ग्रिड-इंडिया
GRID-INDIA

ग्रिड कंट्रोलर ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)
GRID CONTROLLER OF INDIA LIMITED
(A Government of India Enterprise)
[formerly Power System Operation Corporation Limited (POSOCO)]
राष्ट्रीय भार प्रेषण केन्द्र / National Load Despatch Centre

आज़ादी का अमृत महोत्सव

कार्यालय : बी-9, प्रथम एवं द्वितीय तल, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110016
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**संदर्भ:** NLDC/SO/FRO/2024-25/Rev1 **दिनांक:** 02nd Apr 2024

**सेवा में,**

All the Stakeholders

**विषय:**Assessment of Frequency Response Obligation of each control area for FY 2024-25_Rev-1

**महोदय/महोदया,**

NLDC, in consultation with RLDCs, had assessed Frequency Response Obligation (FRO) of each control area for FY 2024-25 in compliance with Reg. 30 (10) (f) and as per Annexure-2 of the Central Electricity Regulatory Commission (Indian Electricity Grid Code), Regulations 2023. It was informed to all stakeholders vide communication from ED, NLDC dated 21.03.2024.

Stakeholder consultation meeting was held on 22.03.2024. Pursuant to the feedback received, the assessment of FRO for FY 2024-25 has been revised. The changes effected are as below:

1. Western Region: Correction in capacity of some generation stations
2. Southern Region: Addition of Puducherry and NTPC Telangana U-2 (800 MW) as control areas and removal of Simhapuri Energy Limited (thermal unit capacity less than 200 MW).
3. Eastern region: Removal of KBUNL (thermal unit capacity less than 200 MW) and RANGEET (hydro unit capacity less than 25 MW).
4. North-Eastern Region: Removal of Agartala Gas Based Power Station (Gas) and Assam Gas Based Power Station (Gas) (gas turbine capacity less than 50 MW).

In addition to the above, average generation and average demand figures used in the assessment of FRO are also being shared. The revised assessment is enclosed herewith. It may also be downloaded from the Grid-India website https://posoco.in/en/notices/

सधन्यवाद,

**भवदीय,**

**(एस. सी. सक्सेना/S.C. Saxena)**
**कार्यपालक निदेशक, रा°भा°प्रे°कें°/Executive Director, NLDC**

**Copy for kind information:**

1. Chairman and Managing Director, Grid India
2. Director (Market Operation)/ Director (System Operation), Grid India
3. Secretary, Central Electricity Regulatory Commission
4. Member Secretary, NPC/NRPC/WRPC/SRPC/ERPC/NERPC, CEA
5. Executive Director, NRLDC/WRLDC/SRLDC/ERLDC/NERLDC, Grid India

# Grid Controller of India Limited
## National Load Despatch Centre

### Frequency Response Obligation (FRO) of each control area for FY 2024-25

**Revision No. 01** **Issue Date: 02nd April, 2024**

## I. Calculation of Frequency Response Obligation (FRO) of each control area:

As per Annexure-2 of IEGC, 2023, the minimum Frequency Response Obligation (FRO) of each control area in MW/Hz has been calculated as:

**FRO = (Control Area average Demand + Control Area average Generation) * minimum all India Target Frequency Response Characteristic/ (Sum of average demand of all control areas + Sum of average generation of all control areas)**

The relevant terms and their definitions, used in the assessment of FRO are available at **Section-V**

**1. Control Area Identification:**

| Total Control Areas considered for FRO assessment | Control Areas for whom FRO shall be nil i.e. FRO=0 | Control Areas for whom FRO has been assessed |
|---|---|---|
| 175 | 07 | 168 |

a) All Indian states (28 Nos.)
b) Union Territories viz. Delhi, Chandigarh, J&K and Ladakh, DD & DNH and Puducherry (05 Nos.)
c) Control Areas viz. AMNSIL, Balco (Bulk Consumer) and DVC (03 Nos.)
d) Regional Thermal (Coal/Lignite) Generating Entity of 200 MW and above (82 Nos.)
e) Regional Hydro Generating Entity of 25 MW and above (47 Nos.)
f) Regional Gas based Generating Entity of Gas Turbine above 50 MW (08 Nos.)
g) Transnational Control Areas viz. Nepal and Bhutan (02 Nos.)
   Note: Bangladesh and Myanmar are exempted and not been considered for FRO assessment due to asynchronous connection with India

**FRO shall be nil in case of a control area not having any generation resources viz. Chandigarh, Goa, DD & DNH, Puducherry, Sikkim, Manipur and BALCO (Bulk Consumer).**

As per Reg. 30(10) (h) of CERC (IEGC), 2023 quoted below, the WS sellers, nuclear generating stations and hydro generating stations (with pondage up to 3 hours or Run of the river projects) have been excluded from assessment of FRO and have the option to provide primary response.

1. *"WS Sellers commissioned after the date as specified in CEA Technical Standards for Connectivity shall have the option to provide primary response individually through ESS or through a common ESS installed at its pooling station.*
2. *Nuclear generating stations and hydro generating stations (with pondage up to 3 hours or Run of the river projects) shall be exempt from mandatory primary response. They may provide the primary response to the extent possible, considering the safety and security of machines and humans."*

**2. Data Source and Resolution for FRO assessment:**

| Particulars | Data Source | Data Resolution |
|---|---|---|
| **State, UTs and Control Area average Demand and Generation** | SCADA telemetry | 5 minutes |
| **Regional Entity Generating station average Generation** | Interface Energy Meter data | 15 minutes |
| **Transnational Control Area average Demand and Generation** | SCADA telemetry | 5 minutes |

**3. Reference Contingency https://posoco.in/en/reference-contingency/english-reference-contingency-2024-25/) and Minimum All India Target Frequency Response Characteristic (as per Annex-2 of IEGC, 2023) for Generation/Load loss in Indian Power System for FY 2024-25**:

| FY 2024-25 | Solar Hours | Non-Solar Hours |
|---|---|---|
| **Reference Contingency (MW)** | 7000 | 4500 |
| **Minimum All India Target FRC (MW/Hz)** | 23,333 | 15,000 |

*Minimum All India Target Frequency Response Characteristic = Quantum of load or generation loss in reference contingency divided by frequency deviation value of 0.3 Hz*

## II. Assessment of Frequency Response Obligation (FRO) of control areas for FY 2024-25:

FRO has been assessed for **168 control areas** for solar as well as non-solar hours. The table is enclosed as **Annexure-I**

## III. Calculation of Frequency Response Performance (FRP) of each control area:

The performance of each control area in providing frequency response characteristic shall be calculated for each reportable event. Each control area shall separately assess their frequency response characteristic and share with RLDC along with high resolution data of at least one (1) second for regional entity generating stations and ten (10) second for state control area. The concerned generating station and state control area shall furnish the requisite data to the LDCs within two days of notification of reportable event by the NLDC.

**Frequency Response Performance (FRP) = Actual Frequency Response Characteristic (AFRC)/ Frequency Response Obligation (FRO)**

FRC Calculation shall be done in accordance with Methodology for Computation of Primary Frequency Response Obligation and Performance, available as Annexure-V of NLDC Operating Procedure.

**Timeline for FRC and FRP computation during events**

| Particulars | Stipulated Timeline* |
|---|---|
| Submission of high resolution data by regional entity generating stations and state control area to RLDCs[#] | 2 working days after the event |
| FRC and FRP computation by NLDC | 3 working days after the event |
| FRC and FRP computation by RLDC, SLDC and Generating Units | 6 working days after the event |

**Timeline for data submission and FRC computation are excluding the day of event*

*[#] In case of delay in data submission by regional entity generating stations and state control area to RLDCs, SCADA data available at RLDCs shall be used for FRC and FRP calculations.*

**FRC and FRP Calculation Sheet to be used by all SLDC/RLDC/NLDC/CONTROL AREA**

| S.No | Particulars | Dimension | Control Area/ Region/Generator |
|---|---|---|---|
| 1 | Actual Net Interchange before the Event (Time= hh:mm:ss) | MW | |
| 2 | Actual Net Interchange after the Event (Time= hh:mm:ss) | MW | |
| 3 | Change in Net Interchange (2 - 1) | MW | |
| 4 | Generation Loss (+) / Load Throw off (-) during the Event | MW | |
| 5 | Control Area Response (4-3) | MW | |
| 6 | Frequency before the Event | Hz | |
| 7 | Frequency after the Event | Hz | |
| 8 | Change in Frequency (7-6) | Hz | |
| 9 | Frequency Response Characteristic (5 / 8) | MW/Hz | |
| 10 | Frequency Response Obligation (FRO) of control area | MW/Hz | |
| 11 | Frequency Response Performance (FRP) (9/10) | | |

**Note:** In addition to the above, FRC would also be calculated for events involving significant change in frequency, say during hourly boundary, cloud movement etc.

**IV. Grading of Frequency Response Performance (FRP)**

Each control area shall be graded based on median Frequency Response Performance annually (at least 10 events) as per following criteria:

**FREQUENCY RESPONSE CRITERIA**

| Performance | Grading |
|---|---|
| FRP≥ 1 | Excellent |
| 0.85 ≤ FRP < 1 | Good |
| 0.75 ≤ FRP | Average |
| 0.5≤ FRP < 0.75 | Below Average |
| FRP | Poor |

As per Reg. 30(10) (q) of CERC (IEGC), 2023*, NLDC, RLDCs and SLDCs shall grade the median Frequency Response Performance annually, considering at least 10 reportable events. In case the median Frequency Response Performance is less than 0.75 as calculated as per Annexure2, NLDC, RLDCs, SLDCs, as the case may be, after analyzing the FRP shall direct the concerned entities to take corrective action. All such cases shall be reported to the concerned RPC for its review.*

## V. Definitions as per CERC (IEGC) Regulations, 2023

| S.No. | Particulars | Definitions |
|---|---|---|
| 1 | **'Control Area'** | means an electrical system bounded by interconnections (tie lines), metering and telemetry which controls its generation and/or load to maintain its interchange schedule with other control areas and contributes to regulation of frequency as specified in these regulations; |
| 2 | **'Event'** | means an unscheduled or unplanned occurrence in the grid including faults, incidents and breakdowns; |
| 3 | **Free Governor Mode of Operation** | Means the mode of operation of governor where machines are loaded or unloaded directly in response to grid frequency i.e. machine unloads when grid frequency is more than 50 Hz and loads when grid frequency is less than 50 Hz. The amount of loading or unloading is proportional to the governor droop. |
| 4 | **'Frequency Response Characteristics' or 'FRC'** | Means automatic, sustained change in the power consumption by load or output of the generators that occurs immediately after a change in the load-generation balance of a control area and which is in a direction to oppose any change in frequency. Mathematically it is equivalent to FRC = Change in Power (ΔP) / Change in Frequency (Δf); |
| 5 | **'Frequency Response Obligation' or 'FRO'** | means the minimum frequency response a control area has to provide in the event of any frequency deviation; |
| 6 | **'Frequency Response Performance' or 'FRP'** | means the ratio of actual frequency response with frequency response obligation; |
| 7 | **'Governor Droop'** | in relation to the operation of the governor of a generating unit means the percentage drop in system frequency which would cause the generating unit under governor action to change its output from no load to full load; |
| 8 | **'Load'** | means the active, reactive or apparent power consumed by a utility/installation of consumer; |
| 9 | **'Maximum Continuous Rating' or 'MCR'** | means the maximum continuous output in MW at the generator terminals guaranteed by the manufacturer at rated parameters; |
| 10 | **'Nadir Frequency'** | means minimum frequency after a contingency in case of generation loss and maximum frequency after a contingency in case of load loss; |
| 11 | **'Primary Reserve'** | means the maximum quantum of power which will immediately come into service through governor action of the generator or frequency controller or through any other resource in the event of sudden change in frequency as specified in clause (10) of Regulation 30 of CERC (IEGC), 2023; |
| 12 | **'Reference contingency'** | means the maximum positive power deviation occurring instantaneously between generation and demand and considered for estimation of reserves; |
| 13 | **Reportable Event** | Means any load or generation loss incident involving net change of more than 1000 MW of load or generation or a frequency change involving 0.1 Hz or more. The event shall be notified by the NLDC. |

**Annexure-I**

## Frequency Response Obligation of Control Areas in Northern Region for FY 2024-25

| Northern Region | | | | | |
|---|---|---|---|---|---|
| Sl. No. | States | Av.Generation (MW) | Av. Demand (MW) | FRO (MW/Hz) | |
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Punjab | 4322 | 7937 | 796 | 512 |
| 2 | Haryana | 2320 | 7139 | 615 | 395 |
| 3 | Rajasthan | 8239 | 11847 | 1305 | 839 |
| 4 | Delhi | 455 | 3959 | 287 | 184 |
| 5 | Uttar Pradesh | 10146 | 16633 | 1740 | 1118 |
| 6 | Uttarakhand | 673 | 1761 | 158 | 102 |
| 7 | Chandigarh* | 0 | 199 | 0 | 0 |
| 8 | Himachal Pradesh | 742 | 1361 | 137 | 88 |
| 9 | J&K(UT) and Ladakh(UT) | 593 | 2256 | 185 | 119 |

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Dadri-1 (TH) | 840 | 490 | 32 | 20 |
| 2 | Dadri -2 (TH) | 980 | 611 | 40 | 26 |
| 3 | Jhajjar (TH) | 1500 | 874 | 57 | 37 |
| 4 | Rihand-1 (TH) | 1000 | 853 | 55 | 36 |
| 5 | Rihand-2 (TH) | 1000 | 835 | 54 | 35 |
| 6 | Rihand-3 (TH) | 1000 | 847 | 55 | 35 |
| 7 | Shree Cement (TH) | 300 | 201 | 13 | 8 |
| 8 | Singrauli (TH) | 2000 | 1591 | 103 | 66 |
| 9 | Tanda-2 (TH) | 1320 | 997 | 65 | 42 |
| 10 | Unchahar stg-4 (TH) | 500 | 343 | 22 | 14 |
| 11 | Unchahar (TH) | 1050 | 628 | 41 | 26 |
| 12 | Anta (G) | 419 | 130 | 8 | 5 |
| 13 | Auraiya (G) | 663 | 168 | 11 | 7 |
| 14 | Dadri (G) | 830 | 286 | 19 | 12 |
| 15 | AD Hydro (H) | 192 | 110 | 7 | 5 |
| 16 | Bairasiul (H) | 180 | 89 | 6 | 4 |
| 17 | Bhakra (H) | 1415 | 782 | 51 | 33 |
| 18 | Budhil (H) | 70 | 53 | 3 | 2 |
| 19 | Chamera-1 (H) | 540 | 298 | 19 | 12 |
| 20 | Chamera-2 (H) | 300 | 220 | 14 | 9 |
| 21 | Chamera-3 (H) | 231 | 171 | 11 | 7 |
| 22 | Dehar (H) | 990 | 327 | 21 | 14 |
| 23 | Dhauliganga (H) | 280 | 174 | 11 | 7 |
| 24 | Dulhasti (H) | 390 | 291 | 19 | 12 |
| 25 | Karcham (H) | 1045 | 524 | 34 | 22 |
| 26 | Kishenganga | 330 | 213 | 14 | 9 |



*FRO shall be nil in case of a control area not having any generation resources

^The generation for year 2023 was zero

**Annexure-I**

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 27 | Koldam (H) | 800 | 632 | 41 | 26 |
| 28 | Koteswar (H) | 400 | 147 | 10 | 6 |
| 29 | Malana-2 (H)^ | 186 | 0 | 0 | 0 |
| 30 | Nathpa Jhakri (H) | 1500 | 983 | 64 | 41 |
| 31 | Parbati-2 (H) | 800 | 12 | 1 | 0 |
| 32 | Parbati-3 (H) | 520 | 60 | 4 | 3 |
| 33 | Pong (H) | 396 | 215 | 14 | 9 |
| 34 | Rampur (H) | 412 | 235 | 15 | 10 |
| 35 | Sainj (H) | 100 | 59 | 4 | 2 |
| 36 | Salal (H) | 690 | 395 | 26 | 17 |
| 37 | Sewa-II (H) | 120 | 96 | 6 | 4 |
| 38 | Singoli Bhatwari (H) | 99 | 61 | 4 | 3 |
| 39 | Sorang (H) | 100 | 31 | 2 | 1 |
| 40 | Tanakpur (H) | 94 | 53 | 3 | 2 |
| 41 | Tehri (H) | 1000 | 628 | 41 | 26 |
| 42 | Uri-1 (H) | 480 | 302 | 20 | 13 |
| 43 | Uri-2 (H) | 240 | 170 | 11 | 7 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero

## Frequency Response Obligation of Control Areas in Western Region for FY 2024-25

| Western Region | | | | | |
|---|---|---|---|---|---|
| Sl. No. | States | Av.Generation (MW) | Av. Demand (MW) | FRO (MW/Hz) | |
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Chhattisgarh | 2309 | 4409 | 436 | 281 |
| 2 | DNHDD* | 0 | 1192 | 0 | 0 |
| 3 | Gujarat | 9242 | 16826 | 1694 | 1089 |
| 4 | Goa* | 0 | 483 | 0 | 0 |
| 5 | Madhya Pradesh | 5039 | 11048 | 1045 | 672 |
| 6 | Maharashtra | 15415 | 23549 | 2531 | 1627 |
| 7 | Arcelor Mittal Nippon Steel India Limited | 374 | 752 | 73 | 47 |
| 8 | Bharat Aluminium Company Ltd (Bulk Consumer)* | 0 | 516 | 0 | 0 |

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 1 | ACB (India) Limited + Maruti Clean Coal and Power Limited (TH) | 793 | 526 | 34 | 22 |
| 2 | Adani Power Limited - Raigarh TPP (TH) | 600 | 427 | 28 | 18 |
| 3 | Adani Power Limited-Raipur TPP (TH) | 1370 | 880 | 57 | 37 |
| 4 | Bharat Aluminium Company Ltd. (TH) | 1200 | 776 | 50 | 32 |
| 5 | D B Power Limited (TH) | 1200 | 942 | 61 | 39 |
| 6 | Dhariwal Iinfrastructure Limited (TH) | 600 | 383 | 25 | 16 |
| 7 | GMR Warora Energy Limited (TH) | 1370 | 470 | 31 | 20 |
| 8 | Jaypee Nigrie Super Thermal Power Plant (TH) | 1320 | 937 | 61 | 39 |
| 9 | Jhabua Power Limited (TH) | 600 | 372 | 24 | 16 |
| 10 | Jindal Power Limited, Stage-1 (TH) | 1000 | 640 | 42 | 27 |
| 11 | Jindal Power Limited, Stage-2 (TH) | 2400 | 1853 | 120 | 77 |
| 12 | Jindal Steel & Power Ltd , DCPP (TH) | 270 | 98 | 6 | 4 |
| 13 | KSK Mahanadi Power Company Limited (TH) | 2400 | 1138 | 74 | 48 |
| 14 | LANCO Amarkantak Power Limited (TH) | 600 | 386 | 25 | 16 |
| 15 | Mahan Energen Limited. (TH) | 1200 | 660 | 43 | 28 |
| 16 | MB Power (Madhya Pradesh) Limited (TH) | 1200 | 895 | 58 | 37 |
| 17 | NTPC Gadarwara (TH) | 1600 | 1024 | 66 | 43 |
| 18 | NTPC Khargone (TH) | 1320 | 770 | 50 | 32 |
| 19 | NTPC Korba Stage I &II (TH) | 2100 | 1774 | 115 | 74 |
| 20 | NTPC Korba Stage III (TH) | 500 | 447 | 29 | 19 |
| 21 | NTPC Lara Stage I (TH) | 1600 | 1230 | 80 | 51 |
| 22 | NTPC Mouda Stage I (TH) | 1000 | 746 | 48 | 31 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 23 | NTPC Mouda Stage II (TH) | 1320 | 860 | 56 | 36 |
| 24 | NTPC SAIL Power Company Limited (TH) | 500 | 422 | 27 | 18 |
| 25 | NTPC Sipat Stage I (TH) | 1980 | 1562 | 102 | 65 |
| 26 | NTPC Sipat Stage II (TH) | 1000 | 796 | 52 | 33 |
| 27 | NTPC Solapur (TH) | 1320 | 779 | 51 | 33 |
| 28 | NTPC Vindhyachal Stage I (TH) | 1260 | 979 | 64 | 41 |
| 29 | NTPC Vindhyachal Stage II (TH) | 1000 | 845 | 55 | 35 |
| 30 | NTPC Vindhyachal Stage III (TH) | 1000 | 864 | 56 | 36 |
| 31 | NTPC Vindhyachal Stage IV (TH) | 1000 | 815 | 53 | 34 |
| 32 | NTPC Vindhyachal Stage V (TH) | 500 | 442 | 29 | 18 |
| 33 | R.K.M Powergen Private Limited (TH) | 1440 | 783 | 51 | 33 |
| 34 | Sasan Power Limited (TH) | 3960 | 3331 | 216 | 139 |
| 35 | SKS Ispat and Power Limited (TH) | 600 | 264 | 17 | 11 |
| 36 | The Tata Power Co Ltd (MTPS) (TH) | 4150 | 1627 | 106 | 68 |
| 37 | TRN Energy Private Limited (TH) | 600 | 352 | 23 | 15 |
| 38 | DGEN Mega Power Project (G) | 1200 | 56 | 4 | 2 |
| 39 | NTPC Jhanor Gandhar (G) | 657 | 71 | 5 | 3 |
| 40 | NTPC Kawas (G) | 656 | 65 | 4 | 3 |
| 41 | Ratnagiri Gas and Power Private Limited (G) | 1966 | 93 | 6 | 4 |
| 42 | Sardar Sarovar Project (H) | 1450 | 432 | 28 | 18 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero

## Frequency Response Obligation of Control Areas in Southern Region for FY 2024-25

| Southern Region | | | | | |
|---|---|---|---|---|---|
| Sl. No. | States | Av.Generation (MW) | Av. Demand (MW) | FRO (MW/Hz) | |
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Andhra Pradesh | 5782 | 9092 | 966 | 621 |
| 2 | Karnataka | 6658 | 10389 | 1108 | 712 |
| 3 | Kerala | 703 | 3374 | 265 | 170 |
| 4 | Tamil Nadu | 6937 | 14314 | 1381 | 888 |
| 5 | Telangana | 5124 | 9668 | 961 | 618 |
| 6 | Puducherry* | 0 | 365 | 0 | 0 |

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Coastal Energen Pvt Ltd., (TH) | 1200 | 577 | 38 | 24 |
| 2 | Infrastructure Leasing & Financial Services (IL&FS) (TH) | 1200 | 700 | 45 | 29 |
| 3 | Meenakshi Energy Limited (TH)^ | 1000 | 0 | 0 | 0 |
| 4 | New Neyveli Thermal Power Project (TH) | 1000 | 720 | 47 | 30 |
| 5 | Neyveli Thermal Power Station -1 Expansion (TH) | 420 | 283 | 18 | 12 |
| 6 | Neyveli Thermal Power Station 2 - Stage 1 (TH) | 630 | 256 | 17 | 11 |
| 7 | Neyveli Thermal Power Station 2 - Stage 2 (TH) | 840 | 278 | 18 | 12 |
| 8 | Neyveli Thermal Power Station -2 Expansion (TH) | 500 | 230 | 15 | 10 |
| 9 | NLC Tamil Nadu Power Limited (NTPL) (TH) | 1000 | 615 | 40 | 26 |
| 10 | NTPC Kudgi (TH) | 2400 | 1281 | 83 | 53 |
| 11 | NTPC Ramagundam Super Thermal Power Station (TH) | 2100 | 1403 | 91 | 59 |
| 12 | NTPC Ramagundam Super Thermal Power Station - Stage 3 (TH) | 500 | 389 | 25 | 16 |
| 13 | NTPC Simhadri Stage -2 (TH) | 1000 | 661 | 43 | 28 |
| 14 | NTPC Simhadri Stage-1(TH) | 1000 | 632 | 41 | 26 |
| 15 | NTPC Talcher Stage - 2(TH) | 2000 | 1603 | 104 | 67 |
| 16 | NTPC TamilNadu Energy Company Ltd.,(TH) | 1500 | 880 | 57 | 37 |
| 17 | NTPC Telangana Super Thermal Power Plant(TH) | 1600 | 1277 | 83 | 53 |
| 18 | Sembcorp Energy India Limited Project-1(TH) | 1320 | 1016 | 66 | 42 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero

**Annexure-I**

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 19 | Sembcorp Energy India Limited Project-2(TH) | 660 | 504 | 33 | 21 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero

## Frequency Response Obligation of Control Areas in Eastern Region for FY 2024-25

| Eastern Region | | | | | |
|---|---|---|---|---|---|
| Sl. No. | States | Av.Generation (MW) | Av. Demand (MW) | FRO (MW/Hz) | |
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Bihar | 347 | 4627 | 323 | 208 |
| 2 | DVC | 4835 | 3127 | 517 | 333 |
| 3 | Jharkhand | 269 | 1328 | 104 | 67 |
| 4 | Odisha | 3164 | 4764 | 515 | 331 |
| 5 | West Bengal | 5235 | 7213 | 809 | 520 |
| 6 | Sikkim* | 0 | 61 | 0 | 0 |

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 1 | BARH-II (TH) | 1320 | 896 | 58 | 37 |
| 2 | BARH-I (TH) | 1320 | 659 | 43 | 28 |
| 3 | FARAKKA-I (TH) | 1600 | 1086 | 71 | 45 |
| 4 | FARAKKA-II (TH) | 500 | 404 | 26 | 17 |
| 5 | KAHALGAON I (TH) | 840 | 545 | 35 | 23 |
| 6 | KAHALGAON II (TH) | 1500 | 1118 | 73 | 47 |
| 7 | NABINAGAR (TH) | 1980 | 1626 | 106 | 68 |
| 8 | TALCHER STG-I (TH) | 1000 | 837 | 54 | 35 |
| 9 | DARIPALI (TH) | 1600 | 1282 | 83 | 54 |
| 10 | TEESTA-V (H) | 510 | 428 | 28 | 18 |
| 11 | TEESTA-III (H) | 1200 | 791 | 51 | 33 |
| 12 | DIKCHU (IPP) | 96 | 84 | 5 | 4 |
| 13 | TASHIDING (H) | 97 | 64 | 4 | 3 |
| 14 | ADHUNIK (IPP-TH) | 540 | 375 | 24 | 16 |
| 15 | CHUZACHEN (IPP-H) | 110 | 83 | 5 | 3 |
| 16 | GMR (IPP-TH) | 700 | 578 | 38 | 24 |
| 17 | MAITHON.RT BK (IPP-TH) | 1050 | 819 | 53 | 34 |
| 18 | JITPL (IPP-TH) | 1200 | 917 | 60 | 38 |
| 19 | BRBCL (TH) | 1000 | 714 | 46 | 30 |
| 20 | NORTH KARANPURA (TH) | 660 | 583 | 38 | 24 |
| 21 | CHUKHA (H) | 336 | 92 | 6 | 4 |
| 22 | MANGDECCHU (H) | 720 | 347 | 23 | 15 |
| 23 | TALA (H) | 1020 | 55 | 4 | 2 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero

## Frequency Response Obligation of Control Areas in North Eastern Region for FY 2024-25

| North Eastern Region | | | | | |
|---|---|---|---|---|---|
| Sl. No. | States | Av.Generation (MW) | Av. Demand (MW) | FRO (MW/Hz) | |
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Arunachal Pradesh | 4 | 107 | 7 | 5 |
| 2 | Assam | 275 | 1390 | 108 | 70 |
| 3 | Manipur* | 0 | 110 | 0 | 0 |
| 4 | Meghalaya | 98 | 239 | 22 | 14 |
| 5 | Mizoram | 17 | 71 | 6 | 4 |
| 6 | Nagaland | 9 | 103 | 7 | 5 |
| 7 | Tripura | 138 | 322 | 30 | 19 |

| Sl. No. | Entity | Capacity (MW) | Av.Generation (MW) | FRO (MW/Hz) | |
|---|---|---|---|---|---|
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Bongaigaon Thermal Power Plant (TH) | 750 | 536 | 35 | 22 |
| 2 | ONGC Tripura Power Company Limited, Palatana (G) | 727 | 536 | 35 | 22 |
| 3 | Doyang Hydro Power Station (H) | 75 | 47 | 3 | 2 |
| 4 | Kameng Hydro Power Station (H) | 600 | 312 | 20 | 13 |
| 5 | Khandong Hydro Power Station (H)^ | 50 | 0 | 0 | 0 |
| 6 | Khandong Stg-2 Hydro Power Station (H) | 25 | 25 | 2 | 1 |
| 7 | Kopili Hydro Power Station (H) | 200 | 90 | 6 | 4 |
| 8 | Loktak Hydro Power Station (H) | 105 | 41 | 3 | 2 |
| 9 | Panyor Lower Hydro Power Station (H) | 405 | 251 | 16 | 11 |
| 10 | Pare Hydro Power Station (H) | 110 | 89 | 6 | 4 |



*FRO shall be nil in case of a control area not having any generation resources

^The generation for year 2023 was zero

## Frequency Response Obligation of Nepal & Bhutan for FY 2024-25

| Transnational | | | | | |
|---|---|---|---|---|---|
| Sl. No. | States | Av.Generation (MW) | Av. Demand (MW) | FRO (MW/Hz) | |
| | | | | Solar Hours | Non-Solar Hours |
| 1 | Nepal | 129 | 378 | 33 | 21 |
| 2 | Bhutan | 752 | 214 | 63 | 40 |



*FRO shall be nil in case of a control area not having any generation resources
^The generation for year 2023 was zero