सं. 22-1306/4/2022-ओ एम [E-262577]
भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power

F-Wing, 2nd Floor, Nirman Bhawan
New Delhi, the 30th October, 2024

To,

1. Principal Secretary/Secretary (Energy) of State Governments/UTs.
2. CMD, Grid-India, New Delhi

Subject: Workforce Adequacy Guidelines for Load Despatch Centres and Guidelines for deputation of Workforce from SLDCs to Grid-India for fixed terms-reg.

Sir/Madam,

A copy each of the 'Workforce Adequacy Guidelines for Load Despatch Centres' and **'Guidelines for deputation of Workforce from SLDCs to Grid-India'** approved by the Hon'ble Minister of Power is forwarded herewith for information and compliance.

2. The Workforce Adequacy Guidelines for Load Despatch Centres will serve as a benchmark for enhancing the Load Despatch Centres by ensuring they are equipped with sufficient skilled human resources. The Guidelines for Deputation of Workforce from State Load Despatch Centres (SLDCs) to Grid-India focus on fostering collaboration and knowledge-sharing among various LDCs. These guidelines facilitate the exchange of personnel, thereby promoting functional cohesion and building a robust talent pool of Power System Operators.

3. By adhering to these guidelines, LDCs can enhance their operational capacity, ensure efficient management of the grid and ultimately contribute to the stability and reliability of the electricity supply across the nation. Compliance with these guidelines is essential for achieving the goal of a well-equipped and skilled workforce in the power sector.

Encl: As Above

Yours faithfully
30/10/24
(Parveen Dudeja)
Director (OM)
Email:parveen.dudeja@nic.in

Copy to : Chairperson, CEA

Copy for information to: PS to Hon. MoP /Sr. PPS to Secretary (Power)/ Sr. PPS to AS(SN)/ PPS to JS(OM)

Copy to: Incharge, NIC, Ministry of Power for uploading the guidelines on the website of Ministry of Power under 'New Notices' with heading "**Workforce Adequacy Guidelines for Load Despatch Centres and Guidelines for deputation of Workforce from SLDCs to Grid-India for fixed terms**".

Workforce Adequacy Guidelines for Load Despatch Centres

July 2024

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Introduction

The Electricity Act 2003 designates the Load Despatch Centres (LDCs) as apex bodies to ensure integrated, secure, reliable, economic, and efficient operation of power system under their jurisdiction. The LDCs would play an important role in facilitating the energy transition towards a sustainable and decarbonised electricity grid. Human Capital is the most important Asset in in any organizational setup. Human Resource adequacy has a direct effect on performance and efficiency of all functions and activities. Since LDCs carry out mission critical activities on a 24X7 basis, the availability of adequate human resources in the Load Despatch Centres play a very critical role for reliable and efficient power supply. These guidelines have been formulated to provide a benchmark for strengthening the State Load Despatch Centres by ensuring adequacy of skilled human resources.

The Committee on 'Manpower, Certification, and Incentives for System Operation and Ring-fencing Load Despatch Centres' 2008, estimated a total requirement of 60-70 persons in each Load Despatch Centre. However, it has been more than 14 years since the report was published and the landscape of Indian Power Sector has undergone major transformations since then.

The report on 'Capacity Building of Indian Load Despatchers'(CABIL) endorsed by the Forum of Regulators in 2018 elaborated the manifold expansion in the roles and responsibilities of the load despatch centres in India. The load despatch centres were placed in three groups viz Group-A (Large LDCs), Medium LDCs and Emerging LDCs. The total number of executives (including Supervisors, excluding staff for Sub-LDCs, Physical Security and REMC) in Group-A (Large LDCs) recommended in the report was in the range of 100 – 150 nos. The report further recommends additional 25 personnel for Renewable Energy Management Centres (REMCs).

Categorization of Load Despatch Centres

Considering the diversity of power system profile of different states in terms of their peak demand met, energy consumption and installed capacity of Renewable Energy Sources, all SLDCs have been categorised. Their Human Capital requirements are different as well. The thirty-five SLDCs have been grouped into three categories – Large SLDCs, Medium SLDCs, Emerging SLDCs. NLDC and RLDCs have been considered in the category of large LDCs for the purpose of estimating workforce requirement.

Table 1- Categorisation of SLDCs

S. No.	Large SLDCs	Medium SLDCs	Emerging SLDCs
1	Andhra Pradesh	Assam	Arunachal Pradesh
2	Gujarat	Bihar	Chandigarh
3	Haryana	Chhattisgarh	Dadra and Nagar Haveli /Daman & Diu
4	Karnataka	Damodar Valley Corporation	Goa
5	Maharashtra	Delhi	Manipur
6	Madhya Pradesh	Himachal Pradesh	Meghalaya
7	Punjab	Jammu & Kashmir and Ladakh	Mizoram
8	Rajasthan	Jharkhand	Nagaland
9	Tamil Nadu	Kerala	Puducherry
10	Telangana	Odisha	Sikkim
11	Uttar Pradesh	Uttarakhand	Tripura
12	West Bengal		Andaman & Nicobar*
13			Lakshadweep**

* As of now, LDC functions of A& N are being managed by the Energy Management Centre (EMC) at Port Blair. Considering the power system profiles such as Peak Demand Met, Energy Consumption and Installed Capacity of Renewable Energy Sources, A&N can be categorize under Emerging LDC.

** Managed by Electricity Department, Lakshadweep

The functions discharged by LDCs can be broadly classified into following categories - System Operation (SO), Market Operation (MO), Logistics, and

Support services. The System Operation function covers operational planning (including assessments, studies, crew management), real-time operation (including scheduling, forecasting, outage planning and reporting) and post despatch analysis (including reporting, MIS, feedback and analytics). The market operation function covers open access administration, day ahead market, real-time market, energy accounting and settlement activities, regulatory functions etc. Logistics covers decision support, Information technology. Cyber Security has emerged as an important function and requires dedicated specialized personnel. Support Services include human resource management, contract services, finance and account, establishment, administration are support services.

There are thirteen Renewable Energy Management Centre (REMC) in India which include the REMCs in Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Telangana, Tamil Nadu, Karnataka and Andhra Pradesh which are collocated with SLDCs. The REMCs are also envisaged for UT Ladakh and 3 more locations (under discussion stage). The REMC takes care of the forecasting, scheduling and real-time monitoring renewable energy resources. REMCs at all regions require dedicated, specialized employees.

Imperatives

In the past decade, due to rapid developments / interventions in the sector, through reforms, policy initiatives, changing corporate landscape and LDCs' own evolving roles in the Power Sector, several imperatives have emerged. Additional HR will be required to meet challenges related to exponential increase in electrical energy demand, growth in the economy and changes in technology, regulations, market design, administration and management of the power system. These imperatives will impact functions and require additional resources including Human Resources. Some of these are enumerated below:

1. Grid management has transitioned from supervisory role to sophisticated controls & faster Electricity Market administration such as Automatic Generation Control, System Integrity Protection Systems, Real Time

Market, Advance metering Architecture/Smart Grid. There is now an increased thrust on optimization – Economic Dispatch, Energy Optimization, Asset Optimization and Demand Optimization.

2. In addition to the round-the-clock System Operation, the Load Despatch Centres are expected to contribute in Market Operation, research & analysis, support / advocacy in regulatory affairs, Data dissemination (system data acquisition, Communication, IT systems) and other establishment services to carry out the various functions with suitably skilled workforce.

3. There have been dynamic changes in the electricity consumption patterns, in addition to this, System Operation is facing another major challenge of integration of Renewable resources, such as Solar & wind, in line with India's commitment to Climate change & NDC targets. This brings in new challenges in respect of its variability, intermittency and technological aspects associated with Power electronic devices. Further, constraints in terms of flexibility of conventional resources also contribute towards these challenges.

4. LDCs have undertaken several new work domains to improve reliability, security and economy, these include:- Load forecasting, RE forecasting, fuel security assessment, production cost optimization studies, generation outage planning, transmission outage planning, assessment of Transfer Capability, Reactive Power studies, Short circuit and transient stability studies, small signal stability studies, Electromagnetic transient studies, Mock black start drills, Activation of back up control centre, preparations for special events like festivals, natural calamities like cyclone, floods etc. and documentation of procedures (operating, restoration).

5. With advent of new players such as distributed generation, storage, electric vehicles, aggregators etc., there is a need for renewed thrust in areas such as Market Design, Open Access Administration, Day Ahead

Market, Real Time Market, Ancillary Services Market, Metering, Accounting, Settlement & Pool Accounts, Tax reconciliation & LDC fees and charges etc. With introduction of ancillary services, forecasting scheduling & deviation settlement regulations for RES, demand for market-based instruments (balancing & flexibility services viz. AGC, fast response tertiary regulation, ramping, load following etc.) is likely to arise on a significant scale. Hence, adequate personnel will be required to meet these challenges and carry out these evolving activities.

6. On technology front, focus areas essential for building and strengthening of technical infrastructure in LDCs are Engineering of new SCADA/EMS upgrades, Synchro-phasor technologies, Real time Applications, Off-line applications, Big Data Analytics tools, Website development, upgrading and maintaining Cyber security, etc.

7. Cyber Security is a new emerging area, where keeping updated, timely assessment of threats and facilitating collaboration on devising policies and strategies to strengthen Cyber Security efforts across Power Systems is important

8. Furthermore, for efficient running of the LDCs HR functions, Finance functions, Planning, Vigilance, etc. deployment of matching additional HR Resources would be a necessity.

9. There should be a sufficient number of power system operators to ensure that the grid can be operated safely and efficiently at all times, and that operators are not overworked. There is a need for some type of rotation of staff for scheduling, continuity of service and stress reduction of the power system operators, hence, a minimum tenure and reserve shift are important.

Figure 1- Emerging Areas for LDCs

Methodology adopted for working out HR Requirement

1. Based on existing functions and envisaged future functions, an organigram was prepared for LDCs.

2. Comprehensive list of existing and anticipated activities based on present area of operations and anticipated requirements was prepared.

3. Working out FTE (Full Time Equivalent) requirement for each activity- This was done based on daily time-required estimate for completion of each activity. FTEs have been estimated in particular function in increments of 0.25.

4. While estimating FTE Requirement, degree of automation and outsourcing which is present and/ or anticipated is also accounted for. Certain activities such as housekeeping, security etc. are envisaged to

be outsourced completely, with only supervisory function remaining with the LDCs.

5. In critical functions such as Real-Time System operation, it is essential to plan for contingencies and build reserves, a requirement underscored by COVID-19 Pandemic. Hence, in a major change of approach, a reserve shift has been considered, making it 5 shifts in total for Real –Time Grid Management.

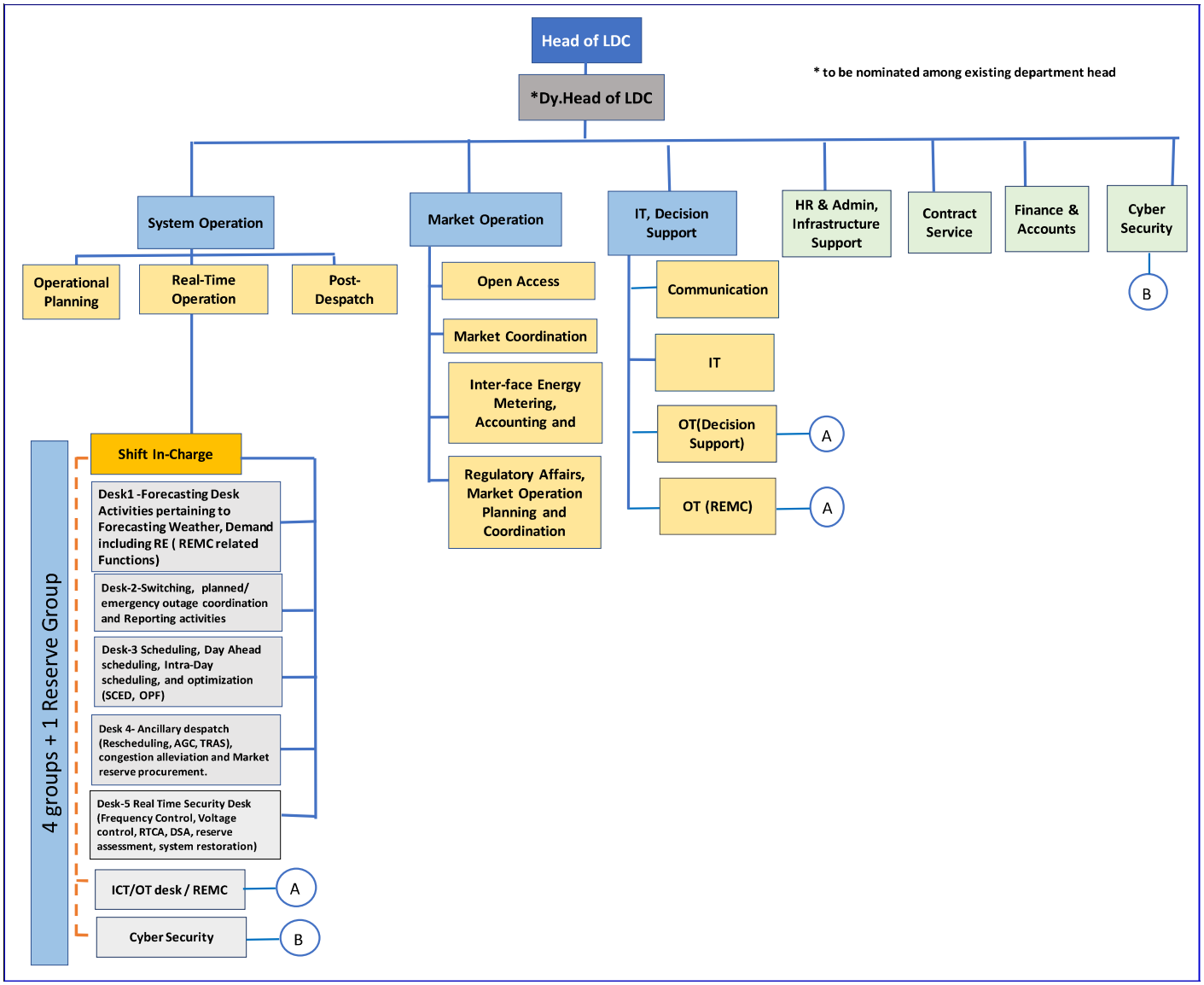
6. The number of activities performed in Large, Medium and emerging LDCs remain more or less the same, the volume and extent of the activities being carried out differs based on the size of the LDC, hence, the number of personnel differs at each LDC. There are certain statutory activities which will remain the same irrespective of the size of the LDCs and therefore, a minimum number of workforce allocation will be required at each LDC.

DEPARTMENT CATEGORISATION - NLDC, RLDCs & SLDCs

FTEs allocation has been done to these 7 Functions: i. System Operation,ii. Market Operation iii. Logistics iv. Cyber Security v. Contract Services vi. Finance and Accounts vii HR, Admin & Infrastructure Services. These numbers do not include workmen or staff requirement for non-core functions such as general upkeep of the premises, security, assistants etc. and do not include workmen, these requirements are different for every LDCs based on their local. Regional requirement and ongoing legacy.

Further, it is not envisaged that these numbers are achieved immediately, as culture and socialisation of employees is important it is important that there is a gradual scaling or workforce at every LDCs.

Figure 2- Typical Organogram for an LDC



1. System Operation

System Operation in each LDCs has been organized under three divisions- i. Operational Planning or Pre-Despatch; ii. Real-Time Operation- to be operated in Shifts, with respective Shift-In charges and with one offline In-charge, iii. Post-Despatch

a. Functions, roles and responsibilities of **Operational Planning** are as follows:-

i. Primary Frequency Response Testing
ii. Primary/secondary/tertiary reserve capacity assessment
iii. Validation of standards conformity test reports submitted by RE developers through in-house simulations
iv. Enforcement and Compliance of various standards and regulations under RE
v. Network model validation for simulation studies
vi. Fuel adequacy assessment
vii. Protection coordination, resilience coordination
viii. Enhanced coordination with stakeholders for system reliability for high impact low probability events (Lights off, cyclone, Solar Eclipse etc.
ix. Increasing number of Power System Elements- especially Renewables, EVs, Solar Roof-top
x. Studies such as Steady State Studies, Dynamic Studies, Optimisation Studies. Forecasting, Fuel Security Assessment and Generation & Network Outage Planning.
xi. Disaster Management Coordination
xii. Transnational Coordination, resilience coordination Mock black-start drills, contingency plans, Preparation for Special Events
xiii. Augmentation in Back-Up control centre operations- As a part of the initiatives to enhance resiliency of control centre operations, back-up control centres and disaster recovery systems are being implemented in some of the LDCs. Dedicated HR is required for satisfactory operation of these centres to enable them to cater for emergency situations.
xiv. Resource Crew Management, documentation

Some of the key additional functions also include Carrying out data intensive research consultation / collaboration with other grid operators, multilateral agencies, academia and other statutory bodies in India. Strengthening capabilities in system simulation, optimization, forecasting, model validation, data management, situational awareness, synchrophasor applications, dynamic security assessment and other decision support technologies, harmonization of operating procedure.

b. Functions, roles and responsibilities of **Real-Time Grid Operation** are as follows :

Real-Time operation is at the heart of any LDC. Therefore, adequate deployment of trained and certified personnel is required. Each control room must operate in five shift groups with 3-8 Nos. per shift. There would be total 5 shift groups. The fifth group is recommended to factor leave reserves and training needs of real-time operations personnel. This is in line with the international best practices. COVID-19 Pandemic has underscored the importance of Reserve Shifts. This fifth reserve group will ensure continuity of operation even in cases where entire groups have been quarantined Thus, the HR budget for real-time operations takes into account round-the clock operations, entitled leaves, public holidays, festivals, business travel, training, special assignments etc. making a total of 15 – 40 Nos. overall for control room shift operation.

These functions in each shift group have been segregated into desks, each desk will perform specific duties. Shifts will be headed by Shift In-charges, with an overall in-charge in offline (General Shift), to oversee and coordinate. The Desks are as follows:-

i. Desk 1- Forecasting Desk – Activities pertaining to Forecasting Weather, Demand including RE (REMC related Functions)

ii. Desk-2-Switching, planned/emergency outage coordination and Reporting activities

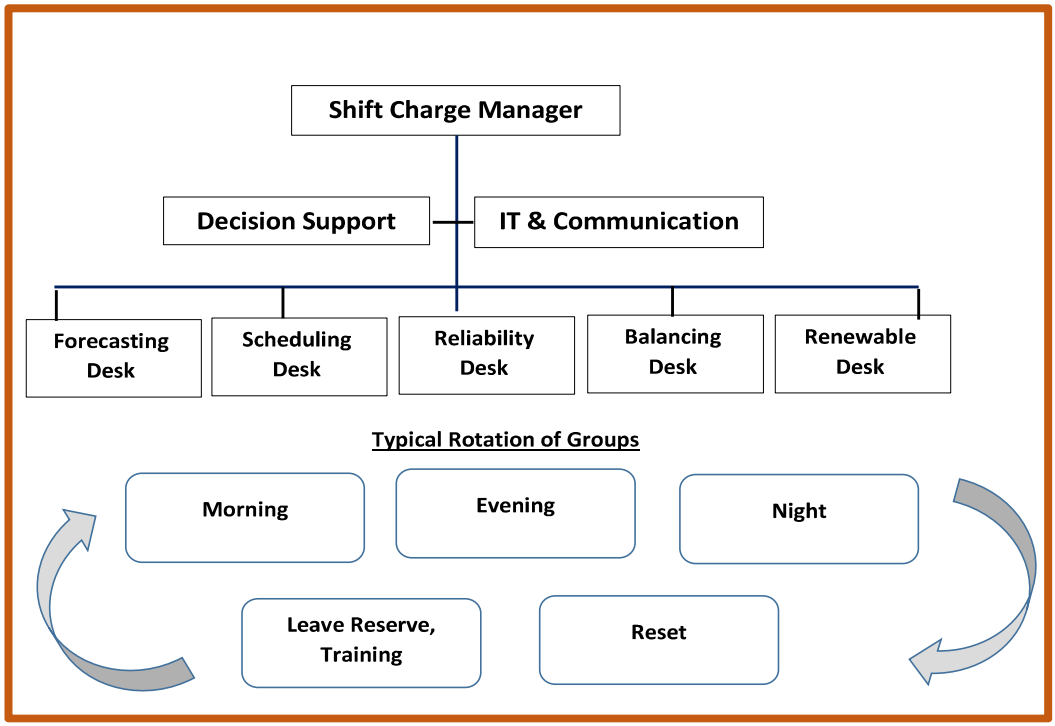
iii. Desk-3 Scheduling- Day Ahead scheduling, Intra-Day scheduling, and optimization (SCED, OPF)- for activities and functions pertaining to Security Constrained Economic Despatch and Optimal Power Flow.

iv. Desk 4- Ancillary despatch (Rescheduling, AGC, TRAS), congestion alleviation and market reserve procurement. This require dedicated persons in real-

time for reserve assessment, reserve procurement from DAM/RTM and despatch and coordination with the ancillary service providers.

v. Desk-5 Real Time Security Desk (Frequency Control, Voltage control, RTCA, DSA, reserve assessment, system restoration).

Figure 3- Organogram of Real-time shift operation



c. Functions, roles and responsibilities of **Post Despatch** are as follows: -

i. System performance assessment.
ii. MIS and Reporting, Grid standards, code compliance monitoring and reporting.
iii. Low Frequency Oscillation Display and Analysis Evaluating Primary Response- Inertia and frequency response Ramp performance assessment AGC response assessment Network availability verification Grid incident/ disturbance analysis, reporting and documentation.
iv. Operation feedback compilation.
v. Simulation of events and learning, Data analytics and research.

2. Market Operation

Market Operation function is an evolving Dynamic Function, which is changing due to various regulatory initiatives and reforms. Market Operation has been organized under 4 divisions - Open Access, Market Coordination, Inter-face Energy Metering, Accounting and Settlement, Regulatory Affairs. Functions and activities related to Electricity markets are limited in medium and emerging LDCs, hence, comparatively the staffing requirements are lower in these LDCs. Functions, roles and responsibilities which have been added to Market Operation include: -

a. **Open Access Administration**:

i. Administration of Electricity Market through National Open Access Registry (NOAR) Short term open access - bilateral / e-bidding Open Access Short term open access - collective / DAM, RTM, billing, collection, disbursement, reconciliation
ii. Day Ahead Market, proposed GDAM, MBED, Market coupling
iii. Real Time Market
iv. Accounting and settlement of Secondary/Tertiary Reserve and Ancillary Services
v. Ancillary Services Market
vi. forecasting scheduling & deviation settlement regulations for RES
vii. Market based instruments (balancing & flexibility services viz. AGC, fast response tertiary regulation, ramping, load following etc.)
viii. DSM Amendment Regulations

b. Market Coordination:

i. Grid Access- User registration, fees and charge sharing

ii. Market Participants Coordination, allocations, Energy contracts, losses, regulation of power supply, Day Ahead Ancillary Requirement
iii. Finalisation of inter-change schedule

c. Inter-face Energy Metering, Accounting and Settlement:

i. Energy meter placement and integration, FTC clearance
ii. Meter data collection, AMR
iii. Energy meter data validation including with SCADA
iv. Energy meter data processing
v. Energy accounting (active & reactive) including trans-national accounting, Congestion Account
vi. Congestion, Ancillary (SRAS, TRAS...) account
vii. SCED account
viii. Transmission charge computation
ix. Pool account operation including reconciliation (Finance Executive)
x. Transnational exchanges Settlement and Reconciliation

d. Regulatory Affairs, Market Operation Planning and Coordination

i. Market analytics,
ii. Market design feedback
iii. Audit / Stakeholder coordination
iv. Physical Grid access administration-Connectivity, long/medium term access
v. Power purchase agreement, database
vi. Regulatory compliance verification coordination, first time charging coordination, Performance test, COD verification
vii. Filing petitions and replies
viii. Coordination with legal, regulatory institutions, law firms

3. Logistics

Logistics functions have been organised in 4 divisions which are:- i. Operation Technology; ii. Renewable Energy Management Centres; iii. Information Technology; iv. Communication.

Real-Time SCADA/ IT Support Desk - With automation of the scheduling process and introduction of ancillary despatch, AGC control system, dynamic security assessment, the real-time supervision of the communication and the information technology systems has become critical. This desk would oversee the decision support systems and the data and speech communication in real-time.

b. Functions, roles and responsibilities of **Operation Technology Logistics** are as follows**:**

i. Engineering of upgrades of SCADA/ EMS, R&M, Integration of PMU and RTU,
ii. Development & Maintenance-SCADA database, SCADA Display, ICCP,
iii. Synchro-Phasor Technologies- Database and display development & maintenance
iv. Real-Time Software Application - SCED, AGC, RRAS, State Estimation
v. Decision Support-State Estimation, EMS, Dynamic security assessment, Optimal Power Flow
vi. Dispatcher training simulator maintenance
vii. Local and remote back up control centre (incl REMC) maintenance
viii. Power Supply System - UPS/DG Set, Control Room Air Conditioning
ix. AMC coordination, certification, verification
x. Support for real-time ICT/OT desk / REMC Support

c. Functions, roles and responsibilities of **Information Technology - Logistics** are as follows:

Advanced digitization and automation requirements without compromising cyber security and hygiene. Effective redundancy and disaster recovery mechanism which is seamless and wide-spread. The thrust would be towards timely execution of the Technology roadmap that has been evolved through a wide consultation.

i. IT systems infrastructure, networking, hardware engineering design and maintenance
ii. -JanIT systems- Application software maintenance
iii. Information access control and security (Implementation of CISO,
iv. CERT-GO Advisories)
v. Information interface (Internal, external)
vi. Database administration and maintenance
vii. Application software design and development
viii. Data analytic system
ix. Disaster recovery system
x. Data lake, warehouse and mining

d. Functions, roles and responsibilities of **Communication Logistics** are as follows**:**

i. Voice communication (Internal and external, recording)
ii. Data communication - (PLCC, Leased line, Optic fibre, GPRS, VSAT, Satellite), Wi-Fi
iii. Remote Conferencing and Meeting Facilities- Audio-Visual
iv. Communication Network Availability Verification

4. **Renewable Energy Management Centres(REMCs)**

The REMCs in the southern, western, northern region and the national REMC in New Delhi began operations in February 2020 are being managed by GRID - INDIA. They require dedicated human resource for maintaining the IT systems, overseeing the operations, and other related IT, OT and forecasting aspects.

Functions, roles and responsibilities of **Renewable Energy Management Centre**s are as follows**:**

i. RES Integration
ii. REMC database/ Display development, maintenance, Support for Real-time REMC Desk
iii. Forecast Service Provider, Weather Service Provider coordination in REMC
iv. Availability and Performance Verification

5. **Cyber Security**

Cyber Security is a major focus area in view of changing Information Technology Landscape globally. A real-time 24X7 desk to coordinate activities and functions pertaining to Cyber Security in LDCs. RLDCs and NLDC are under the same corporate structure, a few cyber security functions have been centralised at GRID-INDIA, at the corporate level.

Functions, roles and responsibilities of **Cyber Security** are as follows**:**

i. Roles and responsibilities of CISO, Alternate CISO, and various requirement to coordinate with the statutory bodies and monitoring and ensuring cyber security initiatives and compliances within the LDC
ii. Coordination and enactment of cyber security controls and compliances.

i. SOC function - works related to 24 x 7 monitoring at Security operation Centre (if established at the organizational level) and

analysis of the events thereof, . With future growth and possibility of establishment of NOC (Network Operation Centre), SOC at unit level etc. the requirement may also increase.

ii. CISO, CERT GO related coordination with stakeholders, CERT-In, NCIIPC

iii. ISMS compliance

iv. Real-time Cyber security monitoring

6. Support Functions– Contract Services, Finance and Human Resources

For efficient running of the LDCs the support functions like HR/ Admin, Finance, Planning, Vigilance, Contract service, Legal etc. play a very important role. The Work place policies keep up with necessary protective measures and implementation and provide solutions to issues between team members, avoiding risk for the company and its employees. The financial information are required to operate effectively and efficiently, keeping the overall guidelines and direction.

Functions, roles and responsibilities of **Support Functions** are as follows:

Finance & Accounts : Revenue Accounting & Reconciliation, Pool Accounts & STOA - Accounting & Reconciliation, Third party payment (CAPEX/REPAX/Opex, Admin exp.) - Accounting, Payments, MIS, Maintenance of BG, Establishment - (Salary & Employee Claims, Loans and Advances) - Payments to employees viz Salary, TA, Medical, Contingent claims, Lease payments, Tax calculation, Issuance of Form 16, Filing of quarterly and annual TDS returns, Payment to retired Employees claims, Financial Concurrence and Committee works, Banking , Payment to employees & Third party on daily basis, Bank Reconciliation, Liaoning with bank, Taxation - Deposit of monthly tax, Filing of Quarterly & Annual return, TDS reconciliation, Coordination with Income Tax Deptt. GST Returns & Compliance, internal, statutory and CAG audits etc.

HR/HRD & Admin : Performance Appraisal & Coordinating Promotion, HRD, HR Operation, Social Security and Compliances including IMS/ DPE/ MoP/ CERC etc., Recruitment, HR Operation, Social Security and Compliances including IMS/ DPE/ MoP/ CERC etc., House Keeping, Despatch, Reception & Visitor Management; Welfare, AMS, Sports, Other agencies; Ergonomics & ambience - Furniture, Lighting, Acoustics, horticulture, Public Address System etc.

Contract Service: Quotation collection, tender preparation, GeM portal, Bid processing, opening, Placing of LoA/PO, Contract closing.

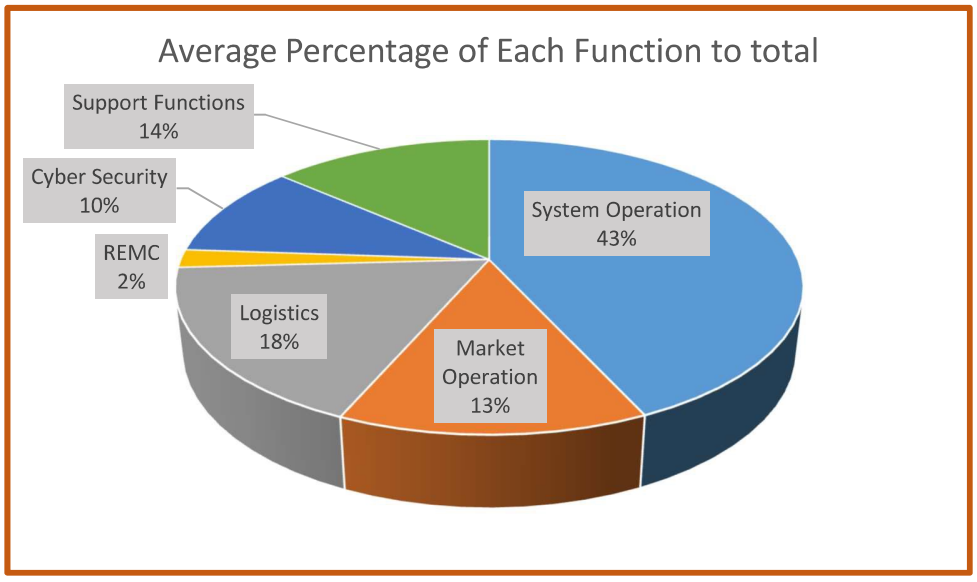
7. Summary of Function-wise Allocation of FTEs in LDCs are follows:-

Table 2- Function-wise Workforce allocation

LDCs - Workforce Staffing Norms						
SN	**Function**	**NLDC**	**RLDC**	**Large SLDC**	**Medium SLDC**	**Emerging SLDC**
System Operation						
1	System Operation - Operational Planning	18	18	18	16	9
2	Real Time Grid Operation (For SO only)	31	31	31	26	18
3	Post-Despatch	10	10	10	10	4
Sub -Total (SO)		**59**	**59**	**59**	**52**	**31**
Market Operation						
4	Open Access Administration	5	4	4	1	1
5	Market Coordination	4	4	4	3	1
6	Inter-face Energy Metering, Accounting and Settlement	10	8	8	4	1

7	Regulatory Affairs, Market Operation Planning and Coordination	7	5	5	1	1
Subtotal - MO		**26**	**21**	**21**	**9**	**4**
Logistics						
8	Logistics _Operation technology	15	14	14	8	3
9	IT Logistics	9	9	9	6	3
10	Communication Logistics	4	4	4	2	2
Subtotal - Logistics		**28**	**27**	**27**	**16**	**8**
REMC						
11	REMC Logistics	3	3	3	2	1
Cyber Security						
12	**Cyber Security**	**17**	**8**	**14**	**13**	**10**
Support Functions						
13	Contract Services	3	3	3	2	2
14	Finance and Accounts	9	9	9	5	3
15	HR & Admin	8	8	8	4	3
Subtotal -Support Functions		**20**	**20**	**20**	**11**	**8**
Grand-Total		**153**	**138**	**144**	**103**	**62**

Figure 4- Average percentage of each function



Level-Wise Requirement

In order to facilitate decision making and empower control rooms and functions to take decisions independently without any time lag and waiting for approval for all actions, it is imperative that appropriate senior level persons are deployed at every level.

Table 3- Level-wise Requirement at each LDC

Level	Percentage of total Workforce in LDCs
Top Management	1 %
Senior Management (experience of 20 years & above)	9 %
Middle Management (Experience of 15 -20 Years)	20 %
Working Executives (experience of below 15 Years)	70 %

a. Top Management:

Head of LDC- All LDCs are required to be headed by senior level executive, as they are required to interact with external stake-holder and give inputs. Hence, experienced and senior person is required who is able to communicate with all institutions such as SERCs, STUs & SLDCs and interact with head of institutions, at the level of Secretary of State Energy dept., CMD / Directors of other Power Utilities etc.

b. Senior Management:

i. They typically serve as Heads of functions (based on their seniority. Further, it is essential to keep succession planning in mind and these

senior executives shall take the roles of Head of LDCs / future Directors of similar institutions.

ii. Represent LDCs at various forums and multi-lateral agencies. They are responsible for motivating their teams, leading and coordinating efforts, and have to undertake assignments.

c. Middle Management Level

Will head each shift group and divisions, within functions in LDCs including function like HR, Finance etc. It is essential that he/she is given responsibility to ensure that there is independent real-time decision making. They are empowered to take complex actions and decisions. Thus, there is decentralization of authority and responsibility.

d. Working Level

These are working and learning levels and these employees progress through the hierarchy to take more responsibilities.

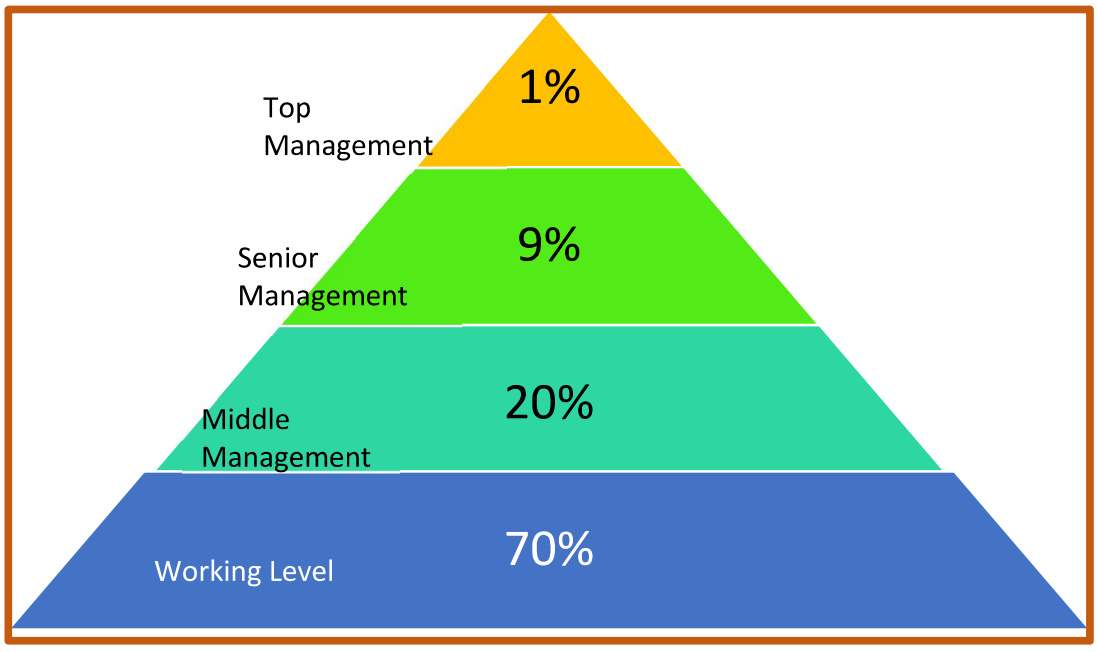


Figure 5- Level-wise distribution of Workforce

Creating Skilled and Motivated Workforce at LDCs

i. Training of System Operators

System operators need to be up-to-date with the evolving technology, policies, rules, standards, regulations, procedures and best practices. Therefore, capacity building through training and refresher programme has been implemented through National Power Training Institute (NPTI) for Load Despatchers. It is categorized into 3 levels - Basic Level, Specialist Level and Management Level. Basic Level System Operation programme is the foundation course required for all System Operators and can also be attended by those posted in other functional areas in LDCs. Basic Level Course on Cyber Security is required for those posted in IT & OT functions. The specialist courses on topics such as Reliability, Regulatory Framework in Power Sector, and Advanced course on Cyber Security are available for experienced specialist professionals employed in these respective fields in LDCs. The payment of Tuition fee for these courses is exempt for employees of SLDCs. Detailed list of Training Courses for LDC personnel is given at **Annexure-I.**

In addition to this, LDC personnel should also be encouraged to pursue online training and certification available at several national and international academic institutes and offered by Massive Online Open Courses (mooc) platforms such as LinkedIn Learning, Edx, Coursera etc. Learning has evolved from structured learning programs to individualised learning journeys where the content, pace, and assessment of the learning are tailored to the individual learner's needs and preferences. This approach allows learners to set their own learning goals. The learning journey must align to employees' career advancement as well as bridge the gaps between the present skills, knowledge and behaviours to what is required to meet future challenges and promote the mantra of 'Learning on the go'. Forum of Load Despatchers (FOLD) can also evolve its own e-learning platform, to cater to unique requirements of system operators.

ii. Certification of System Operators & Fixed Retainer-Ship Incentives

Presently, National Power Training Institute (NPTI) has been entrusted as Nodal Agency for Training & Certification of System Operators and various certification exams for Basic and Advance Level are being conducted by NPTI. List of training/certification programs is given at Annexure-I. As per Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2022, Ref No. CEA-PS-16/1/2021-CEI Division, dated 8th June 2023, "***no personnel shall be engaged as Load Despatcher without certification***". For details guidelines regarding mandatory Training & Certification of Basic and Advance Level refer Central Electricity Authority's *"**Statutory Guidelines for Training and Certification of Load Despatchers & Recognition of Training Institutes' January 2024".***

The Load Despatchers who acquire the certificate of basic level and of advance level in their respective area of specialization shall be allowed a fixed retainer-ship amount during the validity of such certificate period in line with the Central Electricity Authority's "**Statutory Guidelines for Training and Certification of Load Despatchers & Recognition of Training Institutes' January 2024.**

iii. Short term exposure Programme for System Operators

Power system operators should have the necessary education and training to perform their duties, and should be regularly updated on new technologies and industry developments, there should be concerted efforts to increase collaboration and communication among System Operators from LDCs. A Short-Term Exposure Programme has been envisaged to provide opportunity the system operators to learn from each other and to propagate best-practices. Rotation of System Operators would also enhance cohesive working and coordination in operations. The programme will include 2-10 days' duration rotational assignments to other LDCs. The officials from one LDC will be rotated to other LDCs in System Operation, Market Operation and Logistics functions. Detailed modalities of the Short-Term Exposure Programme are given **as Annexure- II.**

iv. Tenure of Posting in SLDCs

Reliable and safe operation of power systems is critical to the country. Tacit knowledge gained through practical experience is essential for handling minute to minute challenges and for training new entrants. Therefore, a minimum posting for a period of three years is recommended for any official posted in SLDC. Any person posted in an LDC shall be provided training and must acquire relevant basic level certificate within six months of being posted in the LDC.

v. Creating a Progressive Culture

LDCs play a critical role in ensuring the reliability and efficiency of the electric power grid. Organizational culture, the values, beliefs, and practices that shape how an organization functions.

There have been immense transformations in the power sector resulting into an increase in the scope, volume and complexities of all the functions. LDC's external business environment has always been fast-evolving, requiring continuous knowledge upgradation and inherently challenging. The years ahead will bring additional challenges, both anticipated and uncertain. LDC's success in meeting them will depend largely on an engaged, highly skilled and motivated workforce.

In order to build competence and ensure that LDCs are able to deliver high levels of performance, due importance must be given to developing a progressive culture and creating an ecosystem that values employees and empowers them.

A strong organizational culture can help establish trust with stakeholders, by promoting transparency and consistency, LDCs can demonstrate its commitment to fair and impartial decision-making internally and externally.

When employees feel that they are valued and respected, they are more likely to be committed to the organization and motivated to perform at their best.

A positive organizational culture can improve communication and collaboration among employees, which can help ensure that the grid is operated in a safe and efficient manner. It can help in building teamwork and trust among employees, resulting in better coordination and better outcomes.

An LDC's culture plays an important role in encouraging innovation, improving communication, attracting and retaining talents and maintaining safety and compliance. A strong, positive culture can help the LDCs operate more effectively and efficiently, and ultimately better serve the nation.

LDCs must create and provide opportunities to their employees for continuous professional development, employees must be given exposure and networking opportunities to interact and network. LDCs must participate in national and international for a such as FOLD, NPSC etc. Mentorship must be provided to the new joinees in the organization in order to assimilate and socialize them to the culture. Reward and recognition mechanisms must be designed to recognize high performance individuals, motivate and reward them.

Behavioral Training on topics such as communication skills, leadership skills and skill based training on topics such as Data Analysis. It is important to develop strong values and ethics in the organization to develop high performance culture which empowers every employee.

Apart from Training and Certification, clearly defined procedures and protocols for handling different types of situations help create clearly defined goals for System Operators and enables them to do carry out their functions effectively. Established performance parameters for organisations, departments and individuals such as Key Performance

Indicators (KPIs), Annual Appraisal for System Operators help peomote accountability and excellence. These create a positive work environment, where everyone is aware of their goals, roles and responsibilities and is responsible for outcomes.

Tools and processes must be established to ensure that there is communication and collaboration among all System Operators, especially among different shift groups, off-line studies, post-despatch functions. Special measures such as peer-to-peer learning sessions mjust be organised to ensure this.

Conclusion

Given the strategic and unique nature of LDC's operations, it is important to ensure sufficient bench strength for diverse functional areas and adequate talent pool for leadership roles at senior and top management. Optimal deployment of human resources is imperative for employee satisfaction and motivation across functions, regions and levels. Deployment of additional HR coupled with their capacity building as detailed above, is vital to effectively carry out the statutory/corporate roles and responsibilities at present and in the future to the satisfaction of all its stakeholders.

List of Tables

List of Figures

List of Abbreviations

1. LDCs- Load Despatch Centres
2. VUCA- Volatile Uncertain Complex and Ambiguous
3. REMC- Renewable Energy Management Centre
4. FTE- Full Time Equivalent
5. ESCerts- Energy Saving Certificates
6. RPO- Renewable Purchase Obligation
7. HPO- Hydro Purchase Obligation
8. REC- Renewable Energy Certificate
9. PAT- Perform Achieve Trade
10. CISF- Central Industrial Security Force
11. PSDF- Power System Development Fund
12. CERC- Central Electricity Regulatory Commission
13. CEA- Central Electricity Authority
14. MoP- Ministry of Power
15. CERT-GO- Computer Emergency Response Team Grid Operator
16. IMS- Integrated Management System
17. IT- Information Technology
18. OT- Operational Technology
19. NOAR- National Open Access Registry
20. SCED- Security Constrained Economic Despatch
21. AGC- Automatic Generation Control
22. EV- Electric Vehicles
23. DAM- Day Ahead Market
24. RTM- Real Time Market
25. STATCOM- Static Synchronous Compensator
26. SVC- Static Var Compensator
27. HVDC- High Voltage Direct Current
28. UFR- Under Frequency Relays
29. ROCOF- Rate of Change of Frequency
30. SPS- Special Protection Schemes
31. RPC- Regional Power Committee
32. FOLD- Forum of Load Despatchers
33. MIS- Management Information System
34. STOA- Short Term Open Access
35. SCADA- Supervisory Control and Data Acquisition
36. ICT- Information Communication Technology
37. PMU-Phasor Measurement Unit
38. RTU-Remote Terminal Unit
39. EMS- Energy Management System
40. UPS- Uninterruptible Power Supply
41. DG- Diesel Generator
42. CISO- Chief Information Security Officer
43. PLCC-Power Line carrier Communication
44. GPRS- General Packet Radio Service
45. VSAT-Very Small Aperture Terminal
46. ISMS- Information Security Management System

References

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2. Report on 'Capacity Building of Indian Load Despatchers'(CABIL)-
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3. GRID - INDIA Vision 2030 document

4. Report on the Grid Disturbance on 30th July 2012 and 31st July 2012
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5. Ministry of Power order dated 18th March 2021, regarding establishing CERT-GO to be housed at GRID - INDIA

Annexure – I: Training and Certification Program for capacity building

1. System Operator Training Programmes

SN	Name of the Training Program	Level
1	Basic Level Programme on Power System Operation	Basic
2	Power Market	Specialist
3	Regulatory Framework in Power Sector	Specialist
4	Power System Logistics	Specialist
5	Power System Reliability	Specialist
6	RE source and Grid Integration	Specialist
7	Familiarization on Despatcher Training - Simulator	-
Cyber Security (Training cum Certification)		
8	Training and Certification Program on Cyber Security	Basic
9	Training and Certification Program on Cyber Security	Intermediate
10	Training and Certification Program on Cyber Security	Advance

2. System Operator Certification

SN	Name of the Certification	Level
1	Basic Level Power System Operation Certification	Basic
2	Advance Level Power System Reliability Certification	Specialist
3	Advance Level Regulatory Framework in Power Sector Certification	Specialist
4	Advance Level Market Operation	Specialist
5	Adance Level Power System Logistics Certification	Specialist

Annexure – II: Short Term Exposure Program

A Short-Term Exposure Programme to facilitate rotation of System Operators, to enhance cohesion and exposure among System Operators in LDCs is being implemented for all State Load Despatch Centres, Regional Load Despatch Centres and National Load Depatch Centre. The objective of this programme is to propagate best-practices, facilitate peer-to-peer learning from each other and propagate best-practices through hands on exposure of real time working of other LDCs This will be beneficial for new and emerging SLDCs, where resource adequacy concerns for multi-tasking executives have been expressed. The planned exposure programme comprises of rotation of LDC officials to other LDCs for a duration of Two to Ten Days.

1. Modalities
    a. Rotational assignments will be done on reciprocity basis. Generally, the ratio of requirement and number of persons to be rotated will endeavoured to be kept as 1:1, however, in certain cases especially for emerging LDCs this can be relaxed.
    b. All LDCs will analyse their own requirement, work out number of officers they wish to post to other LDCs for exposure, clearly specifying periods of assignments in both cases. Each LDC can prepare an **Annual Rotation Plan** for – (i) officials they wish to rotate to other LDCs and (ii) officials they can host in their LDC, keeping in mind their Human Resource Adequacy.
    c. The host organization may design specific programme including a few class-room sessions to facilitate the learning delivery in share with the visiting organization beforehand.
    d. In order to leverage familiarity and already established sense of comfort, initially the rotation will be within the same region.
    e. The Rotation will be in the areas of System Operation, Market Operation, Logistics and REMC Functions.

f. Any short-term assignment will be for a minimum period of 2 working days but not exceeding 10 working days in total.

2. Eligibility:-
    a. All LDC officials working in System Operation, Market Operation, Logistics and REMC functions will be eligible to be rotated to other LDCs.
    b. LDC officials should have minimum 1 year or regular service in an LDC before they can be considered for the exposure programme.

3. Execution
    a. LDCs can send their Annual Rotation Plan to the Forum of Load Despatchers (FOLD) Secretariat at the beginning of the Financial year.
    b. FOLD secretariat will compile requirements and assist in devising a Region-wise rotational plan on round-robin basis so that Human Resource adequacy is maintained at all Load Despatch Centres.
    c. This programme is focused on increasing capacity building of SLDCs, therefore, the focus must be on giving exposure to SLDC officials. However, to kickstart the programme, RLDCs and NLDC will start by posting their officers out to SLDCs and host officers from other LDCs in their region. FOLD Secretariat will coordinate the liasoning with LDCs, if require. Travel arrangement including accommodation & logistics will be done by respective LDCs.

4. TA/DA including accommodation expenses will be borne by the parent organization as per their rules. Host organization will not be obligated to provide any facility to the visiting officer.

Annexure to Short Term Exposure Programme:- Requirement Detail Format

Name of the LDC _____

Total number of Job Roles identified for officers from other LDCs_____

Details of the roles identified for officers from other LDCs

Sl. No.	Department	Area of the task/ project	Proposed Assignment Details (To which the officer from LDCs will be deputed)	Proposed Period of the Assignment (Start Date & End Date)

GUIDELINES FOR DEPUTATION OF WORKFORCE FROM STATE LOAD DESPATCH CENTRES TO GRID-INDIA FOR FIXED TERMS

Table of Contents

A. Objective

1. Load Despatch Centres (LDCs) play a very important role in secure and reliable operation of the Grid. Grid Management has become challenging and complex. With such a vast size of the Grid, LDCs play an important role in facilitating the energy transition towards a sustainable and decarbonised electricity grid. Human Capital is the most important Asset in any organizational setup. Human Resource adequacy has a direct effect on performance and efficiency of all functions and activities. Since LDCs carry out mission critical activities on a 24X7 basis, the availability of trained human resources in the Load Despatch Centres is critical for reliable and efficient power supply. These guidelines have been formulated to strengthen the Load Despatch Centres by facilitating mobility of trained skilled human resources and thus, bolstering cooperation and cohesion.

2. To achieve these aims of improving cooperation across Load Despatch Centre (LDCs) and introducing cohesion in functions and propagating best-practices, a focused effort to enhance Human resource inter-change within LDCs is required. For this, Load Despatchers from SLDCs must be given adequate exposure and opportunities for career growth and learning. There should be regular exchange of Human Resources amongst the LDCs, especially SLDCs and Grid-India to facilitate better coordination, camaraderie and create a nation-wide Power System Operator talent pool.

3. In addition to the training and experience that load dispatchers receive during the recruitment process at the State Load Despatch Centre (SLDC), it is imperative to provide them with comprehensive exposure and prospects for career advancement and learning. Fostering a consistent exchange learning program between SLDCs and Grid-India thus becomes crucial. To support the developmental journey of SLDCs and enhance their learning experiences, Guidelines for Deputation of Workforce from SLDCs to GRID-INDIA for fixed terms have been drafted. Through this initiative, System Operators from SLDCs will get the chance to undergo training and hands-on work exposure at GRID-INDIA for a specified duration on fixed-terms deputation basis.

B. Methodology

1. A scheme has been formulated to provide an opportunity to eligible System Operators from State Load Despatch Centres (SLDCs) for exposure of working in Load Despatch Centres at Regional or National Level. The deputed officer will be given adequate training, work exposure etc. in Grid-India. The pay and perks of the officer during the period of deputation to GRID-INDIA will be as per applicable DPE guidelines.

2. Invitation for deputation from SLDCs will be sent annually by RLDCs and NLDC. Total workforce in Grid-India, which will be on deputation from SLDCs would be capped at 10% of the eligible technical executive strength in respective RLDCs/NLDC. Though, to start with this number may be kept as 1 % of the total eligible technical executive strength at a particular RLDC and may gradually be increased upto 10 % of the eligible technical executives of the RLDCs as the programme progresses. The officer on deputation from SLDCs will be given comprehensive exposure in the areas of System Operators, Market Operation and Logistics.

3. In order to ensure that there is uniformity across RLDCs and NLDC, the invitation to SLDCs for **deputation at RLDCs and NLDC will be for posts equivalent to the levels of E3 to E6 in Grid-India.**

4. The details Job description and responsibilities are given at Annexure.

5. The scheme is proposed to be rolled out by 2025, when mandatory certification of System Operators comes in to affect.

6. The System Operators from SLDCs will apply to Grid-India based on the annual vacancies released by RLDCs/NLDC. They will be shortlisted against the Job Description and thereafter selected through interview and other screening mechanisms, introduced as deemed fit.

7. **Duration of Deputation-** This exposure will be for a period of six months to three year on deputation basis.

8. **Mode of Deputation:** Through notification floated by RLDCs and NLDC, inviting applications for willingness from SLDCs executives. Since the approach is to fill the gap in terms of staffing numbers, skill sets and to enhance mobility for strengthening the LDCs, the vacancies may be operated Region-wise (WR, NR, ER, SR & NER).

9. **Mode of selection:** The selection will be done on merit basis (criteria for drawing the merit will be decided based on relevant factors) for the sanctioned vacancies for each region. The candidate meeting the criteria in the annexed job description will be further interviewed and assessed for suitability as required.

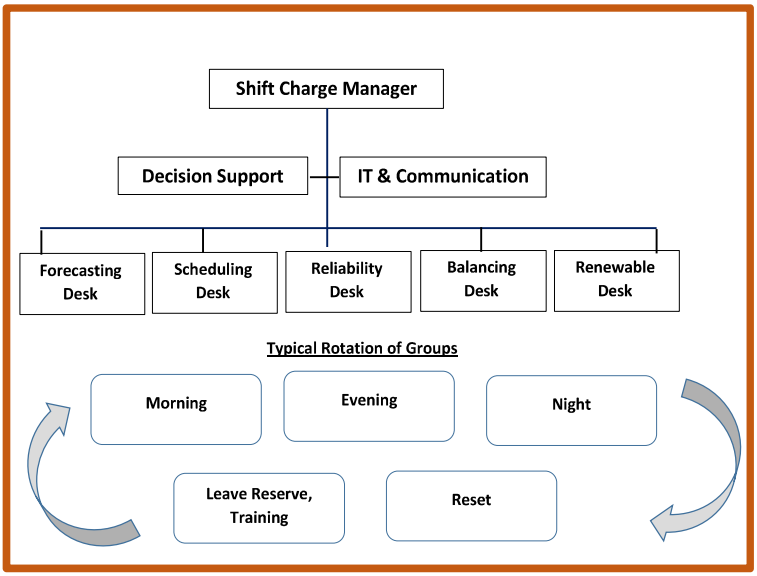
10. Consent of concerned SLDC will be obtained by the applicant at the time of forwarding of application.

C. Functional Domains Identified for Deputation

1. **System Operation**

The System Operation (SO) function covers operational planning (including assessments, studies, crew management), real-time operation (including scheduling, forecasting, outage planning and reporting) and post despatch analysis (including reporting, MIS, feedback, and analytics) and all operational functions pertaining to REMC etc.

Figure 1- Organogram of Real-time shift operation



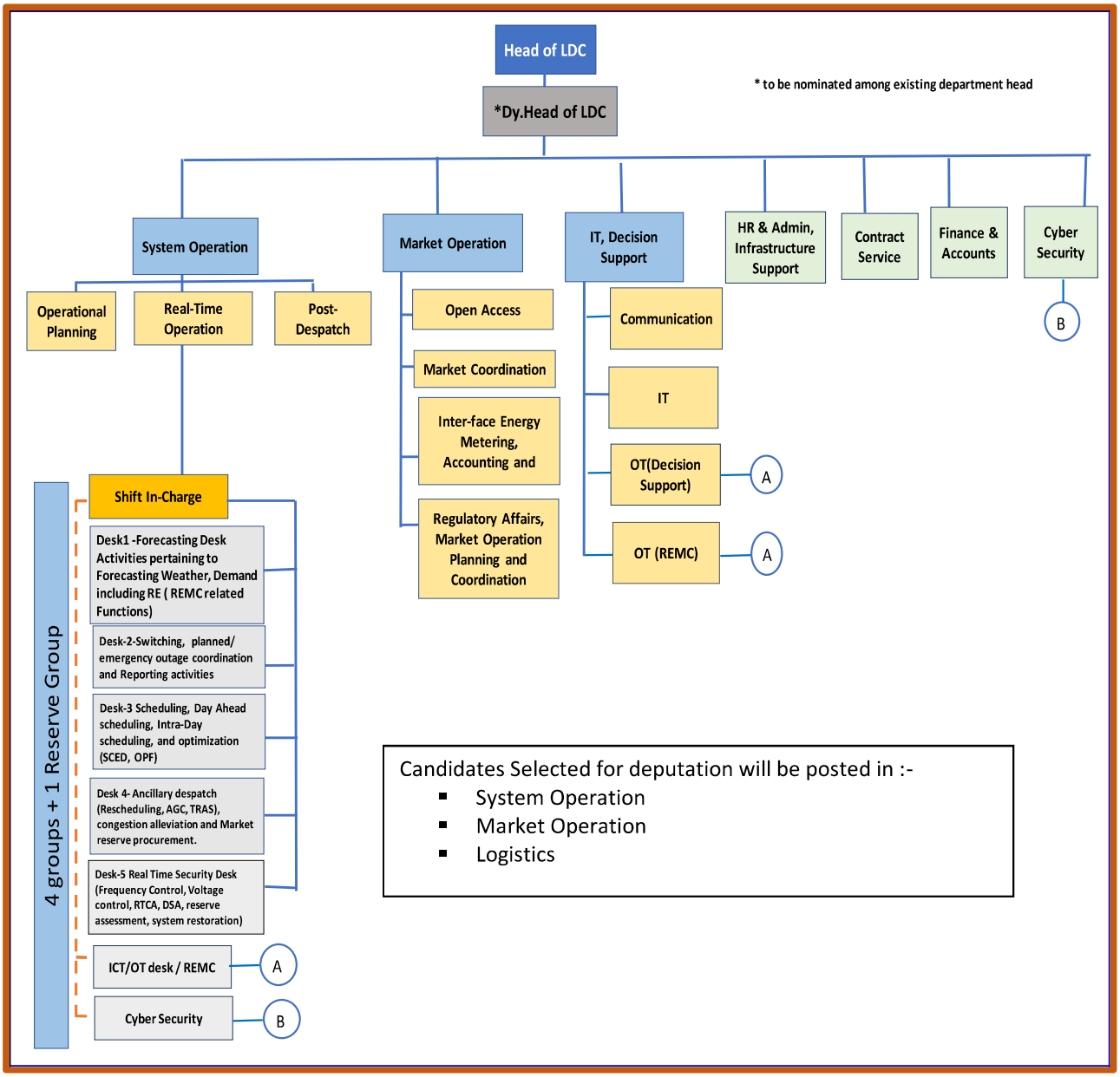
2. Market Operation

The Market Operation (MO) function covers open access administration, day ahead market, real-time market, energy accounting and settlement activities, regulatory functions etc. Market Operation function is an evolving Dynamic Function, which is changing due to various regulatory initiatives and reforms. Market Operation has been organized under 4 divisions - Open Access, Market Coordination, Inter-face Energy Metering, Accounting and Settlement, Regulatory Affairs.

3. Logistics

Logistics functions is essential to maintain situational awareness and support decision making in real-time. Technology plays an increasingly important role in Grid Management and will continue to increase in scope and importance. Logistics has e been organised in 4 divisions which are:- i. Operation Technology; ii. Renewable Energy Management Centres; iii. Information Technology; iv. Communication.

Figure 2- Organogram of Typical LDC


Head of LDC
*Dy.Head of LDC
* to be nominated among existing department head
System Operation
Market Operation
IT, Decision Support
HR & Admin, Infrastructure Support
Contract Service
Finance & Accounts
Cyber Security
Operational Planning
Real-Time Operation
Post-Despatch
Open Access
Market Coordination
Inter-face Energy Metering, Accounting and
Regulatory Affairs, Market Operation Planning and Coordination
Communication
IT
OT(Decision Support)
OT (REMC)
A
B
4 groups + 1 Reserve Group
Shift In-Charge
Desk1 -Forecasting Desk Activities pertaining to Forecasting Weather, Demand including RE (REMC related Functions)
Desk-2-Switching, planned/ emergency outage coordination and Reporting activities
Desk-3 Scheduling, Day Ahead scheduling, Intra-Day scheduling, and optimization (SCED, OPF)
Desk 4- Ancillary despatch (Rescheduling, AGC, TRAS), congestion alleviation and Market reserve procurement.
Desk-5 Real Time Security Desk (Frequency Control, Voltage control, RTCA, DSA, reserve assessment, system restoration)
ICT/OT desk / REMC
Cyber Security
Candidates Selected for deputation will be posted in :-
System Operation
Market Operation
Logistics

D. Annexure: Job Description and Responsibilities

1. Responsibilities

The System Operator plays a crucial role in the operation and management of a power system. The primary responsibility is to ensure the reliable and secure operation of the electrical grid. They continuously monitor the system's parameters, including voltage, frequency, and line flows, and take appropriate actions to balance electricity supply and demand. The selected System Operators will be posted in the following areas of the Load Despatch centres - SO, MO and Logistics. He/she is responsible for the efficient operation and management of a power system, and for achieving the corporate objectives.

2. Eligibility

- **Age & Experience:** Upper age limit (in years) and minimum no. of years of experience as on date of Notification

Level	*Upper Age Limit (in years)	Minimum no. of Years of Post Qualification Experience (excluding trainee period) as system Operators in SLDC (in years)
E3	32	3
E4	35	6
E5	38	9
E6	41	12

* Age relaxation as per govt.norms

- **Qualification:**

I. Graduate in Electrical /Computer Engineering/ IT/Electronics & Communication (Full time).
II. Valid certification as per Power System Operator Training and Certification framework conducted by NPTI (presently).

- **Experience:**

The applicant should have worked three to twelve years (depending on the position notified) as System Operator (excluding training period) in SLDCs in executive cadre as on the date of notification.

- **Pay Scale:** The pay of the officer on deputation will be as per DPE guidelines.

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E. Terms used:

LDCs	- Load Despatch Centres
RLDCs	- Regional Load Despatch Centres
SLDCs	- State Load Despatch Centres
ER	- Eastern Region
NER	- North-Eastern Region
NR	- Northern Region
SR	- Southern Region
WR	- Western Region
SO	- System Operation
MO	- Market Operation
REMC	- Renewable Energy Management Centres
RES	- Renewable Energy Source
OT	- Operation Technology

F. Table of Figures