IEA CLEAN COAL CENTRE

EXECUTIVE SUMMARY
DECEMBER 2020

REDUCING MERCURY EMISSIONS FROM THE COAL SECTOR IN INDONESIA

The IEACCC has been awarded a significant US State Department project to evaluate emissions of mercury from the coal sector in Indonesia and to provide capacity building which will enable the development of a cost-effective emission reduction plan for the utility coal fleet. These are the results from Phase 1 of this 3-phase project.

Indonesia is committed to potentially doubling its coal capacity over the next decade to guarantee power to its growing population. At the same time, the country has tightened emission standards and ratified the Minamata Convention on Mercury, pledging to 'control and, where feasible, reduce' emissions of mercury. The IEACCC is working closely with Basel Convention Regional Centre in Asia (BCRC-Asia), the Ministry of Environment and Forestry (MOEF) and the Ministry of Energy and Mineral Resources (MEMR) in Indonesia. The results from this work will be used to inform future policy on mercury reduction strategies in Indonesia and will form the basis of the development of the Indonesian National Action Plan for the coal sector under the Minamata Convention.

POPULATING A DATASET OF THE COAL FLEET

BCRC-Asia provided information to populate a dataset on the Indonesian coal fleet, with over 30 fields for each unit covering information such as plant size, location, configuration, and coal characteristics. Some data could not be obtained due to COVID-19 restrictions and to a portion of the data being proprietary. Missing data fields were filled by using proxy data from similar plants and coals. The completed dataset contains information on over 100 coal-fired units with a combined output of 35 GW.

The coal characteristics of the blends fired provided the base emission factor for each unit. The interactive process optimisation guidance tool (iPOG), produced by Niksa Energy Associates on behalf of the United Nations Environment Programme (UNEP) Coal Partnership, was used to predict the mercury retention factor for each unit. The retention factor provides a quantitative estimate of the effectiveness of mercury capture within the plant, for example in the ash collected from particulate matter controls or gypsum as a by-product of flue gas desulphurisation (FGD). By combining all these data with the coal utilisation rate and energy production for each plant, it was possible to produce a mercury emission intensity value for each unit, measured as grammes of mercury per gigawatt hour (gHg/GWh). The significant conclusions of the analysis were:

- Mercury emission rates do not correlate to plant size;
- Mercury emission rates do not correlate to plant age; and
- Mercury emission intensity (gHg/GW) is important, especially for plants with high utilisation rates and long remaining lifetimes.

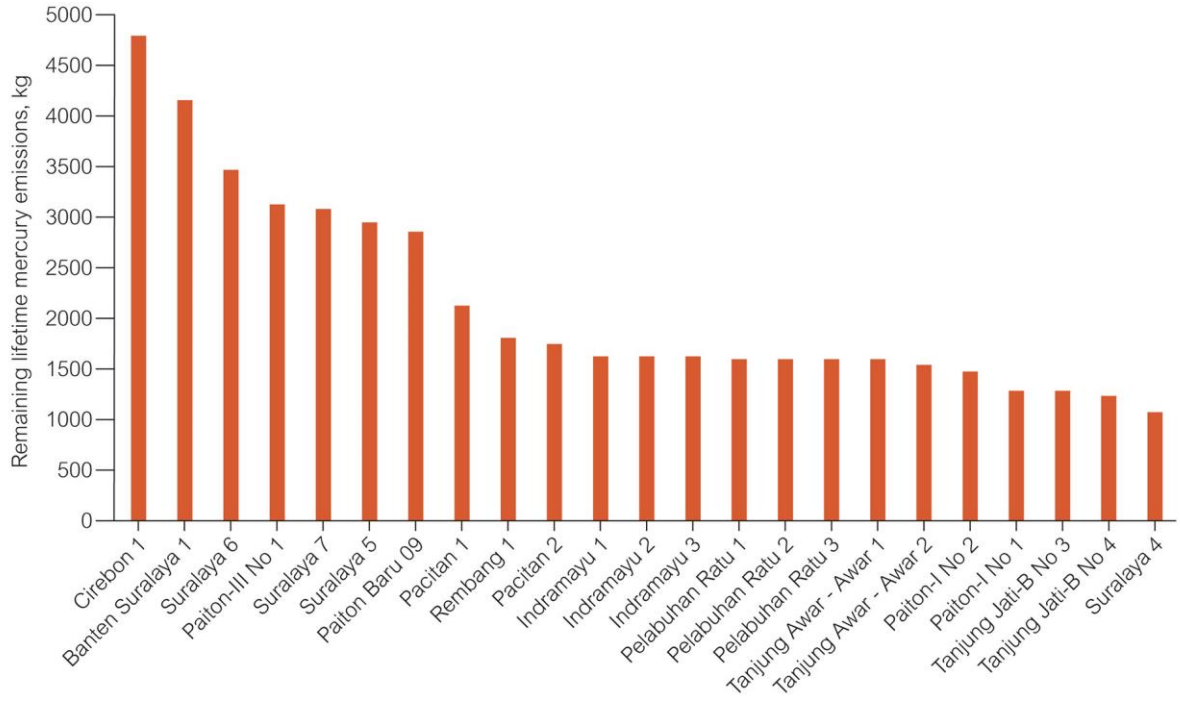
Using the mercury emission intensity values, it was possible to estimate annual mercury emissions from each unit. However, this annual emission rate provides only a snapshot of current emissions. A more useful

value is the amount of mercury that will be released over the remaining unit lifetime (assuming that all plants run until they are 40 years old). This latter value will highlight those plants where mercury reduction strategies will achieve the largest and most cost-effective emission reductions.

The primary aim of the work within this Phase 1 of the project was to evaluate emissions from the coal fleet in order to identify three high-emitting plants. These plants will be studied more closely in Phase 2, with the aim of identifying cost-effective mercury emission reduction strategies specifically suited to Indonesian coal plants.

RANKING THE COAL FLEET

The graph below shows the mercury emissions over the remaining lifetime of units, focusing on those which are predicted to emit the most (ranging from roughly 1– 4.7 t mercury in total). The total emissions from all units (>100 MW) in the Indonesian fleet, over their remaining lifetimes, is estimated to be almost 70 t mercury. There are 10 high emitting plants which, together, over their remaining lifetimes, will contribute over 40% of these emissions. This indicates that a mercury reduction strategy focusing on a few high-emitters would be significantly more cost-effective than a 'blanket' requirement for control technology across the entire fleet.



Coal units with remaining lifetime mercury emissions over 1000 kg

SELECTING PLANTS FOR REDUCTION STRATEGIES

Whilst simply targeting the top three ranking coal-fired power plants could potentially reduce emissions of mercury significantly, this approach would be limited in its overall efficacy – the resulting reduction in emissions would only be achieved on three units out of over 100 in operation. Instead, by considering three top-ranking coal-firing unit 'types', the project has the potential to identify reduction strategies that can be replicated across a significant portion of the Indonesian coal fleet. The coal power plant types selected were:

- a plant nearing the end of life – likely to upgrade and/or retrofit in the near future;
- a plant with seawater FGD – to represent the growth in plants of this type in the region; and
- an inefficient plant with high-intensity emissions, due for imminent refurbishment.

Phase 2 will confirm three named coal-fired power plants and investigate them in more detail.

Thanks to the US State Department for the funding: Agreement Number: SLMAQM19CA238: 'Capacity building in Southeast Asia to reduce mercury and other pollutant emissions from the coal combustion sector'.

This executive summary is based on a detailed study which is available separately from www.iea-coal.org. This is a summary of the report: Reducing mercury emissions from the coal sector in Indonesia by Dr Lesley Sloss, Paul Baruya, Dr Malgorzata Wiatros-Motyka, Toby Lockwood, Dr Wojciech Jozewicz, Roger Brandwood, Ilham Riyadi Muhammad, Anton Purnomo, Erlangga Hassan, 76 pp, December 2020.