**Brief input on operational experience of REMCs**

Impact of integration of RE generation on power generation and transmission network is different from that of conventional generation. The decision for establishment of Renewable Energy Management Centre (REMC) as dedicated RE management system was taken by Ministry of Power to facilitate adequate grid operation in the area of responsibility. Renewable Energy Management Centre (REMC), equipped with Forecasting and scheduling tool & Real Time Monitoring of RE generation for safe, secure and optimal operations of the overall grid.

REMCs are equipped with SCADA, Forecasting and Scheduling tool. REMC SCADA acquires data from RE ISTS Pooling stations on standard protocols. The REMC architecture consists of forecasting tool which provides prediction of wind and solar power generation. The forecasting tool provide power forecast based on input from three Forecasting service providers (FSP) one forecast from Internal Forecast Tool (IFT) and One Forecast Combination & Aggregator (FCA). The scheduling tool provide platform to QCA/RE generators/RE developers to upload their schedules.

The facilities provided in REMCs are very very useful in managing renewable energy generation on day to day basis. Some experiences are as follows:

1. **Managing Solar Eclipse**

India has experienced annular solar eclipse twice within a span of few months and the effect could be predicted through the REMCs and could be monitored in real time basis to facilitate reliable grid operation.

26th December 2019: Annular eclipse of the sun was mainly visible mainly in the Southern part of India in the states of Kerala, Tamil Nadu and Karnataka while rest of the country witnessed partial eclipse of the Sun. During the solar eclipse on 26th December 2019, there was all India reduction of 6.5 GW solar generation as compared to the solar generation on 25th December 2019. All India demand reduced by 2.4% with an instantaneous maximum reduction of 4.2%. After the eclipse was over, all India demand increased by 6372 MW which led to all India demand crossing 170GW which was the highest in the month of December 2019.

• 21st June 2020: Annular eclipse of the sun was mainly visible in Northern part of India in the states of Rajasthan, New Delhi, Punjab, western Uttar Pradesh and Uttrakhand. There was solar generation reduction of 11160 MW at all India level on 21st June 2020 as compared to solar generation on 20th June 2020.Demand reduced from 145 GW to 142 GW at maximum eclipse time. All India demand started increasing gradually from minimum of 142 GW to 151 GW after end of the eclipse.

It is pertinent to mention that India was in the unlocking phase during June 2020 after a countrywide lockdown due to the COVID-19 pandemic. It was an unprecedented situation which made RE forecasting a challenge for system operators which could be accomplished through REMCs.

1. **Managing cyclone Nivar on 25th and 26th Nov 2020**

Cyclonic Storm “NIVAR” over southwest Bay of Bengal Bay of Bengal (BoB) moved northwestwards and crossed Tamil Nadu and Puducherry coasts near Puducherry (near latitude 12.1°N and longitude 79.9°E) during 2330 IST of 25th to 0230 IST of 26th November as a very severe cyclonic storm with an estimated wind speed of 120-130 kmph gusting to 145 kmph. The wind generation could be monitored in real time and it is observed that there was an increase of 1484 MW of wind generation in SR region during the Cyclone Impact Day (26th 03:30 hrs).

1. **Voltage Profile at ISTS connected RE stations**

With a high RE addition target set by India, ultra-mega solar and wind power parks are getting commissioned and need of the hour. RE generation at ISTS system is being integrated at fast pace. Consequently, voltage excursions are being experienced at RE pooling stations during day and night hours on daily basis.

Operation of various solar plant connected to ISTS could be monitored to ensure compliance of the CEA’s Technical Standards.

1. **Mock Reactive Power Capability Tests**

Mock reactive power capability tests was carried out test at Pavagada Ultra Mega Solar Park and at Sprng Agnitra Solar at NPKunta Ultra Mega Solar Park. The Station could be monitored in real time.