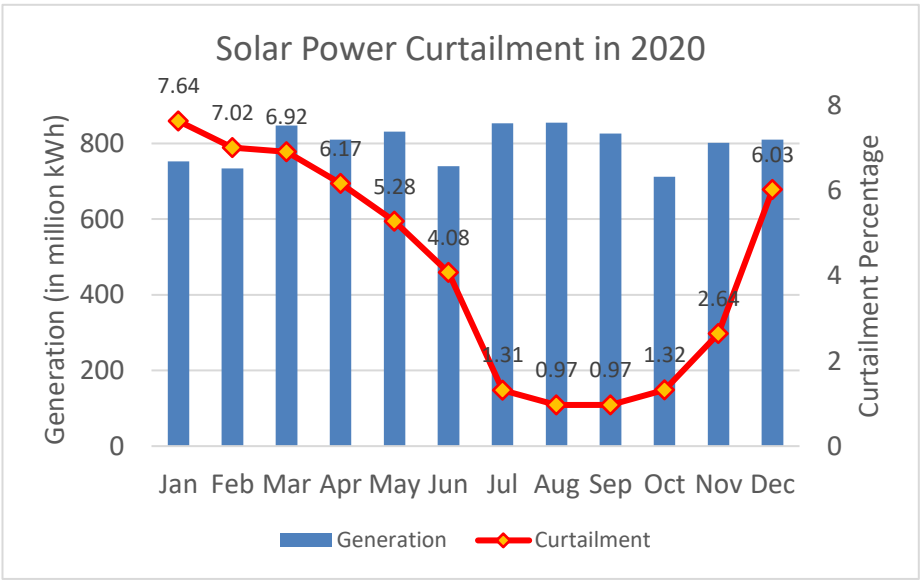
vRE Curtailment Summary and Recommendations

(SGREEE: Duong Manh Cuong, Do Tung Duong)

1. vRE Curtailment in 2020

The beside figure summarizes the total solar generation (*left axis*) and curtailment (*right axis*), expressed in percentage of generation, in 2020. Overall, the total electricity generation from solar power plants reached 9,575 million kWh in 2020. However, about 4.16% of this amount (~400 million kWh) is curtailed mainly due to the overload of transmission and distribution lines.



In last three months of 2020, due to the rapid development of solar power, with ~40 new plants, equivalent to ~3000MW, were put into operation. Besides, other unfavorable factors such as: (i) low demand growth due to impacts of COVID-19, (ii) impacts of severe floods in Northern and especially Central region, a lot of hydropower plants (up to 40-50) have to discharge, (iii) peak load in the evening but no solar power available, large difference between daily peak and off-peak (10,000 – 15,000 MW), have created serious challenges to the operation of power system. The overload in the 500kV transmission line (especially in the segment Nho Quan – Ha Tinh) and regional 220-110kV lines also forced NLDC to curtail the solar power. Noticeably, on 27th December, all RE plants have been curtailed with the highest curtailed capacity was ~3000MW.

2. vRE Curtailment in 2021

Recently, EVN reported to MoIT about the progress of wind power projects and estimation of vRE curtailment in 2021. Up till now, EVN has signed PPA with 113 wind power projects with total installed capacity of 6038, in which 582 MW has already in operation, 4,432 MW will be in operation before 31/10/2021, and other 1,042 MW will not be in operation before 31/12/2021.

EVN also provided the assessment of vRE curtailment scenario. Due to the requirement to disconnect the 500kV line Nho Quan – Ha Tinh to connect Nghi Son 2 power plant, and disconnect 500kV, 220kV lines to connect the constructing 500kV lines, the curtailment of vRE will be necessary, especially in the flood season and in late 2021 when there is excess power supply with new vRE projects but low demand in holiday. In details:

- ***From July – September, 2021***: This is the flood season in Northern region, hydropower generation will be maximized, hence, the transmission from Central to Northern will be small. Therefore, the risk of excess power supply will be more serious. The curtailed capacity in weekday/weekend could be up to 3,000/6,500 MW respectively, while the curtailed generation is estimated to be 180.6 million kWh per month.
- ***From October – December, 2021***: The curtailed capacity in weekday/weekend could be up to 6,800/10,800 MW respectively. The reduced renewable energy is projected to jump to 350 million-400 million kWh monthly in October-

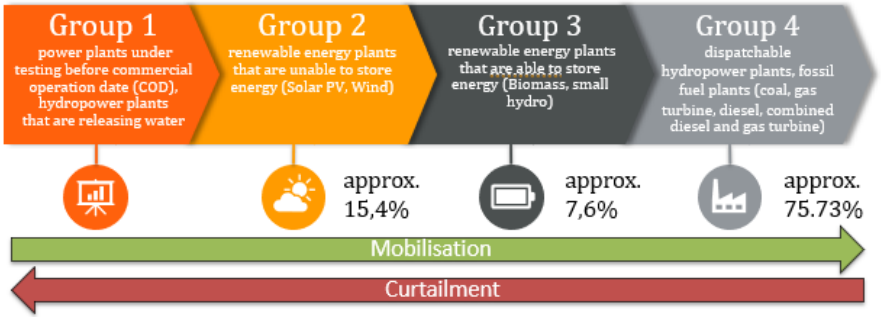
December, as all planned wind power sources come into operation coinciding with the flood season in the central and southern regions.

3. Recommendations

The project "Smart Grids for Renewable Energy Efficiency" (SGREEE) is a joint cooperation project between ERAV (Electric Regulatory Authority of Vietnam) and GIZ (Deutsche Gesellschaft für internationale Zusammenarbeit GmbH). GIZ are supporting ERAV in the assignment "Congestion Management Solution to reduce vRE curtailment", in which the consultant will analyze Vietnam's power system and market, then present the international best practices in congestion management, and recommend suitable solutions.

The following recommendations can emerge from the first comparison of Vietnam with the countries in the Master Group (Germany, Taiwan, Norway, United States, South Korea, Japan) regarding congestion management solutions:

- **Regulatory framework**
  - ***Load-depending/regional feed-in-tariffs***
    The national feed-in-tariffs led to a huge expansion of wind and solar PV in the Central and Southern region due to better conditions. By varying the feed-in-tariffs according to the time of day or through regional differentiation, congestions could be bypassed.
  - ***Prioritization of RE feed-in-tariffs***
    Beyond the feed-in-tariff, there is currently a prioritization of vRE in Vietnam in terms of mobilization and curtailment of generation as shown in figure below. This priority order is suggested to be modified, especially in case of overloading and excess supply.



- ***Grid-related measures: HVDC connection between North and South region (long-term)***
  HVDC offers a good alternative for the transmission over long distances with lower losses compare to HVAC. In addition, new HVDC technology also provides grid support service. Therefore, HVDC is recommended as a congestion management measure that can relieve the lines on the North-South connections in Vietnam and at the same time deliver a positive grid input through its grid-stabilizing properties.
- ***Market-related measures: Spread and expand energy storage options***
  Energy storage is particularly important in the field of an efficient integration of vRE, as they can compensate for fluctuations in vRE feed-in and create flexibility in operation. Furthermore, storage options can be used to store the surplus supply at peak vRE generation and re-use it at peak demand. Therefore, the spread and expansion of energy storage options in Vietnam is recommended in order to more flexibly adjust the generation peaks of vRE generation to the load peaks.
- ***Digitalization/Automation: Strengthening the digital components in Vietnam's distribution system***
  The promotion of generation plants based on solar PV and wind will lead to electricity in Vietnam being increasingly generated remote from load-centers in the coming years – which is already partly the case today. Above all, the progressive expansion of rooftop solar plants will lead to an increased feed-in of electricity at the distribution grid level, for which the transformers and lines are not fully designed. In order to avoid congestions and to efficiently integrate electricity from VRE sources into the grid, a high level of coordination is now required between the generators, the distribution grid operator and even the transmission grid operator. For this, digitalization of the distribution grid level is necessary. It is therefore recommended that the development of a solid digitalized infrastructure is extended to the distribution grid level.

Imprint

Published by the
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany
Energy Support Programme Unit 042A, 4th Floor,
Coco Building14 Thuy Khue, Tay Ho District
Hanoi, Vietnam
T + 84 4 39 41 26 05 F + 84 4 39 41 26 06

As at
April 2021

Text
Duong Manh Cuong Senior project officer SGREEE

Do Tung Duong Project Intern SGREEE

GIZ is responsible for the content of this publication.

On behalf of the
German Federal Ministry for Economic Cooperation and Development (BMZ)