Sl.No.	Extract from IEGC/ brief details	Existing IEGC Clause	Remarks
1	However, notwithstanding the above, the RLDC may direct the SLDCs/ISGS/other regional entities to increase/decrease their drawal/generation in case of contingencies e.g. overloading of lines/transformers, abnormal voltages, threat to system security.	6.4(12)	The following is to be added at the end: "....., conditions under Security Constrained Economic Despatch"
2	The schedule finalized by the concerned load despatch centre for hydro generating station, shall normally be such that the scheduled energy for a day equals the total energy (ex-bus) expected to be available on that day, as declared by the generating station, based on foreseen/planned water availability/release. It is also expected that the total net energy actually supplied by the generating station on that day would equal the declared total energy, in order that the water release requirement is met.	6.5(13)	FRAS Up and Down schedules to be included. Mileage to be mentioned.
3	-	6.5	Intraday market to be accommodated in schedules as per prevalent or future regulations.
4	-	New Clause	ATC/TTC calculations to be done in real time by NLDC/RLDC. The contingency and OA curtailment if any is to be displayed via SCADA to SLDCs.
5	-	6.5	To accommodate Run of the river generating stations, under-requisitioning from other plants by the beneficiary is to be allowed in same time frame.
6	Ripple filter for RGMO to be set at +/-0.03Hz to prevent governor hunting	5.2(f)	It has been observed(ref. 156th OCCM, event dated 05.02.2019) that due to sudden incursions in the RGMO band (with Δf <ripple) RGMO is triggered. In such cases no primary response is present. Since frequency has stabilised at/or almost 50.00Hz the RGMO may be discontinued via Cl. 5.2(f)(d) of the same regulations. Only FGMO may be kept.
7	"…..the interruptible loads shall be arranged in four groups of loads, for scheduled power cuts/load shedding, loads for unscheduled load shedding, loads to be shed through under frequency relays/ df/dt relays and loads to be shed under any System Protection Scheme identified at the RPC level…."	5.4.2(e)	The following is to be added. "SLDCs to inform daywise scheduled power cuts/load shedding, loads disconnected under unscheduled load shedding to concerned RLDC."
8	New Clause for Margin regarding Secondary and Tertiary Reserves	New Clause	5.2.3 of National Electricity Policy, 2005 envisages 5% spinning reserves at

			national level. Also, as per the recommendation of the Committee on Spinning Reserves in its Report dated 17.09.2015, each region should maintain secondary reserve corresponding to the largest unit size in the region and tertiary reserves should be maintained in a de-centralized fashion by each state control area for atleast 50% of the largest generating unit available in the state control area. In light of the above, a specified percentage margin in both secondary and tertiary reserve may be stipulated in the IEGC.
9	Review of Technical Minimum i.e. 55% of MCR/Installed Capacity	6.3B	• Level of Technical minimum at 55% needs to be reconsidered. • Block-wise technical minimum schedule for stable plant operation and to avoid flaring of excess Fuel Gas at supplier end may be considered. • Detailed report attached at Annexure-I

Annexure-I

REPORT ON TECHNICAL MINIMUM AT AGTCCP

Agartala Gas Turbine Combined Cycle Power Plant (AGTCCP), North Eastern Electric Power Corporation Ltd (NEEPCO Ltd), with an installed capacity of 135 MW is a Combine Cycle Power Plant. The waste heat generated by the Gas Turbine units are used in Heat Recovery Steam Generator for running the Steam Turbine Generator.

There are total 4 (four) nos. of Gas Turbine and 2 (two) nos. of Steam Turbines runs in 2 modules each module consisting of 2 GT + 1 ST.

Output of Steam Turbines are in proportion with Input variables mainly:

- Steam flow (TPH)
- Steam temperature (Deg.C)
- Steam pressure (Kg per sq.cm)

As Input variables to Steam turbine depends on output of WHRB, the performance of boiler depends on its input condition governed by:

- GT load (MW)
- Gas turbine exhaust flow (Kgs/S)
- Gas turbine exhaust temperature at WHRB inlet (^{0}C)
- Ambient temperature
- Feed water temperature at Economiser inlet (^{o}C)

Design Specification of HRSG:

- WHRB has one HP drum & one Integral Dearator (LP drum)
- MCR rating of HP Boiler = 44.61 TPH
- MCR rating of LP Boiler = 10.8 TPH
- Steam parameters of Main Steam Stop Valve (MSSV) from minimum load upto MCR 480°C±5 for HP, 230 °C for LP
- STG output is directly depend on GT output

Effect of Un-Requisition Scheduling

- Minimum 17 MW of GTG load is required to sustain one HRSG i.e to maintain required Temperature & Pressure of boiler.
- We are forced to generate 20MW (5 MW each GTG) more than NERLDC given schedule generation (SG) at CERC Techno minimum for the plant stability.
- Over generation may lead Grid instability and against the principle of DSM Regulation.
- LP injection system get disabled at above SG resulting loss in 2MW in each STG.
- Frequent start/stop and Part load operation of GT affect its life.
- Reduced in GTGs load affect STG main stem temperature and flow (TPH).

Case study for dtd. 03.06.2017 based on NERLDC schedule:

- Schedule changed from 80 MW to 54.86 MW
- That forced to reduce GTG generation but to sustain HRSGs following Generation was maintained :

Time	**GTGs(MW)**				**STGs(MW)**		**Total**	**DC**	**Schedule**	**Remarks**
(Hrs)	1	2	3	4	1	2	MW	MW	MW	
00:00	19	19	S/B	19	21	10	88	80	80	
01:15	16	16	S/B	15	18	8	73	80	54.86	18MW excess generation

- After GT load settings Main steam temp. of STG falls.
- Gas flared at GAIL's end due to reduced load.

Conclusion

- In case of sudden load regulation in GTG to a considerable limit, GT exhaust flow temperature will drop , causing low MS temperature
- MS (Main Steam) input at low temperature will cause thermal stress to the ST.
- If the generation of the Plant is to be back down to the schedule (prepared considering Technical Minimum at 55% of On Bar IC or MCR after deducting AEC), will force to surrender considerable quantity of fuel gas.
- Sudden dropping in quantum of gas drawl will lead heavy flaring at suppliers end, meant wastage of natural resources.
- As it is happening earlier, in case of grid disturbance, outage of units, Plant is compel to surrender fuel gas.
- In such, for further restoration of units, immediate recovery to get back the required quantity of gas is not possible which leads to run the plant in the stage of under generation, due to less availability of gas.

Expected Technical Minimum for AGTCCP:-

- **Level of Technical minimum at 55% needs to be reconsidered.**
- **Block-wise technical minimum schedule for stable plant operation and to avoid flaring of excess Fuel Gas at supplier end following may be considered:-**

Sl. No	Machine Combination	Required Minimum SG to sustain HRSGs	% of IC on Bar
1	4 GTGs 2 STGs(with 4 HRSGs)	106 MW	78.5%
2	3 GTGs 2 STGs(with 3 HRSGs)	79MW	78.2%
3	2 GTGs 1 STG(with 2 HRSGs)	53 MW	78.5%

REPORT ON TECHNICAL MINIMUM AT AGBP

Assam Gas Based Power Plant (AGBP), North Eastern Electric Power Corporation Ltd (NEEPCO Ltd), with an installed capacity of 291 MW is a Combine Cycle Power Plant. The waste heat generated by the Gas Turbine units are used in Heat Recovery Steam Generator for running the Steam Turbine Generator.

There are total 6 (six) nos. of Gas Turbine and 3 (three) nos. of Steam Turbines runs in 3 modules each module consisting of 2 GT + 1 ST.

Output of Steam Turbines are in proportion with Input variables mainly:

- Steam flow (TPH)
- Steam temperature (Deg.C)
- Steam pressure (Kg per sq.cm)

As Input variables to Steam turbine depends on output of WHRB, the performance of boiler depends on its input condition governed by:

- GT load (MW)
- Gas turbine exhaust flow (Kgs/S)
- Gas turbine exhaust temperature at WHRB inlet (^{0}C)
- Ambient temperature
- Feed water temperature at Economiser inlet (^{o}C)

In case of AGBP, considering APC (Automatic Plant Controller) , OEM standard guidelines and from practical operational experience, the CC mode can be operated efficiently only when the minimum required steam parameters are within safe limits, that is when the GTG load ≥80 % of MCR or On Bar installed capacity.

- For AGBP, GTG load ≥ 80% of MCR ≥ 33.5*80%MW ≥ 26.8 MW, say 26 MW

Below 80% of GTG base load, the steam parameters drops down to well below the design limits.

- As per present technical minimum, if 55% is considered it will be= 33.5*0.9725*55% MW
  = 17.91 MW ≈ 18 MW (considering Aux. Conspt. as 2.75%)
  Which falls far below the operational limit

As per OEM recommendations, the Normal Operating Parameters for Steam Turbine at AGBP are

Steam temperature ^{o}C = 473
Steam pressure KG/cm^2 (Abs) = 43

Operating Parameters under practical conditions:

1. At GTG Load 30 MW => Steam Temperature : 468 ~478 ^{0}C Steam Pressure: 31~34 kg/cm^2
2. At GTG Load of 26 MW => Steam Temperature : 423~448 ^{0}C Steam Pressure : 24~26 kg/cm^2
3. At GTG Load of 18 MW => Steam Temperature : 380~395 ^{0}C Steam Pressure : 20~22 kg/cm^2

Effect of Un-Requisition Scheduling:

- With GTG load at 18 MW (considering 55% Tech Min), the required minimum design parameters cannot be achieved.
- Steam turbine start-up and loading procedure is restricted by shaft surface and shaft mean temperature which is achievable only at or more than 80% GTG load.

- Hence in case of Technical Minimum allowed to AGBP is 55% of On Bar IC after deducting AEC, then either we have to run only one full and half module in CC mode or run GTG units in OC mode at the required load.
- As per the Grid code, it is not advisable to run a unit in OC mode.
- Excess generation is against the principle of DSM Regulation.

Conclusion

- In case of sudden load regulation in GTG to a considerable limit, GT exhaust flow temperature will drop , causing low MS temperature
- MS (Main Steam) input at low temperature will cause thermal stress to the ST.
- If the generation of AGBP is to be back down to the schedule(prepared considering Technical Minimum at 55% of On Bar IC or MCR after deducting AEC,), will force to surrender considerable quantity of fuel gas.
- Sudden dropping in quantum of gas drawl will lead heavy flaring at suppliers end, meant wastage of natural resources.
- As it is happening earlier, in case of grid disturbance, outage of units, AGBP is compel to surrender fuel gas.
- In such, for further restoration of units, immediate recovery to get back the required quantity of gas is not possible which leads to run the plant in the stage of under generation, due to less availability of gas.

Expected Technical Minimum for AGBP (considering 1.4 MMSCMD available Gas Linkage)

- 80% GTG load: Minimum load for maintaining Boilers as well as Steam Turbine parameters.
- Keeping 80% load in 02 Gas Turbines with 01 Steam Turbine would be:(26x2+24)=76 MW
- Keeping 02 modules, at same capacity would be=76x2=152 MW
- Keeping 01 Gas Turbine at 80% base load with half load Steam Turbine in 01 module: 26MW+12MW = 38 MW

Total Technical minimum load = 152+38 = 190 MW considering 2& ½ module with availability of gas @ 1.4 MMSCMD.