Hybrid Power Plants

Southeast Asia looks to accelerate its deployment of renewables

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Pieter Hokkeling, Director, Growth & Development, Middle East & Asia, Wärtsilä Energy Business

With nearly 700 million residents, a growing population, and a rapidly improving standard of living, Southeast Asia is a region whose energy needs are growing by the day. By adopting hybrid power plants to meet this growing need instead of inflexible thermal baseload power plants, Southeast Asian countries can make a technological jump that will result in lower power costs, reduced fuel price risk, lower carbon emissions, and greater flexibility.

Hybrid power plants – which are plants with some combination of Internal Combustion Engines (ICEs), energy storage, and renewables – offer numerous advantages over traditional plants that use Combined Cycle Gas Turbines (CCGTs) or coal for baseload.

Economically competitive alternative to traditional baseload

Hybrid power plants can be thought of as a portfolio of assets, such as solar, wind, and engines, that are packaged together to provide an economically competitive alternative to traditional baseload power plants. While this means a higher initial investment cost and oversized capacity installations, the competitiveness of the portfolio comes from displacing fuel usage and variable costs with this capital cost for renewables.

Global trends are showing that renewables provide a lower Levelised Cost of Energy (LCOE) as compared to traditional baseload generation today. The learning curves for solar and wind reflect that the cost of renewables is expected to continue to decline as more capacity is installed. Making use of cheaper renewables in the portfolio reduces the overall cost of generation for the hybrid.

A hybrid power plant enables the use of renewables while still providing baseload capacity that offers security of energy supply when the sun doesn't shine, or the wind doesn't blow because engines are included in the mix.

When comparing traditional baseload, for example, gas or coal power plants, to a hybrid power plant, then the hybrid is displacing fuel usage because you are only dispatching engines to balance renewable generation. Therefore, a portfolio with renewables has a lower cost than a traditional baseload power plant.

In traditional power plants, 70% of costs are fuel and 30% are capital costs. This means 70% of the costs are linked to international fuel prices. When replacing fuel with renewables, this is reversed: 30% fuel and 70% capital costs. You have lower exposure to international fuel cost variation, which reduces risk associated with changing fuel prices.

A hybrid power plant enables countries to become less reliant on importing fuels, resulting in a lower need for foreign currency reserves. In addition, reducing reliance on fuel also protects against price volatility.

Additionally, in a world where financing traditional baseload generation, such as coal, is becoming increasingly challenging, hybrid power plants can meet the lower carbon emissions requirements for lenders and investors while providing the security of firm energy supply.

Unique use of flexibility in the Philippines

Philippines, which can use both engines and energy storage in combination with solar,is an example of hybrid power plants' value to Southeast Asian countries.

On Luzon Island, the power system has been modelled to show that the lowest-cost power system in 2030 can be achieved through the addition of the following capacities: 12,000 MW of wind power, 8,000 MW of solar power, 3,000 MW of flexibility, and 0 MW of new coal or baseload gas.

With more renewables in Luzon Island's power system and the presence of the electricity spot market in the Philippines, the need for flexibility can be fulfilled in various ways through a hybrid power plant.

For instance, with a portfolio of solar, engines, and the spot market, solar generation can meet much of the load during the day. During hours without solar generation, electricity is purchased from the spot market to meet the remaining load. The price risk can be hedged with engines, which are dispatched if the hourly spot price is higher than the marginal cost of the engine power plant. Many such combinations of assets are possible in a system to make the portfolio even more economical. These include, but are not limited to, combining energy storage with engines to further limit spot market exposure, oversizing solar capacity to sell to the spot market, and making use of the ancillary services market to generate additional revenue.

As Southeast Asian countries begin to develop more sophisticated electricity markets, hybrid power plants will further introduce value that is unable to be provided by traditional baseload capacity in energy systems.

Future-proofing energy systems

For energy systems seeking to plan for the future, hybrid power plants offer long-term advantages that traditional plants cannot.

With countries rapidly deploying more renewables in their system, the role of traditional thermal capacity will change dramatically in the coming years. Once renewables are dispatched, the load balancing will be left to thermal capacity. What will be seen is reduced running hours for thermal generation, with multiple starts and stops throughout the day to balance the intermittency of renewables.

By installing a portfolio of renewables and engines today, countries can future-proof their system – this thermal capacity can be used as baseload today, while seamlessly transitioning into peaking capacity as more renewables are deployed.

As Southeast Asian countries look to meet their populations' ever-growing energy needs, they may consider the numerous short- and long-term advantages hybrid power plants offer. In the long run, Southeast Asian countries that choose hybrid plants will be rewarded with lower energy costs, improved stability, and lower carbon emissions, while easily transitioning towards a 100% renewable energy future when the time comes.