

SECTION 8

A) DESIGN PARAMETERS AND PERFORMANCE TABLES

The SCADA/DMS system shall be designed as per the technical parameters defined in the specification and the tables specified here. The SCADA/DMS system (such as databases, network elements etc.) shall be sized to accommodate the requirement mentioned in table 7.

The system shall be tested with the doubled present power system size (ultimate capacity) as defined in table 7& measure the various performance of the system as defined in the tables and technical specification including peak and average load scenarios.

The auxiliary memory utilisation , average CPU, RAM & LAN utilisation parameters shall not exceed the limits as defined in table 8. This memory utilisation includes the memory used for storage of data for the defined duration as specified in the various sections of technical specification.

The SCADA/DMS system shall be suitable for addition of atleast double the operator workstations (in future) without requiring any up gradation of the servers.

The SCADA/DMS system design & performance parameters are defined in the following tables:

TABLE 1 - DESIGN PARAMETERS FOR SCADA FUNCTIONS

TABLE 2 - DESIGN PARAMETERS FOR ISR FUNCTIONS

TABLE 3 - DESIGN PARAMETERS FOR DMS FUNCTIONS

TABLE 4 - MAINTENANCE ACTIVITIES

TABLE 5- DESIGN PARAMETERS FOR USER INTERFACE

TABLE 6 - CONFIGURATION CHARACTERISTICS & AVAILABILITY FUNCTIONS

TABLE 7 - POWER SYSTEM SIZE

TABLE 8- OTHER PERFORMANCE REQUIREMENTS

TABLE 9 - ACTIVITIES FOR NORMAL AND PEAK LEVEL OF LOADING

TABLE 1 – DESIGN PARAMETERS FOR SCADA FUNCTIONS

Note ; The parameters which are not indicated in the tables & only mentioned elsewhere in the specification shall also be considered as design parameters

Ref. Section	Function Description	Design capacity	Execution rate
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Ref. Section	Function Description	Design capacity	Execution rate
1.2.2.1	Data Acquisition from RTU	As per specification	
	a) Status data	All status points	<ul style="list-style-type: none"> ▪ By exception, updated & displayed within 4sec from data collection from RTU at S/s 6 sec from data collection from FRTU/ FPI ▪ Integrity check of all status at every 10 Minutes (configurable) ▪ On demand
	b) Analog data	All analog points	<ul style="list-style-type: none"> ▪ By exception, updated & displayed within 5 sec & 10sec ▪ Integrity check for all analog at every 10 Minutes (configurable) ▪ provision for all analog update at periodicity of 10 sec configurable upto 1 hour. ▪ Energy values periodically configurable from 5 min to 24 hours ▪ On demand <p>The time skew at SCADA/DMS control centre ,S/S , RMU,FPI shall not be more than 0.1sec at each location & latency shall not be more than 0.5sec for status. For analog data the time skew shall not be more than 1sec & latency shall not be more than 1sec for analog as per IEEE C37.1.</p> <p>Energy values of 15 minute blocks shall be collected periodically from the RTU, FRTU at scan rate of 15 minute/1 hour (configurable upto 24 hours). Alternatively, the energy values shall be calculated for each 15 minute/1 hour blocks at SCADA level from the acquired energy values of MFTs through RTU & FRTU.</p>
1.2.3	Time synchronisation of RTU	All RTUs shall be synchronised from Master station	every 5 Minutes (Configurable from 5-60 minutes)

Ref. Section	Function Description	Design capacity	Execution rate
1.2.4 ,1.3 sub section	SCADA/DMS Data Exchange with other system as specified (R-APDRP system).	As per specification	A/R for ISR function & data exchange
1.2.5	Data Processing		
1.2.5.1	Analog data processing:		
	a) Conversion to engineering units	Per analog points	Each time the value is received in SCADA
	b) Zero dead band processing	Per analog points	Each time the value is received in SCADA
	c) Reasonability Limit checking	High and Low reasonability limits per analog point	Each time the value is received in SCADA
	d) Limit Monitoring (Operational, Alarm and Emergency limits)	High and Low for each of the limits per analog point	Each time the value is received in SCADA
	e) RATE OF CHANGE	per analog point	Each time the value is received in SCADA
	f) Sign conventions	per analog point	Each time the value is received in SCADA
	g) Accumulator processing	Accumulator points	Each time the value is received in SCADA
1.2.5.3	Calculated Data Processing:		
	- Arguments for analog calculations	32	Each time the value is received in SCADA
	- Arguments for status calculations	32	Each time the value is received in SCADA
	- No. of calculated data (Min / Max with time stamp and Average)	3 X no. of analog point for max /min/avg and 1x no. of max/min/avg for other calculations	Min/Max /Average calculation for each 5 min duration
1.2.5.2	Digital Input data processing	As per specification	As per specification
1.2.5.4	Substation Topology Processing	For no. of status, refer RTU/FRTU/FPI point counts in the technical specification. within 1 sec response after updation in SCADA database	Triggered by status change.
1.2.5.5	Alternate source of data	For all status , analog telemetered parameters	Each time the value is received in SCADA
1.2.5.6	Quality codes	As per specification	Each time value is received by SCADA

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Ref. Section	Function Description	Design capacity	Execution rate
1.2.6	Continuous Real time data storage & Playback	a) Atleast 2 days storage for all tele-measurands	a) Each time the value is received from RTU in SCADA database
		b) Playback of stored data for selected time period of 1 to 10 minutes	b) playback sampling rate configurable in Second/ minutes
1.2.7	Sequence-of-Events data	1000 events circular buffer in the SCADA database	SOE retrieval Periodically (5 minutes) or by exception and On demand
1.2.9	Supervisory Control		
	a) Control Inhibit Tag Types	4	(a) (b) (c) On demand by Dispatcher/DMS function initiated
	b) Control inhibit Tags Per Device	4	
	c) Control Action Monitor	10 timer periods (1 to 60 sec)	(d) Each time supervisory control is requested
	d) Control permissive	For all control points	
1.2.10	Failsoft capability	Critical functions	in the event of system crosses mark of peak loading requirements through graceful degradation of non-critical functions & also relaxing periodicity / update rate of display refresh & critical functions by 50%..

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TABLE 2 – DESIGN PARAMETERS FOR ISR FUNCTIONS

Reference section	Function Description	Design capacity	Execution rate	Response time
1.3.1	Circuit breaker status table	Data as per spec for all CBs	Updation on change in CB status or any of the associated information	2 sec after updation in SCADA database
		b) data storage On Auxiliary memory	b) 2 months retention	
1.3.2	Data Snapshot table	a) Volume of data = Total telemetered status and analog points and max/min with time stamp and average for each analog point with quality codes	a) Snapshot - 5 minutes periodicity	
		b) data storage On Auxiliary memory	b) 2 months retention	
1.3.3	Hourly data table	a) Volume of data = Total telemetered points and max/min with time stamp and average for each analog point with quality code	a) Hourly	
		b) data storage On Auxiliary memory	b) 2 months retention	
1.3.3	Hourly Energy data table/Missed hourly data table	a) Volume of data = Export/Import KWh & Export/Import KVARh for all energy meters with quality code	a) Energy values of 15 minute blocks of each Hour	
		b) data storage On Auxiliary memory	b) 2 months retention	
1.3.4	Daily Energy data table	Volume of data = Export/Import KWh & Export/Import KVARh for all energy meters with quality code	a) Energy values of 15 minute blocks of each Hour	
		b) data storage On Auxiliary memory	b) 2 months retention	

Reference section	Function Description	Design capacity	Execution rate	Response time
1.3.5	Load priority table	Data as per spec for all CBs	On demand by Billing system Under R-APDRP IT implementation. Besides load priority shall be possible to assign locally in SCADA/DMS system .	
1.3.6	SOE data table	daily 4 changes per SOE point	Each time the SOE is received from RTU/FRTU/FPI in SCADA database	
1.3.7	Data exchange with Billing system Under R-APDRP IT implementation	a) Daily Energy values of specified hour b) Load priority table	a) Daily & on demand b) On demand by SCADA or change in priorities by Billing system Under R-APDRP IT implementation	a) 30 sec
1.38	Data Exchange with Customer Care System under R-APDRP IT implementation	Circuit breaker status table	By exception & On demand by CCS	30 sec
1.3.9	Data Exchange with GIS System under R-APDRP IT implementation	Data of electrical network	On user request/validation	
1.3..10	Historical information data retrieval	Retrieval of all stored data	On demand	
1.3.11	System message Log Storage	a) 20,000 entries /month		
		b) data storage On Auxiliary memory	b) 2 months retention	
1.3.12	Mass storage of data file	As per spec		
1.4	DR function	As per spec	As per spec	
DATA EXCHANGE REQUIREMENTS WITH SLDC SHALL BE DEFINED BY UTILITY AS PER EXISTING SLDC SYSTEM CONDITIONS				

TABLE 3 - DESIGN PARAMETERS FOR DMS FUNCTIONS

Reference section	Name	Design capacity	Execution rate	Response time
2.2	NETWORK MODEL	One model with atleast 10 possible islands. Islands may be formed dynamically.. All electrical components mentioned in the spec		
2.3	NETWORK CONNECTIVITY ANALYSIS (NCA)	Complete network		
	2) Real time mode		- - Event driven	2sec
	b) Study mode		- On demand	2sec
2.4	State estimation	Complete network	On change	Complete network
2.5	LOAD FLOW APPLICATION (LFA)	Complete network		
	a) Real time mode		- periodic (10 minutes) - On demand by user/application - Event driven	5sec
	b) Study mode		On demand	5 sec
2.6	Voltage/VAR Control	All tap changers & cap bank	On change	5sec
2.7	LOAD SHED APPLICATION (LSA)	Complete network		
	a) Manual mode		a) On demand	a) 30sec (for analysis)
	b) Auto mode		b1) On scheduled time (Time of day) b2) Event driven (Frequency threshold)	b) 30 sec (for analysis)

Reference section	Name	Design capacity	Execution rate	Response time
2.8	FAULT MANAGEMENT & SYSTEM RESTORATION (FMSR)	Atleast two simultaneous faults in the network shall be supported & Complete network		30 sec
	Manual mode		On demand	
	Auto mode Generation of switching plans		Event driven	
	Prefault configuration mode		On demand	
2.9	LOSS MINIMISATION VIA FEEDER RECONFIGURATION Generation of switching plans (Manual & Auto mode)	Complete network	-Periodic (15 minutes) -On demand	30 sec
2.10	LOAD BALANCING VIA FEEDER RECONFIGURATION Generation of switching plans Manual & Auto mode	Complete network	-Event driven -periodic (15 minutes)	30sec
2.11	Distribution Load Forecasting	Complete network	Periodic & on demand	30 sec
2.12	Operations Monitor	Complete network	change in devices status	5 sec
2.13	DTS (Also refer specification clause 2.13)	Complete Network	Replica of SCADA/DMS	Same response

Table - 4**Maintenance activities**

Action	Performance
Complete database regeneration	2 hours
Complete system software build, including operating system, applications, and databases	6 hours
Software build of all applications and databases	3 hours
Software build of a single applications and databases	10 minutes
Installation of a single, new display including distribution to all consoles	60 seconds
Reinstallation of all displays	60 minutes
Perform an on-line update of a database parameter and propagation of the change to the source data	60 seconds

TABLE 5 - DESIGN PARAMETERS FOR USER INTERFACE

Reference section	Name	Design capacity	Execution rate
3.1&3.2	SCADA/EMS SYSTEM ACCESS SECURITY Function and Data Access Security Operating jurisdictions	16	
3.3	Windows Environment		
	Rooms	32	
	Layers	8	
	Declutter Levels	16	
	Panning and Zooming	supported	
3.5.5	TREND		
	a) Trend files	10	
	b) Variables per trend file	4	
	c) Samples per trend variable	5,000	

Reference section	Name	Design capacity	Execution rate
	d) Sampling rate	Configurable from 5 sec to 15 minutes	
3.6	ALARMS		Triggered by event
	Alarm priority levels	16	
	Alarm Message Recording on auxiliary memory - alarms	2months	
3.7	EVENTS		
	Event Message Recording on Auxiliary memory - events	2months	

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TABLE 6 - CONFIGURATION CHARACTERSTICS & AVAILABILITY FUNCTIONS

Reference Section	Name	Execution Rate	Maximum Response Time (With in)
6.6	CONFIGURATION CHARACTERISTICS AND AVAILABILITY		
	Backup Databases Data backup	60 seconds or event driven	5 seconds
6.8	Processor Errors Processor failure detection		10 seconds
	Device Errors Device failure detection		10 seconds
6.10	Processor Redundancy and Configuration Management		
	Function Restart Other functions except ISR ISR		30 seconds 120 seconds
6.11	Processor Start-Up <i>with applications functional</i>		
	1) Hot Start 2) Warm Start a) all applications		1) Not more than failover time 2) 10 minutes

Reference Section	Name	Execution Rate	Maximum Response Time (With in)
	3) Cold Start a) Application except ISR operational b) ISR application		a) 15 minutes 3) 15 minutes a) 20 Minutes b) 60 Minutes
6.12	Device/Processor Failover		30 seconds from detection of failure

TABLE 7- POWER SYSTEM SIZE

POWER DISTRIBUTION SYSTEM SIZING

AS PER ATTACHED NETWORK DIAGRAMS -

Note Control system hardware & software shall be equipped & sized for for double the size of the above

1.

S.no	System	Present	Ultimate
1.	Primary S/S		
2.	RMU		
3.	FPI		
4.	Power transformer		
5.	Distribution transformer		
6.	Feeders		
7.	Bus bars		
8.	Capbanks		
9.	OLTCS		
10.	Switchable breakers		
11.	Switchable isolators/swirtches		
12.	sectionizer		
13.	MFTs		
14.	Meters		
15.	Any other network parameter		

Table 8- PERFORMANCE REQUIREMENTS

(a) USER INTERFACE REQUIREMENTS

At no time the SCADA/DMS system shall delay the acceptance of User request or lockout console operations due to the processing of application functions.

User interface requirements	Response time (Peak loading)
Requests for call-up of displays shall be acknowledged with an indication of request is being processed	Within 2 sec
Any real time display and application display (except RDBMS DB displays) on workstation console, Complete display & data values shall appear on screen	Within 3 sec after acknowledgement of request
Manual Data entry of the new value shall appear on screen	Within 2 sec
Display update rate	Every 2 sec for at least 4 displays together
Panning of a world display from one end of screen to other end of screen in a continuous manner	Within 2sec
Supervisory control action shall be completed with result displayed on the screen	Within (2sec + scan time + communication delay time +field device operation time)
Alarm and event response time	display within 1 sec of receipt in SCADA/DMS system
Alarm and event acknowledgement	With in 2 sec
Requests for printing of displays shall be acknowledged with an indication of request is being processed	Within 2 sec
Requests for generation of reports shall be acknowledged with an indication of request is being processed	Within 2 sec

(b) UTILISATION

(Considering double the present power system size)

Name	Average Utilization	Comments
PROCESSOR UTILIZATION		
Servers	30%	Normal loading
	50%	Peak loading
Communication Front end/ ICCP server	30%	Normal Loading
	67%	Peak loading
LOCAL AREA NETWORKS		
Uncontrolled Access	15%	Normal loading

Name	Average Utilization	Comments
(e.g., Ethernet)	20%	Peak loading
Controlled Access (e.g., token-ring)	40%	Normal loading
Memory	40%	Peak loading
Main memory utilisation (avg)	50%	Normal loading
	67%	Peak loading
Auxiliary memory utilisation	50%	

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Table 8c- ACTIVITIES FOR NORMAL AND PEAK LEVEL OF LOADING

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(Considering double the present power system size), (1) NORMAL LEVEL OF ACTIVITY

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The normal level of activity shall simulate system activities spread over one hour period. During the testing, the response times and the average utilizations shall not exceed the specified values. The following conditions define normal level of system activity to generate the normal loading scenario. Test simulation shall be done using software tool to generate this loading within 1 hr . Staggering of loads during the test duration of 1 hour is permitted.

- (a) All RTU/FRTU/FPI data shall be scanned and processed as specified in the Specification.
- (b) All data exchange with other systems shall occur as specified in the Specification.
- (c) All periodic functions shall be executed at the rates defined in tables
- (d) The following SCADA/DMS functions shall be executed on-demand:

Function	Number of demand executions
Substation topology processor	50 state changes
Sequence-of-Events data	50 SOE points reported
All DMS applications	4 on-demand per DMS application

- (e) Alarms (2 X no. of RTUs +FRTU+FPI) per hour shall be generated. Each alarm shall be acknowledged individually within 5 seconds.
- (f) Events (2 X no. of RTUs +FRTU+FPI) per hour shall be generated.
- (g) 1% analog of total analog/ 5sec measurements of total analog point count changes as per IEEE37.1

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- (h) One complete run of on-line diagnostics shall be performed on all computers
- (i) Communications channel monitoring shall be performed.
- (j) The following user interface actions shall be performed:

Display Selection	30 per operator workstation & VPS
Supervisory control actions	2 per RTU & 1 per 50 FRTUs
Display Updates	Each operator workstation shall display 3 updating and 1 non-updating display window per monitor. This also includes VPS. Updating displays: - alarm summary list - world display containing a S/S SLD - Network display Non-updating displays: - SCADA/DMS System Display
Data Entry	5 data entry actions from any single display
Display Trending	8 display trends, each trending 4 variables
Reports	Prepare and printing of 5 reports

- (k) The following maintenance activities shall be performed:

Function	Task
On-Line Database Editing	Modify 20 data points in each of the 5 RTUs
Display Generator and Management	Modify one single-line diagram one tabular display

2) PEAK LEVEL OF ACTIVITY

The peak level of activity is an addition to the average level of activity described in (A) NORMAL LEVEL OF ACTIVITY above. The peak level of activity shall be applied for a five minute period. During the next ten minutes, only the normal level of system activity shall be applied. This test shall be repeated for four consecutive fifteen minute periods, for a total peak level test time of one hour. The five-minute peak loading period shall coincide with SCADA/ DMS system period where all periodic software is scheduled for execution and at least one five minute period shall span an hour boundary to consider the scheduled hourly periodic activities. There shall be no restrictions on the period when the five-minute peak can occur.

The software execution rates and response times defined in tables of this section , shall not be degraded and the utilization defined in tables of this section shall not exceed during the peak loading conditions. The following conditions shall define the additional peak level of system activity:

- (a) As per IEEE C37.1
 - a. 15 % of status of total status points/ 5sec measurements
 - b. 40% analog of total analog measurements /5sec

- 50% of the alarms shall be acknowledged within the five-minute period (automatic acknowledgement is unacceptable).

- (c) Display Requests
6 display requests per minute per console

- (d) Supervisory Control
Total 1 per RTU & 1 per 10/ FRTUs in four 5Minute period of peak loading cycles

- (e) DMS applications
3 Network Connectivity Analysis

- (f) Reports
Prepare 5 reports.

End of SCADA/DMS PERFORMANCE TABLES