



**NLC TAMILNADU POWER LIMITED**  
**DEPARTMENTAL PROCEDURE MANUAL**  
(Incorporating ISO 9001:2015, ISO 14001: 2015 & ISO 45001: 2018)  
**STANDARD OPERATING PROCEDURE**

**TITLE:- SOP FOR HP-LP BP OPERATION**

**Doc. ID: NTPL/OPRN/SOP-4**

**PURPOSE:** To define procedure for HP-LP Bypass Operation

**SCOPE:** This SOP is applicable at NTPL

**RESPONSIBILITY:** Shift Engineer / Operation Engineer

**PERFORMANCE CRITERIA:**

**ACTIVITIES:**

The H.P. Bypass system in co-ordination with LP-Bypass enables boiler operation and loading independent of the turbine. This allows quick raising of steam parameters to a level acceptable to turbine for rolling during start up. Steam is bypassed from main steam line to cold reheat line through HP-Bypass and from hot reheat line to condenser through LP Bypass.

**FUNCTION**

The station is provided with two nos. HP Bypass valves BPV 1& 2 which regulates the pressure based on set values along with associated spray system BPE 1&2 regulates the spray flow based on the downstream temperature set value. capable of handling a maximum of 60% of the 100 % MCR steam generation at rated live steam parameters of 170 kg/cm<sup>2</sup> and 537°C. Each valve has been sized to pass 520 T/hr of rated live steam. It shall be designed for constant / sliding / modified sliding pressure modes of operation.

The bypass system would work in parallel with turbine during load rejection in a coordinated manner with steam generator. However, during start-up of boiler to build matching steam parameters required for turbine and also when load transfer to turbine, the bypass system would function in a non-coordinated manner as per the operator demand.

The bypass system would be capable of meeting following requirements for various modes of operation viz. constant pressure, sliding pressure and modified sliding pressure:

1. Quick start-up of the steam generator from cold and warm start up conditions for achieving turbine matching parameters.
2. Quick hot restart of the turbine.
3. Parallel operation of the bypass with turbine in the event of large load throw-off condition.
4. Allowing boiler operation following turbine trip provided boiler load is less than 60%.
5. Preventing safety valves opening at raised steam pressures.

The purpose of HP/LP bypass system is to ensure minimum steam flow through Superheater and Reheater tubes during start-ups, low load operation and sudden unloading of unit. Avoiding the boiler trip on Reheat protection. No steam flow through



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Boiler steam tubes will lead to starvation and thereby overheating and lead to premature failure of tubes. The HP bypass dumps steam into CRH inlet of Reheater and thereby followed by LP Bypass bypasses IP and LP turbine and dumps steam into condenser.

**HP BP Operation**

- Open CRH line drain to condenser and CRH atmospheric drain and check for any water draining. If no water, close it otherwise keep it open until water stops.
- Before opening the Bypass, open its line drain and allow the temp before BPV to rise. When this temperature comes in superheated (Sat.Temp+50deg.C) region corresponding to the MS pressure, open the warmup line to charge the downstream of Bypass.
- After charging open HPBP valves 5 % on each side, at a Main steam pressure of 8 Ksc. RH air vents are kept opened till LPBP is ready and vacuum available.
- Gradually open BPV1&2, according to the firing in the boiler, till rolling parameters are achieved.
- When both BPV 1&2 open>20%, close its line drain valves (BPV 101&102).
- Keep BD isolation close till Downstream temperature reaches 280 deg.C.
- When MS pressure reaches 40 Ksc, match the pressure set point to actual MS pressure and put one side in auto for better control and keep both valve (BPV1&2) almost same opening. Slowly rise pressure set point to reach rolling parameters.
- Ensure HPBP opening is sufficient for rolling and a minimum block load thereafter, after reaching the parameters.
- Always keep (MS actual-MS Set Point)< 8 Ksc to avoid any protection opening.
- While operating HPBP, Drum level has to be maintained carefully.
- Once unit gets Synchronized and block load comes, HPBP valve which was in auto will close automatically to maintain the set pressure and operator has to close manual valve according to match the other one.
- When both HPBP valve close fully, put other valve in auto and after that put pressure set point in auto. Pressure set point will automatically change to MS Actual pressure +5 ksc.
- Ensure full closing of BPV 1&2 and BPE 1&2 from local.

**Protections & Interlocks:**

1. HPBP valves trip closes if downstream temperatures go beyond 380 degC.
2. BD & BPE Open, if BPV opening is > 2 %.



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3. BPV 1&2 opens only if the controller output is  $> 2\%$ .

4. HPBP valves Fast Open within 3 secs during the following conditions: -

- Turbine trip
- Generator Circuit Breaker Opens (GCB)
- Load Shedding Relay Acted (LSR)
- Pressure deviation High ( $> 8$  Ksc )

Once the valve is fully opened in about 3 sec the fast opening signals will be cut off by the timer set at 4 sec. The control is now shifted to pressure control set point.

**Oil Supply Unit (OSU) for HPBP System:**

The HP BP System valves are operated / controlled hydraulically by the pressure oil supplied by the Oil Supply Unit (OSU) located at 8.5 ML.

Oil Level (dip stick) in tank, opening of all valves in the Supply lines (P line) and return lines (T line) , Power supply and local latch release for the pump motors are to be ensured before taking HPBP System into service. Pumps start at low press (120 ksc), and trips at high press (160 ksc). Oil press too low (90 ksc) and too high (180 ksc) indications and pump status are available in DCS.

Running / Idle timings of both the OSU pumps are to be monitored every shift.

**LP BYPASS OPERATING PROCEDURE**

**Introduction**

There are two LPBP Stop valves and Control valves for relieving HRH Steam into Condenser. Separate Oil supply unit(OSU) is used for LPBP Valves actuation. LPBP Controller has auto / manual provisions in the DCS.

**Function**

LPBP Controller gets its Pressure Set Point from the Fixed/Variable Set points (MAX Gate Output) and the actual value of HRH Line pressure.

**Set Point formation:**

- Fixed set point: Set at the OWS
- Variable set point: Derived from the wheel chamber pressure
- Flow dependent set point: Depends on injection flow setting



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- Vacuum pulling condition reached.
- HP/BP pass is in open condition.

**LPBP OPERATION**

- Open both side LPBP line drains (HRHV 109-110).
- Open both side LPBP warmup drains (HRHV 113-114).
- Pressure controller to be in manual mode.
- Open Spray to LPBP around 10-15%.
- Give command to pressure controller. Gradually and observe the following.
- 27-30 % valve of pressure controller, pilot valve will open after that stop valve will open both side.
- After opening of pilot valve and stop valve, raise pressure controller gradually to open control valve at 35-37% control valve will start opening.
- Re-Heater vents to be closed after LPBP charging and HRH pressure reaches >2 Ksc.
- Gradually open LPBV control valve till HRH pressure becomes >5 Ksc and valve opening is around 40%.
- Keep Pressure set point at 5 Ksc and put the pressure control valve in auto.
- Slowly increase pressure set point till 9 ksc.
- Don't allow LPBP to full open, accordingly adjust pressure set point.

**RECORDS:**

Record No.	Record Title	Location	Responsibility	Retention Time
NTPL/OPRN/R-01	UCB B&T LOG	CCR	Operation Div.	3 Years

**VERIFICATION, CORRECTIVE AND PREVENTIVE ACTION:**

HOD shall ensure adequacy and implementation of the above procedure through periodic interaction with department personnel, and regular review and monitoring of the processes and compliances. In case of any observed deviation, corrective and preventive action shall be immediately undertaken.

**HOD**