

VIETNAMESE-DANISH ENERGY COOPERATION



INTEGRATION OF RENEWABLE ENERGY IN VIETNAM

In 2013, Vietnam and Denmark entered a long-term cooperation agreement for the purpose of strengthening Vietnam's transition to a low-carbon economy. It is financed by the Danish Climate Envelope and administered by the Danish Energy Agency. The Danish Energy Agency cooperates with the Ministry of Industry and Trade (MOIT) in Vietnam through the joint Energy Partnership Programme (DEPP) between Vietnam and Denmark. Part of the cooperation is focused on integration wind and solar power in the power system. The Danish Transmission System Operator (TSO), Energinet, has cooperated closely with Vietnamese experts from Electricity Regulatory Authority of Vietnam (ERAV) and National Load Dispatch Centre (NLDC) to develop solutions for better integration of renewables based on Danish experiences. As a result, specific recommendations enabling increasing shares of wind and solar energy, has been part of the past three years of cooperation.

Renewable energy forecasting

Experts from Energinet and NLDC have developed forecasts of wind and solar power production on both day-ahead and intraday horizons for individual plants in Vietnam. The forecasts improves continuously since they evaluate historical data and then update the algorithms. The forecasts are currently being benchmarked and if the results turn out positive they will be considered for application by NLDC in the real-time operation for better balancing of the power system and more efficient use of the renewable resource. Forecasting of the availability of the renewable resources is increasingly important for system operation as the amount of renewables increases.

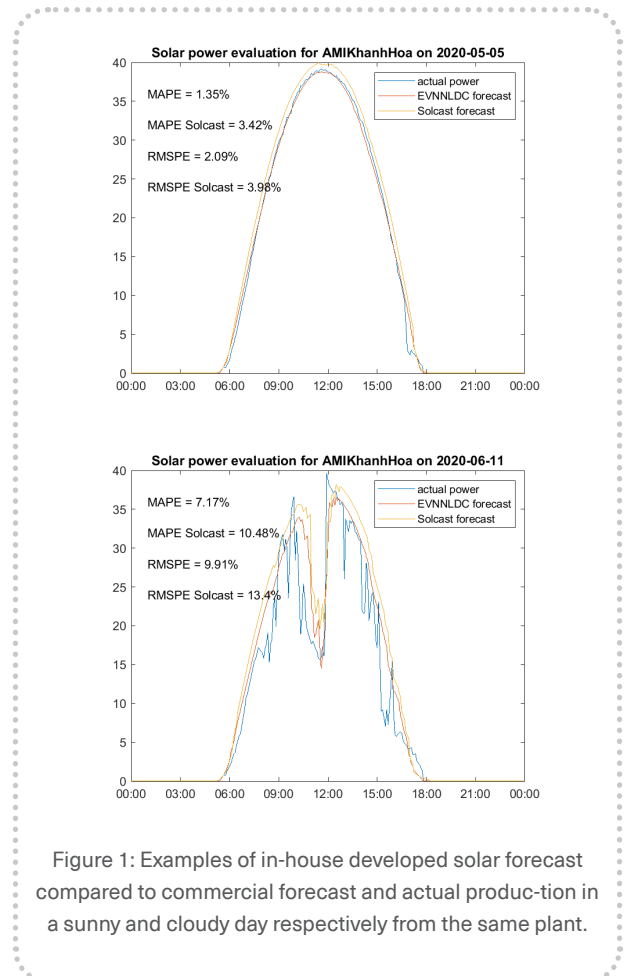


Figure 1: Examples of in-house developed solar forecast compared to commercial forecast and actual production in a sunny and cloudy day respectively from the same plant.

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Ancillary services

The need for **secondary reserves** in order to maintain a stable frequency was analysed based on the European ACE approach (Area Control Error) and a tool was developed to carry out this calculation. It is recommended to implement the approach in the Vietnamese regulation (D106) in order to ensure an adequate amount of secondary reserves to stabilise the frequency.

Similarly, an analysis of the amount of inertia was carried out and compared to levels of **inertia** in other power systems. The results showed that the amount of inertia in the Vietnamese power system is currently adequate but after 2025 when more wind and solar power is expected to be integrated and less thermal power plants will be in operation at certain times the level might be challenged. Hence, the following three recommendations are given:

1. **Develop a routine for annual calculations of inertia in the system to follow the development.**
2. **Include requirements for synthetic inertia in the grid codes.**
3. **Develop a Wide Area Monitoring System (WAMS) when new Phasor Measurement Units (PMUs) are installed in the system in order to be able to monitor the power system in real time.**

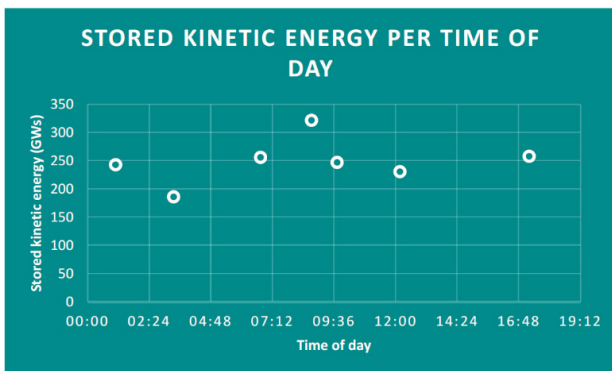


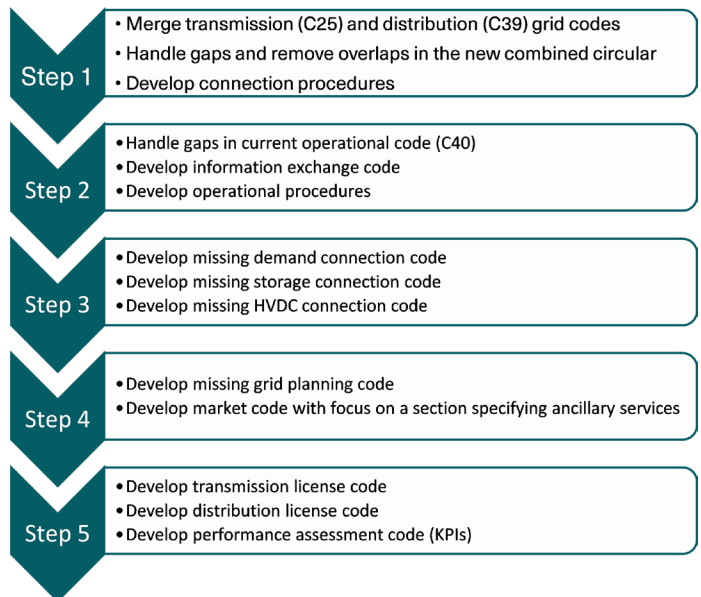
Figure 2: Shows the inertia in the Vietnamese power system at historical times when an incident of a power plant trip happened. It is seen that there is currently no clear correlation between time of day and level of inertia. However in the future when more solar power is expected, the inertia could hit a critically low level around noon.

Grid codes

Experts from Energinet has reviewed the Vietnamese grid codes and provided recommendations based on Danish and European experiences. The recommendations have two overall purposes, namely

1. **Transparency:** Organise the grid codes to make it as easy as possible for the users such as developers of re-newable energy facilities.
2. **System stability:** Ensure all necessary requirements are included in order to maintain a stable power system.

Recommendations for regulation of transmission code (C25) provided in 2019 are already reflected in the updated version. Further recommendations are organised in a five-step roadmap shown below.



Next steps

The DEA, ERAV, Energinet and NLDC will continue the cooperation in a newly approved 5-year programme, DEPPIII, commencing in November 2020.

Find more information here: <https://ens.dk/en/our-responsibilities/global-cooperation/country-cooperation/vietnam>.

