Delivering a long-term programme of combustion and efficiency improvements to ensure combustion stability and controlled emissions using local coal

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Abstract AES-VCM Mong Duong II (MDII), built in September 2011, is Vietnam's largest power station and consists of two downshot 677MWe units firing locally-mined anthracite. At the time of construction, it was the biggest private sector power project undertaken in the country.

RJM International is a UK-based global leader in bespoke solutions for combustion optimisation and emission reduction across coal, gas, oil, biomass and other biofuels. RJM was invited by AES MDII to carry out a combustion and performance audit to help the plant operators understand how combustion stability could be improved. The plant was suffering from a high frequency of boiler trips related to slag falls, leading to significant usage of highly polluting stabilisation oil burners and loss of generation.

This commenced with a highly detailed baseline test programme including third party measurement cross-checks against existing instrumentation. Computational fluid dynamics (CFD) models were created to simulate the air supply ductwork to obtain additional data. Since the coal is a locally mined anthracite, it has not been previously studied in literature. Therefore, a highly detailed coal characterisation study was performed in a leading UK university in order to allow it to be accurately simulated.

This dataset was used to create a high-fidelity baseline CFD combustion model, which successfully matched test emissions, observed flame locations as well as the documented slag fall regions. The model revealed combustion issues, which were resolved by using the model to design a bespoke hardware upgrade package specifically tailored for MD2 within CFD. The upgrades were installed within already scheduled outage periods and resulted in marked improvements to loss of generation through boiler trips, as well as improvements to boiler efficiency of up to 3% primarily due to reduction in unburnt losses.

One of the biggest challenges at the plant is the poor coal consistency, made more impactful by the high variability in required load profile. This can make the performance vary over time. Switching to a higher quality imported coal would cause an improvement but would incur additional costs as well as increased emissions from shipping. The need to offset these variations resulted in RJM providing long-term ongoing support to the plant.

The ongoing support involves weekly monitoring of plant performance through a live data link in addition to further operation optimisation as well as tracking coal quality and unburnt losses. Throughout the programme, the unit's mill configuration was optimised providing additional benefits. The furnace was also made further resilient to trips through a refractory upgrade and hopper modifications. In addition, a number of auxiliary works was completed, including erosion mitigation and further combustion improvement through minor hardware changes. Further work targeting a reduction in oil burner flow through flame scanner optimisation is ongoing.