Points for consideration of Expert Group engaged by CERC to review Indian Electricity Grid Code and other related issues

Nov 2019

IEGC - KEY Issues/Concerns

- Issues have substantial impact on the **operations** as well as the **financial position** of the Generators.

Thermal

Part load operation/RSD

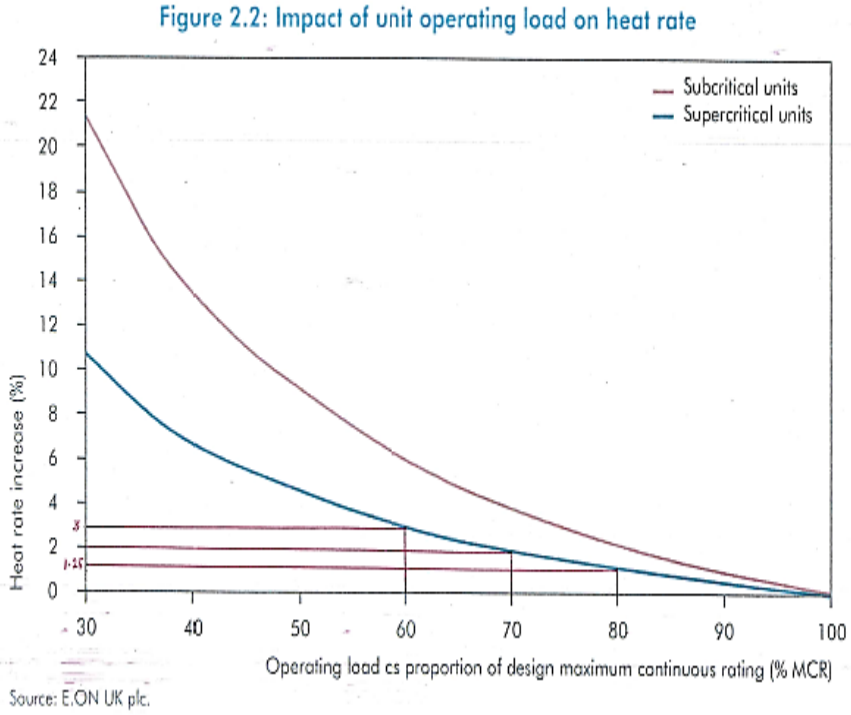
- **Compensation for SHR & Aux Power Consumption**
- **Impact of frequent start/stops on account of Reserve Shut Down (RSD)**
- **Advance Notice for RSD**
- **Revision in schedule of short term open access transactions in case of RSD**

Compensation for SHR & Aux Power Consumption

Heat rate loss Vs PLF (660 MW units)

Load (MW)	PLF (%)	SHR (kCal/kWh)	Diff (kCal/kWh)
660	100%	2180*	--
627	95%	2184	4.4
594	90%	2191	11.2
561	85%	2200	20.3
528	80%	2211	31.4
495	75%	2224	44.3
462	70%	2239	58.9
429	65%	2259	74.9
396	60%	2272	92.1
363	55%	2291	110.4
330	50%	2310	129.6

* Excluding the correction factor of 6.5%



- **Non linear trend- High degradation at low PLF.**

Compensation for SHR & Aux Power Consumption- IEGC 4th Amendment

SN	Unit Loading as % of Installed capacity of the Unit	Increase in SHR (Super critical units) (%)	Increase in SHR (Sub critical units) (%)	% Degradation in AEC admissible
1	85-100	nil	nil	nil
2	75-84.99	1.25	2.25	0.35
3	65-74.99	2	4	0.65
4	55-64.99	3	6	1.00

- As per the CERC mechanism, the compensation is worked out for a month on cumulative basis considering degradation of SHR and Aux based on Average Unit Loading, subject to reconciliation at the end of the year.

- No compensation for PLF above 85%. Therefore, a part of loss suffered during the period when PLF is below 85% cannot be recovered when compensation is computed on cumulative PLF as it gets nullified by the time blocks when PLF is above 85%.

Compensation for SHR & Aux Power Consumption

- This anomaly does not allow full compensation to the generating companies for actual loss suffered due to part load operation and defeats the objective of providing the compensation.

12 Hrs running @ 75% & 12 Hrs @ 95% Load Factor					
Load Factor (%)	Nos. of Hours	% (Hrs)	SHR Loss As Per OEM Curve (kcal/kWh)	SHR Loss as Per CERC(kcal/kWh)	SHR Loss as Per Norms on Avg Load basis (85%)
95	12	50.0	4.44	----	0.00
85	0	0.0	0.00	----	
75	12	50.0	44.34	13.6	
65	0	0.0	0.00	----	

Recommendation: Compensation for degradation of Heat Rate (SHR) and Auxiliary Energy Consumption (AEC) needs to be computed separately for each time Block of 15 Min instead of monthly basis cumulative over a year.

Impact of frequent start/stops on account of RSD

- Damage is caused to the metallurgy of the boiler and other parts due to frequent start/stops and the consequential additional capital expenditure is required for renovation of the plant/equipment to mitigate such impact (reduction of the useful life of the plant).

- The framework of competitive bidding for procurement of thermal power was designed to cater base load of the distribution utilities. Therefore, the scenario of frequent start/stops on account of RSDs and consequential impact on machinery was not envisaged while submitting the bid.

- While the power plants supplying power under regulated tariffs are allowed relief through additional capital expenditure, such a dispensation is not available for the plants supplying power under competitive bidding regime. The relief available to Section 63 PPA is only in terms of change in law and Force Majeure provisions.

Recommendation: Section 63 projects should be allowed relief available to cost plus PPAs to restore the developer to the same economic position which could not be envisaged at the time of bid. A suitable provision may be incorporated in IEGC.

Advance Notice for reserve shut down

- The DoP for RSD only provides for instantaneous instruction of RSD which adversely impacts the Generators in the following ways:

  - **Fuel Related Issues -** The coal consumption reduces significantly and leads to piling up of coal stock (esp. for imported coal based plants) at the plants which creates the operational issues for stacking of coal and also leads to smouldering of coal stock and moisture ingress, causing decrease in coal GCV which further increases variable cost of Generator and forms a viscous circle with RSD.
  - **Availability and Plant Life Related issues -** Supercritical units which are base load units are operated as peak load units and frequent on/off bar operations with rampant cycling of units from full load to no load & vice-versa, such operations adversely affect the life & availability of units.

Recommendation: TPPs should be given an advance notice of 15 days before instructing such plants for Reserved Shut down. In particular, projects based on imported coal need to plan their coal supply in advance and cannot go for RSD on instantaneous instructions. Therefore, a suitable provision may be incorporated in IEGC in this regard.

Revision in schedule of short term open access transactions in case of RSD

- Regulation 6.5.19 of the IEGC Regulations, 2010 does not allow for revision in the Schedule of Short Term Open Access transactions in case of Reserve Shut Down.

- Reserve Shutdown (RSD) of a unit is done on the instantaneous instructions of concerned SLDC/RLDC and the generator is bound to follow the instructions. Therefore, RSD cannot be considered a planned outage since it is immediate & instantaneous in nature.

Recommendation: Revision in schedule of short term open access transactions should be allowed in case of RSD along with forced outages.

Renewable

- **Centralized Forecasting of wind and solar generation by SLDC/RLDC**
- **Revision in Schedule**
- **Injection of Excess Capacity**

Comparison of DSM Regulations in States

Regulations	Applicable to	Aggregation of Multiple pooling stations by QCA/Generator	Error Based on	Permissible Deviation	Charges on Deviation	No of Revisions
FoR - Model Regulation	All	Yes	Available Capacity	+/- 15% Old +/- 10% New	Fixed rate of Rs./Unit	Every 1.5 hours
CERC Inter State DSM Regulation	Regional Entities: Wind & Solar projects	No	Available Capacity	+/- 15% for all	As % of PPA	Every 1.5 hours
Karnataka	>=10MW-Wind >=5MW-Solar	Yes	Available Capacity	+/- 15% for all	Fixed rate of 0.50 Rs./Unit	Every 1.5 hours
Andhra Pradesh	All	Yes	Available Capacity	+/- 15% Old +/- 10% New	Fixed rate of 0.50 Rs./Unit	Every 1.5 hours
Rajasthan	>=5MW for both Wind & Solar	No	Available Capacity	+/- 15% for all	Fixed rate of 0.50 Rs./Unit	Every 1.5 hours
Madhya Pradesh	All	No	Available Capacity	+/- 15% Old +/- 10% New	Fixed rate of 0.50 Rs./Unit	Not specified
Telangana	>=5 MW	No	Available Capacity	+/- 15% for all	Fixed rate of 0.50 Rs./Unit	Every 1.5 hours
Maharashtra	>=5 MW	No	Available Capacity	+/- 15% for all	Fixed rate of 0.50 Rs./Unit	Every 1.5 hours
Meghalaya	>=1MW	No	Available Capacity	+/- 15% for all	Fixed rate of 0.50 Rs./Unit	Every 1.5 hours

Centralized Forecasting of wind and solar generation by SLDC/RLDC

- Allow Centralized Forecasting at State level instead of Plant / PSS level
  - Centralised Forecasting as followed by other developed countries like: USA, Australia , Germany , Spain etc.
  - The forecasting charges to be shared amongst RE Generators.
- Allow aggregation at State level as recommended by FOR Model Regulations.
  - The objective of FOR regulations is not to penalise individual generator but to achieve integration of RE at the same time maintaining grid security.
  - FoR model Regulations followed by KERC and APERC.

Reconnect Performance for Solar Projects in Karnataka

Plant Name	Cap (In MW)	Penalty(in Paise/kwh) MTD									Penalty Aggregation(In ps/kwh) YTD	Penalty(In ps/kwh)YTD
		May-18	June-18	July-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19		
Shorapur	20	6.70	9.24	12.31	13.75	8.81	4.04	3.23	2.70	0.50	0.07	6.81
Rajeshwar	50	17.38	9.29	12.01	11.79	14.54	3.54	4.36	6.98	4.82		9.41
Periyapatna	20	10.85	15.09	12.51	14.64	5.76	7.67	4.28	4.14	1.02		8.44
T Narsipura	20	2.82	9.43	6.77	8.47	2.97	4.47	5.52	3.09	2.08		5.07
Bagewadi	20	4.72	9.09	8.10	12.57	8.51	7.88	6.40	2.94	0.61		6.76
Maaluru	20	13.35	8.68	13.67	10.36	11.31	7.07	7.20	4.52	2.53		8.74
Tiptur	20	DNA	DNA	DNA	9.47	11.77	6.55	3.56	4.66	2.13		6.36
K R Pet	20	6.01	9.20	11.11	10.70	6.16	3.96	3.68	3.67	0.89		6.15
Ramnagar	20	DNA	DNA	9.88	22.73	0.13	25.35	6.36	3.11	5.95		10.50
Channapattana	20	DNA	12.27	15.78	11.42	9.09	4.49	4.41	4.50	1.41		7.92
Gubbi	20	10.10	4.34	7.08	9.60	8.60	3.84	1.69	2.00	5.09		5.82
Kallur	50	DNA	0.46	5.76	12.70	14.04	7.52	5.21	3.10	2.80		6.45
Magadi	20	DNA	DNA	12.69	40.08	6.01	4.05	4.97	5.15	1.98		10.70
Yatnal	50	5.51	7.21	12.88	13.75	10.64	3.07	3.75	2.18	1.71		6.74
Maskal	50	9.90	10.40	15.90	14.59	7.35	2.29	1.99	5.14	1.79		7.70
Nalwar	40	8.00	8.70	14.60	14.32	11.45	5.18	3.66	4.60	1.04		7.95
Yadgir	50	8.70	11.90	9.00	11.72	9.76	6.27	7.50	3.79	3.45		8.01
Madhuhavali	100	2.20	6.40	8.40	10.06	6.18	5.88	6.82	5.25	1.17		
Holenarasipura	20	5.79	6.60	7.62	8.35	7.44	4.63	4.45	3.60	1.36		5.82
Byadagi	20	3.91	10.04	10.55	9.42	5.57	6.67	3.68	7.99	5.04		5.54
Jevargi	20	7.00	9.90	14.20	13.99	7.19	3.84	3.71	3.00	0.66		6.99
												7.06

Aggregated Penalty in ps/kwh, SCADA Availability- 100%

Note : Portfolio considered for Aggregation is of 2000MW at QCA level.

Revision in Schedules (Clause 6.5, 23 (iii))

- Wind and Solar power forecasting depends on the atmospheric condition, wind speed and incoming radiation of particular location.
- Impossible to forecast within 15% accuracy on 1.5 Hours ahead basis continuously at Plant. This makes the forecasting of solar power plant unpredictable up to certain extent.
- Frequent Revisions in schedule will help the generator to cover this error.
- **Recommendation:** To remove restriction of 16 revisions (Once in 1.5 hours) in 24 hours
  - It will enable capturing the rapid fluctuations in solar generation
  - It will be in line with thermal generators
  - Revision should be applicable from 2nd time block (instead of 4th time block) to capture sudden changes in local weather conditions.

Injection of Excess Capacity

- IEGC allows Hydro generating stations (irrespective of ownership) to inject power corresponding to overload capacity upto 10% of LTA without obtaining additional LTA/ MTOA/ STOA. Hydro generating stations pay additional LTA charges and RLDC fees & charges for the overload capacity.

- **Recommendation:** Similar dispensation should be provided to the wind and solar generators and necessary amendment to be incorporated in the IEGC. This will allow the RE generators to generate additional electricity if the climatic conditions allow.

Thank You