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पावर सिस्टम ऑपरेशन कॉरपोरेशन लिमिटेड

(पावरग्रिड की पूर्ण स्वामित्व प्राप्त सहायक कंपनी)

POWER SYSTEM OPERATION CORPORATION LIMITED

(A wholly owned subsidiary of POWERGRID)

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संदर्भ सं: NLDC / Operational Feedback/ दिनांक: 01 जुलाई 2015

सेवा मे,

सदस्य (पावर सिस्टम), केंद्रीय विद्युत प्राधिकरण, सेवा भवन, आर के पुरम, नई दिल्ली.	मुख्य परिचालन अधिकारी (के पा कं), पावर ग्रिड कॉरपोरेशन ऑफ इंडिया लिमिटेड, गुडगॉव

Sub: Operational Feedback on the issue of skewed inter regional power flows towards Northern Region – June 2015

Sir/Madam,

National Load Despatch Centre (NLDC) has been assigned with the responsibility to provide operational feedback for planning of the National Grid to the Central Electricity Authority (CEA) and Central Transmission Utility (CTU) as per clause 4(j) of NLDC Rules, 2005.

Operational Feedback on the issue of skewed inter regional power flows towards Northern Region has been prepared by NLDC and enclosed herewith.

Thanking you.

भवदीय,

एस॰ आर॰ नरसिम्हन

(एस॰ आर॰ नरसिम्हन)

अतिरिक्त महाप्रबंधक

(प्रणाली प्रचालन)

प्रति: सचिव, सी ई आर सी

National Load Despatch Center

Operational Feedback on Skewed Inter-Regional Power Flows Towards Northern Region

(In line with clause 4(j) of NLDC Rules, 2005)

New Delhi

June 2015

Contents

1. Inter-regional AC connections with Northern Regional grid

A) With Eastern Region (3 x 765 kV, 10 x 400 kV high capacity, 2 x 400 kV normal capacity)

i. 765 kV Gaya-Fatehpur
ii. 765 kV Gaya-Sasaram-Fatehpur
iii. 765 kV Gaya-Ballia
iv. 400 kV Sasaram-Allahabad
v. 400 kV Sasaram-Sarnath
vi. 400 kV Muzaffarpur-Gorakhpur-1 (Quad Moose) with 40% FSC plus 5-15% TCSC at Gorakhpur
vii. 400 kV Muzaffarpur-Gorakhpur -2 (Quad Moose) with 40% FSC plus 5-15% TCSC at Gorakhpur
viii. 400 kV Patna-Ballia-1 (Quad Moose)
ix. 400 kV Patna-Ballia-2 (Quad Moose)
x. 400 kV Patna-Ballia-3 (Quad Moose)
xi. 400 kV Patna-Ballia-4 (Quad Moose)
xii. 400 kV Biharshariff-Ballia-1 (Quad Moose)
xiii. 400 kV Biharshariff-Ballia-2 (Quad Moose)
xiv. 400 kV Barh-Gorakhpur-1 (Quad Moose)
xv. 400 kV Barh-Gorakhpur-2 (Quad Moose)

B) With Western Region (2 x 765 kV, 2 x 400 kV normal capacity)

i) 765 kV Gwalior-Agra-1
ii) 765 kV Gwalior-Agra-2
iii) 400 kV Zerda-Kankroli
iv) 400 kV Zerda-Bhinmal

Note: 1 x 220 kV tie is available between East and North while West to North has 4 x 220 kV lines. All these 220 kV lines are operated in closed loop. ***In addition, 1 +/-500 kV 2500 MW HVDC bi-pole and 2 x 250 MW HVDC back to back station is available between West and North.***

Typical distribution of flows for 7000 MW import by NR in the Real time data from 1st June to 20th June observed is as under: (WR-NR flows go even higher in some hours)

West to North: 4500-5000 MW or 65 % - 72 % despite only 4 AC lines at 400 kV and above
East to North: 2500-2000 MW or 35 % - 28 % despite 15 AC lines at 400 kV and above

The actual inter regional flows on a typical day with skewed flows are attached in Annexure -1.

2. Impact on System Security

Surpluses in southern part of Eastern Region also gets routed substantially on ER-WR-NR and the transfer capability of NR import is therefore restricted by the WR-NR inter-regional corridor. Any stress on the WR-NR corridor would lead to a significant impact on system security. Within the Eastern Region there is no constraint under normal operating conditions. However, on the South to North axis within Eastern Region, only 8 x 400 kV lines exist (2 lines of high capacity). The 400 kV Maithon-Gaya D/C line (Quad Moose) on this section suffers from frequent trippings. Other lines in Eastern Region recently also have suffered from frequent trippings.

The North – South axis is attached in Annexure – 2.

Any contingency on WR-NR corridor (for e.g. Outage of both circuits of 765 kV Agra - Gwalior) means power gets routed to NR via WR-ER-NR and the South to North axis corridor within ER could get stressed. Improved generation at Barh NTPC, Kahalgaon, hydro units in Sikkim, Bhutan ad NER would solve the problem to some extent. However new lines on this South to North section within ER are not planned. They should be planned and construction should be expedited in view of grid security. **The actual skewedness in percentage is attached in Annexure-3. Flows on important lines under scrutiny are attached in Annexure-4.**

SPS (System Protection Scheme) operations of 765 kV Agra – Gwalior D/C have become quite common in this period, resulting in load shedding in Northern Region sometimes prompting Northern to deviate further more from the schedule. SPS may not provide adequate response if it is required to operate too frequently.

In view of the skewed nature of the inter-regional flows, the simultaneous import capability of NR reduces and the import TTC had to be reduced for the June – September period. Controllability on the WR-NR corridor through the HVDC links has reduced drastically as the Mundra – Mohindergarh HVDC bipole is operated at 2200-2500 MW power order continuously while congestion on the lines emanating from Singrauli / Rihand complex restricts flow from West to North over Vindhyachal HVDC back to back.

3. Reasons for Skewed flows towards Northern Region

- Less demand in WR due to Monsoon
- Heavy requisition for JP Nigrie and Sasan generation and corresponding despatch.
- High Demand in Bihar
  - Approximately 400 MW compared to last year
- High Demand in ER
  - 9.69 % growth is recorded in May 2015
- High demand and low generation in North Eastern Region (NER)
- Less generation mainly at
  - Barh (only one unit of 660 MW running out of 2*660 MW units)
  - Koderma
  - Bhutan (Tala, Chukha, Kurichu)
- Non commissioning of Teesta-III (1200 MW)

4. Application of Congestion Charges

Congestion charges were imposed on the following dates on both the constituents of downstream and upstream in view of violation of the TTC/ATC limits to maintain grid security. Apart from that, several congestion warnings were also issued from the control room. From 1st to 17th June 2015, the congestion charge periods are enlisted below.

- On 17.06.2015 @ 1245 hrs – 1715 hrs
- On 04.06.2015 @ 2130 hrs – 05.06.2015 @ 0300 hrs
- On 05.06.2015 @ 2230 hrs - 06.06.2015 @ 0445 hrs
- On 06.06.2015 @ 2100 hrs - 07.06.2015 @0230 hrs
- On 02.06.2015 @ 1645 hrs – 1745 hrs

Annexure 1: Actual inter regional flows on a typical day with skewed flows

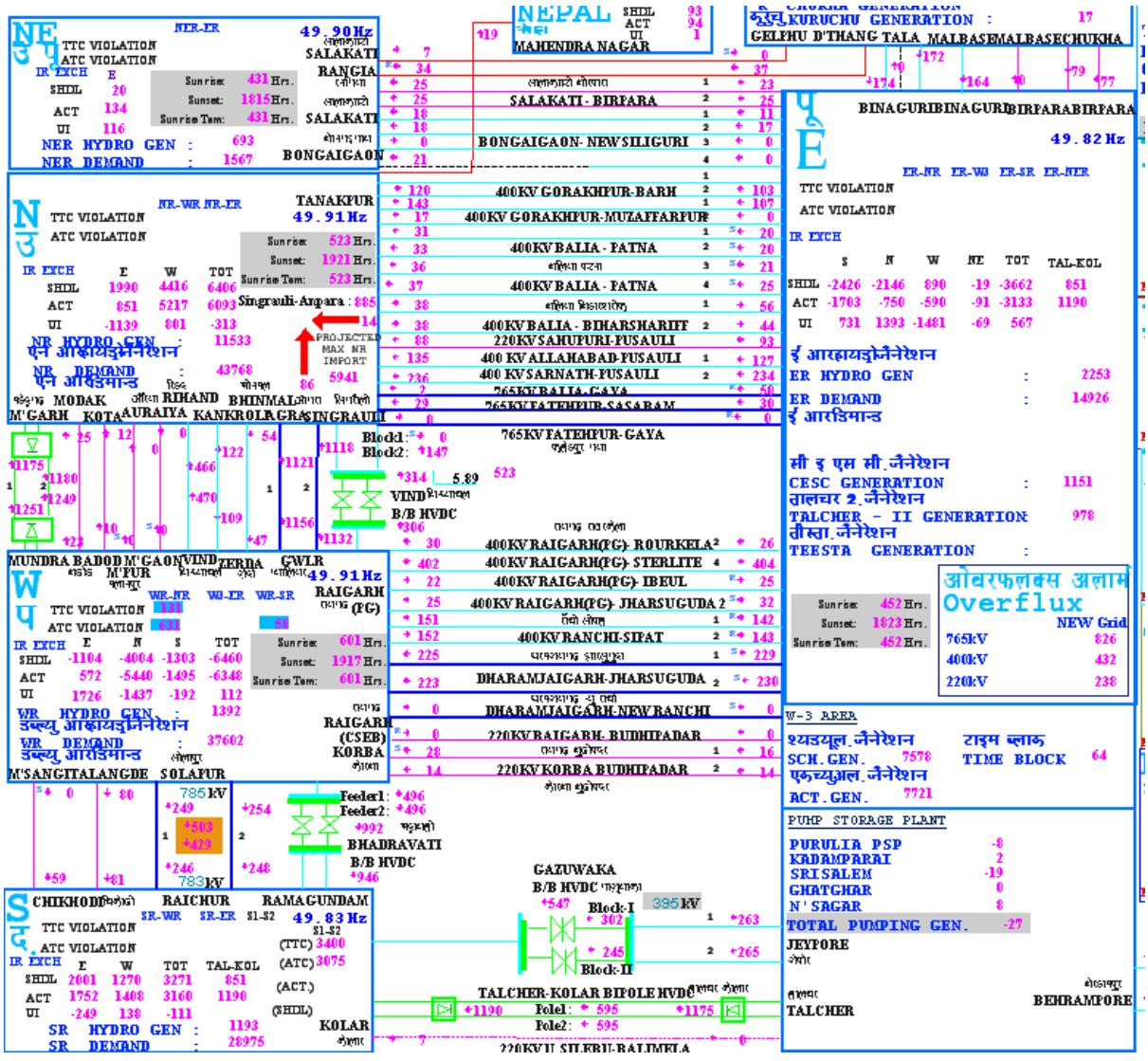

Figure 1 : Actual inter regional flows on a typical day (5th June) with skewed flows of 86% from WR and 14% from ER

Annexure 2: South to North axis within Eastern Region

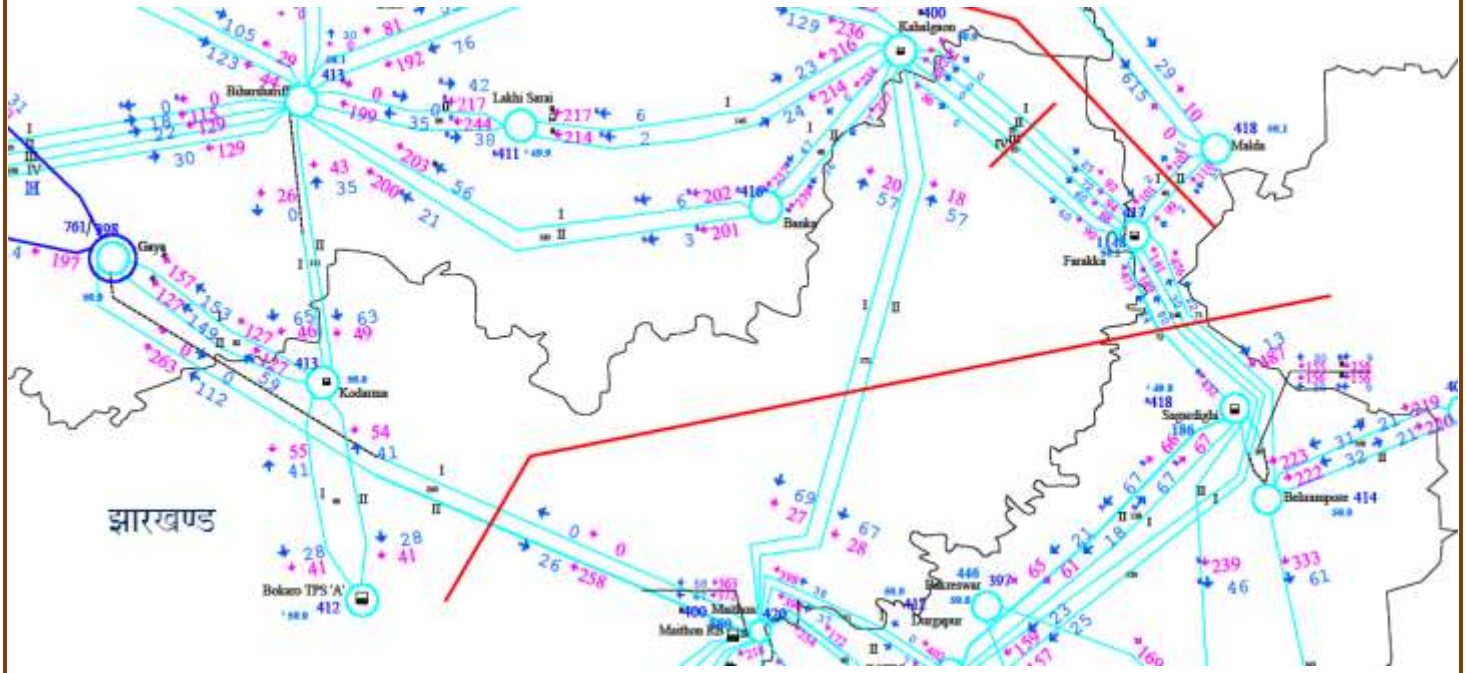

Figure 2: South to North axis within Eastern Region

Annexure 3: WR-NR & ER-NR Inter Regional flows in percentage

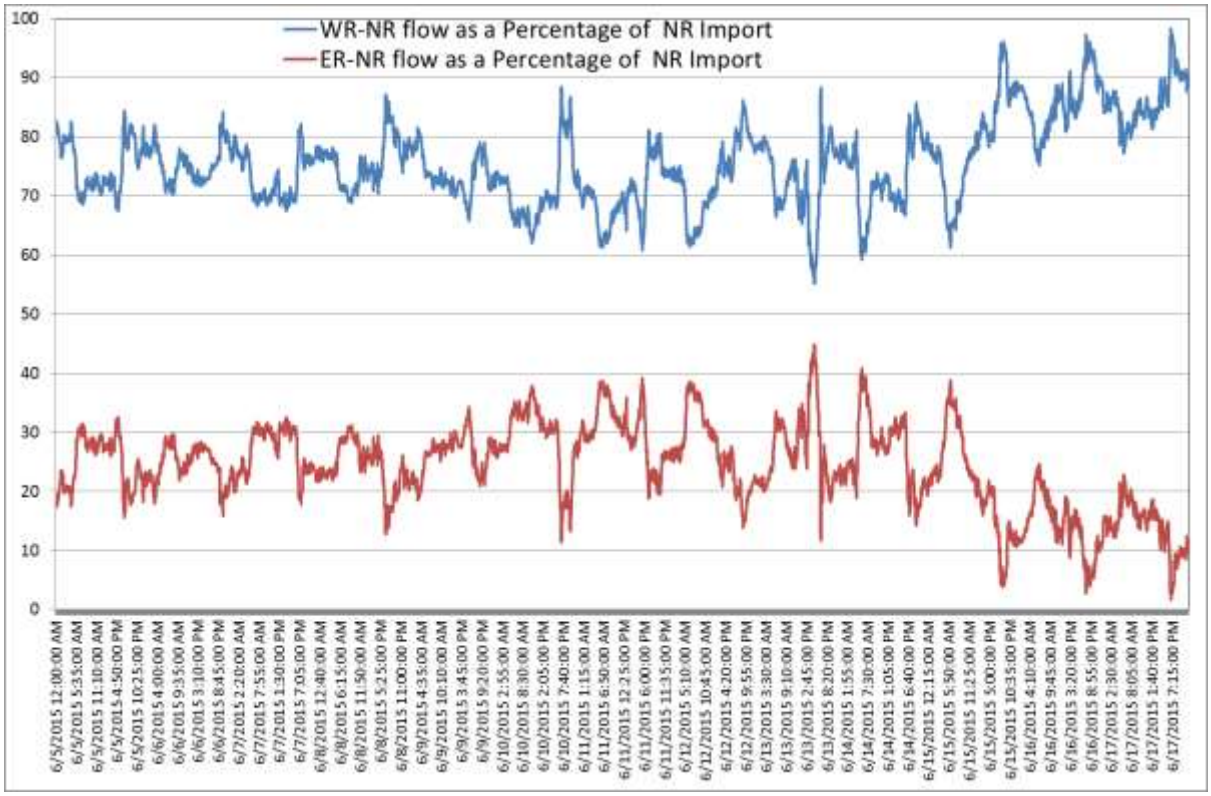

Figure 3: WR-NR & ER-NR Inter Regional flows in percentage

Annexure 4 : Important Line flows

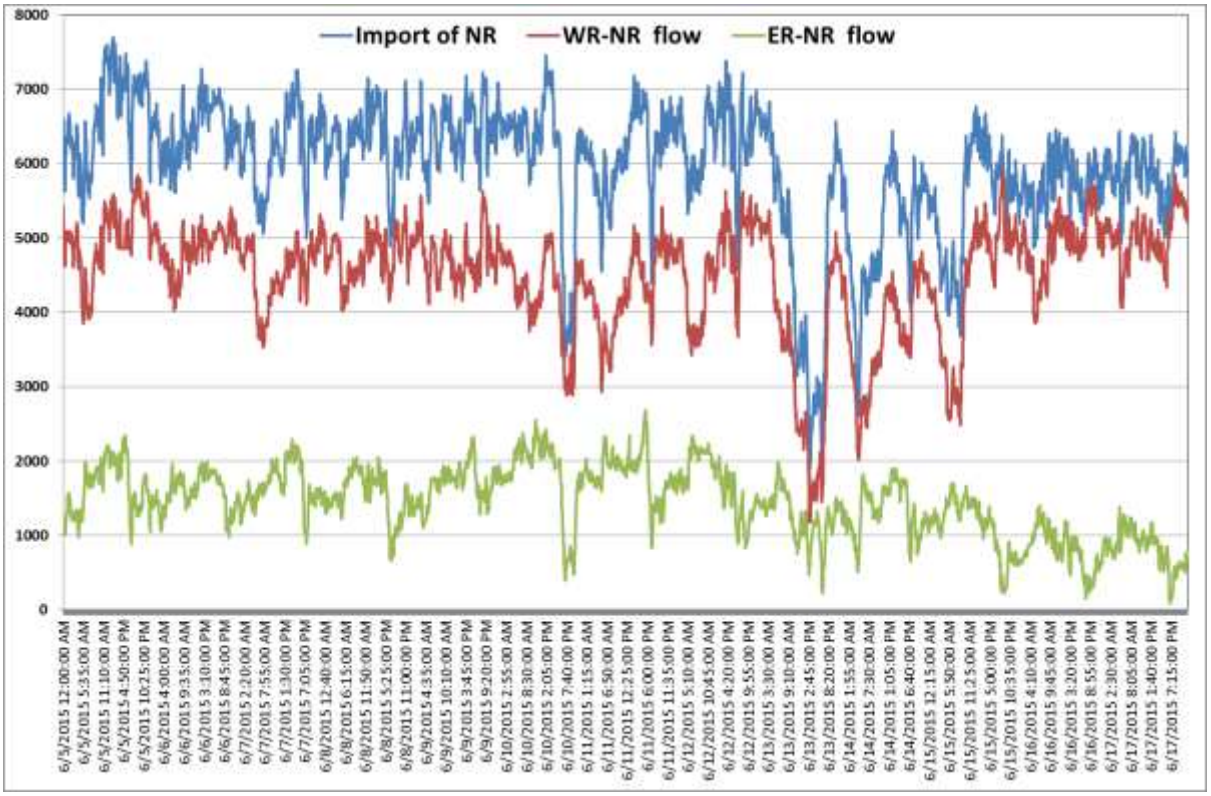

Figure 4: Inter Regional Flows and total import by Northern Region

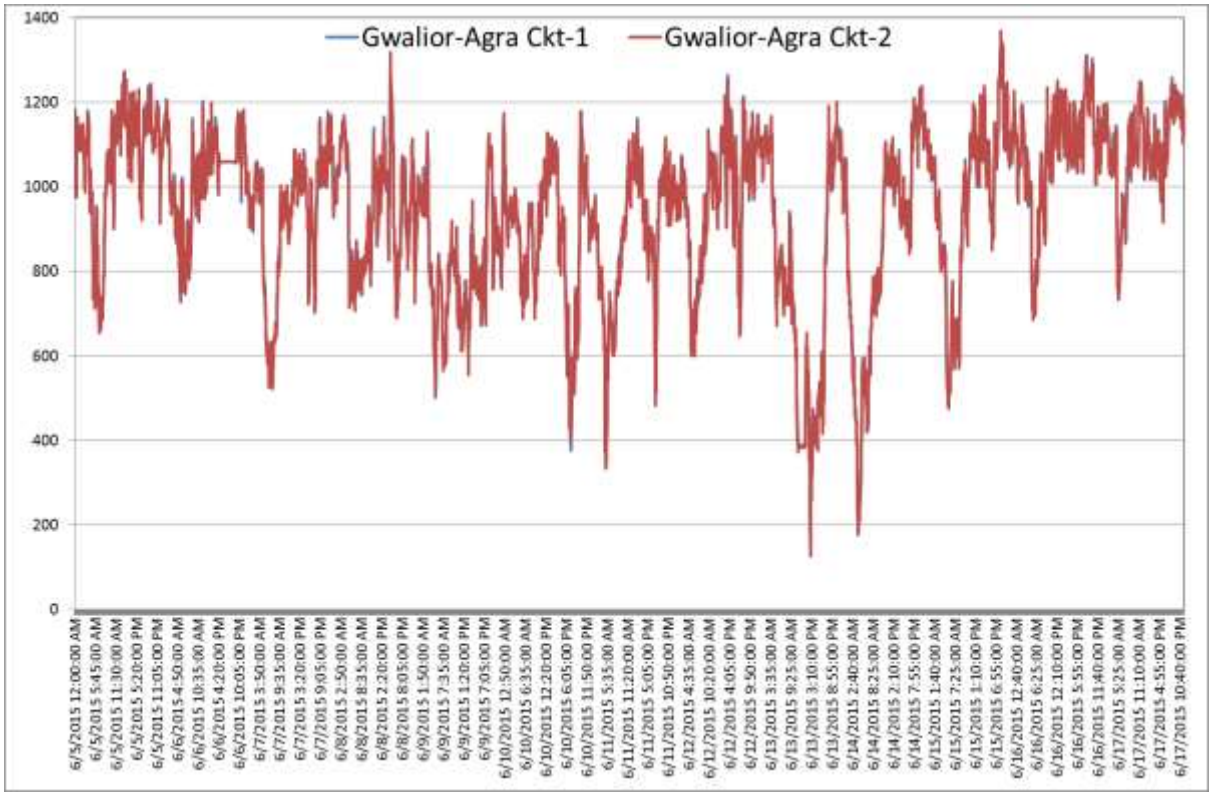

Figure 5: Flows on Gwalior – Agra D/C

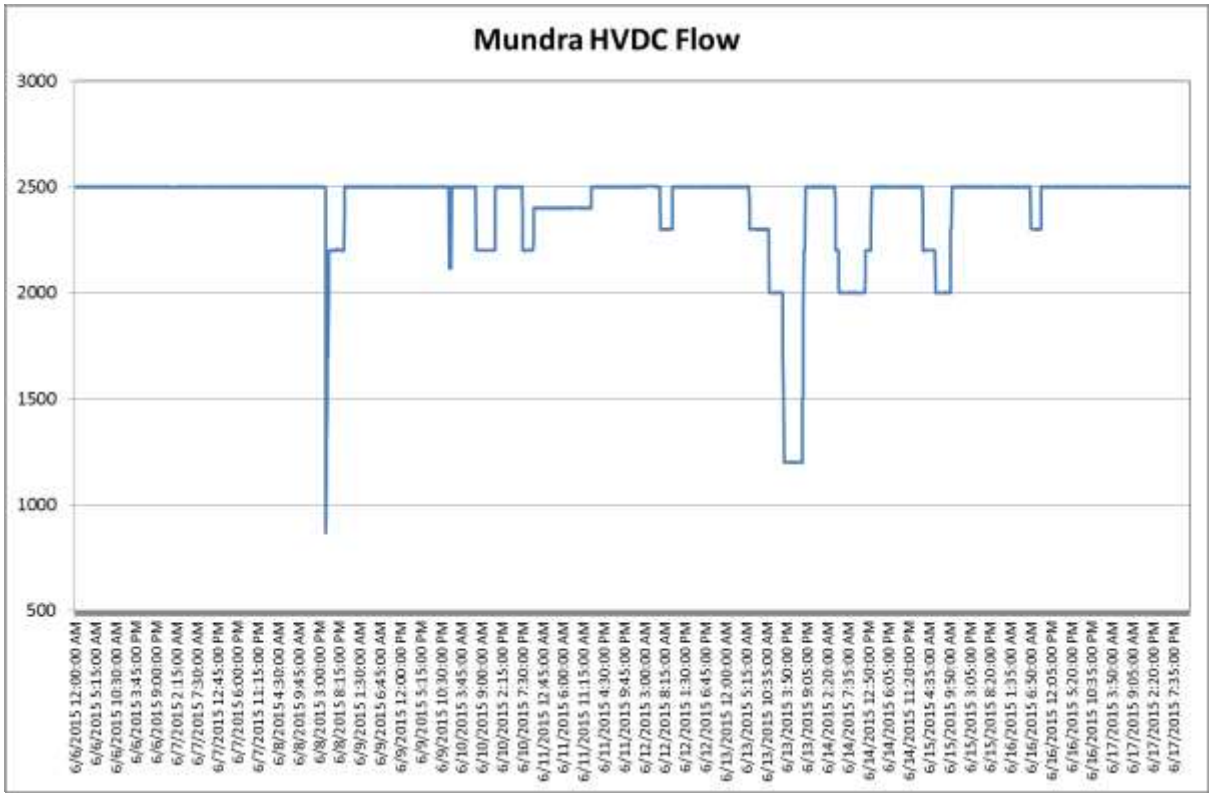

Figure 6: Flow on 400 kV Singrauli - Anpara

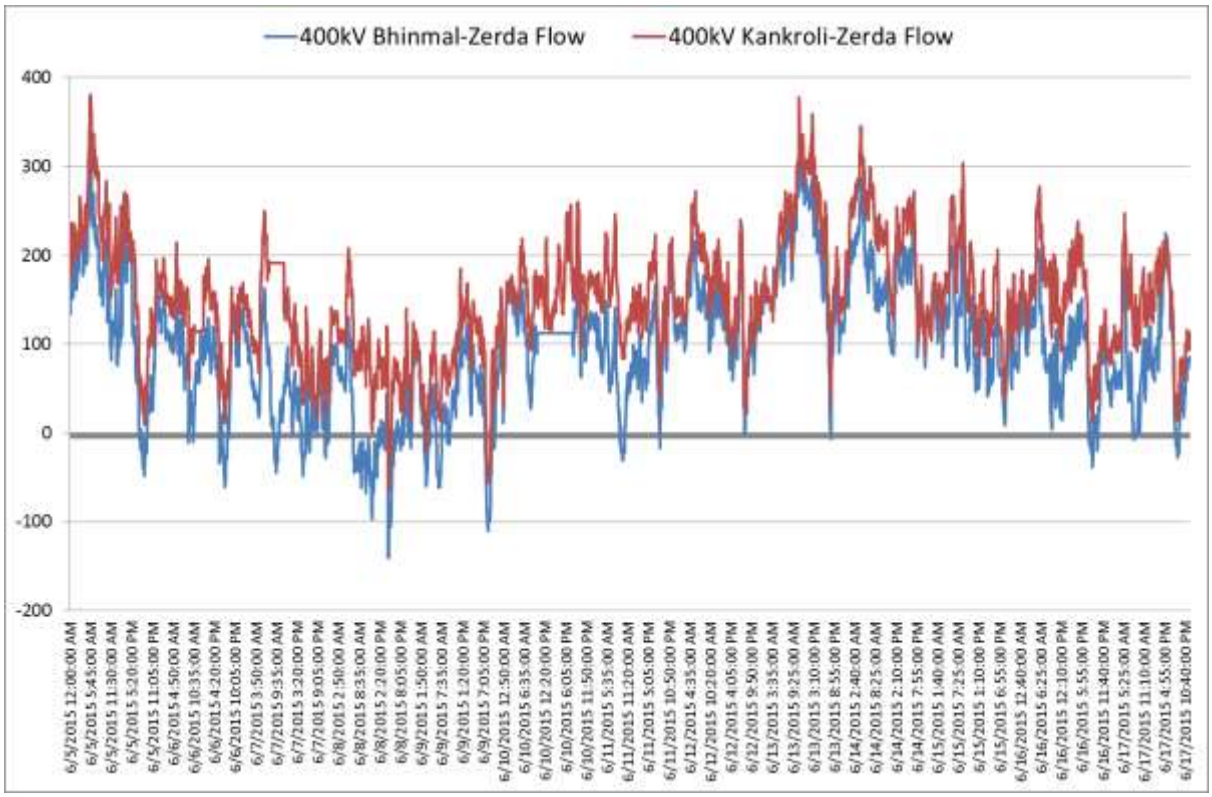

Figure 7: Flow on 400 kV Bhinmal – Zerda and 400 kV Kankroli - Zerda

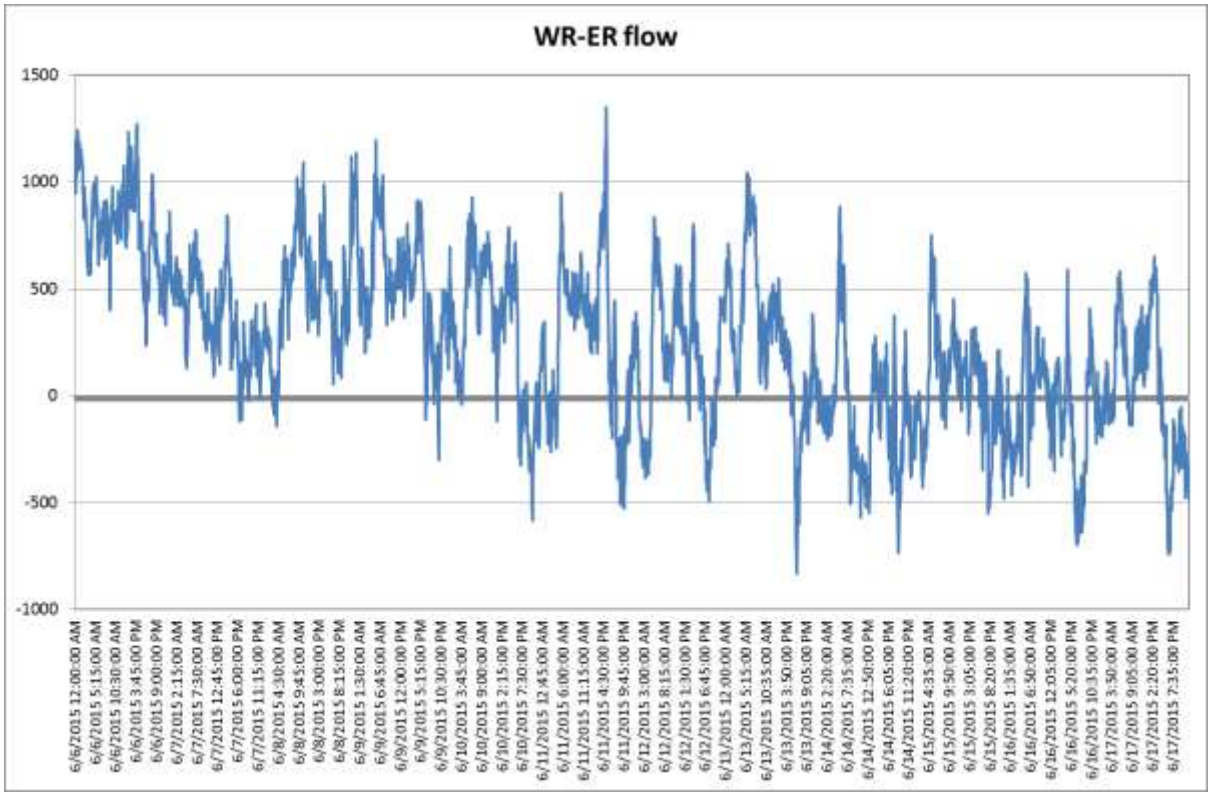

Figure 8: WR – ER flow

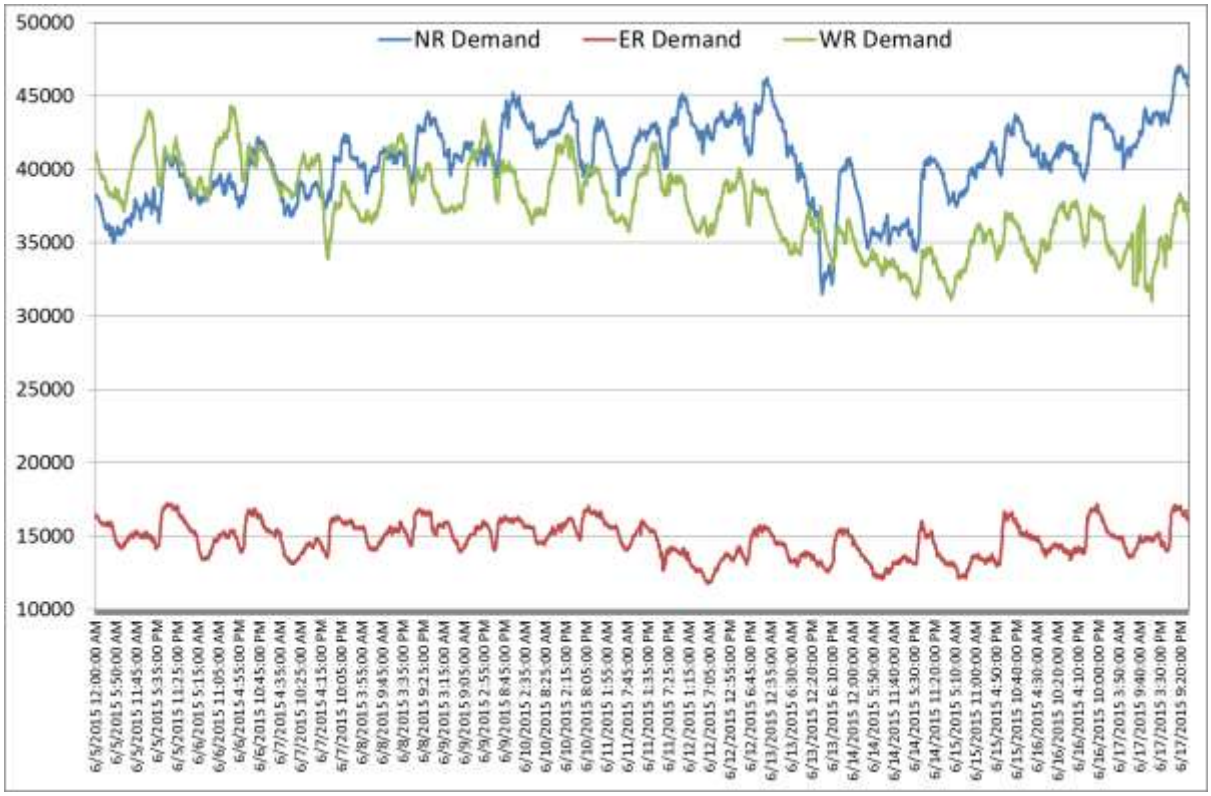

Figure 9: Demand met of NR, ER and WR