

**CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI**

Petition No. 08/SM/2019 (Suo-Motu)

Coram:

**Shri P.K. Pujari, Chairperson
Dr. M. K. Iyer, Member
Shri I.S. Jha, Member**

Date of Order: 11th September, 2019

In the matter of:

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

ORDER

The Commission vide Suo-Motu Order dated 31st January, 2019 in Petition No. 02/SM/2019, directed Power System Operation Corporation (POSOCO) to implement a Pilot on Security Constrained Economic Dispatch (SCED) w.e.f. 01.04.2019, for Inter-State Generating Stations pan India. The prime driver behind the pilot was to explore the scope of optimisation and therefore the possibility of minimising the system cost without major structural changes in the existing system.



2. The salient features of the SCED framework as approved by the Commission were as under:-

- a. SCED optimisation model to be implemented by POSOCO for all 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 Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 (hereinafter referred to as IEGC or Grid Code) on trial basis for six months.
- b. The variable charges declared by the generators for the purpose of Reserve Regulation Ancillary Services (RRAS) to be considered in the optimisation process.
- c. Schedules of the States/beneficiaries not to be changed and the beneficiaries to continue to pay the charges for the scheduled energy directly to the generator as per the existing practices.
- d. NLDC to open a separate bank account called 'National Pool Account (SCED)'. All payments to/from the generators on account of SCED schedules to flow to and from the said National Pool Account.
- e. For any increment in the injection schedule of a generator due to



optimization, the generator to be paid from the National Pool Account (SCED) for the incremental generation at the rate of its variable charge.

f. For any decrement in the schedule of a generator due to optimization, the generator to 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.

g. The incremental changes in schedules on account of optimization not to be considered for incentive computation for the generating stations. The deviation in respect of such generators to be settled with reference to their revised schedule. The increment or decrement of generation under SCED not to form part of RRAS.

h. The RPCs to issue weekly SCED accounts along with the DSM, RRAS, FRAS and AGC accounts based on the data provided to them by RLDCs.

i. RPCs to issue the regional accounts including the SCED schedules and NLDC to issue a consolidated "National SCED Settlement Statement" comprising payment and receipts to/from all generators participating in the SCED.

j. The sharing of benefits/savings accepted in principle by the Commission. However, methodology of sharing to be decided after the



results of the pilot and the extent of savings are available.

k. In view of the above, the savings obtained through SCED after settlement of all accounts of SCED is to be recorded and maintained in the 'National Pool Account (SCED)' by the NLDC. POSOCO to 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.

l. The above pilot for SCED to be implemented by POSOCO for a period of six months w.e.f. 1.4.2019.

3. In compliance of the said directives, POSOCO has implemented w.e.f 1.4.2019 the pilot for all thermal Inter State Generating Stations (ISGS) that are regional entities and whose tariff is determined or adopted by the Central Commission for their full capacity honouring the existing scheduling practices prescribed in the Grid Code.

4. POSOCO prepared the procedure for pilot on SCED for Inter State Generating Stations (ISGS) pan India and also fine-tuned it further later based on



consultation with concerned stakeholders.

5. The Commission appreciates the initiative taken and efforts made by POSOCO in addressing various complexities in scheduling changes, synchronisation of data, challenges in communication, etc. while developing the software application in house.

6. The Commission has been informed that in order to operationalize SCED, a separate bank account in the name of “National Pool Account (SCED)” has been opened and operated by NLDC. NLDC is managing this account as a custodian of National Pool Account (SCED) under the directions of the Commission for settlement of SCED transactions . The Commission has also been appraised that National SCED weekly account is being issued by concerned Regional Power Committees (RPCs) regularly as per the directives in Order No. 02/SM/2019 dated 31/01/2019.

7. As per the Order of the Commission, for any increment in the injection schedule due to optimization, the SCED generators are to be paid from the National Pool Account (SCED) for the incremental generation at the rate of its variable charge. Similarly, for any decrement in the schedule due to optimization, the SCED generators are to be paid to the aforesaid National Pool



Account (SCED) for the decremental generation at the rate of its variable charge after adjusting compensation due to part load operation as certified by RPC.

Operational Experience:

8. The Commission sought feedback report from the POSOCO, in order to assess the operational experience of SCED pilot and to decide on the methodology to share the residual benefits in the National Pool Account accrued on account of optimisation process through pilot on SCED. In its response, POSOCO submitted an interim feedback report on 19th August, 2019, highlighting benefits, and optimisation results for the period between 01st April, 2019 - 28th July, 2019 on SCED Pilot.

9. The interim report highlights that primarily pit head generation with lower variable cost is being increased in Western Region and Eastern Region whereas generation with higher variable cost is being decreased in Southern Region and Northern Region. This has led to optimisation of the generation across the country thereby reducing the production cost.

10. As informed in the interim report submitted by the POSOCO, 49 coal and lignite based thermal ISGS generators constituting 132 generating units and having total installed capacity of 55,940 MW are participating in the SCED pilot



with daily average perturbation of 1276 MW. The average system Marginal price (SMP) during this period was found to be 298.27 Paisa/Unit. The charges to be paid to SCED UP generators during this period amount to Rs 759 Crore against the charges to be refunded by SCED DOWN generators amounting to Rs 1149 Crore. Considering the heat rate compensation Rs. 58.28 Cr. payable as of now, only for southern region generators, around Rs. 330 Crore reduction in the system cost has been observed subject to the heat rate compensations applicable for other regional generators.

11. The report also highlights that implementation of SCED pilot has resulted in consolidation of the available spinning reserve in the higher variable cost generators. Further, availability of reserve is getting constrained by the ramping capability of generation units carrying reserve resulting in reduction in cumulative reserve quantum after the SCED optimisation process.

Analysis & Decision:

12. The Commission observes that the SCED Pilot has helped gain experience in the scope of optimisation at the ISGS level. It is seen from the feedback report that the SCED implementation involved software development, creating interfaces, improving the inter-control centre communication systems, information dissemination in real time and streamlining settlement system.



13. The reduction in fuel cost due to SCED is largely attributed to the system level visibility of the available cheaper generation at the National level. Similarly, utilization of available transmission capability towards North Region, North Eastern Region and Southern Region since the implementation of SCED pilot showcases the utilisation of available cheaper generation within and across the regions to their full capacity.

14. The Commission finds that the implementation of SCED pilot for the four months mentioned in the report has shown positive results and helped in understanding the operational challenges and possibility of optimisation of generation dispatch at inter-regional level.

15. In the previous order dated 31st January, 2019, the Commission accepted in principle the proposal of sharing of benefits / savings on implementation of SCED, and also held that the methodology of sharing the net benefits (after adjusting the heat rate compensation) accruing from the optimisation through SCED shall be decided after the results of the pilot and the extent of likely savings. After going through the interim report, the Commission sets out the methodology of sharing the savings / benefits accrued from the SCED for the duration of the pilot project.



16. The Commission notes that the Ministry of Power (MoP) in the scheme on 'Flexibility in Generation and Scheduling of Thermal Power Stations to reduce the cost of power to the consumer' envisages the benefit sharing of the surplus realised with the beneficiaries in the ratio of 50 (Beneficiaries): 50 (Generating Company). Further, it provided that the benefits to the beneficiaries shall share in proportion to the total drawal by the beneficiaries from the generating company.

17. The Commission has also analysed the surplus accrued in the pool and the contribution of the participants in the optimisation process since the implementation of SCED pilot as submitted in the interim feedback report. On the basis of the above, the Commission decides to share the net benefits accrued in the pool after adjusting compensation for part load operation of the generators in the ratio of 50:50 between the generators participating in SCED and the concerned beneficiaries / Discoms, on a monthly basis. The benefits (50% of the net benefit accrued in the pool) corresponding to the beneficiaries/Discoms would be shared in proportion to their final schedule from the generating stations covered under SCED pilot (viz. 55,940 MW at present as reported by POSOCO) on a monthly basis as per the Regional Energy Account (REA). It may be ensured that all accounts including heat rate compensation account are issued in



a timely manner so as to facilitate smooth disbursement and settlement.

18. On analysis of the data for the two months April & May, 2019, it is observed that the ratio of number of generators receiving SCED UP and SCED DOWN signals is in the proportion of 60:40. Accordingly, the Commission decides to share the generators benefit (i.e. 50% of the net savings / benefit accrued in the pool) between SCED UP and SCED DOWN generators in the ratio of 60:40 respectively for each time block. Further, share for each generator would be calculated in proportion to their SCED schedule for the corresponding time block to take into account their contribution in benefits during SCED pilot. In other words, 60% of the generator's benefit in a time block shall be shared among all the participating generators receiving SCED up signals in proportion to their SCED schedule. Similarly, 40% of the generator's benefit shall be shared among all the participating generators receiving SCED down signals in proportion to their SCED schedule. Benefits received by the SCED generators would then be summed every month to estimate the cumulative benefit for each generator in a month. RPCs while preparing REA shall provide and settle monthly benefit for each generator participating in SCED pilot. Further, POSOCO shall modify the SCED procedure accordingly and ensure the settlement of accounts as per the methodology with the help of RPCs and RLDCs. To illustrate, consider a hypothetical situation for a 15 minute time



block, where the net benefit accrued in the National pool after adjusting compensation for part load operation is Rs. 5 lakhs. This will imply that Rs. 2.5 lakhs i.e. 50% of the net benefit will accrue to the SCED generators. This benefit will be assigned between the SCED Up and the SCED Down generators in the ratio of 60:40, i.e. Rs. 1.5 lakh will be assigned to SCED Up generators and Rs. 1 lakh to SCED Down generators. Assuming further that in that particular time-block, three Generators (Gen-1, Gen-3 and Gen- 3) are contributing to SCED UP and two generators (Gen-4 and Gen-5) are contributing to SCED Down say for 100 MW, then benefits will be shared among the generators for the specified time block as shown in the table below:

SCED Up Generators		SCED Schedule	Generator's Contribution	Generator's Benefit
		(MW)	(x_i / X) in (%)	Rs. Lakh
Gen-1	x_1	50	50	$1.5 \times 50\% = 0.75$
Gen-2	x_2	20	20	$1.5 \times 20\% = 0.30$
Gen-3	x_3	30	30	$1.5 \times 30\% = 0.45$
SCED UP Total	$X = \sum x_i$	100	100	1.5
SCED Down Generators		SCED Schedule	Generator's Contribution	Generator's Benefit
		(MW)	(y_i / Y) in (%)	Rs. Crore
Gen-4	y_1	40	40	$1.0 \times 40\% = 0.40$
Gen-5	y_2	60	60	$1.0 \times 60\% = 0.60$
SCED DOWN Total	$Y = \sum y_i$	100	100	1.0



Accordingly, benefits for each time block will be summed monthly for each generator participating in the SCED pilot.

19. The scope of optimisation and therefore the possibility of minimising system cost steers the need for appropriate regulatory framework in the context. It requires detailed analysis of the operational parameters of the generating stations participating in SCED along with the challenges faced by POSOCO to operationalize the SCED. It also requires consultation with stakeholders directly or indirectly impacted by the implementation of SCED before framing any regulations.

20. POSOCO highlighted in its feedback report that the SCED pilot has been running during summer/monsoon seasons of April to September 2019 and there is a need for gaining the experience during the winter season as well. The Commission recognizes the time required for framing the relevant regulatory amendments / enactments and the need for gaining experience across all the seasons in a year. Accordingly, the Commission has decided to extend the SCED pilot for the period upto 31st March, 2020. However, this shall apply in respect of the generating stations that are willing to participate in the SCED pilot, for the extended period from 1st October, 2019 to 31st March, 2020.



Summary of Decisions:

21. Accordingly, POSOCO is directed to implement the SCED pilot for the thermal Inter State Generating Stations (ISGS) that are willing to participate in the SCED, for the period from 1st October, 2019 to 31st March, 2020.

22. The net savings / benefits after adjusting the compensation for part load operation to the generators shall be shared among the beneficiaries and the participating generators in the manner as specified in the preceding paras of this order, for the entire duration of the pilot from 1st April, 2019 to 31st March, 2020.

23. POSOCO shall accordingly modify the procedure to suitably incorporate the above directions.

24. POSOCO is also directed to apprise the Commission periodically regarding the experience gained in the form of a detailed feedback report covering all the aspects.

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

Sd/-

**[I. S. Jha]
MEMBER**

Sd/-

**[Dr. M. K. Iyer]
MEMBER**

Sd/-

**[P.K Pujari]
CHAIRPERSON**

