

Frequency Response Characteristic Calculation for All India based on NLDC SCADA Data

EVENT:

At 11:22 Hrs on Dated 11th-August-2022, As reported due to fault on 220kV Bhadla-Clean Solar Jodhpur Ckt (Y-B Fault), renewable generation loss observed in almost all the RE stations connected at Bhadla(PG), Bhadla2(PG), Fatehgarh2(PG) & Bikaner(PG) and over voltage in transmission network at Rajasthan RE complex was also observed. Multiple 765kV lines and 220kV lines to RE stations tripped due to over voltage. Total RE generation drop of approx. 6157MW (5807MW Solar & 350MW Wind) observed and at the same time, load shedding of around 850 MW (400MW in UP, 200MW in Punjab & 150MW in Haryana control area) has been reported on df/dt protection operation. accordingly effective generation loss figure 5407MW has been considered for FRC calculation.

| S No | Particulars | Dimension | NR | ER | WR | NER | SR |
|------|---|-----------|--------|--------|--------|--------|--------|
| 1 | Actual Net Interchange before the Event (11:22:50) | MW | 5207 | -2537 | -1124 | 62 | -2847 |
| 2 | Actual Net interchange after the Event (11:24:00) | MW | 9397 | -3367 | -3467 | -93 | -4683 |
| 3 | Change in Net Interchange (2-1) | MW | 4190 | -830 | -2343 | -155.0 | -1836 |
| 4 | Generation Loss (+) / Load Throw off (-) during the Event | MW | 5407 | 0 | 0 | 0 | 0 |
| 5 | Control Area Response (3 - 4) | MW | -1217 | -830 | -2343 | -155 | -1836 |
| 6 | Frequency before the Event | Hz | 50.16 | 50.16 | 50.16 | 50.16 | 50.16 |
| 7 | Frequency after the Event | Hz | 49.62 | 49.62 | 49.62 | 49.62 | 49.62 |
| 8 | Change in Frequency (7 - 6) | Hz | -0.540 | -0.540 | -0.540 | -0.540 | -0.540 |
| 9 | Frequency Response Characteristic (5 / 8) | MW/Hz | 2254 | 1537 | 4339 | 287 | 3400 |
| 10 | Net System Demand met before the Event | MW | 57788 | 20462 | 41412 | 2566 | 42725 |
| 11 | Internal Generation before the Event (10 - 1) | MW | 52581 | 22999 | 42536 | 2504 | 45572 |
| 12 | Ideal load response assuming 4% per Hz (0.04*Row 10) | MW/Hz | 2312 | 818 | 1656 | 103 | 1709 |
| 13 | Ideal generator response assuming 5% droop.....40% per Hz (40% of Row 11) | MW/Hz | 21032 | 9200 | 17014 | 1002 | 18229 |
| 14 | Composite ideal response (12 + 13) | MW/Hz | 23344 | 10018 | 18671 | 1104 | 19938 |
| 15 | Percentage ideal response | % | 9.7% | 15.3% | 23.2% | 26.0% | 17.1% |

(*) - Data may be constant/suspected during the event
 Note: +ve exchange=> import ; (-)ve exchange => export

| | |
|--|--------------|
| Total Change in (MW) | 5407 |
| FRC for NEWS GRID (dp/df) MW/Hz | 10013 |
| Power Number (net change in MW/maximum change in frequency) | 7724 |

| Source Wise Generation (MW) | GAS | HYDRO | NUCLEAR | Thermal | WIND | SOLAR |
|-----------------------------|------|-------|---------|---------|-------|-------|
| | 2031 | 31903 | 4591 | 84843 | 17594 | 26960 |