP/IP TBT Secondary Server post June 13, 2012, at least once and were not reprimanded.

8.2.9 EY, in its Report has made the following observations regarding accessing Secondary Server in the CD segment:

a) 21 members connected to Secondary Server at least once in the period February 02, 2012 (operationalization of Secondary Server) to June 08, 2012 (last day NSE sent out reprimanding emails for this segment with respect to Secondary Server connections). Of these 21 members, there were 7 members who connected to Secondary Server on the four days when NSE sent reprimanding emails and all of them were warned at least once.

b) On certain days of the four days when NSE reprimanded the members for connecting to Secondary Server, there were certain members who were not reprimanded (even though they had connected to the Secondary Server on those respective days) on those days.

c) Out of these 7 members who were reprimanded by NSE, we

observed 4 members connected to Secondary Server at least once after they were reprimanded by NSE.

d) There were 12 members who made their first connection to NSE TCP/IP TBT Secondary Server post June 08, 2012 at least once, and were not reprimanded.

8.2.10 Details of reprimanding emails sent by NSE across all market segments when TM connected to Secondary Server without appropriate reason or prior approval from the exchange are provided below –

TABLE XIV

Sl. No.	Date of warning/ advisory	Trading Member (TM)	Segment for which warning/ advisory was issued		
			FAO	CM	CD
1	21/11/2011	CNB Finwiz	Yes		
2	30/01/2012	SMC Global		Yes	
3	10/02/2012	Antique Stock	Yes		
4	10/02/2012	Barclays Securities	Yes		
5	10/02/2012	CNB Finwiz	Yes		
6	10/02/2012	DB International	Yes		
7	10/02/2012	Emkay Global	Yes		
8	10/02/2012	Marck Securities	Yes		
9	10/02/2012	OPG Securities	Yes		
10	10/02/2012	SMC Global	Yes		
11	10/02/2012	Universal Stock	Yes		
12	14/02/2012	AB Financial Services	Yes		
13	14/02/2012	Antique Stock	Yes		
14	14/02/2012	Barclays Securities	Yes		
15	14/02/2012	Open futures	Yes		
16	14/02/2012	OPG Securities	Yes		
17	14/02/2012	SMC Global	Yes		
18	14/02/2012	Universal Stock	Yes		
19	17/02/2012	Barclays Securities	Yes		
20	17/02/2012	SMC Global	Yes		
21	21/02/2012	Barclays Securities	Yes		
22	21/02/2012	OPG Securities	Yes		
23	15/03/2012	OPG Securities	Yes		
24	04/05/2012	APT Portfolio		Yes	
25	04/05/2012	Globe Capital			Yes
26	04/05/2012	IKM Investor			Yes

27	04/05/2012	Indo Global Share			Yes
28	04/05/2012	Millennium Stock Broking		Yes	
29	04/05/2012	OPG Securities		Yes	
30	04/05/2012	Parwati Capital			Yes
31	04/05/2012	Religare Capital		Yes	
32	04/05/2012	Religare Securities		Yes	
33	04/05/2012	RKSV Securities		Yes	
34	04/05/2012	ShareIndia Securities		Yes	
35	04/05/2012	Silver Stream		Yes	
36	18/05/2012	Adroit Financial	Yes	Yes	
37	18/05/2012	APT Portfolio	Yes	Yes	
38	18/05/2012	Ashlar Securities	Yes		
39	18/05/2012	CPR Capital	Yes		
40	18/05/2012	Divya Portfolio	Yes		
41	18/05/2012	East India Securities	Yes		
42	18/05/2012	Edelweiss Securities		Yes	
43	18/05/2012	Estee Advisors	Yes		
44	18/05/2012	GKN Securities	Yes		
45	18/05/2012	Global Vision	Yes		Yes
46	18/05/2012	Globe Capital	Yes		
47	18/05/2012	Goldman Sachs	Yes		
48	18/05/2012	GRD Securities		Yes	Yes
49	18/05/2012	IKM Investor	Yes		Yes
50	18/05/2012	India Infoline	Yes		
51	18/05/2012	Indo Global Share	Yes		Yes
52	18/05/2012	Indus Portfolio	Yes		
53	18/05/2012	J M Financials	Yes		
54	18/05/2012	Karvy Stock Broking	Yes		
55	18/05/2012	Kotak Securities	Yes		
56	18/05/2012	Kredent Brokerage	Yes		
57	18/05/2012	Kumar Shares	Yes		
58	18/05/2012	Labdhi Finance	Yes		
59	18/05/2012	Lohia Securities	Yes		
60	18/05/2012	M F Global	Yes		
61	18/05/2012	Mansukh Securities	Yes		
62	18/05/2012	Marwadi Securities	Yes		
63	18/05/2012	Millennium Stock Broking	Yes	Yes	
64	18/05/2012	Modex International	Yes		
65	18/05/2012	Motilal Oswal	Yes		
66	18/05/2012	New Edge Broker	Yes		
67	18/05/2012	Open futures	Yes		
68	18/05/2012	OPG Securities	Yes	Yes	
69	18/05/2012	PRB Securities		Yes	

70	18/05/2012	Quadeye Securities	Yes	Yes	Yes
71	18/05/2012	ShareIndia Securities		Yes	
72	18/05/2012	Silver Stream	Yes	Yes	
73	18/05/2012	SMC Global		Yes	
74	07/06/2012	Adroit Financial		Yes	
75	07/06/2012	Deutsche Equities	Yes		
76	07/06/2012	Edelweiss Securities		Yes	
77	07/06/2012	Global Vision			Yes
78	07/06/2012	IKM Investor	Yes		
79	07/06/2012	Indo Global Share			Yes
80	07/06/2012	KNA Shares	Yes		
81	07/06/2012	Open futures	Yes		
82	07/06/2012	OPG Securities		Yes	
83	07/06/2012	PFIL Securities		Yes	
84	07/06/2012	ShareIndia Securities		Yes	
85	07/06/2012	SMC Global		Yes	
86	07/06/2012	Universal Stock	Yes		
87	08/06/2012	Global Vision			Yes
88	11/06/2012	Edelweiss Securities		Yes	
89	11/06/2012	Open futures	Yes		
90	11/06/2012	SMC Global		Yes	
91	13/06/2012	CNB Finwiz	Yes		
92	13/06/2012	Edelweiss Securities		Yes	
93	13/06/2012	Open futures	Yes		
94	13/06/2012	Religare Capital	Yes		
95	14/06/2012	Open futures	Yes		

8.2.11 Mahesh Soparkar, in his statement dated July 19, 2017, stated "*PSM team initially never use to monitor the Secondary connection as was not part of their function as per my understanding. But during the first six months of 2012, TBT server were migrated from NSE's Primary Datacenter to NSE's Co-location Datacenter for resiliency purpose (as has been explain earlier) during that time the PSM team was monitoring the secondary server connection to keep the secondary server free in case while migration the primary server had chances of going down. Hence PSM team use to communicate to the Co-location team which than use to communicate the same to members. Co-location helpdesk use to take the list and send the emails to members as is and inform the members. This issue specifically also was not escalated by any of my team members to me, but PSM and COLO team do not have the authority to disconnect the member.*"

8.2.12 On the issue of monitoring of connection to secondary server, Deviprasad in his statement dated July 14, 2017 stated, *"I took charge of PSM operations from April 2013 onwards. I am not aware of any such advantages which a member would gain by virtue of connecting to fall back server. Further, no such issues were raised or escalated for resolution at my level by the PSM team line managers or anyone else to me."*

8.2.13 On the issue of reprimand emails pertaining to members connecting to Secondary Server sent on limited days in 2012, Chitra Ramkrishna, in her statement dated April 12, 2018 stated "*These were operational issues which I would not be aware of."*

8.2.14 Ravi Narain, in his statement dated April 13, 2018 stated "*I was not aware of such emails and this was not an issue that would come up to my level. Further, I was not aware of such advantage if any*."

8.2.15 Ravi Apte, in his statement dated May 2, 2018, stated *"I believe it (sic. Secondary server) was to provide a back-up facility and members were to connect to the secondary server in case of a failure of the primary server. It was assumed that the members would demonstrate good faith and would connect to the secondary server only in case of a failure of the primary server and only during the duration of such failure. He also stated that he was not aware of any monitoring."*

8.2.16 <u>NSE Response</u>

8.2.16.1 In response to the said allegation NSE submitted that in order to ensure reliability of the infrastructure deployed for providing TBT data, one of dissemination servers was designated as the backup server / Secondary Server / the redundant server. In the event of a primary server failure, the Secondary Server would allow trading members' to continuously receive TBT market feed without disruption. Each trading member is also given an IP address for connecting to the Secondary Server, and it was expected that members would only connect to the Secondary Server when they were unable to connect to the primary servers.

8.2.16.2 The Noticee would uniformly send a 'registration enablement mail' to all members who subscribed to the TBT service, which contained all the relevant operational details, including the connection details for the primary server and Secondary Server (and the IPs assigned to such member). Each IP connection allotted on the dissemination server to a trading member was also mapped to the Secondary Server.

8.2.16.3 To ensure that members could easily and quickly switch to the Secondary Server if the primary server failed, the backup server was always in active-active mode — i.e., the members would be able to connect to the Secondary Server at all times and receive data. However, it was expected that members would act in good faith and only connect to the Secondary Server when the primary server was down, and not otherwise — this was set out in the Colocation Guidelines issued by the Noticee. There was no form of access control employed in this regard, and members did not need to be 'enabled' by the Noticee to be able to connect to the Secondary Server. Further, the Noticee did not have any mechanism of continuously monitoring the connections to the Secondary Servers.

8.2.16.4 However, as has already been informed to SEBI, during the period 2010 to 2011, NSE had experienced many hardware (server) failures, due to inter alia, environmental factors which were causing corrosion of hardware components. Therefore, in order to avoid a market-wide TBT failure and ensure greater reliability of the TBT servers, it was decided to undertake a resiliency improvement programme that involved: (i) to host the TBT application on Stratus Fault Tolerant hardware, and (ii) to move the entire TBT infrastructure from the primary data centre of the Noticee to a separate Co-location data centre. The Noticee's employees had already shared a report by Hitachi concerning the failure and corrosion of hardware and exchanged internal emails regarding the aforementioned activities and plans, as well as the failure reduction report post the migration of the data centre. The migration of TBT servers to the new data centre location (that was better protected from the adverse environment) was undertaken in the first six months of 2012. During this period, in order to ensure that the Secondary Server was free in the event that the primary server went down during the migration

activity, the PSM team performed some limited checks with respect to connections to the Secondary Server.

8.2.16.5 To perform this check, the PSM team would run a script to check the connections which would return a list of members who were connected to the Secondary Server. It should be noted that the list would not specify all members who had connected to the Secondary Servers on that particular day, but only those members who were connected to the Secondary Servers at that point in time. The PSM team would communicate this list to the Co-location team which would, in turn, email the members warning them about connections to the Secondary Server. During this period of data centre migration, the Noticee sent emails to various members who had been connecting to the Secondary Servers (including OPG Securities), on a uniform basis, informing them to desist from doing so. At no point in time did the Noticee have a mechanism to continuously or automatically monitor connections to the Secondary Server. These were only periodic checks which were carried out by the PSM team on 18 days only during the migration period.

8.2.16.6 The SCNs have alleged that the Noticee did not issue warnings to certain members who had connected to the Secondary Server on the same days that warnings were sent to other members. In this regard, it is submitted that it is plausible that, if the PSM team ran the script at 2 pm, and a member had connected to the Secondary Server the same day but after 2 pm (for example, if the member only connected at 3 pm), then such member's name would not appear in the list of persons to whom warnings were sent. Of course, if at a later stage, if one were to check the connection logs (as the forensic auditors have done), such members name would appear among the persons who connected to the Secondary Server on that day. Therefore, it cannot be alleged that the Noticee was selective in issuance of warnings. Warnings were issued to whoever was connected to the Secondary Server at the time that the check was performed. It is possible that some members were connected to the Secondary Server during the same day but were not connected at that precise point of time, and therefore were not recipients of warnings.

8.2.16.7 NSE further submitted that it did not resort to proactive measures such as disconnecting the members who were connecting to the Secondary

Server mainly because: (i) this could seriously disrupt the business of the member and cause large financial loss, as the members may not be able to close out their open positions; and (ii) in order to take such action against a member, the Noticee would have to follow a formal process of taking disciplinary action against the member, which would have been time consuming. After June 2012, once the migration activity was complete, the PSM team ceased to perform the limited checks on connections to the Secondary Server. This has also been noted and confirmed by EY.

8.2.16.8 On the basis of the above, NSE submitted that the allegations in the SCNs that it afforded differential treatment to its members is unfounded, as it had acted fairly and equitably at all times and had applied uniform rules to all its members. This is also evident from the material presented in the EY Report — CM segment and the EY Report — CD/ IRF segment, which state that a large number of members accessed the Secondary Server, and that "access to Secondary Server may have been given to all members equitably." In fact, the data produced by EY shows that in the CM and CD segments, the members connecting most frequently to the Secondary Server did not include OPG.

8.2.16.9 NSE further submitted that it did not intentionally permit OPG to continue accessing the Secondary Server in order to give it any special benefits — in fact, as is evident from the 2018 Deloitte Report, the EY Report — CM and the EY Report — CD/ IRF, not only OPG but also several other members (including Barclays Securities India Private Ltd. and SMC Global Securities Ltd.) continued to access the Secondary Server from 2012 to 2014 in breach of the colocation guidelines. The Noticee was no longer monitoring access to the Secondary Server and was therefore not aware of the same. Once the matter was brought to the attention of the Noticee, the Noticee promptly took disciplinary action against errant members, including OPG.

8.2.16.10 NSE submitted that it should not be held liable for a breach of its rules / guidelines by TMs, particularly as the Noticee did not encourage or facilitate such breaches, or show preferential treatment in allowing the breaches to continue. Just because a market participant violates the rules and regulations implemented by a market regulator, it does not

mean or imply that the market regulator should be held liable for (or said to be complicit in) any violations by such participant. Similarly, as a first-line regulator, the Noticee cannot (and should not) be held liable for any improper acts committed by individual trading members in breach of the Noticee's guidelines. In any event, and without prejudice to the foregoing, it is submitted that even connecting to the Secondary Server did not guarantee any benefit to a TM, as EY's simulations have demonstrated that despite the lower load, members on the Secondary Servers did not receive all the ticks ahead of members on other servers.

8.2.17 Consideration and findings

Upon a consideration of the aforementioned, my observations are as follows:

a) From the NSE Colocation Guidelines dated August 08, 2011 (as revised on April 16, 2012), issued to the TMs, it is observed that in the case of non-availability of data from TBT primary source, they can move to the secondary source. According to NSE, the Co-location Guidelines were sent as a welcome e-mail to all the new members in co-location. Admittedly, there was no circular issued by NSE in this regard. Further, NSE has stated in its reply that it expected that members would connect to the Secondary Server only when they are unable to connect to the primary sever. Merely stating that they expected a particular conduct from the side of the TMs does not suffice. In a scene of cut-throat competition to get information packets before the others in terms of time advantage (milli-second / micro-second etc.), the propensity on the part of TMs to misuse the Secondary Server access should have been kept in check by active and constant vigil;

b) From the sample of the IP enabling emails, sent by NSE to the applicant members (containing login credentials such as TBT Serve IP Address, User ID etc.), it is observed that all member IPs were mapped to the corresponding Port of the Secondary Server, so as to facilitate the members to move to the Secondary Server, in case of non-availability of data from primary source.

c) As the Co-location Guidelines were silent on the specific time slots for testing the functioning of the Secondary Severs, it appears that the TMs could have done the testing at any point, during the course of the trading day. Thus, the IP connections on the Secondary Server could not be distinguished as those relating to testing purposes and those for genuine purpose of non-availability of primary server. The ambiguity in the instructions leaves room for any TM to contend that it logged-in to the Secondary Server for test purposes, even though the actual intention would be to by-pass the load factor in its primary server queue for obtaining TBT data feed.

d) The simulation conducted by EY has demonstrated that about 95-96% in CM segment and 80-85% in CD segment of all the batches (of data packets) were disseminated first to TMs connected first to Ports of Secondary Server.

e) From the SCN, I observe that in the F&O segment, during 2010-16, altogether 93 TMs had connected to the Secondary Server, with 25 TMs having connection to Secondary Server more than 100 days. Further, in the CM segment, 67 TMs (out of 108 TMs) had connected to Secondary Server at least once. Out of the same, 17 TMs had connected to Secondary Server more than 100 days.

f) It is seen that NSE used to intermittently monitor connections to the Secondary Servers. For instance, during November 2011 to June 2012, on 14 days NSE had issued warning/ advisory to 53 TMs (94 communications issued in total) communicating that they should not connect to Secondary Server without intimation. However, after June 2012, NSE ceased to perform the limited checks on connections to the Secondary Server.

g) It is clearly a fact that the Secondary Servers were less loaded in terms of IP connections, primarily due to the fact that TMs were expected to access only the primary servers in compliance with NSE's colocation guidelines. In the absence of a strict monitoring system and punitive mechanism, the non-compliant and recalcitrant TMs who routinely connect to the Secondary Servers, were able to harvests the benefits of early access to TBT feeds. NSE has set up

a two-fold defense for not having adopted any pro-active measure such as disconnecting the TMs, viz. (i) disruption of business to the TMs due to inability to close out open positions and (ii) the procedure to take disciplinary proceeding being time-consuming. This defense does not justify the stand of a first-line regulator, which is expected to regulate the conduct of TMs, both from the market integrity perspective and from the perspective of fairness and equity. It failed to take effective action or invoke penal action so as to dissuade habitual and recalcitrant TMs from continuously connecting to the Secondary Server even when the primary source was available.

h) Thus, I concur with the findings that NSE did not have defined policies and procedures around Secondary Server access, except for those mentioned in the 'NSE Co-location Guidelines'. Also, NSE did not have a documented policy or procedure around reprimanding TMs connecting to Secondary Servers. It is also observed that in the absence of defined policy and procedures, the monitoring of connections by TMs to the Secondary Server was assigned to the level of junior staff in the exchange and not supervised by any higher ups, paving the way for misuse of Secondary Servers with impunity.

8.3 Issue III: Liability of NSE under SEBI (PFUTP) Regulations, 2003 and SEBI (SECC)Regulations, 2012

8.3.1 Based on the facts alleged with respect to First Connect / Early Login and Secondary Server, in the SCN, it is alleged that NSE has violated section 12A(a),(b) & (c) of SEBI Act read with regulation 3(a), (b), (c) & (d) and 4(1) of PFUTP Regulations, 2003; regulations 41 (2) and 42(2) of SECC Regulations; Clause 4(i) of SEBI circular CIR/MRD/DP/09/2012 dated March 30, 2012 and Clause 3 of SEBI circular CIR/MRD/DP/07/2015 dated May 13, 2015. The relevant provisions are elaborated and taken up for consideration in the subsequent part of this order.

8.3.2 Response of NSE

In response to the said allegations in the SCN, the NSE submitted inter alia the following:

8.3.2.1 That the charges levelled against it under the PFUTP Regulations (namely, under Regulations 3(a), 3(b), 3(c), 3(d) and 4(1) of the PFUTP Regulations), are vague and unsubstantiated, and in any event, are not made out based on the material on record. The 2018 SCN merely refers to a bundle of legal provisions being Regulations 3(a), 3(b), 3(c) and 3(d) of the PFUTP Regulations, without even attempting to apply the facts and circumstances to the ingredients of the above regulations. This in itself makes the charges vague, ambiguous and totally unsustainable in law and on facts. The 2018 SCN fails to make out a case under the PFUTP Regulations, as the Noticee's conduct does not fall within the ambit of 'fraud' as defined thereunder.

8.3.2.2 No attempt has been made to evince how the TBT architecture (which has been alleged to be prone to manipulation) is fraudulent for it to attract the violations under the PFUTP Regulations. The definition of 'fraud' under the PFUTP Regulations requires a person to do an act or omission with a view to 'induce another person to deal in securities'. The SCNs have failed to attribute any such conduct to the Noticee. The test for determining 'inducement' under the PFUTP Regulations has been laid down in the case of SEBI v. Kanaiyalal Baldevbhai Patel which is as under:

> *"The test to determine whether the second person had been induced to act in the manner he did or not to act in the manner that he proposed, is whether but for the representation of the filets made by the first person, the latter would not have acted in the manner he did."*

8.3.2.3 The 2018 SCN merely attributes fraudulent conduct to the Noticee on the grounds that it did not consider the principle of 'Fair and Equitable' while taking a decision regarding the system architecture. The TBT architecture was introduced on account of the Noticee's paramount concern for safety and reliability of dissemination of ticks in an orderly manner. The TBT system was intended to minimize disruptions and to ensure that all ticks were delivered to the members. In fact, it was the

reliability and safety in the TBT architecture which encouraged the members to trade. Additionally and without prejudice to the above, first or early connect by the POP server did not guarantee first receipt of the TBT data. The members had no way of knowing which POP Servers connected to the PDC first. Further, the absence of randomization or load balancer by itself cannot be considered as an inducement for a trading member to deal in securities. The decision of not implementing these technologies was bona fide and was for reduction of risks. An act of creating a safe, reliable, and efficient system for consistent and uninterrupted flow of TBT data cannot be construed as a scheme to induce another person to deal in securities.

8.3.2.4 For Regulations 3 and 4 of the PFUTP Regulations to apply, an act alleged to be fraudulent "*should have an element of some motive or ill-conceived idea or design*" As stated above, these provisions are not attracted as TBT architecture was not designed by the Noticee with the motive or ill-conceived idea or design to defraud or induce any other person to deal in securities. Assuming but not accepting that there was any advantage on account of early connect, absence of randomisation and load balancers, or connection to Secondary Server, the alleged advantage was merely incidental, which may have occurred due to technicalities of the TBT architecture. In light of the above and the absence of evidence to the suggest connivance, the Noticee's TBT architecture cannot be deemed to be per se fraudulent.

8.3.2.5 Other instances of fraud, as mentioned in Regulations 2(c)(1) to 2(c)(9), also do not apply to the Noticee. There is no "knowing misrepresentation", "active concealment", false promise, "representation made in a reckless and careless manner", fraudulent act or omission, "deceptive behaviour", "false statement" etc. Further, Regulations 3(a), 3(b), 3(c) and 3(d) of the PFUTP Regulations are not attracted in the present case.

8.3.2.6 Regulation 3(a) demands the satisfaction of test of market manipulation such as creation of artificial volumes and price and/or misleading appearance of trading. Regulations 3(b), (c) and (d) presuppose employment of a "manipulative or deceptive device or contrivance", "device, scheme or artifice to defraud" and engaging in an act "which

operates or would operate as fraud or deceit upon any person". As stated earlier, the TBT architecture is fair and equitable and not prone to market abuse, which was introduced in good faith. Therefore, the present case does not fall within any of the abovementioned clauses of the PFUTP Regulations.

8.3.2.7 With respect to the charge under Regulation 4(1) of the PFUTP Regulations, which prohibits indulgence in a fraudulent and unfair trade practice in securities, it is submitted that the Noticee has not done anything in contravention of the same. As stated in the foregoing paragraphs, the conduct of the Noticee or the TBT architecture does not satisfy the ingredients of fraud. As regards, 'unfair trade practices', the Noticee submits that the concept of 'fairness' in relation to the PFUTP Regulations has been explained by the Supreme Court in ***SEBI v. Kanaiyalal Baldevbhai Patel*** in the following words:

> *"45. Now we come back to Regulations 3 and 4(1) which bar persons from dealing in securities in a fraudulent manner or indulging in unfair trade practice. Fairness in financial markets is often expressed in terms of level playing field. A playing field may be uneven because of varied reasons such as inequalities in information, etc. Possession of different information, which is a pervasive feature of markets, may not always be objectionable. Indeed, investors who invest resources in acquiring superior information are entitled to exploit this advantage, thereby making markets more efficient. The unequal possession of information is fraudulent only when the information has been acquired in bad faith and thereby inducing an inequitable result for others."* [Emphasis supplied]

8.3.2.8 Further, the standard for determining equality had been discussed by the Hon'ble Supreme Court in ***Khandige Sham Bhat v. Agrl. IT0***, wherein the Hon'ble Supreme Court observed that:

> "*If there is equality and uniformity within each group, the law will not be condemned as discriminative, though due to some fortuitous circumstance arising out of a peculiar situation some included in a class get an advantage over others, so long as they are not singled out for special treatment*." [Emphasis supplied]

8.3.2.9 In view of the above, it is submitted that the foregoing sets out the constitutional standard for determining equal treatment, then the regulatory actions of the Noticee should not be held to any higher standard. It is submitted that since the Noticee's choice of TCP/IP architecture was a bona fide decision made in good faith, and did not single out any specific individual for special treatment, it does not offend the norms of equality and fairness, and cannot be termed as unfair (even assuming for a moment that that due to some fortuitous circumstance, some brokers get an advantage over others).

8.3.2.10 Further, according to P Ramanatha Aiyar's Advanced Law Lexicon, "unfair" has been defined as "not fair, marked by injustice, partiality or deception; not equitable in business dealings." and according to Black's Law Dictionary, "unfair" has been defined as "not honest". Terms such as "deception" and "not honest" necessarily involve an element of motive and ill-conceived design. Furthermore, the Supreme Court has also held that a trade practice is unfair if the conduct in question undermines the ethical standards and good faith dealings between parties. It also held that trade practices are not subject to a single definition and requires adjudication on a case to case basis. It is submitted that the Noticee was completely honest in its actions with respect to implementation and functioning of the TBT architecture and that this architecture was introduced in good faith.

8.3.3 Consideration and findings –

8.3.3.1 Regulation 41 (2) of The SECC Regulations, 2012 casts a duty on every stock exchange to provide equal, fair and transparent access. The relevant provisions referred in the SCN are extracted below:

Securities Contracts (Regulation) (Stock Exchanges and Clearing Corporations) Regulations, 2012:

Regulation 41 (2): *The recognised clearing corporation and recognised stock* ***exchange shall ensure equal, unrestricted, transparent and fair access to all persons*** *without any bias towards its associates and related entities*.

Clause 4(i) of SEBI circular CIR/MRD/DP/09/2012 dated March 30, 2012

Guidelines to the stock exchanges and the stock brokers

4. Stock exchanges shall ensure the following while permitting algorithmic trading:

*(i) The stock exchange shall have arrangements, procedures and system capability to manage the load on their systems in such a manner **so as to achieve consistent response time to all stock brokers**. The stock exchange shall continuously study the performance of its systems and, if necessary, undertake system upgradation, including periodic upgradation of its surveillance system, in order to keep pace with the speed of trade and volume of data that may arise through algorithmic trading. (Emphasis supplied)*

Clause 3 of SEBI circular CIR/MRD/DP/07/2015 dated May 13, 2015

In order to ensure fair and equitable access to the co-location facility, stock exchanges shall:

3.1. provide co-location / proximity hosting in a fair, transparent and equitable manner.

*3.2. ensure that all participants who avail co-location / proximity hosting facility have **fair and equal access to facilities and data feeds** provided by the stock exchange.*

3.3. ensure that all stock brokers and data vendors using co-location / proximity hosting, experience similar latency with respect to exchange provided infrastructure.

8.3.3.2 At the outset, I would like to place reliance on the provisions of the 2015 circular, though it is subsequent to the period of the alleged violations, for the limited purpose of highlighting the importance of certain fundamental pervasive principles contained in SCRA. To begin with, fairness in the trading and clearing system of a stock exchange is ingrained in the regulatory framework under the SCRA and the regulations framed thereunder. The SECC Regulations of 2012 envisages every stock exchange to "encourage fair trade practice" so that it becomes an "engine for the growth of the securities market" (Ref: Schedule II – part A "Code of conduct for the directors on the governing

board"). The Clause V thereof provides that the directors are mandated to endeavour to analyze and administer the stock exchange with professional competence, efficiency and effectiveness and all these to be laced with "fairness and impartiality". The Code of Ethics for directors and KMPs explicitly lays down that it is imperative to "establish a minimum level of business/ professional ethics to be followed by these directors and KMPs, toward establishing a fair and transparent market place." Ultimately, the SECC regulation emphasizes that the directors and KMPs of recognized Stock exchanges should commit themselves to the task of enhancing the fairness and integrity of the system in letter and spirit. By fastening these responsibilities on the Directors and KMPs of a Stock Exchange, the law has mandated high standards of ethics for the business of conduct of a stock exchange in general.

8.3.3.3 The Securities Contracts (Regulation) Act, 1956 was framed with the object of preventing undesirable transactions in securities. The Act requires all contracts in securities (excluding spot delivery contracts) to be dealt only on recognised stock exchanges. The Act therefore confers a large responsibility of regulating members of the exchanges and companies whose securities are listed on the exchanges. The role of stock exchanges was discussed by the Hon'ble Supreme Court initially in ***Madhubhai Amathalal Gandhi v. Union of India*** (AIR 1961 SC 21) :

"The history of Stock Exchanges in foreign countries as well as in India shows that the development of joint stock enterprise would never have reached its present stage but for the facilities which the Stock Exchanges provided for dealing in securities. They have a very important function to fulfil in the country's economy. ...Without the Stock Exchange, capital would become immobilized. The proper working of a Stock Exchange depends upon not only the moral stature of the members but also on their caliber. ...."

8.3.3.4 The decision of the Hon'ble High Court of Allahabad in the case of ***UPSE Brokers Association & Others v. SEBI & Anr.*** [(2014) 3 COMP LJ 462 (All.)] expressed an overview of the role of the stock exchanges in the following words:

"Stock *exchanges maintain electronic systems worldwide that match orders for buying and selling of shares automatically. Stock exchanges are*

market organisers. Apart from the function of being market organisers, stock exchanges are (i) information distributors; (ii) regulators of the market which they organise; (iii) involved in setting standards of corporate governance through their listing rules; and (iv) at an institutional level, business enterprises. In the judgment of the Bombay High Court in MCX Stock Exchange Limited Vs. Securities and Exchange Board of India & Ors.24 delivered by one of us (D.Y. Chandrachud, J), the role of exchanges as "the first layer of oversight" was noticed in the following observations:

"51. Stock exchanges provide what is described as "the first layer of oversight". In many areas, stock exchanges are self-regulators. ***As self-regulatory organizations, stock exchanges have a front-line responsibility for regulation of their markets and for controlling compliance by members of rules to which they are subject****. They ensure, in that capacity, compliance of the requirements established by the statutory regulator. Apart from the regulation of members, market surveillance carried on by stock exchanges in certain jurisdictions regulates issuers. They do so by ensuring that the stocks of issuers are reliably traded and that issuers meet standards of corporate governance.* ***In exercising these powers, stock exchanges may face issues involving a conflict of interest. Such conflicts of interest have to be handled and addressed effectively within the regulatory framework****."* (emphasis supplied)

8.3.3.5 The report of the Jalan Committee in 2010 adverted to the position of these institutions as constituting *"the nucleus of (the) capital allocation system", indispensable for economic growth and constituting a part of the vital economic infrastructure.... The Jalan Committee characterized the price signals produced by stock markets as partaking of a public good. The price signals produced by these institutions was, in the view of the Committee, something which must be accessible to everyone and must be governed by a transparent and efficient market economy. Unless the prices are fair, that would result in the expropriation of unjust profits by any one side to the transaction. The Jalan Committee observed that the nature of the public good that is supplied collectively by market infrastructure institutions is dependent exclusively on the quality and integrity of the process that accompanies its production. Hence, to*

ensure dependability of the process, some degree of regulatory powers have to reside within these institutions to varying degrees."

8.3.3.6 It is seen from para 1.9 of the Jalan Committee Report that to "provide transparency and equal access to participants" was one of the key norms felt desirable in the norms regulating Market infrastructure intermediaries. Regulation 41(2) of the SECC Regulations accordingly stipulates that unrestricted, transparent and fair access must be provided irrespective of whether the concerned person is an associate/related entity or not. The above provision lays down the standards of conduct expected from the stock exchange as an institution and the leadership of the stock exchange unequivocally.

8.3.3.7 In the instant case, inequity is quite evident at different stages of the technology process – (i) the allocation of IPs which was done by NSE without imbibing the necessity of equitable distribution of IPs/ TMs in various ports across servers to the subscribers; (ii) the absence of load balancer which would make the IP arrays at the Ports even and thereby provide an equitable spread of the advantages and disadvantages, arising out of the login rank fixed for the day, across all IPs; (iii) the non-inclusion of randomizer in the Normal TBT data feed segment which would have given a fair opportunity for every TM, irrespective of the Port or the rank in the array, to receive the data feed equitably; and (iv) the failure to monitor frequent connections to the Secondary Server by certain TMs to by-pass load in primary servers. I note that as elaborated earlier, it is clear that many TMs had repeatedly resorted to accessing the Secondary Server without any concrete action on the part of the first-level regulator except for certain emails/ advisories. In short, the Stock Exchange failed to ensure a level playing field for TMs subscribing to the TBT data feed system of NSE.

8.3.3.8 As far the exchange is concerned, the factual build up and the allegations levelled in the SCN, pertain to violations that are arising by flouting the principles underlying the conduct of business of a stock exchange, pertaining to fair and equitable access to information. Alleging “fraud” against the Exchange, in this scenario, tantamounts to attributing “intention” or “knowledge”. In the absence of facts pointing towards the

collusion of employees with the TMs or proof of specific discrimination towards any specific TM or the accrual of monetary benefits/ unjust enrichment to any employee or TM, etc., I find it difficult to conclude that there is a violation of the provisions of SEBI (PFUTP) regulations, involved in the matter.

8.3.3.9 Having highlighted the importance of fair and equitable dissemination, as part of the functions of a stock exchange, I am of the view that a failure to have '*randomizer*' or '*load balancer*' in the TCP IP dissemination protocol, cannot per se be categorised as breach of the principle of "fairness and equity" as an act attracting the provisions of the SEBI (PFUTP) Regulations. In other words, dissemination of information which is in breach of the stipulations contained in SECC Regulations cannot automatically attract the rigors of the SEBI (PFUTP) regulations, without there being any proof to indicate fraud. In the absence of any evidence leading to the culpability of any specific employee of NSE or the collusion or connivance from the side of NSE with any specific TM, I am compelled to rule against the possibility of existence of a "fraud". All the findings in the foregoing observations, lead to the conclusion that the exchange has failed to comply with the provisions of SECC Regulations in letter and spirit, which has given scope to the complaints in question. The stock exchange, as a first level regulator, has a fiduciary duty to the entire ecosystem. Market participants' confidence in the trading system is based on the presumption that the rules of trading are completely uniform and transparent.

8.3.3.10 Thus, in these circumstances, I am of the view that the acts of omissions/commissions on the side of NSE, as brought out above, are in violation of Regulations 41 (2) and 42(2) of Securities Contracts (Regulation) (Stock Exchanges and Clearing Corporations) Regulations, 2012, read with Clause 4(i) of SEBI circular CIR/MRD/DP/09/2012 dated March 30, 2012.

8.4 Issue IV: Liability of Employees for PFUTP and SECC Regulations

8.4.1 The respective position/designation held by each individual Noticee in NSE during the Investigation period is tabulated below:

Table XV:

S. N.	Noticees	Designation held during the period of investigation
1	Ravi Narain	• Former MD and CEO of NSE (2000 to March 2013)
2	Chitra Ramkrishna	• Former MD and CEO of NSE (April 2013 to December 2016); • Deputy MD: 2008-10, and Joint MD: 2010-2013)
3	Subramanian Anand	• Former Chief Strategic Officer: April 2013 to March 2014; • Group Operating Officer: April 2014 to October 2016
4	R. Nandakumar	• Senior VP
5	Mayur Sindhwad	• Chief Operation Officer -Trading
6	Ravi Varanasi	• Chief Business Development Officer
7	Ravi Apte	• Former CTO: 2007 to September, 2012
8	Umesh Jain	• Former CTO: October 2012 to June 2015
9	Mahesh Soparkar	• Head of PSM Team at NSE during 2009-13
10	Deviprasad Singh	• Head of PSM Team at NSE during 2013-16
11	Sankarson Banerjee	• Former CTO
12	G. Shenoy	• CTO - Operations
13	Suprabhat Lala	• Vice President
14	Nagendra Kumar SRVS	• Chief Business Officer
15	N. Murlidaran	• MD & CEO, NSE IT
16	Jagdish Joshi	• Former Sr. Project Manager

8.4.2 Apart from the allegation in the SCNs against NSE, it was inter-alia alleged that Ravi Narain (Noticee no. 2) being the MD and CEO of NSE upto March 2013), Chitra Ramkrishna (Noticee no. 3) being the MD and CEO of NSE between April 2013 to December 2016 and Anand Subramanian (Noticee no. 4) being the Chief Strategic Officer (April 2013 to March 2014) failed to take effective steps to ensure proper systems, checks and balances so as to provide fair and equitable access to all. The adherence to the principle of 'fair and equitable' was left to the technology team without any specific guidance.

8.4.3 In the SCNs, it was alleged that it was the duty of Ravi Narain, Chitra Ramkrishna and Anand Subramanian, amongst others, to prevent

manipulation of the system architecture and ensure fair, transparent and equitable access and that by not taking preventive as well as curative measures proactively, they facilitated fraud and manipulation by TMs. They have allegedly failed to perform their role in establishing adequate systems, which led to the scenario whereby certain TMs were allowed to breach the norms of fair and equitable access. Thus, they are alleged to have violated section 12A (a), (b) & (c) of SEBI Act read with regulation 3(a), 3(b), 3(c), 3(d) & 4(1) of PFUTP Regulations, 2003; Part A and Part B of schedule II of SECC Regulations read with Regulation 26(1) & (2) of SECC Regulations and clause 3.8.1 of SEBI Master circular dated December 31, 2010.

8.4.4 In addition to the above, it was also alleged in the SCNs that Ravi Apte (Noticee No. 8) (CTO during 2007 to September, 2012) and Umesh Jain (Noticee No. 9) (CTO during October 2012 to June 2015) being the CTO of NSE had not taken adequate steps to make the TBT architecture robust and prevent it from being manipulated. It was the duty of Ravi Apte and Umesh Jain to prevent manipulation of the system architecture and ensure fair, transparent and equitable access, which they allegedly failed to do. Therefore, it is alleged in the SCNs that by not taking preventive as well as curative measures proactively, Ravi Apte and Umesh Jain facilitated fraud and manipulation by OPG, thereby violating the provisions of section 12A(a),(b) & (c) of SEBI Act read with Regulation 3(a), 3(b), 3(c), 3(d) & 4(1) of PFUTP Regulations, 2003; Part B of schedule II of SECC Regulations read with Regulation 26(2) of SECC Regulations and clause 3.8.1 of SEBI Master circular dated December 31, 2010.

8.4.5 The 2018 SCN alleged that Mahesh Soparkar (Noticee No. 10) (Head of PSM team during 2009-13) and Deviprasad Singh (Noticee No. 11) (Head of PSM team during 2013-16), being the Head of PSM Team at NSE, were responsible for monitoring unauthorized connections to the Secondary Server and following up with COLO team to ask members to stop connecting to this server. However, PSM team had failed to monitor the TMs who were connecting to the Secondary Server. Therefore, it was alleged that Mahesh Soparkar (Noticee no. 10) and Deviprasad Singh (Noticee no. 11) have violated the provisions of Section 12A(a), (b) & (c)

of SEBI Act read with Regulation 3(a), 3(b), 3(c), 3(d) & 4(1) of PFUTP Regulations, 2003.

8.4.6 Replies of Noticees:

8.4.6.1 Ravi Narain and Chitra Ramkrishna had adopted the submissions of NSE and further in their replies they have *inter alia* submitted that :

(i) They were not familiar with technology and as an institutional head they had gone with the aid and advice of the Functional heads and the decisions were collective decisions of the NSE Board.

(ii) They were not involved in the day-to-day operations of the COLO system.

(iii) They have also submitted that Board of NSE had other technically qualified persons, namely Prof S. Sadagopan, IIIT Bangalore and Dr. V.A Sastry, who holds a Post Graduate Degree from Indian Institute of Science and Ph.D. in Computer Application from the University of Waterloo, Canada and the Board acted on their advice also.

(iv) None of the two SCNs have brought out any specific allegation or *mala fide* intention against them apart from the general allegations against NSE.

(v) They have also submitted that the issues raised in the SCNs were never escalated to them.

(vi) Ravi Narain retired on March 31st 2013 and Chitra Ramkrishna resigned on December 2, 2016.

8.4.6.2 Anand Subramanian, (Noticee No. 4) in his reply dated September 11, 2018 submitted that:

(i) He joined NSE on April 1, 2013;
(ii) He was never a party to COLO either directly or indirectly. He was never a designated Key Management Personnel;
(iii) He was involved in the regular operations of the exchange and the regulatory side of the exchange;

(iv) He was a consultant part time and he demitted office in October 2016.

8.4.6.3 Mahesh Soparkar (Noticee No. 10) had adopted the reply / arguments of the NSE and in his reply dated November 19, 2018 to the SCN, has further submitted that:

(i) From mid-2010, the TBT facility was introduced and the PSM team was handed over the operations of the TBT Application. From mid-2010 to April 2013, he was *inter alia* responsible for heading the PSM Team;

(ii) His role in the PSM team also required him to (a) look overall IT operations, tooling, business continuity planning, disaster recovery; (b) planning and presenting the annual budget for all the teams that report to him; (c) cost and resource management of the teams reporting to him; (d) vendor and employee management as well;

(iii) PSM Team initially never used to monitor the Secondary Server connection as the same was not part of their function;

(iv) Since (the first six months of 2012), TBT servers were migrated from NSE's Primary Datacenter to NSE's Co-location Datacenter for resiliency purpose. During that period, the PSM team was monitoring the Secondary Server connection in order to keep the Secondary Server free. This was being done because during migration, there was chance that the Primary Servers may go down, resulting in disruption of services;

(v) Hence, the PSM team, during the said period, used to communicate to the Co-location team about TMs accessing the Secondary Server and thereafter, the COLO Team used to warn the TMs regarding the same;

(vi) This issue, specifically, was not escalated by any of his team members to him. Moreover, the PSM and COLO team did not have the authority to disconnect the member for accessing the Secondary Server.

8.4.6.4 Deviprasad Singh (Noticee No. 11) also adopted the reply/arguments of the NSE and further submitted in his reply dated November 19, 2018 that:

(i) he was not in charge of PSM operations team prior to April 2013;

(ii) he was not responsible for processes, policies, procedures and documentations in PSM operations at that time;

(iii) he took over the responsibility of heading the PSM team from Mahesh Soparkar whose duties had already been laid down earlier;

(iv) PSM team continued with monitoring of TBT Primary and Secondary Servers with respect to their technical parameters such as CPU utilization, Memory utilization, key application processes for availability etc;

(v) The aforementioned functions were done by the PSM team supervised by experienced technology team members; and

(vi) He did not have access to any of TBT systems and servers nor did he play any role in day to day operational activities of the PSM team.

8.4.6.5 Ravi Apte, (Noticee No. 8) adopted the reply of NSE and further in his reply dated November 15, 2018, *inter alia* submitted that:

(i) he was not an employee of NSE and was hired only as a Consultant and his services ended in September 2012;

(ii) he was not involved in management / operations of the Co-location Facility at NSE;

(iii) his scope of work in the NSE was only to conceptualize the broad architecture needs for the co-location, achieve high-level framework (without getting into nitty-gritties), adhere to timelines as provided by the Business team and provide guidance for implementation of the same from time to time;

(iv) he reviewed the recommendation of the technology team. The technology team had done due diligence based on the then prevailing best architectures across the globe;

(v) A comparison of the pros and cons inter se of TCP/IP and MTBT technologies were also taken into account;

(vi) Speed, accuracy, reliability, safety, efficiency, and capacity of handling large data in a systematic manner as also the probabilities of failure and other eventualities were considered;

(vii) Based on the team's recommendation and the discussions that took place, the decision of conceptualizing the architecture was made in a *bona fide* manner and in *a* good faith, keeping in mind legitimate considerations of market safety, reliability, and integrity.

8.4.6.6 Umesh Jain in his reply dated November 20, 2018 and during the hearing submitted that:

(i) He joined NSE on September 1, 2012 and was designated as senior vice president;

(ii) He was brought in, to strengthen technology governance and that initially he was being recruited for the post of Deputy CTO with the assurance that he will be designated as the CTO when Ravi Apte retires;

(iii) After joining NSE, he was neither made the in-charge of all technology related functions at NSE nor did all technology related employees report to him;

(iv) He was surprised to find out that none of the staff belonging to the technology team reported to Ravi Apte. Only the business solutions group (development team) of NSE reported to Ravi Apte. All the staff belonging to the technology team reported to N. Murlidaran, the CEO of NSE Infotech Service Limited, the wholly owned subsidiary of NSE, who in turn reported to Chitra Ramkrishna, Joint Managing Director at that time;

(v) No documents/ files were handed over to Umesh Jain by Ravi Apte and/or N. Murlidaran during the handing over procees;

(vi) Post retirement of Ravi Apte on September 30, 2012, he continued to be designated as Senior VP and head technology. He was assured that he would be made CTO with full control of all technology related functions by March 31, 2013;

(vii) Between October 16, 2012 and March 31, 2013 teams at NSE such as the Information security risk and intrusion, Information technology operations and IT infrastructure had been jointly reporting to N. Murlidharan and him;

(viii) On April 10, 2013 he was given the title of CTO;

(ix) When he joined NSE, software development and design was not part of his portfolio and the same was led by N. Murlidharan, who reported to Chitra Ramkrishna. However, on April 12, 2013, software design and development was made part of his portfolio;

(x) Thereafter, he prioritized the design and development of multicast architecture;

(xi) Despite formal roles in the technology team, the technology related functions of NSE were scattered. There were other employees in NSE who were made in-charge of certain technology related function and such people carried out the technology related function along with /as part of their own department/ roles and they reported directly to Chitra Ramkrishna and at no point of time reported to him;

(xii) During the interaction with the external stakeholders, none of the stakeholders ever complained that the TCP/IP based TBT Architecture led to any kind of manipulation. The only suggestion which the stake holders seemed to have was that of slow dissemination of information and keeping in line with the development in world's best exchanges, NSE should also come out with multicast based TBT Architecture;

(xiii) In December 2013 the technology team delivered multicast based TBT Architecture for F&O segment, which was rolled out by the business team in April 2014.

8.4.7 Consideration and findings:

8.4.7.1 At the outset, as the allegation of fraudulent and unfair trade practices levelled against the Noticee No. 1 stands disproved, the same can no longer survive against the employees. Hence, I refrain from any further examination and drop the allegations in the SCNs against the employees in 2018 SCNs, with respect to violation of the provisions of SEBI Act, 1992 read with the Regulations 3 and 4(1) of the SEBI (Prohibition of Fraudulent and Unfair Trade Practices relating to Securities Market) Regulations,2003.

8.4.7.2 Having decided the liability of the Noticees under the SEBI (PFUTP) Regulations, it is necessary for me to ascertain the liability of the employees under the provisions of the SCRA read with the applicable provisions of SECC Regulations, as alleged in the SCNs. It is reiterated that providing equal, fair and transparent access to all persons in the securities market is one of the underlying unassailable principles, which is embodied throughout the SCRA and the regulations framed thereunder, more particularly in regulation 41(2) of SECC Regulations. The said provision specifically provides that *"the recognised clearing corporation and recognised stock exchange shall ensure equal, unrestricted, transparent and fair access to all persons without any bias towards its associates and related entities."* I note that as a fundamental principle of corporate law, the obligation to comply with the abovementioned principle of equality and fair access percolates down to the directors and KMPs of stock exchanges. In fact, regulation 26 (1) of SCRA specifically casts such onus on the directors by requiring them to abide by the Code of Conduct specified under Part-A of Schedule-II of SECC Regulations. Further, regulation 26(2) additionally requires the directors and KMPs to abide by the Code of Ethics specified under Part-B of Schedule-II of SECC Regulations. The relevant provisions are extracted hereunder:

SCHEDULE - II PART - A [Regulation 26(1)]

5. General responsibility.

Every director of the recognised stock exchange and recognised Clearing Corporation shall—

(a) place priority for redressing investor grievances and encouraging fair trade practice so that the recognised stock exchange or recognised clearing corporation becomes an engine for the growth of the securities market;

PART - B [Regulation 26(2)]

Code of Ethics for directors and key management personnel of stock exchanges or clearing corporations

The 'Code of Ethics' for directors and key management personnel of the recognised stock exchanges or recognised clearing corporations, is aimed at improving the professional and ethical standards in the functioning of recognised stock exchanges or recognised clearing corporations thereby creating better investor confidence in the integrity of the securities market.

1. Objectives and underlying principles.

The Code of Ethics for directors and key management personnel of the recognised stock exchange or recognised Clearing Corporation seeks to establish a minimum level of business/ professional ethics to be followed by these directors and key management personnel, towards establishing a fair and transparent marketplace. The Code of Ethics is based on the following fundamental principles:

(a) Fairness and transparency *in dealing with matters relating to the stock exchange or Clearing Corporation and the* investors.

(Emphasis supplied)

8.4.7.3 Further, I note that the provisions contained in clause V (b) of the Code of Conduct provide that every director shall endeavour to analyze and administer the stock exchange issues with professional competence, fairness, impartiality, efficiency and effectiveness. As seen above, the Code of Ethics for directors and KMPs explicitly lays down that it is imperative to "establish a minimum level of business/ professional ethics to be followed by these directors and KMPs, toward establishing a fair and transparent market place."

8.4.7.4 While, I note that the SECC Regulations casts an omnibus duty on the stock exchange, its directors and KMPs to abide by the fundamental principle of equal, fair and transparent access, these provisions cannot be interpreted to have such overarching ambit so as to implicate all the directors and KMPs at the relevant point of time, *ipso facto*, for a breach committed by the Stock Exchange. The liability for such breaches, if any, ought to be determined by taking into consideration, the functions

entrusted to such directors by virtue of their position or designation, which are relevant to the allegations contained in the SCNs.

8.4.7.5 As regards Ravi Narain and Chitra Ramkrishna, I note that they had held the position of MD and CEO of NSE in succession, during the relevant point of time. Having held the senior most management position in the NSE and being in charge of the affairs of the conduct of the stock exchange business, they cannot limit their roles to the non-technology issues of the exchange. The MD and CEO of a stock exchange cannot abdicate his/ her responsibility by citing limited knowledge in certain spheres of the business activities. Undisputedly, they were vested with the general and overall responsibility of ensuring the implementation of the principle of equal, fair and transparent access, as mandated under Regulation 41 of The SECC Regulations. I find that while implementing TBT dissemination architecture at NSE, the essence of "Fair and Equitable access" was not attempted to be imbibed into the various stages of implementation of the technology and only "safety and reliability" was taken into account. While a stock exchange with a commercial focus can introduce technological innovations for enhancing the overall efficiency of the platform, it ought to have also reinforced the mandates laid down in the law, with respect to equal and fair access to TMs, in the interests of the market participants and the investors in the market. Ravi Narain and Chitra Ramkrishna having officiated as the Managing Directors of the Exchange during the relevant time, I find them liable for breaches of the provisions of SECC Regulations, as alleged in the SCNs.

8.4.7.6 Coming to the cases of Mahesh Soparkar and Deviprasad Singh, i.e. the two Noticees who have been additionally added to the 2018 SCN, I have considered the positions occupied by them and their submissions. Their main contention is that the monitoring of Secondary Server was not within the functional ambit of PSM team and that their monitoring of the servers during the first six months of 2012 was merely an exception, since the servers were being migrated during that period. As the employees of the Stock Exchange heading the Project Support Management Team, the responsibility of enforcing discipline with respect to connections established by TMs to the Secondary Server fell within

their portfolio. Having perused their recorded statements, their replies to the SCNs and some e-mail correspondences with TMs, it is seen that the Colo facility implementation and response to TMs was not done with a view to ensure fairness and equitable opportunity to all TMs. A close perusal of several related documents and submissions does reveal that it was the responsibility of the PSM team to inform the COLO team, which would escalate the issue further. Therefore, I am of the view that Mahesh Soparkar (Head of PSM team during 2009-13) and Deviprasad Singh (Head of PSM team during 2013-16) being the Head of PSM Team at NSE, were responsible for monitoring unauthorized connections to the Secondary Server and following up with COLO team to ask evading members to stop connecting to this server. I find that both Mahesh Soparkar and Deviprasad Singh, failed to discharge their duties as PSM team Heads, by monitoring the access to Secondary Server by TMs from time to time and administering uniform standards of discipline against the TMs. In the circumstances, I am compelled to pass suitable directions against Mahesh Soparkar and Deviprasad Singh. In my view this needs to be looked into by NSE, so as to fix accountability on the employees, as deemed fit and appropriate.

8.4.7.7 I have considered the allegations against Anand Subramanian, Ravi Apte and Umesh Jain. Anand Subramanian has contended that he was not involved in COLO matters directly or indirectly and was only taking care of the regular operations of the exchange and the regulatory side of the exchange. His case is that he was a part time consultant and he demitted office in October 2016. I note that though Ravi Apte was designated as CTO during the relevant period, he was a consultant on contract, who was involved in providing guidance to the broad architecture needs for the Co-location. Similarly, I note from the records that Umesh Jain became the CTO only on April 10, 2013 and after becoming a CTO, his responsibility was focused on changing the unicast TBT dissemination architecture into Multi cast dissemination. In view of the aforesaid observations, I am not inclined to pass any direction against Anand Subramanian, Ravi Apte and Umesh Jain.

8.4.7.8 As regards the remaining employees, namely, R. Nandkumar, Mayur Shindwad, Ravi Varanasi, Sankarson Banerjee, G. Shenoy, Suprabhat Lala, Nagendra Kumar SRVS, N. Murlidaran and Jagdish Joshi, I do not

find sufficient material available on record supporting the allegations in the 2017 SCN, on account of the implementation of the architectural aspects including Secondary Server. Hence, I am inclined to drop the allegations against the above named Noticees.

9.0 Miscellaneous Issues

9.1 The 2017 SCN had levelled some other related allegations against NSE and its employees. For instance, it was inter alia alleged that NSE had weak or inadequate electronic record retention policy. While evaluating the systems and procedures of NSE, I find that there was no policy with respect to maintenance of records. Therefore, I concur with the allegations in the SCN to the effect that there was no Standard Operating Procedures (SoP) for IP allocation to TMs, dealing with the TM - requests for reassignment of different servers, etc. Likewise, the records of log-in or running of Epsilon script were not maintained. Though some of the electronic data could have been voluminous in nature, NSE ought to have put in place a documented policy, after identifying the crucial data that would be required to be stored for purposes of review of any conduct issues from the side of TMs or employees or for other investigations, etc.

9.2 Likewise, there are remarks in the SCNs, with reference to certain e-mails referred in the 2016 Deloitte Report and the TAC Report to the effect that the NSE and its officials have not co-operated with the inspection team and have failed to provide requisite details/ information/ data sought by them.

9.3 NSE had inter alia made the following submissions:

a) While the 2017 SCN refers to various instances of non-cooperation by NSE and its officials with the Deloitte team, the 2016 Deloitte report has not drawn any adverse findings on the same. Even the examples quoted in the 2017 SCN with regard such alleged non-cooperation appear to relate primarily to instances in which there were apparent contradictions between emails and statements made by employees.

b) These apparent differences could be on account of multiple factors such as:

(i) Time elapsed - Enquiry was conducted after a period of 3 to 6 years because of which many of the employees could not recollect the events;

(ii) Change of team members - Many of the relevant employees and senior management who were involved in the colocation / TBT operations during the relevant time, had ceased to be associated with the Noticee at the time of the enquiry;

(iii) *Bona fide* difference in understanding and difference of opinion – The 2017 SCN refers to an instance where Deloitte was not informed of the `rand()' function used for the Bucket POP, until they discovered it in the course code analysis, even though the NSE's employees were aware of the same. Deloitte enquiry was limited to the NSE's TBT system (F&O segment) and not the Bucket POP service, the employees of the NSE had not considered this information relevant to the enquiry. This was not suppressed intentionally (as has been assumed or alleged) — rather, NSE and its employees had only responded to the information sought from them (which was limited to the primary TBT architecture). Also, the Bucket POP service has been discontinued, and therefore this service was no longer an active part of the NSE's system architecture;

c) Also, the delay in providing data on some instance was on account of same being voluminous and historical (3 to 6 years old data).

9.4 I note that these are based on some inconsistencies that have arisen between what was explained to the Expert Committee members and the Forensic Audit team members and the e-mails of various NSE officials, which were later brought to the notice of the Forensic Auditors. I note that no specific instance or allegation has been raised against any specific employee so as to attribute any motive on the side of the employee to mislead the concerned teams. Moreover, when the Expert Committee members were interacting with different NSE officials with differing levels

of knowledge, carrying out different and distinct part of the COLO related activities, contradictions and inconsistencies could surface. As long as an attempt to deliberately mislead the inspection or investigation is not apparent, such instances cannot be considered to warrant a direction at this point of time. I also note that subsequent to the issuance of the 2017 SCN, NSE has given detailed replies / responses. Thus, in view of the above observations, I am inclined to drop all the related allegations in the 2017 SCN against NSE and its employees. However, this finding is not intended, in any way, to undermine the importance of co-operation from the side of the exchange and its employees in forensic audits and investigation of the instant nature.

10.0 Conclusion:

10.1 To sum up, even though sufficient evidence is not available before me to conclude that the Noticee No.1, NSE has committed a fraudulent and unfair trade practice as contemplated under the SEBI (PFUTP) Regulations, I find that it is established beyond doubt that NSE has not exercised the requisite due diligence while putting in place the TBT architecture. The same created a trading environment in which the information dissemination was asymmetric, which cannot be considered fair and equitable. This failure of NSE to ensure equal and fair access, in the facts and circumstances as detailed and discussed in above paragraphs, has resulted in violation of Regulation 41(2) of SECC Regulations, 2012. The significance of compliance with the requirement of the said provision by a Stock Exchange has already been elaborated in paragraphs 8.3.3.1 to 8.3.3.10, in the earlier part of this order. Hence, I am compelled to issue appropriate directions against NSE for the same.

10.2 While issuing directions, I note that NSE being a Market Infrastructure Institution (MII), cannot be treated at par with other market intermediaries or participants, as it derives its power to act as a Stock Exchange from the recognition granted to it under SCRA. Issuance of any direction which would have a bearing on its status as a recognized Stock Exchange falls outside the scope of these proceedings. At the same time, it is imperative that suitable directions with respect to the violation of the provisions of SECC Regulations be issued. In these circumstances, I am of the view

that an order for disgorgement of a portion of the profits derived from the TBT data dissemination activity during the relevant period, for being transferred to the Investor Protection and Education Fund (IPEF), created by SEBI under section 11 of the SEBI Act, would be an appropriate direction, commensurate with the violations. For the purpose of such computation, I note that TBT data dissemination commenced from June 2010 onwards and continued till March 2014. The Table of computation to arrive at the disgorgement amount is provided below:

TABLE XVI - Revenue from co-location facility*				
Financial Year	**Transaction Charges from Co-location Facility (A)**	**Rack Charges (B)**	**Connectivity Charges (C)**	**Total of (A+C)** (E)**
2010-11	77,76,63,347.65	18,44,73,783.93	5,79,95,615.64	83,56,58,963.29
2011-12	1,83,58,36,732.12	24,51,67,221.88	13,06,88,934.29	19,665,25,666.41
2012-13	1,91,96,77,107.73	21,51,47,840.90	20,62,02,323.69	2,12,58,79,431.42
2013-14	2,90,73,42,975.10	14,65,96,301.37	28,00,23,424.69	3,18,73,66,399.79
TOTAL	**7,44,05,20,162.61**	**79,13,85,148.08**	**67,49,10,298.31**	**8,11,54,30,460.92**
***Figures provided by NSE ****Rack charges excluded from computation as these are not relatable to TBT data dissemination.				

From the above table, it is observed that during the period 2010-11 to 2013-14, NSE's revenue from co-location facility (excluding Rack charges) was Rs.811.54 crores.

10.3 For the purpose of arriving at the share of NSE's profits to be transferred to IPEF, I am inclined to take into consideration, the Net Profit margin [i.e. Profit after Tax *over* Revenue from Operations] for the relevant period, as shown in the table below:

TABLE XVII - NSE's Net Profit margin over operations:			
Year	**Revenue from Operations (In Rs. Cr.)**	**Profit after Tax (In Rs. Cr.)**	**(PAT/Revenue from Operations)*100**
2010-11	1,047.20	637.51	60.88%
2011-12	1,080.03	704.89	65.27%
2012-13	1,000.84	877.61	87.69%
2013-14	1,079.07	1,019.28	94.46%
Consolidated	**4,207.14**	**3,239.29**	**77.00%**
Source: NSE Annual Reports for the relevant period			

As observed from the table above, NSE's average Net Profit margin was 77% across the years 2010-11 to 2013-14. Applying the margin on NSE's revenues from co-location facility (excluding rack charges) from 2010-11 to 2013-14, I find that the profit from co-location operation comes to Rs. 624.89 Crores.

11.0 Directions:

11.1 Accordingly, in exercise of the powers conferred upon me under section 19 of the SEBI Act, 1992 read sections 11, 11(4) & 11B of the SEBI Act, 1992 and section 12A of Securities Contracts (Regulation) Act, 1956 read with Regulation 49 of SEBI (SECC) Regulations, 2012, I hereby issue the following directions:-

i) NSE, Noticee No. 1:

a) shall disgorge an amount of Rs.624.89 crores, as ascertained in para 9.3 above along with interest calculated at the rate of 12% per annum from April 01, 2014 onwards to the Investor Protection and Education Fund (IPEF) created by SEBI under Section 11 of the SEBI Act, within 45 days from the date of this order;

b) shall be prohibited from accessing the securities market directly or indirectly for a period of six (6) months from the date of this order; and

c) shall carry out System Audit at frequent intervals, after through appraisal of the technological changes introduced from time to time; reconstitute its Standing Committee on Technology at regular intervals to take stock of technological issues; and frame a clear policy on administering whistle blower complaints.

ii) Ravi Narain, Noticee No. 2, (former MD & CEO of NSE):

a. shall disgorge 25% of the salary drawn for FY 2010-11 to 2012-13 to the IPEF created by SEBI under Section 11 of the SEBI

Act, through NSE, within a period of 45 days from the date of this order;

b. shall be prohibited from associating with a listed company or a Market Infrastructure Institution or any other market intermediary for a period of Five (5) years;

iii) Chitra Ramkrishna, Noticee No. 3, (former MD & CEO of NSE):

a. shall disgorge 25% of the salary drawn for FY 2013-14, to the IPEF created by SEBI under Section 11 of the SEBI Act, through NSE, within a period of 45 days from the date of this order;

b. shall be prohibited from associating with a listed company or a Market Infrastructure Institution or any other market intermediary for a period of Five (5) years;

iv) NSE shall initiate an enquiry under its Employees Regulations against Mahesh Soparkar (Noticee No. 10) and Deviprasad Singh (Noticee No. 11) with respect to the findings contained in paragraph 8.4.7.6 above, and submit a report to SEBI within 6 months from the date of order.

v) In view of the directions at para (ii)(a) and (iii)(a) above, NSE shall determine and intimate the amount arrived, to the concerned Noticees within a period of 10 days from the date of this order under intimation to SEBI.

vi) Noticee Nos. 1, 2 and 3 shall pay the said amounts within 45 days from the date of this Order either by way of demand draft drawn in favour of "Securities and Exchange Board of India", payable at Mumbai or by *e-payment* * to SEBI account as detailed below:

Name of the Bank	**Branch Name**	**RTGS Code**	**Beneficiary Name**	**Beneficiary Account No.**
Bank of India	Bandra Kurla Branch	BKID 0000122	Securities and Exchange Board of India	012210210000008

*Noticees who are making *e-payment* are advised to forward the details and confirmation of the payments so made to the Enforcement department of SEBI for their records as per the format provided in Annexure A of Press Release No. 131/2016 dated August 09, 2016 which is reproduced as under:

1. Case Name:	
2. Name of the payee:	
3. Date of payment:	
4. Amount paid:	
5. Transaction No:	
6. Bank Details in which payment is made:	
7. Payment is made for: (like penalties/disgorgement/recovery/settlement amount and legal charges along with order details:	

11.2 In view of the observations at paragraph 8.4.7.8 above the SCNs dated May 22, 2017, July 3, 2018 and July 31, 2018 against Anand Subramanian, Ravi Apte, Umesh Jain, R. Nandkumar, Mayur Shindwad, Ravi Varanasi, Sankarson Banerjee, G. Shenoy, Suprabhat Lala, Nagendra Kumar SRVS, N. Murlidaran and Jagdish Joshi stand disposed of.

11.3 The above directions shall come into force with immediate effect.

Date: April 30, 2019
Place: Mumbai

G. MAHALINGAM
WHOLE TIME MEMBER
SECURITIES AND EXCHANGE BOARD OF INDIA