Comments on
Draft CERC Indian Electricity Grid Code, 2022
By
India Energy Storage Alliance

Presented by

Dr. Rahul Walawalkar
President

KEY DEVELOPMENT IN AS MARKET IN INDIA

- CERC issued staff paper on ancillary service

- Tightening of IEGC frequency band to 49.9 to 50.05 from 49.7 to 50.5.
- IESA's first report on "Energy Storage Technologies for Ancillary Services in India" prepared in 2013-14 supported by Shakti foundation & CES Ltd

- Ancillary Services Operations Regulations notified by CERC

- CERC issues a staff paper on Ancillary services market including ESS

- CERC approves pilot for all 20 Central Hydro Plants to be used for FRAS. Pilot starts in Nov.
- CERC's proposal paper on market mechanism for AS.

- CEA amends technical standards to grid and include storage eligible for grid connection.
- IESA proposes to CERC to include Storage as a separate asset class for participation in AS market.

- FOR released report on Intra-State Reserves and Ancillary Services For balancing.
- Draft IEGC review in expert committee which suggested storage as a flexible resource for RE integration..
- Real-Time Market Launch.
- Green Term Ahead Market Launch.

- Karnataka draft RE policy state use of existing and new RE projects with storage for AS.
- RERC Discussion Paper on Framework For Large Scale Integration of RE using ESS state use of storage for AS.
- IESA has been made part of CERC Central Advisory Committee

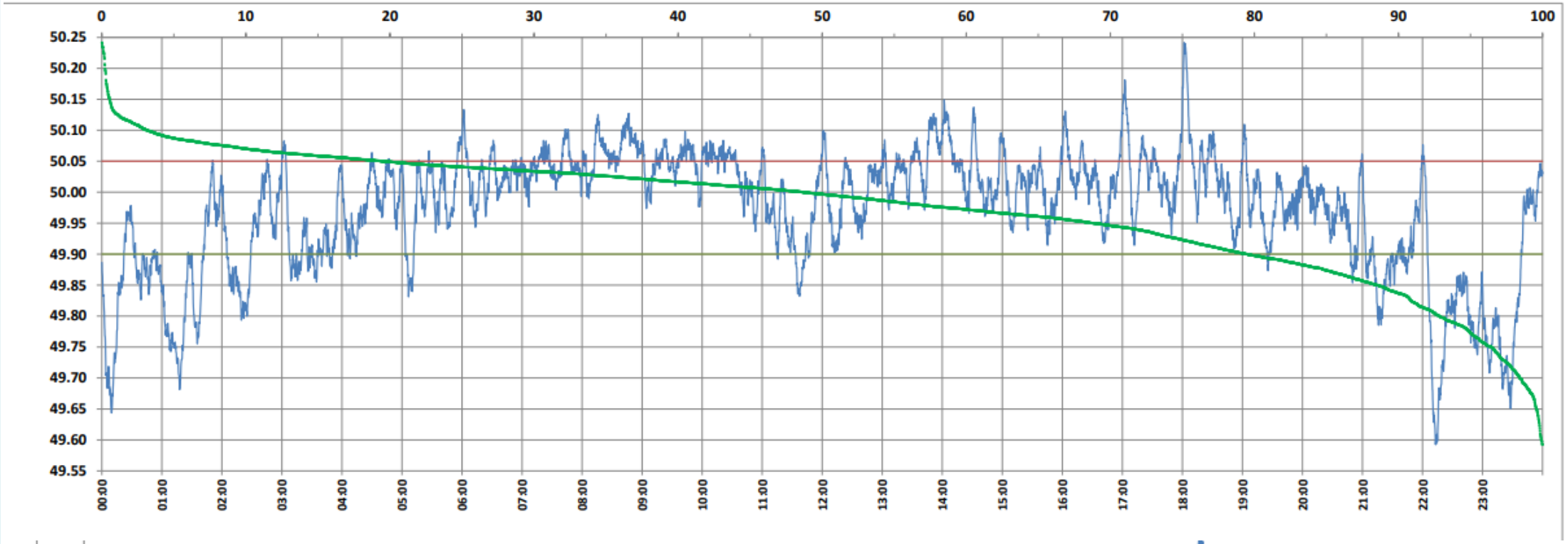
- CERC Ancillary Service Regulations,– included storage part of SRAS and TRAS

POWER SYSTEM OPERATION CORPORATION LIMITED

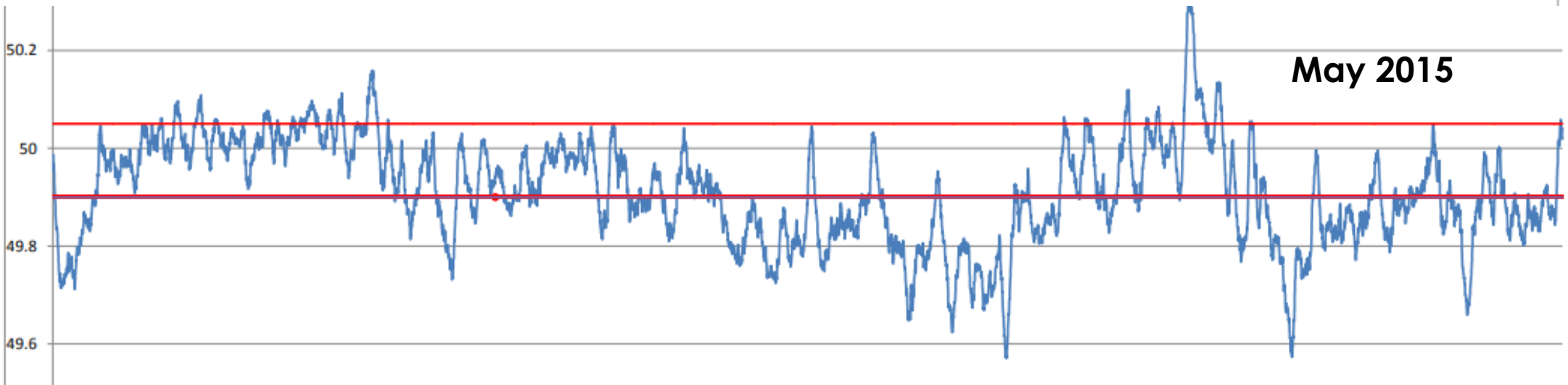
NATIONAL LOAD DESPATCH CENTRE, NEW DELHI

Frequency profile for 24-Apr-2022 (Sunday)

Apr 2022



May 2015



Inputs/Suggestions on Draft IEGC Regulations

- **Consolidated Regulations for Ancillary Service Regulations**: Present regulations only addresses Secondary and Tertiary Reserve services and primary reserves are supposed to be addressed under IEGC regulations. However, in order to avoid any kind of ambiguity in future and bring all the services under one umbrella, it is important to include Primary reserves also under same Ancillary Services Regulations and regulations has to be consolidated for all the reserves under same regulatory framework.

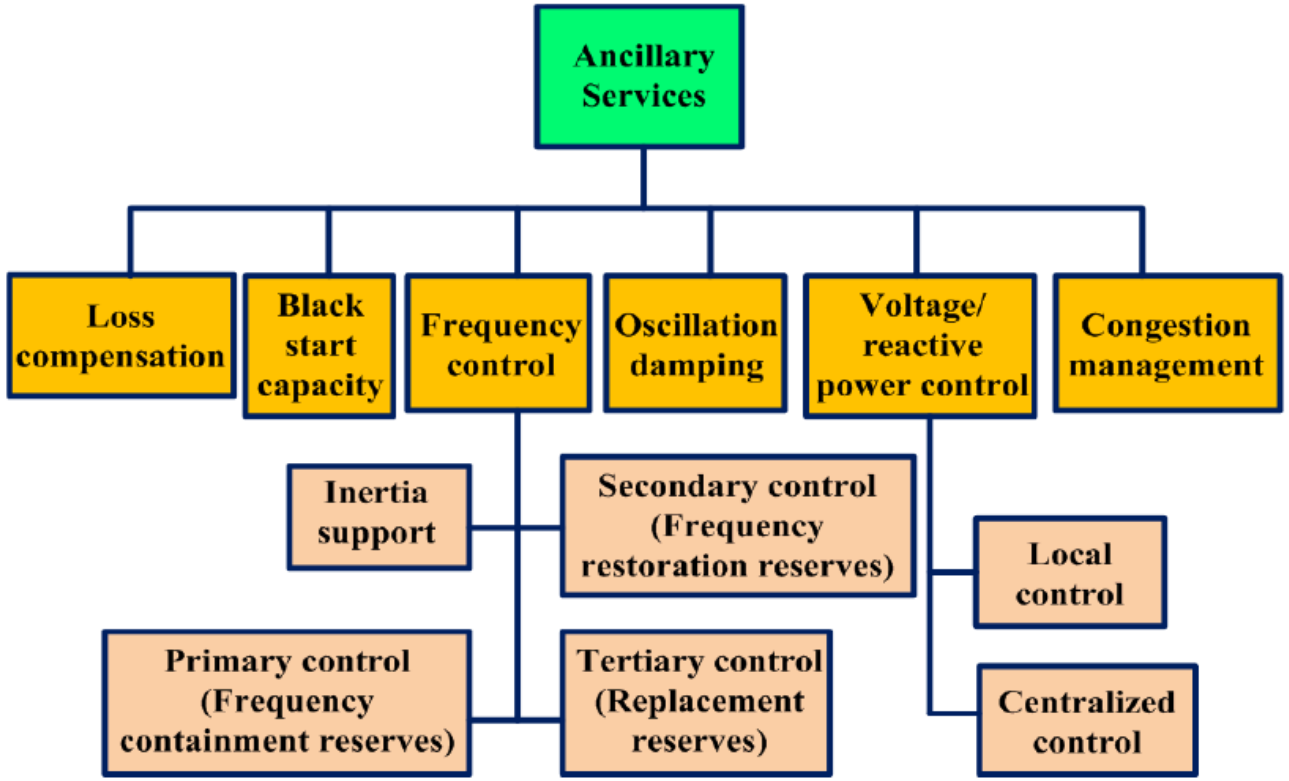


Fig: Classification of Ancillary Services

Inputs/Suggestions on Draft IEGC Regulations

- **Introduction of Secondary Fast Reserves/ Fast Frequency Response in the Regulations:**

  - **Definition:** Power injected to (or absorbed from) the grid in response to changes in measured or observed frequency during the arresting phase of a frequency excursion event to improve the frequency nadir or initial rate-of-change of frequency

  - Overall system frequency response should fundamentally be sustained such that sufficient amounts of energy are injected to arrest frequency excursions, maintain frequency stability, and adequately allow frequency recovery back to nominal following a sudden loss of generation or load. However, there are different types of frequency response, including both PFR and FFR, that can work in coordination to support frequency control

  - Typical Response Time: < 5 seconds.

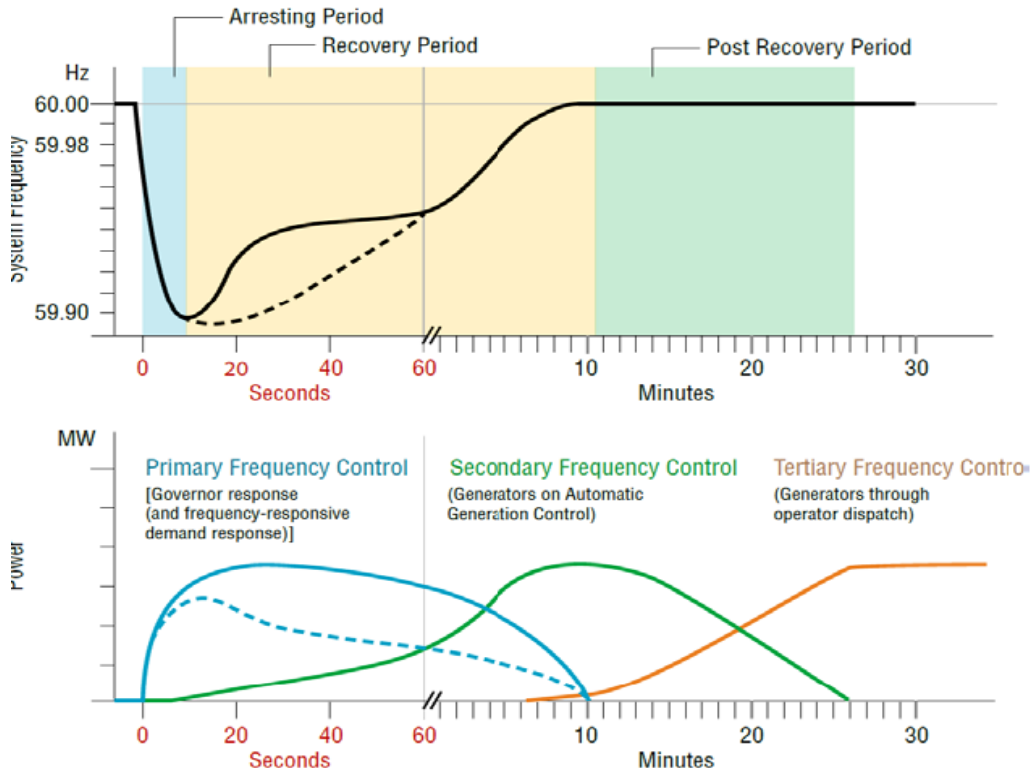


Fig: BPS Frequency Control Time Frames
[Source: LBNL]

Inputs/Suggestions on Draft IEGC Regulations

- **Need for Fast Frequency Response in India:** The rising share of renewables and declining share of conventional generators in the energy mix in the recent years and future addition will eventually led to decreased system inertia and an increase in frequency volatility. This resulted in the need for faster frequency response than the existing options could provide. Min 50% of secondary reserves (estimated 4000 MW at present) can be allocated for Fast reserves. With One Grid One Nation and One Frequency in place, it is very much important to make sure fast restoration of system frequency.

- Some of the existing installed conventional plants may be resourceful in addressing the ancillary services requirements at competitive rates. But, they may not be in a position to address the requirement of faster response

- **Allow aggregation of Distributed Energy Resources** (distributed energy storage, EVs, Demand Response) to meet the 1 MW minimum requirement for providing ancillary services.

Vermont utility balances regional grid with consumers' Tesla batteries

By **Nicholas Nhede** - May 18, 2021

Image credit: Green Mountain Power

In the US, Vermont-based utility company Green Mountain Power has announced that it is using consumer onsite batteries to ensure the reliability of the New England regional grid network. The regional grid is operated by ISO-New England and stretches across six US states including Maine, Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island.

Green Mountain Power claims its pilot is the industry's first incorporating residential batteries for the stability of a regional energy transmission network. As part of the utility's new Frequency Regulation pilot project, some 200 consumers were asked to trade their excess or stored energy into ISO-New England's network. In return, consumers are paid for the participation of their Tesla Powerwall energy storage batteries into the real-time energy Regulation Market. The batteries are integrated with Tesla's Autobidder software to enable quick response to grid status signals sent by ISO-New England.

Inputs/Suggestions on Draft IEGC Regulations

International Experience in FFR

- USA National Grid introduced an enhanced frequency response (EFR) in 2016 to provide sub-second rapid response frequency reserves. The tender to procure EFR contracted eight battery storage facilities for four years at prices between USD 9.21/MW/h and USD 15.74/MW/h.MISO, CAISO, NYISO of USA implemented flexible ramping product would be procured in both day-ahead and real-time markets. The resources providing the ramping service are compensated at the lost opportunity cost of a resource participating in the energy market.

- National Grid, the TSO in the United Kingdom, has the obligation to maintain system frequency within ±1 % of the target value of 50 hertz.

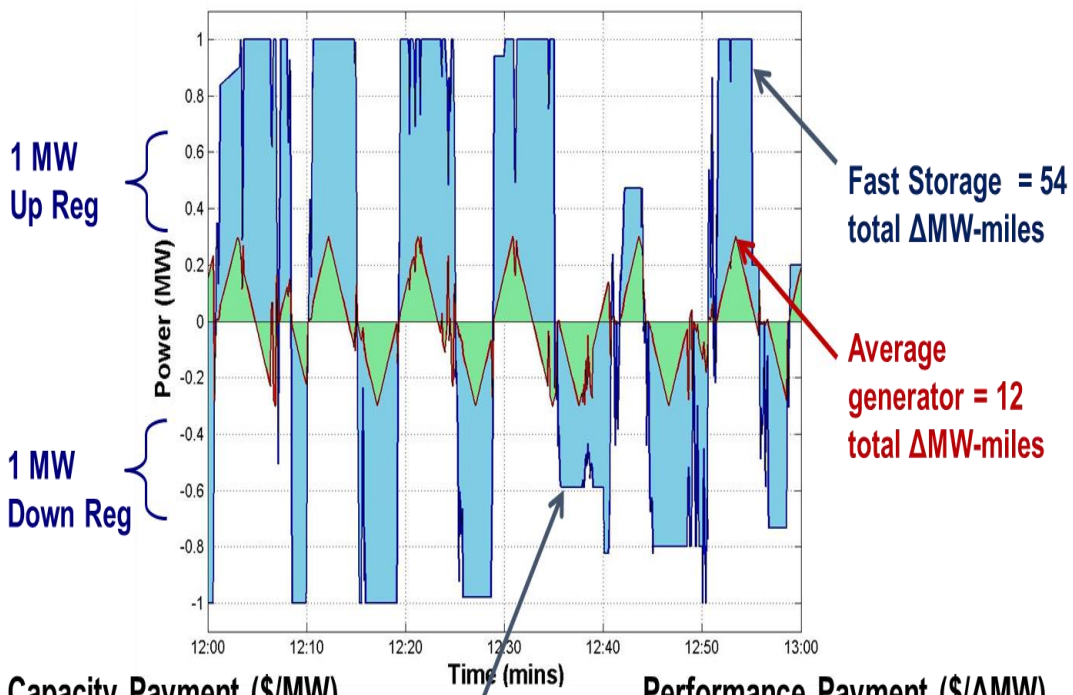
- EU Markets has lays down detailed guidelines on operational planning for ancillary services, as well as load-frequency control and reserve rules, including operational agreements, frequency quality, load-frequency control structure, operation of load-frequency control, FCRs, FRRs, replacement reserves, exchange and sharing of reserves, time control process, co-operation with DSOs, and transparency of information. The balancing capacity products can be defined as a) Frequency containment reserves b) Frequency restoration reserves and c) Replacement reserves.

- Netherlands' automatic and manual FRR markets, as well as Belgium and Denmark's manual FRR market, procure balancing capacity and energy as separate products

- In Japan, some utilities require that large solar PV projects control their feed-in of electricity by using battery storage to meet grid frequency requirements. For example, the 38 MW Tomakomai solar PV project includes a 20 MW lithium-ion battery, one of the world's biggest at the time of construction in 2017. The sole application of the battery is to meet the frequency requirements of the local energy utility, Hokkaido Electric Power Company

Battery storage can participate in FRAS in ancillary service markets of Australia, Belgium, Germany, the Netherlands, the United Kingdom, and the United States

Inputs/Suggestions on Draft AS Regulations



Capacity Payment ($/MW)

- Amount set-aside (MW)
- Includes Opportunity Cost
- *May be adjusted based on state-of-charge*

Performance Payment ($/ΔMW)

- Sum of up and down movement "mileage" (ΔMW)
- Adjusted by accuracy

- **Incentive Structure – Pay for Performance Structure:** Present draft only offers incentives to only secondary services and nothing for the tertiary services. In order to make sure best use of evolving of markets and technologies available, **it is suggested to extend this incentives to Tertiary and fast response services based on "pay for performance" kind of structures.**

- Conventionally, different energy resources providing frequency regulation services have been compensated at the same remuneration, irrespective of their performance. However, new technology resources can provide much faster regulation service than conventional generators. Therefore, the compensation mechanism must appropriately value the performance characteristics of different resources. This will incentivise greater deployment of storage technologies in providing ancillary services

- Incentive mechanism should not be just limited to respond and availability of resources as required. It should be calculated based on remunerate resources based on how fast they are able to respond to the system operator signals. The compensation is proportional to the response time.

Final Remarks

- Regulations should clearly specify the types of ancillary services based on the technical parameters desired such as response rate. There is also need for unbundling the requirements such as faster response essential for frequency regulation and longer duration energy requirements for ramping and / load following. This will help in optimizing deployment of appropriate technology

- Regulations should have a clear roadmap for deployment of ancillary services under various scenarios of renewable penetration and transmission upgrades, which can provide clear investment signals for potential project developers and technology developers.

- Transparent pricing mechanisms through introduction of ancillary services as well as provisions for long term procurement of ancillary services through bilateral contracts / RFPs. Creating framework/standard guidelines and bidding documents for ancillary services requirement

- Similar to the approach adopted in case of RE, the Government may think of introducing such services either through fixed Feed-In-Tariff to be discovered and notified by the Central Commission or it may opt for competitive bidding. If the price discovered through both the mechanisms is higher than the market price, then some incentive mechanism may be introduced like Viability Gap Funding (VGF) or Generation Based Incentive (GBI) etc

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