

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI

Petition No. 02 /SM/2019 (Suo-Motu)

Coram:

Shri P.K. Pujari, Chairperson

Dr. M. K. Iyer, Member

Shri I. S. Jha, Member

Date of Order: 31st of January, 2019

In the matter of

Pilot on Security Constrained Economic Dispatch (SCED) of Inter-State
Generating Stations (ISGS) Pan India

ORDER

The Electricity Act, 2003 (hereinafter also referred to as “the Act”) entrusts on the Central Commission the responsibilities, inter-alia, of regulating the inter-State transmission of electricity, specifying grid code and also enforcing standards with respect to quality, continuity and reliability of service by the licensees. Laying down of framework for effective and secure grid operation causing economy of operation is thus one of the most important mandates of the Commission. The Central Commission has taken many initiatives towards this end by evolving regulations in line with dynamic nature of the grid.



2. The total all India installed power generation capacity is around 349 GW which includes 223 GW (64 %) of Thermal Power Capacity and around 74GW of renewable energy capacity as on 31st December, 2018. Out of 223 GW of thermal Capacity, around 72 GW lies in the State Sector and around 63 GW constitutes the Central Sector. Most of the generating stations are tied up in long-term power purchase agreements (87 %) with the State Utilities and the remaining generating stations through medium-term & short-term contracts. In accordance with Indian Electricity Grid Code (IEGC) provisions, the State Utilities (Distribution Companies/beneficiaries) schedule electricity from Generating Stations contracted within the State and also from inter-State generating stations (as per the allocations/entitlements) to balance their demand portfolio. Accordingly, multiple entities have shares (within and across regions) in the Inter-State Generating Stations (ISGSs) and each State schedules its share of electricity from ISGSs as per its own requirement. Distribution Companies (Discoms) meet majority of their daily power need by requisitioning/scheduling the generation from their portfolio of long-term, medium-term and short-term contracts.

3. A decentralized, multilateral and coordinated scheduling model has been adopted in the country since the mid-1990s. With the synchronization and formation of an All India electricity grid, this complex portfolio has led to a large matrix



comprising 29 States and 7 Union Territories as beneficiaries from around 150 regional Inter-State Generating Stations (ISGSs). This has led to a situation in which some of the ISGSs have as many as 15 beneficiaries spread across India and some of the States have a share from more than 40 ISGSs in their portfolio.

4. While placing requisition / schedule on a day-ahead horizon, each discom generally follows merit order dispatch of generation from its own portfolio of contracts. Thus, a local level of optimization is already taking place. Several mechanisms are available to harness the most economical resources such as bilateral contracts between the States, Scheduling of Un-requisitioned Surplus (URS) in the Inter State Generating Stations (ISGSs) etc. However, it has been observed that some surpluses still remain unscheduled in cheaper power stations whereas relatively costlier stations are despatched on many days. This is because of the fact that the needy discoms cannot requisition/schedule power from the generating stations with which they do not have contracts. Thus, there exists scope for optimization by despatching cheaper stations which are fragmented on a pan India basis. This aspect has become all the more evident post the implementation of Reserve Regulation Ancillary Services (RRAS) in April, 2016 which has led to a transparent system of merit order stacking of URS at the inter-State level bringing out the scope for optimization of generation schedules at the inter-State level.

5. With increase in renewable generation in the system, the discom would need to take into account generation from intermittent energy sources, to ensure flexibility in the system while catering to ‘net load (demand minus the generation from embedded RE resources)’ and scheduling generators from the non- renewable energy sources. Hence, the need for optimization becomes all the more relevant.

6. As per Section 28(1) of the Act, the Regional Load Despatch Centre shall be the apex body to ensure integrated operation of the power system in the concerned region. Section 28(2) of the Act empowers the Commission to specify principles, guidelines and methodologies for optimum scheduling and despatch of electricity for RLDCs through Grid Code. The relevant extract is as follows:

“Section 28 (2) The Regional Load Despatch Centre shall comply with such principles, guidelines and methodologies in respect of wheeling and optimum scheduling and despatch of electricity as the Central Commission may specify in the Grid Code.”

7. As per Section 28 (3)(a) of the Act, the Regional Load Despatch Centres have the responsibility for ‘optimum scheduling and despatch of electricity within the region’. Further, National Load Despatch Centre has been entrusted with the responsibility of optimum scheduling and despatch of electricity among the RLDCs as per Section 26 of the Act which is extracted as under:

“26. National Load Despatch Centre –

(1) The Central Government may establish a Centre at the national level, to be known as the National Load Despatch Centre for optimum scheduling and despatch of electricity among the Regional Load Despatch Centres. (emphasis added)”

8. The Commission is, therefore, exploring the possibility of creating a regulatory framework for further optimising scheduling and despatch of generating stations, particularly ISGSs, with the overall objective of minimising the production cost of the system without compromising grid security. Efforts are already underway at the policy and regulatory levels to harness the cheaper generation resources. In this regard, the Commission has noted the following schemes/proposals as noted in the succeeding paras for optimisation of production cost and eventually the system cost.

9. Ministry of Power (MoP), Government of India, notified the scheme on ‘Flexibility in Generation and scheduling of thermal power stations to reduce the cost of power to the consumer’ on 30th August, 2018 (MoP scheme of Flexibility). The objective of the scheme is to reduce the overall cost of power for the country by utilizing any un-despatched surplus in existing cheaper generating stations by way of flexibility in scheduling of generation. The scheme advocates flexibility to a generating company to supply power from any of its generating stations against



schedule received for its stations. As per the scheme, the cheaper generating stations could be dispatched up to its maximum capacity before scheduling the costlier stations till the power requisitioned by all its beneficiaries is met.

(i) The Scheme proposes Merit Order operation based on the Generation Bucket Filling (GBF) schedule to meet the entire schedule of all beneficiaries. The Scheme also advocates suitable provision of Gate Closure to take into account revision of schedule by beneficiaries from ISGS power stations.

(ii) The Scheme also proposes sharing of gain between the beneficiaries and the generating company in the ratio of 50: 50 on monthly basis with quarterly reconciliation. The share in the surplus, if any, is to be passed on to the beneficiaries during the month in proportion to the total drawl by the beneficiaries from the generating company.

10. POSOCO had on 3rd August 2018 submitted a report on ‘Security Constrained Economic Despatch pan India’ to the Commission. Subsequently, POSOCO through letter dated 12th September, 2018, submitted a consultation paper on “Security Constrained Economic Dispatch (SCED) of Inter-State Generating Stations pan India” to the Commission for consideration. The Consultation paper prepared by the POSOCO seeks to enhance the scope of optimisation of ISGS schedules at pan India level leading to saving in production cost. The paper explores the scope for an optimal



solution to minimize the total production cost from all thermal Inter-State Generating Stations (ISGS) whose tariff is determined or adopted by CERC while honouring the technical constraints of the power plants and the grid. The brief capitulation of scope of the consultation paper is as under:

(a) The scope of the consultation paper covers optimisation after the unit commitment has taken place at a day-ahead level. The SCED based optimisation model advocates the introduction of Gate Closure to facilitate the proposed optimisation process, as the current framework of flexibility to revise the schedule by large number of participants on a continuous basis in the current framework by giving a notice of four (4) time-blocks poses problem in real-time assessment of the available 'hot' reserves available in the system.

(b) Once the gate closure for a particular time block occurs, the system operator prepares for the pre-determined delivery period. The optimisation model dispatches the cheapest available generator to its full declared capacity followed by the next higher variable cost generator (honouring the technical minimum and Declared Capability constraints besides ramp rates, network congestion etc.) and so on till the entire requisition is met. Optimization would result in incremental/decremental changes in the existing schedules which need to be settled. The variable charges declared by the generators for the purpose of ancillary services shall be considered in



the optimization process.

(c) POSOCO has suggested implementation of the National Pool Account to take care of changes in injection schedule for each region due to optimisation process. There would be a need for pay-in/pay-out from the National Pool Account for incremental changes in schedules (Up/Down). As per the present mechanism, the generators receive their variable charges based on the schedules issued by the concerned RLDC. Optimization would result in incremental/decremental changes in the existing schedules of generators and these would need to be settled through the National Pool Account mentioned above.

11. The Commission vide communication dated 27th September 2018 directed POSOCO to upload the consultation paper on its website to seek comments from the stakeholders. Accordingly, POSOCO uploaded the SCED consultation paper on its website on 28th September 2018 seeking comments from the stakeholders till 28th October 2018 and subsequently extended the date to 20th November 2018 on request by some of the stakeholders. Ten stakeholders have submitted their comments on the consultation paper which POSOCO later examined and submitted to the Commission vide letter 28th December 2018 along with its observations/clarifications. The POSOCO also requested the Commission to implement the SCED proposal on trial basis for six months.



12. In addition to the above proposals to optimise the overall scheduled generation, the staff of the Commission also published discussion paper on “Market based Economic Dispatch of Electricity: Redesigning the Day-Ahead Market in India”, which provides for Market based optimisation of the scheduled power on a day-ahead basis. The market based optimisation would ensure reduction of marginal system cost, reduced overall cost of power procurement at national level, better flexibility in the system to integrate intermittent resources in the system and better assessment of ancillary services. Any deviation or correction over the day-ahead schedule by the generators or the beneficiaries may then be corrected at the real-time energy market. The Commission has also noted the discussion paper by the staff of the Commission on “Real Time Energy Market” and “Re-designing Ancillary Services Mechanism in India”. While the Real-Time Energy Market is expected to help the stakeholders manage their energy portfolio closer to Real Time, the proposed framework of co-optimization of energy and ancillary services is intended for optimal utilisation of the generation resources at least cost.

Analysis & Decision

13. The Commission observes that the common objective of all the proposals discussed above is to optimise the scheduling and dispatch of the generation resources and reduce the overall cost of production of electricity.

14. The MoP scheme of flexibility seeks to optimise company wise generation resources, whereas the SCED mechanism as proposed by POSOCO seeks to optimise the pan India Inter-State Generating Stations that are regional entities and whose tariff is determined or adopted by the Commission for their full capacity. The Market based Economic Dispatch of Electricity (MBED)/Real Time Market (RTM) model as proposed by staff of CERC is aimed at optimising all the generating stations pan India whether regulated or not regulated by the Commission.

15. The MoP scheme of Flexibility and the SCED model proposed by POSOCO seeks to optimise the generating resources after the beneficiaries submit their last revision i.e. four-time blocks before the actual dispatch of power.

16. The MoP flexibility scheme proposes to share the gains out of the optimisation exercise with the contracted beneficiary in the ratio of 50:50. The SCED model proposes to utilize the gains out of the optimisation exercise in the Pool.

17. The Commission has also noted the comments received in response to POSOCO consultation paper on SCED model. The major issues raised in the comments pertain to comparison with the MoP's Flexibility scheme and the need for sharing of benefits accruing from the optimisation through SCED model.

18. Similarly, attention has been drawn towards restrictive provisions in PPA of



IPP's (especially those contracted under section 63 of the Electricity Act, 2003) on sale of surplus power beyond that requisitioned by the beneficiary.

19. The POSOCO in its response to the comments has observed that the SCED proposed by it is in line with the spirit of the scheme issued by MoP except that the exercise in its consultation paper is done across all generators rather than company-wise; and that an optimization method is provided for dealing with different constraints as a simple merit order stacking based approach for each time block would be difficult to implement. In regard to the sharing of benefits or provision for mark-up, POSOCO has commented that the changes in the schedule through SCED would be small and proposed a mark-up of 10 Paise/kWh as any mark-up beyond this would wipe out all the savings accrued through optimisation. POSOCO in its clarification regarding the restrictive provisions in PPAs of IPPs on sale of purchase beyond the requisition stated that the participants in SCED are proposed to be the same as those in RRAS. POSOCO has also submitted para-wise comments on all the suggestions received in response to its consultation paper. The Commission directs POSOCO to publish the comments received and its views thereon in its website. The Commission agrees with the observations of POSOCO that the SCED model is in line with the spirit of the MoP flexibility model, except that it is wider in scope (covering all generating stations whose tariff is determined or adopted by the Commission) and that

it does not provide for direct sharing of benefits between the generators and the distribution companies.

20. The Commission is of the view that the scope for optimisation and therefore the possibility of minimising the system cost should be the prime driver for regulatory intervention. The spirit behind all the proposals discussed above being similar in nature, the Commission is of the view that steps should be taken to implement the scheme without major structural changes in the existing system/framework. The implementation of SCED is a desired step in the Indian grid operation towards optimization methodologies. The Commission believes that the SCED Pilot would help gain experience in the scope of optimisation at the ISGS level. It would set the ground for optimisation on a day-ahead horizon and real-time energy market by expanding the ambit of the above mentioned optimisation in due course. SCED implementation is an involved procedure requiring developing software, creating interfaces and establishing various protocols, information dissemination and streamlining settlement system etc. The Commission recognizes the fact that after rolling out the SCED mechanism on pilot basis, based on the stakeholders' feedback, further decision can be made in due course. Accordingly, the Commission directs POSOCO for implementation of Security Constrained Economic Dispatch of Electricity for the Inter-State Generating Stations on pilot basis as follows.

Pilot on Security Constrained Economic Dispatch for ISGS pan India

- a. POSOCO shall implement SCED optimisation model for all the thermal Inter State Generating Stations (ISGS) that are regional entities and whose tariff is determined or adopted by the Commission for their full capacity without violating grid security and honouring the existing scheduling practices prescribed in the Indian Electricity Grid Code on trial basis for six months.
- b. POSOCO is directed to frame the Detailed Procedure within one month from the date of this order to operationalize the scheme and submit to the Commission for information. The Detailed Procedure shall contain the guidelines regarding operational aspects of SCED including scheduling, dispatch, accounting, settlement and any residual matter. The same may be informed to all stakeholders.
- c. The variable charges declared by the generators for the purpose of Reserve Regulation Ancillary Services (RRAS) shall be considered in the optimisation process.
- d. Schedules of the States/beneficiaries shall not be changed and the beneficiaries shall continue to pay the charges for the scheduled energy directly to the generator as per the existing practices.
- e. NLDC shall open a separate bank account called 'National Pool Account (SCED)'. All payments to/from the generators on account of SCED schedules shall flow to and from the said National Pool Account.



- f. For any increment in the injection schedule of a generator due to optimization, the generator shall be paid from the National Pool Account (SCED) for the incremental generation at the rate of its variable charge.
- g. For any decrement in the schedule of a generator due to optimization, the generator shall pay to the aforesaid National Pool Account (SCED) for the decremental generation at the rate of its variable charge after discounting compensation due to part load operation as certified by RPC as per the provisions of IEGC.
- h. The incremental changes in schedules on account of optimization shall not be considered for incentive computation for the generating stations. The deviation in respect of such generators shall be settled with reference to their revised schedule. The increment or decrement of generation under SCED shall not form part of RRAS.
- i. The RPCs shall issue weekly SCED accounts along with the DSM, RRAS, FRAS and AGC accounts based on the data provided to them by RLDCs. NLDC would indicate a consolidated all India statement, week wise and month-wise indicating the schedules on account of SCED.
- j. RPCs shall issue the regional accounts including the SCED schedules and NLDC shall issue a consolidated "National SCED Settlement Statement" comprising payment and receipts to/from all generators participating in the SCED.

- k. The sharing of benefits/savings has been accepted in principle by the Commission. However, methodology of sharing shall be decided after the results of the pilot and the extent of savings are available.
- l. In view of the above, the savings obtained through SCED after settlement of all accounts of SCED shall be recorded and maintained in the ‘National Pool Account (SCED)’ by the NLDC. POSOCO shall also maintain the relevant data during the operation of the pilot including but not limited to generating station-wise installed capacity, declared capacity, schedule (including all revisions), URS, generator-wise Variable cost, optimisation up/down, part-load compensation (if payable), discom/constituent wise share in respective generating stations, requisition (Day-ahead and last revision) from the generating stations.
- m. POSOCO shall procure the hardware and develop the necessary software along with optimization tools for the implementation of SCED framework.
- n. CTU is directed to ensure reliable communication between the respective generating stations and Load Despatch Centres.
- o. Stakeholder awareness programs may be conducted by RPCs and POSOCO for smooth implementation of SCED pan-India.
- p. The above pilot for SCED shall be implemented by POSOCO w.e.f. 1.4.2019.
- q. POSOCO is also directed to apprise the Commission regarding the experience gained in the form of a feedback report covering all the aspects within a month of

completion of the six months of pilot operation.

21. The petition is disposed of in terms of the above directions.

Sd/-

[I. S. Jha]
MEMBER

Sd/-

[M. K. Iyer]
MEMBER

Sd/-

[P.K Pujari]
CHAIRPERSON

