December 12, 2024

SOLAR ENERGY MANAGEMENT GROUP
DOE-RENEWABLE ENERGY MANAGEMENT BUREAU
Department of Energy, 2F PNOC Building V, Energy Center,
Rizal Drive, 34th St, Taguig City

RESPONSE TO DOE COMMENTS ON IRESS POSITION PAPER

Dear DOE Solar Energy Management Group:

We would like to express our sincere gratitude to the Department of Energy (DOE) for taking the time to review our position paper on Integrated Renewable Energy Storage Systems (IRESS) dated Nov 12, 2024.

Collaborative engagement between industry stakeholders and the DOE is essential to refining mechanisms that drive renewable energy growth. Through this collaboration, we believe that IRESS will play a critical role in ensuring the seamless integration of renewable energy into the grid while preventing additional stress on the transmission system. We look forward to continuing this partnership to achieve a greener, more resilient energy future for the Philippines.

On the DOE responses dated Nov 22, 2024, we would like to focus your attention on questions 2, 3, 4, 7, 8, and 9.

A. For Question 3, where PSSEA recommended to “Utilize existing transmission/node capacity”, our response is as follows:

How IRESS can Minimize Stress on Transmission Systems Compared to Solar-Only Systems

IRESS deliver power exclusively to the grid during scheduled periods, especially during high-demand hours, while avoiding real-time solar export during low-demand periods. Compared to solar-only systems, they significantly reduce stress on transmission systems by optimizing the timing and location of energy delivery. Here’s how:

1. Optimized Energy Dispatch During Peak Demand

Solar-Only Systems: Solar-only systems export power directly to the grid as it is generated, typically during midday when demand may be low, contributing to potential grid congestion and leading to curtailment.

IRESS: Integrated systems store surplus solar energy and discharge it during high-demand periods, such as evening peaks, from 18:00 to 21:00. This aligns energy supply with peak demand and reduces congestion on transmission systems during critical hours.

2. Avoiding Midday Grid Congestion

Solar-Only Systems: High solar penetration during midday often overwhelms transmission systems, leading to congestion or curtailment of solar energy.

IRESS: By limiting the solar energy dispatch and storing it locally during the day and releasing it only when the grid requires additional capacity, these systems prevent congestion on transmission lines during peak solar generation hours.

3. Efficient Use of Transmission Infrastructure

Solar-Only Systems: Solar only capacity is set at the peak discharge which will seldomly occur, crowding out the transmission capacity in an inefficient manner

IRESS: Energy is delivered to the grid during high-demand periods from 1800H to 2100H, maximizing the utility of transmission infrastructure when it is most needed. This avoids overloading the system during times of low demand.

The integration of storage will push down on the solar only capacity accommodating significantly larger volumes of renewable energy onto the gird, even allowing for time shifting to evening peak periods in a cost-effective manner.

4. Reducing Curtailment Risks

Solar-Only Systems: Overproduction during midday can lead to curtailment, wasting potential energy and further stressing the grid's capacity to manage variable supply.

IRESS: By decoupling generation from delivery, these systems ensure stored energy is dispatched only when grid conditions are favourable while meeting demand requirements when needed, reducing curtailment and maximizing energy utilization.

5. Smoothing Power Delivery

Solar-Only Systems: Variability in solar generation caused by weather conditions or time-of-day fluctuations can create instability and stress on the grid.

• IRESS: Batteries smooth out power delivery, ensuring a consistent and reliable supply of energy to the grid, especially during critical mid-merit or peak periods.

Conclusion:

IRESS provide a strategic advantage over solar-only configurations by managing the energy generation and its delivery during vital times when it is needed (peak hours). These systems alleviate stress on transmission infrastructure by avoiding midday grid congestion, aligning energy supply with demand, and reducing the need for costly upgrades. Their ability to store and dispatch energy when it is most needed ensures a more stable and efficient grid, making them a key solution for integrating renewable energy into the existing transmission network.

B. On Question 4 regarding the recommended installation capacity for GEAP 4, our recommendation is to target 500 MWac for each year for 2027, 2028, 2029, and 2030.

C. On Questions 2, 7, 8, and 9, we recommend a GEAR price of Php 9.89 per kWh wherein the Solar-BESS system must run for 15 hours including dispatch hours from 1800H to 2100H. This assumes that the solar hours are available to charge the BESS. This GEAR price is based on representative plant of 100 MWac with a 360 MWp solar and 400 MWh BESS.

D. Specifically addressing Question 8. The **capacity factor** of a renewable energy system is the ratio of the actual energy output over a given period to the maximum possible energy output if the system operated at its full capacity 100% of the time during that period. It is typically expressed as a percentage and calculated as:

Capacity Factor = (Actual Energy Output / Maximum Possible Output) X100

Influence of Storage on Capacity Factor

Without storage, the system might only generate at peak capacity during sunny hours, resulting in a capacity factor of ~16–19%. Adding storage, depending on the size of the solar PV plant and the availability to discharge by transmission capacity constraints, the battery will store a proportion of the curtailed solar, increasing the plant's Capacity Factor.

Different scenarios which can be presented are constrained by a plant capacity of 100MW, while proposing different energy discharge periods, which in effect are setting the Capacity Factor. By changing the Capacity Factor of each scenario, the model is different.

On this basis, the support for Capacity Factor approach to monitoring plant performance is ideal, because it will be in the developers onus and (Intellectual Property) to best optimise the plants operation through their own balance between renewable energy and storage technologies available on the market at each corresponding price point.

This approach will not eliminate curtailment, as the plant's ability to store every single kWh generated will blow out the P/kWh rate; increasing marginal costs. However, with Long Duration Energy Storage (LDES) becoming increasingly competitive, the realization of IRESS providing a "baseload" scenario, offering a Capacity Factor of around 80% is quickly becoming a more realistic and feasible solution.

An alternative and simpler means to conceptualizing Capacity Factor is the % of time dispatching a specific capacity over a 24-hour period. Batteries will suppress the capacity of intermittent solar while also extending the dispatch period of that given capacity.

E.

PSSEA's Technical Working Group has done its best efforts to convene and respond to all DOE comments on the position paper. Given the current holiday season, the team has limited bandwidth and, unfortunately, will not be able to provide further clarifications on a simulation for the other IRESS typologies.

We appreciate your understanding and patience, and we remain committed to addressing any outstanding matters as soon as the team's capacity allows.

Thank you for your continued support.

Respectfully,

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