Comments on CERC Draft regulation RA-14026(11)/3/2019-cerc dated 29th May 201 for SRAS and TRAS.

8th June 2021.

Secondary reserves AS understood as:

1. After a disturbance in a particular region/state primary reserves' (this may include storage as they are as fast as primary reserves) in all the regions/states are consumed to stabilise grid frequency. Secondary reserves are systematically dispatched to release all primary reserves.
2. Control standby generation in the region of disturbance through Area Control Error such that interstate tie line flows are not pushed to congestion limit and local generation
3. On routine basis, in systematic manner generation is dispatched keeping intrastate line uncongested and to keep frequency in 0.02 hz band.

2.0 OBJECTIVE:

With this the term used in this clause *safety and security* may be elaborated in quantitative terms in line with grid code so that this document is complete by itself and self explanatory.

3. Definitions and Interpretations:

1c

In addition to PRAS, SRAS, and TRAS document also mentions *Load following*. There is no further mention of this term in whole document. This may be differentiated from SRAS/TRAS.

1e. Capacity procured by nodal agency under *TRAS*, may read as *Capacity procured by pool account through NLDC*, for clarity

1j. *Demand response:* It requires to be defined in terms of MW/min for different regions and should be part of regulation. Provisions of failure to meet demand response may also be part of draft. NLDC is privy to Load-frequency characteristics (automated response of loads due to change in freq) different regions. This information should be part of this document as Primary/secondary responses.

1p. *Load generation balance in control area.* :

What is control area? It could be region, It could be state, it could be cluster of cities, it could be SRAS provider generating station/storage/demand response? It may be defined preferably in geographic terms, either as part of document or separately.

1r. *Nodal Agency* means NLDC. Then name may be just NLDC. Why to jargonise.

1s. *Sudden change in frequency*, Deviation in terms of Hz/sec +/- may be defined upfront as a part of this document. It is rather loosely indicated.

1u. *SRAS-up SRAS-Down* Objective of SRAS makes it an imperative service that is needed to

- Bring back deviated frequency to 50 Hz.
- To relieve transmission congestion,
- To restore critical Primary Reserve at the earliest to meet next contingency.
- To save the grid.

On day to day basis only load following service needs SRAS PROVIDER controlled through AGC by NLDC.
To summon PRAS followed by SRAS, some other grid event is responsible, for example tripping of some heavily loaded line due to mal operation of protections or human error, PRAS and SRAS-down would be activated by same generating station(s), to stabilize the grid. Measuring such rescue operation in terms of fuel consumption is akin to giving less ration(paying back variable charges) to a person (SRAS generating station) who has given his share to the other (SRAS-down) during a famine situation (grid event). Further, invariably CPF for "SRAS-UP" will go in favor of hydro and battery storage, even after normalisation due to faster response as compared to Thermal. They will be paid energy charges/compensation and incentive. SRAS- Down" will favour thermal generating stations due to comparatively slow response and higher variable charges. Variable charges will have to paid by thermal stations to pool account. This is a penalty to bring back freq to 50 Hz by PRAS and SRAS.
Therefore Hon'able CERC may consider not differentiating between SRAS-up and down for grid support.

Hon'able commission may like to include Curtailed renewable capacity also with or without storage in purview of SRAS due to their fast response.

1ae URS, for clarity it may read as :
*"is computed as the **positive** difference between Declared Capacity of the generating station and its Schedule*.

5. Type of ancillary services

1(a) PRAS, it is most critical service and first line of defence for contingencies, but it is only mentioned once in the document but not detailed. *Reference/link to the other document may be given here* OR the word altogether removed if no such document exists as on date, for better clarity.

6. Eligibility of SRAS Provider: 1(b) AGC enabled.

A. What is AGC enablement? All ISGS units of 1980 genre are AGC enabled i.e. their control system is equipped to receive remote MW set point command from Grid operator through Unit Master Control (UMC) and Co-ordinated Master Control (CMC) for whole station.

Other infrastructure to receive this command through PLCC/RTU did not exist at that time. Therefore, requirement of hardware, software, network communication (latency and redundancy) and other critical requirement may broadly be brought out, as part of this document. *For uniformity and interoperability NLDC should provide detailed specifications and list of vendors to all SRAS providers.*

B. NLDC and its subordinate LDCs have at their disposal, archived and online data, for grid "safety and security the following:

- State-of-art communication infrastructure.
- SCADA, RTU'S, PMU's archived and online data.
- Any new addition of generating station, substation, transmission line.
- Grid behaviour, like Load flow studies, in blackouts and partial blackouts
- Load forecast and load pattern of different regions/states in different seasons,
- Ramp rates of different station/units in different grid events.
- Frequency pattern of integrated grid,
- Interstate tie-line loadings, Angular separation of all transmission lines of and generating stations, including renewable.
- Outage or synchronisation of a generating unit or transmission line,
- Power swing data, Voltage sags and swells,
- HVDC,STATCOMs, SVC, Synchronous condensers status etc

Therefore, *NLDC is well equipped to upfront determine desired ramp response rates in MW/min or MW/second for all participating entities in PRAS/SRAS/TRAS*. POSOCO has even published a white paper in this regard. (https://posoco.in/wp-content/uploads/2020/01/Ramp_Assessment_detailed-guidelines_6Jan2020.pdf) In western countries TSOs and ISOs determine this parameters and participating entities follow the guidelines. If required control schemes are modified to meet ramp requirement like Condensate throttling scheme (Implemented at Dadri #5,#6, and widely implemented in Europe), and HP heater bypass. These are used for PRAS as well as SRAS. Such controls can give fast response for up to around 5 min. Thereafter boiler control takes over to sustain. Although fast acting, it accelerates aging of power station components due to thermal cycling and therefore require more downtime for Repair and Maintenance, especially thick walled components, turbine, generator rotor etc Capital inventory is to be built-up to maintain station availability. Similarly, techniques are available to decrease technical Minimum for SRAS down. *Such Technological advancement can be implemented by stations to support grid, if profitability is assured.*

Statistical method of determining CPF may prove counterproductive. Generating stations can ramp at uncontrolled rate to exhaust its available SRAS capacity, that may jeopardise the grid integrity, As different stations and even different units of same station can have drastically different ramp rates.

C. PRAS and SRAS ramps overlap. As SRAS ramps up, PRAS must ramp-down at ideally same slope to restore Primary reserves. This should happen within stipulated up time of SRAS 15mins -30 mins. Also SRAS and TRAS ramps overlap. As TRAS ramps up, SRAS must ramp-down ideally at same slope to restore secondary reserves. This should happen within stipulated up time of TRAS 30 mins -60 mins. Therefore a SRAS provider and/or spinning reserve can act both as PRAS and TRAS provider, subject to its capacity cap.

- *Can SRAS withdraw its support after mandatory 30 min after one-way communication to NLDC with no strings attached?*
- *Can SRAS provider also act as TRAS Provider.*
- *PRAS/SRAS and SRAS/TRAS overlap Ramp down/up gradient may be stipulated by NLDC.*
- *Can TRAS withdraw its support to grid after mandatory 60 minutes after one-way information to NLDC with no strings attached?*

E. AGC enabling is sought for generating stations. AGC will be needed for all SRAS technologies alike.

F. NLDC has already implemented AGC at some stations. *NLDC may provides detailed techno-commercial specifications and short listing of vendors for AGC to all SRAS providers*

7 1(e) Eligibility of SRAS Provider

"SRAS provider should be capable of responding within 30 seconds".

.... A new MW set point will be set before earlier one is executed, as AGC signal will be issued every 4 second.

- *How can this be implemented?*
- *How much response is expected in 30 seconds?*
- *30 seconds will count from which zero time?*

8 Activation and deployment of SRAS

(2) Online load-freq characteristics (B_f) is computed at NLDC/RLDC. ACE will be generated automatically by algorithm developed by NLDC.

- *Why historical figure should be taken and then modified, when exact figure **Bf** is computed and available online at NLDC?*

(4) A. *Metering errors are data, available with NLDC upfront. How can meter error be **decided** by NLDC/RLDC? May be clarified or rephrased.*

B. *Basis of this **decision** to arrive at offset should be transparently known to the constituents upfront before implementation.*

9. Procurement of SRAS:

TSOs in Europe, forecast load, procure energy and procure AS and pay for it for onward transmission to respective country (akin to our states).They charge small margin for this service. Deviations from their contracts, for any service like energy, primary, secondary and tertiary response, TSO is liable to pay for defaults in contract. This is also true for US ISOs. Currently POSOCO /NLDC act as extended arm to the commission. They only *police* the grid. So far they have not been made financially accountable..

(2). It is understood as, that only SRAS provider can modify or withdraw consent after 48 Hrs and not NLDC. *May be clarified.*

(**3)**

i. CPF will invariably favour Hydro and storage for SRAS-up and Thermal for SRAS-down. It is unjustified. Most of the time till thermal will end paying variable charge to pool account..
ii. As stated earlier, ramp up/down rates Mw/min, should be defined upfront by NLDC as per grid requirement and be a part of this document for each type of SRAS provider.

10. Selection of SRAS providers and dispatch of SRAS

(2) Grid integrity is supreme. No one understands grid better than NLDC, therefore NLDC should spell the grid requirement of MW/Min ramp rates for different types of technologies. The ramping requirement will be eventually followed by SRAS provider for profitability. CPF is averaging out the Rate (MW/min) and Cost of all SRAS providers. Incentive performance is compared on basis of MW/5 mins of archived data compared with online data of next 5 min. As brought out earlier, CPF would always favour hydro, storage for SRAS-**up** and Thermal for SRAS-**Down.**

(8) As per clause 7 subclause (1) e, of the CERC document, response time expected from generating station is **30** seconds. How can command be accepted every **4** second, when 30 seconds are envisaged for the first command to get executed. May be explained by NLDC.

(11) *For SRAS up/down **Average** of last 5 min archived data in **absolute** terms shall be used to compare with real time data arriving at NLDC for the next slot*.

How much percentage of SRAS capacity should be deployed in 5 minutes should be known to the generating station upfront. For example say a 500 MW unit is scheduled at 260 MW and balance 240 MW is assigned to SRAS. If required by NLDC, 240MW is expected to get consumed in 15 mins, @ ramp 16MW/min. In

5 min average 80MW should be recorded for 100% compliance to get incentive @ 40P/kwh and variable charges.. Other unit scheduled at 440 MW with 60 MW SRAS ramping @ 4MW/min with 5 min average 20MW to be compared with previous 5 min block to achieve 100% compliance to get same incentive @ 40P/Kwh. Unit that provides **240MW** SRAS @ **16MW/min** suffers more thermal stress, as compared to unit that provides 60 MW support **@ only 4MW/min** but gets paid with the s.ame rate. More grid support more suffering. This is unfair. It is re iterated that ramp rate should be defined by NLDC for each type of technology. Same would be problem with SRAS down. *May be clarified by NLDC*..

11. Payment of SRAS

It is indicated that on 15 min average basis, **variable charges** shall be paid from Deviation and Ancillary service pool account. *Incentive payment will be done From which account* is not mentioned. May be clarified.

12. Performance of SRAS provider and incentive.

(2) As pointed out earlier, clause 7 sub clause 1e of CERC document anticipated response time for SRAS generating station is 30 seconds against the command issued from NLDC. How can a command every 4 second be executed?

14. Eligibility of TRAS provider

Non spinning reserves are also included in TRAS, as mentioned in CERC pdf Cl 3 (1) z *Definition and interpretation.*

- *A non-spinning reserve other than hydro and probably storage cannot be connected to grid within 15 Minutes in cold start as per requirement of this clause*. May be reviewed.
- Zero time of, start of time count to be clearly defined in regulation.
- If a TRAS provider(s) has subsequently replaced a large SRAS 800/660 MW unit(s) which could remain de-commissioned for longer duration than 60 Min stipulated for TRAS herein, then TRAS will be needed for longer duration. May be clarified.
- *Can TRAS withdraw its support to grid after mandatory 60 minutes after one-way information to NLDC with no strings attached?*. May be clarified.
- *The provision envisages deployment of TRAS in 15 Mins and SRAS within 30 seconds and providing entire capacity obligation in 15 mins and sustain for at least 30mins as per 7(1) e of draft provision*. This means that SRAS should be able to ramp down from 15 min to 30min from allowing TRAS to fully take over. This is high ramp down rate would accelerate Thermal aging. **May be clarified**.

18. Price discovery of TRAS

1. By definition, the TRAS will be summoned, after SRAS has brought back the system at 50 Hz within the permissible band and all interstate tie lines are not congested. For example combined slope of different SRAS ramp-down is balanced with TRAS ramp up. ie supply and demand are perfectly balanced. Therefore TRAS would fully release SRAS Capacity and system freq is 50Hz. Therefore MCP will be same as before; As left corrected by secondary reserve fully deployed to bring back freq to 50 Hz. It may be clarified .

2. Merit order for dispatching TRAS should be based on *energy efficiency and then on least polluting generating station basis rather than on economic basis*. This would promote energy efficiency and pollution control. The practice has already been experimented in China.
   Our energy system is more close Chinese system of grid, where federal grid structure is controlled by national, regional and provincial (states) hierarchy.

3. As mentioned earlier Non spinning reserve have also been permitted for SRAS/TRAS. 15 Mins is less for Non spinning reserve. Seperate provision may be incorporated for non spinning reserve as TRAS.

19. Payment of TRAS

(2) What is the basis for 10% of energy up DAM or MCP energy up RTM with cap of 20P/kwh??

20. Shortfall in procurement of SRAS and TRAS Or emergency condition:

2. SRAS/TRAS **Variable charges should include transmission losses** to arrive at landed price to the beneficiary. Local area generation will be encouraged, Efforts will be made to reduce imports to avoid line losses . It will promote energy efficiency.

(3) and (6)(In case of emergency conditions:

Same as above, Grid stability services should not be treated as energy service as they are pressed for deployment in exigencies of faults in Transmission line(s) or Unit(s) outage in some other region/ control area. They are grid support Power (MW) service.

For example if SRAS/TRAS deployed as consequence of any or more of the following

- Protection mal operation due to exceeding loading capability of line (July 2012 incident).
- Tripping of a heavily loaded line due to mal operation of protective relaying
- Due to lack of maintenance of transmission line
- Lack of maintenance its related elements like ICT, CT, PT Breakers etc
- High angular separation as consequence of leading to cascading effect.

- Problems with state transmission and generation companies, leading to heavy rejection/loading

Which entity should be penalised for consequential damages and deployment of reserves, Powergrid/ISTS,State Gencos, Transco or NLDC?

PRAS/ SRAS down would be deployed after heavy load shedding. For this SRAS generating station should pay variable charge to pool account?? Is this Justified? *Hon'able commission may like to pin financial responsibility on our ISO and ISTS for their defaults*.

CERC may consider putting such mechanism in place to penalise PowerGrid/ISTS to pay to pool account from where SRAS providers should be compensated for consequential damages and not just variable charges.

SUMMERY

1. CERC may consider not differentiating between SRAS-up and down for grid support.
2. Hon'able commission may like to include Curtailed renewable capacity also with or without storage in purview of SRAS due to their fast response.
3. For uniformity and interoperability NLDC should provide detailed specifications and list of vendors to all SRAS providers.
4. NLDC is well equipped to upfront determine desired ramp response rates in MW/min or MW/second for all participating entities in PRAS/SRAS/TRAS.
5. Technological advancement such as Condensate throttling Scheme, HP heater bypass scheme, reducing technical minimum etc can be implemented by stations to for fast PRAS and SRAS to support grid, if profitability is assured.
6.
   i. Can SRAS withdraw its support after mandatory 30 min after one-way communication to NLDC with no strings attached?
   ii. Can SRAS provider also act as TRAS Provider.
   iii. PRAS/SRAS and SRAS/TRAS overlap Ramp down/up gradient may be stipulated by NLDC.
   iv. Can TRAS withdraw its support to grid after mandatory 60 minutes after one-way information to NLDC with no strings attached?
7. Response time for AGC is stipulated as 30 second, while command from NLDC will be every 4 seconds
   i. How can this be implemented?

ii. How much response is expected in 30 seconds?

iii. 30 seconds will count from which zero time.

8. Why historical figure should be taken and then modified, when exact figure Bf is computed and available online at NLDC*?*

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i. Metering errors are data, available with NLDC upfront. How can meter error be decided by NLDC/RLDC? May be clarified or rephrased.

ii. Basis of this decision to arrive at offset should be transparently known to the constituents upfront before implementation.

10. Hon'able commission may like to pin financial responsibility on our ISO and ISTS for their defaults to create an emergency.

11. Some clarification sought in above.