Prayas comments on Draft Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2022

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Indian Electricity Grid Code (IEGC or Grid Code) contains the provisions regarding the roles, functions and responsibilities of the concerned statutory bodies, generating companies, licensees and any other person connected with the operation of the power systems within the statutory frameworks envisaged in the Electricity Act and the Rules and Notifications issued by the Central Government.

This draft IEGC is the first consolidated exercise since the 2010 regulation and is based on the 2020 review report by the Expert Group. With increasing share of renewables in Indian grid and technological advancement in various other aspects, it is important to strengthen and periodically update the IEGC.

The Grid Code, apart from the provisions relating to the role of various statutory bodies and organisations and their linkages, contains extensive provisions pertaining to many aspects, namely:

(a) Reliability and adequacy of resources

(b) Technical and design criteria for connectivity to the grid including integration of new elements, trial operation and declaration of commercial operation of generating stations and inter-State transmission systems

(c) Protection setting and performance monitoring of the protection systems including protection audit

(d) Operational requirements and technical capabilities for secure and reliable grid operation including load generation balance, outage planning and system operation

(e) Unit commitment, scheduling and despatch criteria for physical delivery of electricity

(f) Integration of renewables

(g) Ancillary services and reserves

(h) Cyber security

The critical importance of Inter State Transmission System (ISTS) has been growing over the years with greater proportion of generation capacity connections, inter-state and inter-regional power flows, as well as increasing roles in grid security and resource optimisation. Table 1 gives an overview of the changes in the proportion of substation capacity (in MVA) by ownership, across the years 2002 to 2022. It can be seen the proportion of Central transmission capacity has significantly increased in the last two decades - from 16.5% in 2002 to 39.9% in 2022. Since many of the JV/Private transmission companies operate inter-state lines and hence the transformation of capacity of ISTS is nearly 44% in 2022. Looking at

the past trends and future plans in capacity addition (mostly renewable) and accompanying transmission systems, the proportion of ISTS is going to increase in the coming years. A similar trend is seen when circuit kilometre (Ckt-km) proportion is analysed. The proportion of Ckt-km of Central utilities increased from 28% in 2002 to 38% in 2022, whereas that of JV/Private increased from 0% in 2002 to 8% in 2022.

Table 1: Increasing capacity of Central transmission

Owner/ %MVA Year end	2002	2007	2012	2017	2022
Central	16.5	19.9	28.3	37.6	39.9
State	83.5	80.1	71.2	59.1	56.2
JV/Private	0.0	0.0	0.5	3.3	4.0
Total MVA	1,81,943	2,57,639	4,09,551	7,40,765	11,04,450

Source: Compiled by Prayas (Energy Group) from monthly transmission reports of CEA

PEG suggestions on draft Indian Electricity Grid Code (IEGC) Regulations are towards ensuring reliable and effective ISTS operation, while ensuring that interests of all grid users, including state entities and consumers are protected. Our brief comments and suggestions (marked in BOLD) are given in the following sections.

1 Preamble

It is unfortunate that the draft IEGC was shared for public comments on 7th June, 2022, but the Explanatory Memorandum (EM) was published four months later, on 9th October, 2022. The Preamble to the draft IEGC, which gives some background, is very short (3 pages) and two sections in the 2020 IEGC Review report (namely 'Evolution of Grid Code' and 'Background') together are also short at about a page. These do not provide the details on the reasons for this major revision. A comprehensive EM is very important for such an overhaul of a crucial Regulation. On the occasion of major revisions in Regulations, as a good practice, the honourable CERC has been providing detailed EM and in some cases, holding explanatory meetings. But there has been a long delay in publications of the EM in this case, which is unfortunate.

2 Resource Planning Code

The draft IEGC talks about integrated resource planning, expanding its ambit from ISTS planning in its previous version to demand forecasting and generation resource planning. We welcome this vision for holistic approach towards planning, however, state level planning should be in consonance or better than the current processes and could consider a longer time horizon. IEGC should also be in consonance with other rules, regulations and guidelines by central agencies like Ministry of Power (MoP) and Central Electricity Authority (CEA).

2.1 Demand forecasting by distribution licensees (Regulation 5(2))

The proposed grid code stresses on demand forecasting by the distribution licensees and sharing the same with STUs. States should use a forecast methodology and results approved by the respective SERC for submission to all agencies inside and outside the state. Our suggestions are in that direction.

Demand forecasting should also be shared with the state commissions.

Demand forecasting can be done in any of the methods deemed suitable by the distribution licensees, thus providing them enough flexibility. However, it will be advisable to analyse the accuracy of the forecasting on regular basis and improve the forecasting for future years. The relevant processes could be finalised by the respective State Electricity Regulatory Commission (SERC).

The time horizon for the demand forecasting should be increased from 5 years to 10 years and the daily load curve should be on a 15-minute basis.

The guidelines shall be mandatorily developed by Forum of Regulators (FOR), within a time span of 3-6 months from the date of notification of the regulation. These guidelines should include preparation of scenarios based on factors which impact demand of licensee. These include captive generation, open access, energy efficiency measures, DSM measures, and policies like electric cooking, e-mobility, industrial development. Block-wise demand curves should be prepared, not just trend-based estimates for energy and peak demand.

Also, the FOR shall share the best practice in demand forecasting process by distribution licensees across the country on regular basis (3-5 years). The same can be incorporated in the guidelines developed by FOR, hence revising the guidelines as and when needed.

2.2 Generation resource adequacy (Regulation 5(3))

IEGC Regulations should be in consonance with the Guidelines for Resource Adequacy Planning, which is under preparation by the CEA[1] and the draft Electricity Amendment Rules (2022) which also cover resource adequacy.

Assessment of the existing generation resources shall be done with due regard to their capacity contribution to meet the peak demand. In addition to this, the need of adequate ramping, lowering the technical minimum of the generation and provision of ancillary services should also be considered. The time horizon for adequacy planning shall be increased from 5 years to 10 years.

The proposed Regulation 5 (3) mentions about the simulation of generation resource adequacy by NLDC.

[1] Draft Resource Adequacy Guidelines have been released by CEA in September 2022.

The results and inputs of the simulation should be made accessible in the public domain.

The grid code under Regulation 5(3)(f) states that "*Failure of a distribution licensee to meet the generation resource adequacy target approved by the SERC shall render the concerned distribution licensee liable for payment of resource adequacy non-compliance charge as may be specified by the respective SERC.*"

The assessment of generation resource adequacy seems very subjective and will vary from state to state. Hence, the distribution licensees shall be given some time (2-3 years) to understand and implement the adequacy plans in true sense. Hence, we suggest the commission to defer the implementation of penal provision for 2-3 years.

2.3 Transmission resource adequacy assessment (Regulation 5(4))

The assessment process should be in consonance with the existing rules and regulations including the prevalent CEA Manual on transmission planning criteria and MoP rules on Transmission Planning 2021.

The important aspect of co-ordination between CTU and STUs in this exercise is missing from the code. There is a need to align the central and state level transmission planning processes and improve their coordination. This would involve capacity building of transmission planners and institutional strengthening. A national transmission data repository framework should be developed. This would ensure consistency and correctness of data used for system studies by different agencies. There should be standardisation of data and a protocol to share such data among all stakeholders in a transparent manner. More details on these aspects are available in the report, "Transmission Reform Agenda and Action Plan for India", prepared by Idam Infrastructure Advisory Pvt. Ltd., and Prayas (Energy Group) after a consultative process involving senior transmission sector professionals.

We suggest that the proposed grid code should harmonise with existing rules and regulations. Provisions for coordinated planning of the transmission system should be included in the code. The CTU and STUs shall work in co-ordination for optimisation of the use of integrated transmission network.

3 Connection code

Regulation 6(2) suggests that ISTS connection eligibility is based on the CERC connectivity and GNA Regulations 2022. GNA regulation specifies 50 MW as the minimum capacity for eligibility for ISTS connection. This is quite low and can introduce challenges in planning and scheduling for state licensees and may be incentivising generation projects to get connected at much higher voltages than required given this low threshold coupled with the ISTS waiver for RE.

We feel that there is a need of taking up a study to assess the capacity limit for connectivity under GNA regulation and impact of increasing connectivity at ISTS on state

grid operation and associated parties (SLDC, STU, DISCOMs). The study can be used as a basis to review the minimum capacity limit for connectivity to ISTS, as specified the IEGC/GNA.

4 Commissioning and Commercial Operation Code

Regulation 20 indicates the operational parameters to be provided as a preparation to commissioning. These include time required for cold/warm/hot start, ramping up/down capability and minimum turn-down level (previously called technical minimum). As per Regulation 18, these have to tested before declaration of Date of Commercial Operation (COD).

A clarification requested is this: There is a need to periodically re-check these important parameters. Is such periodic re-check included in some other code like the Monitoring & Compliance code?

5 Scheduling and dispatch code

Under Regulation 44(1) and 46, the grid code has specified that RLDC should undertake Security Constrained Economic Dispatch (SCED) and Security Constrained Unit Commitment (SCUC). Regulation 46 indicates that SCUC is for optimisation of reserves and Regulation 47 (2a) that SCED is to optimise generation despatch (based on variable cost) after gate closure in the real time market. Both must ensure that generation and transmission constraints are satisfied. Some details of these functions are given in the Explanatory Memorandum. Generators which contribute to reserve need to be compensated. Since the primary purpose of Grid code is secure and reliable operation of the grid, the introduction of cost optimisation needs some more explanation and plan for implementation.

Considering that SCED and SCUC are relatively new concepts for Indian grid operators and generators, we suggest that SCUC and SCED need not be made mandatory at this stage in the IEGC. The process of rolling these out can be decided based on the results from the pilot implementations of the Market Based Economic Dispatch.

6 Monitoring and Compliance Code

We appreciate the inclusion of this code, since the monitoring of compliance of the Regulation is very important aspect to ensure that the stated objectives are met. Self-audit and 3rd party audits are welcome provisions. Submitting of self-audit reports to the appropriate commission is also welcome. However, the regulation falls short of making them accessible in public domain and suggesting Regulatory Commissions to prepare periodic compliance reports - say once a year.

We suggest that the self-audit reports should be published on the website of the CERC and SERCs within 30 days of the report being submitted to the respective commission. Commissions should also prepare annual compliance reports and make them available on their websites. Regulation 53 (2d) could be changed accordingly.

Regulation 53 (3) states that

"*The Commission may order independent third-party compliance audit for any user, CTU, NLDC, RLDC and RPC as deemed necessary based on the facts brought to the knowledge of the Commission.*"

Considering the importance of the grid code for grid security and operation, we suggest making third party audits mandatory and making the reports available on the public domain.

I**ndependent 3rd party audit shall be made mandatory, and first audit should be done within three years of the date of notification of the regulations. The subsequent audits shall be carried out once in every three years. Commission should also prepare annual compliance reports and make them available on its website. Regulation 53 (3) could be changed accordingly.**

These steps will help to identify good practices and focus attention in areas which need improvement (e.g. State Electricity Grid Code, Merit order Dispatch, state planning process, etc.)

Some of the existing provisions are not fully implemented or incorporated by entities, which raises question over the whole exercise of framing grid code with no timeline for compliance and penalty provision for non-compliance. Despite the laudable audit and reporting aspect for monitoring and compliance of the code, the present regulation also falls short of incorporating timelines for compliance and penalty in case of non-compliance. We are of the view that CERC or appropriate agency should be asked to decide the timeline of compliance of various aspects related to grid code and all other stakeholders should adhere to that timeline. The regulation should also consider inclusion of penalty provision which should get stringent with every default, so that the responsible entities adhere to them on time.

7 Increasing role of RE generators in grid security or maintenance

The grid code stresses on frequency stability and hence mentions inertia, frequency response obligation and Frequency Response Characteristics of generators.

In this regard, the code defines "Grid-forming capability" which means the capability of a Power Generating Module to generate its own voltage waveform without relying on the grid voltage to synchronize and run as a black-start resource.

This definition focuses on solar and wind generators, but there is no mandatory provision (in terms of capacity) for such capability for existing or future projects. This aspect needs to be clarified.

The solar, wind and hybrid generators (commissioned after the date as specified in the CEA Technical Standards for Connectivity) will have to provide primary response up to 10% of the maximum Alternating Current active power capacity in case of frequency deviations in excess of 0.3 Hz (Regulation 30(10)(g)).

We appreciate the inclusion of such generators for primary response, but the allowance of deviation up to 0.3 Hz when the grid frequency is to be maintained within a band of 49.95 to 50.05 Hz seems like a typing error.

This is further strengthened as the Regulation 30(10)(i) states that

"The normal governor action shall not be suppressed in any manner through load limiter, Automatic Turbine Run-up System (ATRS), turbine supervisory control or coordinated control system and no time delays shall be deliberately introduced. In case of renewable energy generating unit, reactive power limiter or power factor controller or voltage limiter shall not suppress the primary frequency response within its capability ***. The inherent dead band of a generating unit/frequency controller shall not exceed +/- 0.03 Hz****."*

Annexure-4 of the proposed regulation regarding Reactive Power Compensation states that:

"(3) All the Inverter Based Resources (IBRs) covering wind, solar and energy storage shall ensure that they have the necessary capability, as per CEA Connectivity Standards, all the time including non-operating hours and night hours for solar. The active power consumed by these devices for purpose of providing reactive power support, when operating under synchronous condenser/night-mode, shall not be charged under deviations and shall be treated as transmission losses in the ISTS."

While we appreciate the reactive power compensation capability, the concession in form of treating of active power as losses and resulting deviations need to be re-visited.

The ramp rates have to be specified by solar and wind generators, which is a right step. **However, we suggest that the grid code should specify the minimum ramp rate for such generators, just like any other generator category**.

The increasing share of solar and wind capacity in Indian grid calls for increasing responsibility of RE generators (solar and wind) in grid operation. The grid code has taken lead towards this, however, a regular re-visit to the grid code while considering the increasing role of RE generators will be appreciated.

8 Other relevant points

8.1 Consolidation of all documents

Grid operation and security involves many of stakeholders at national, regional and state levels. Each one of them has some responsibility and role and there are a number of documents in form of guidelines, rules, regulations, manuals which have to be referred to by such stakeholder. Also, all such regulatory documents should be in consonance with each other and easily available to all stakeholders.

We suggest that the commission should develop a document repository where all the documents relevant to grid operation/ security shall be consolidated and this should be made accessible to public at the website of CERC.

8.2 Separation of transmission licensee and grid operator

Recently, the POSOCO and CTU have been separated for better grid management, which also avoids conflict of interest. A similar separation of SLDC and STU is needed in states. There is also a need to have State Electricity Grid Codes, which are periodically updated.

Hence, we suggest that the regulation should give a timeline for enforcement of separation of SLDC and STU, as well the preparation and periodic updating of State Electricity Grid Codes.

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