

Support for Reduction of Mercury Emission from Coal-fired power plants in Indonesia

Japan Coal Energy Center
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- Established in 1990, with its origin back to 1948
 - Member companies: 170(as of November 2020)
 - Coordinating between the public sector (government) and the private sector in close collaboration with international and domestic partners.
- Covers all coal and energy related issues from upstream to downstream including renewable energy.
- Proposing the coal and energy policies to METI (Ministry of Economy, Trade and Industry of Japan).

CCU/S ,CCT & Renewable Energy



Exploration

Mining &
Preparation



Background 1

- 127 tons of mercury was released to air in Indonesia (2018).
- **21% is coal related source (26.6t-Hg/yr).**

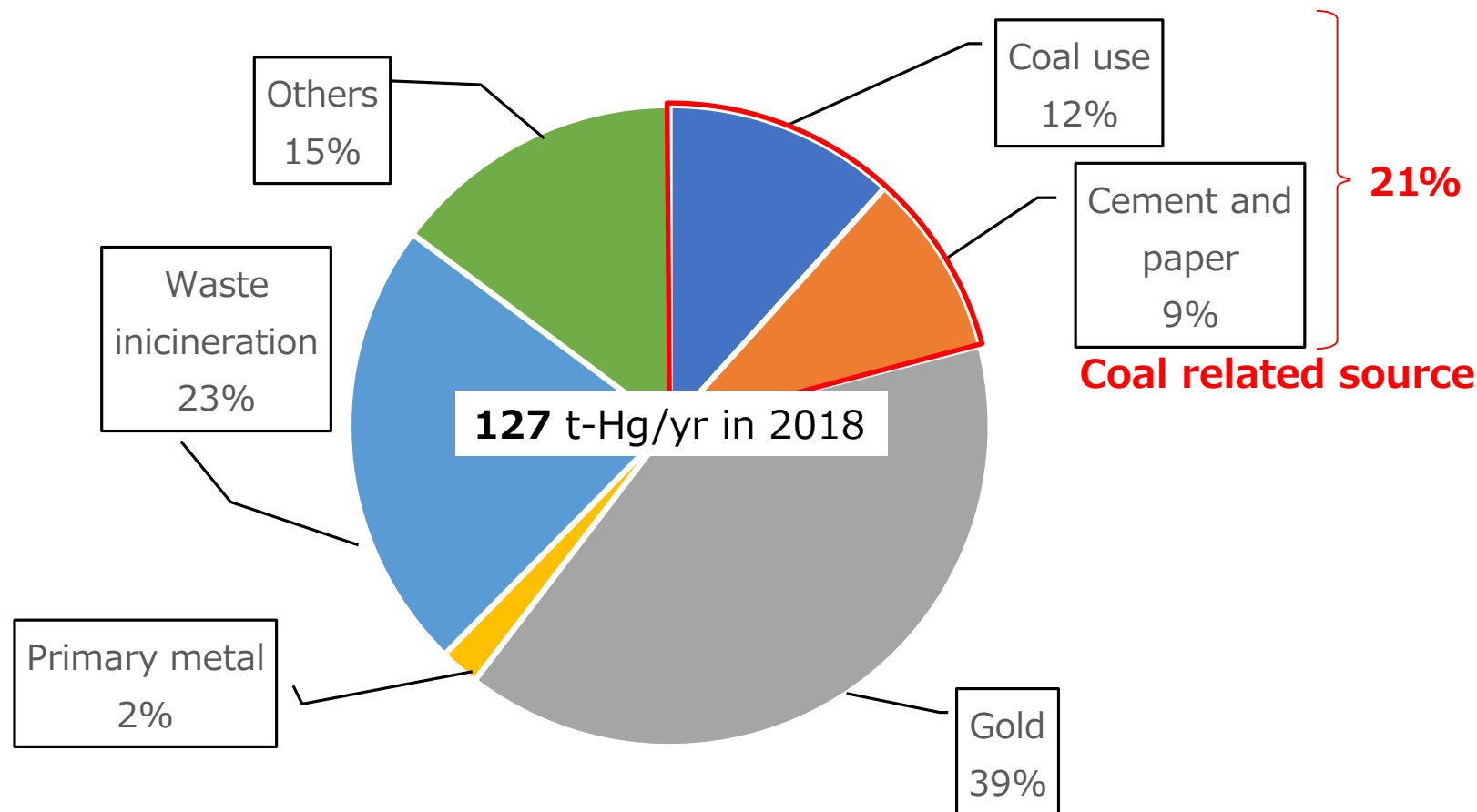


Fig. Estimated mercury release to air in Indonesia of 2018
(Estimated by using UNEP Toolkit Level 1)

SOURCE: Kania Dewi, ITB, Workshop on Effective Mercury Management in relation to Coal (2020)

Background 2

- In spite of COVID-19 restriction, it is estimated that electricity demand will continue to increase and over 60% of electricity will be derived from coal-fired power plant in Indonesia.

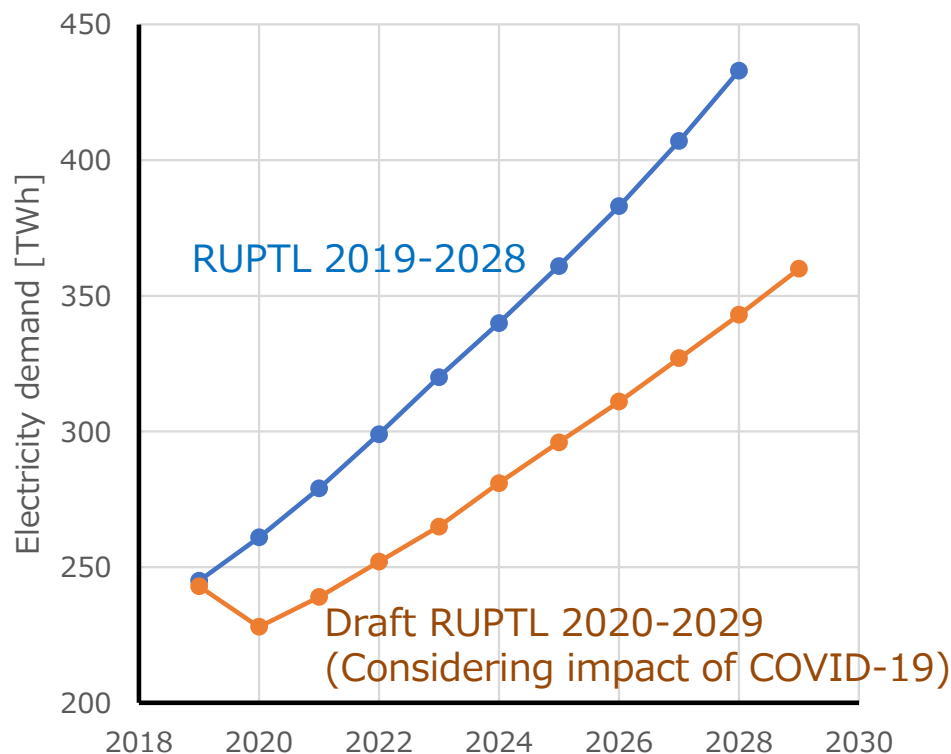


Fig. Electricity demand forecast

SOURCE: PLN, Proyeksi Perencanaan Ketenagalistrikan Melalui RUPTL

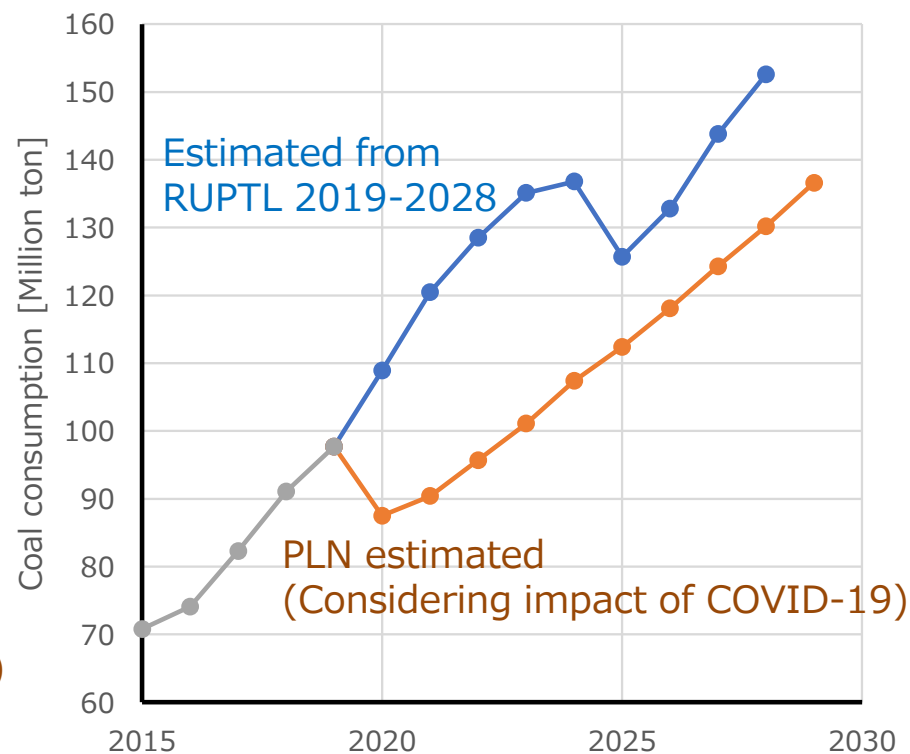
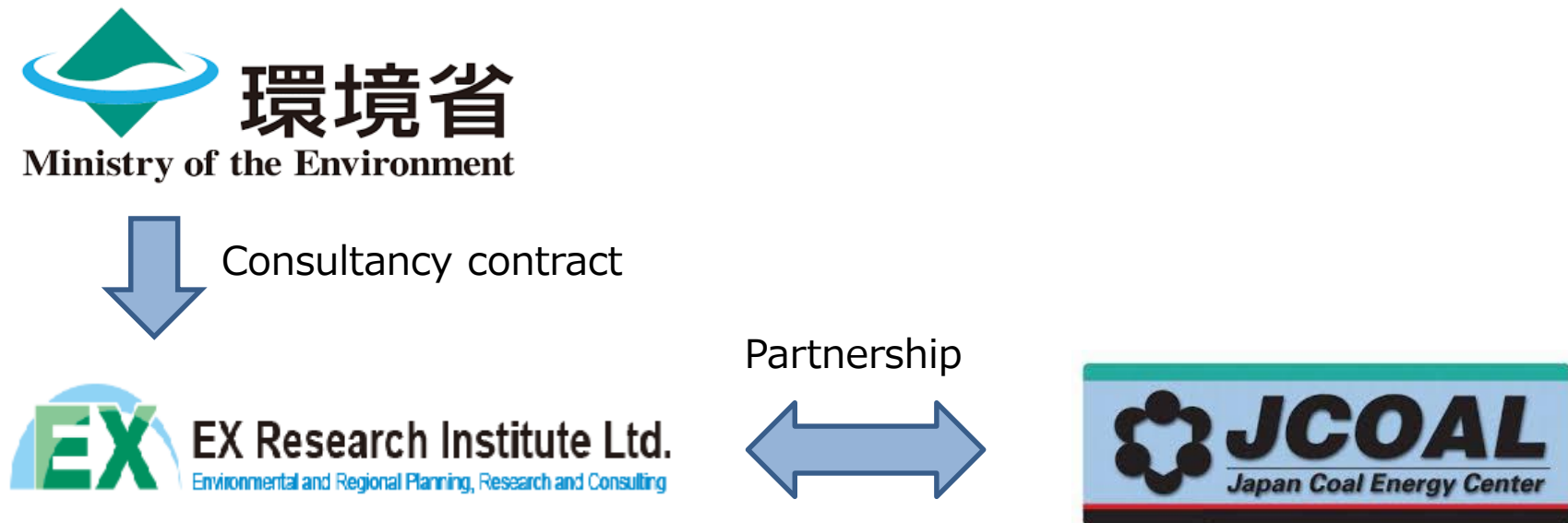


Fig. Coal consumption forecast

SOURCE: PLN, PROYEKSI KEBUTUHAN BATUBARA

Objective

- Ministry of the Environment, Japan (MOEJ) has conducted technical cooperation since 2019 in order to meet targets set by Indonesian NAP on mercury reduction from coal combustion.
- **The purpose of our support activity is to contribute to the NAP of coal sector by introducing Japan's approaches and technologies.**



- The MOEJ study team has conducted cooperation activities since 2019 in a stepwise manner.

1. Survey on situation of coal sector in Indonesia (2019)

- Conducted interviews on the following organizations to have a better understanding of the status and challenges of stakeholders.
 - Government (KLHK, ESDM and Kementerian Perindustrian)
 - Industrial association (APBI and APKI)
 - Individual company (PTBA, Arutmin, PLN and Indonesia Power)
 - Academia (ITB)
 - International organization (BCRC-SEA)
- Analyzed mercury contents of some coals produced in Indonesia and identified applicable emission reduction techniques.

2. Workshop for information exchange (Feb. 2020)

- Reported the outcomes of the above-mentioned survey and shared relevant Japan's experience, techniques and know-how with range of stakeholders in Indonesia.



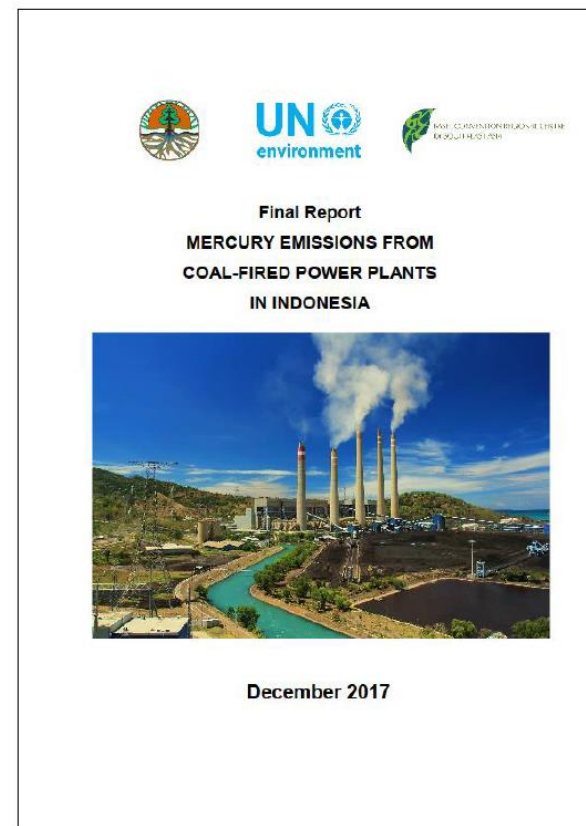
3. Focus-Group Discussion (FGD) targeting on PLN and relevant companies (Dec. 2020)

- Held online information sharing session focusing solely on technical aspects with PLN and relevant companies that will be beneficial for their operation and practice.

- “Regulation of KLHK No. 15/2019 concerning quality standard of thermal power plant emissions” set mercury emission standard from coal-fired power plant. The survey found that the most of coal-fired power plants in Indonesia can meet this standard without additional investments on technologies.
- BCRC-SEA, as a part of UNEP project, measured Hg content of flue gas from Coal-fired power plants in Indonesia in 2017.

Metode	ASTM D6784 / Ontario Hydro		US EPA 29
Parameter	Hg ⁰ (%)	Hg ²⁺ (%)	Hg total (μg/m ³)
PLTU Suralaya	55	45	1.07
PLTU Cirebon	72	28	0.60
PLTU Indramayu	94	6	3.02

Mercury emission standard is **30μg/m³** according to “Regulation of KLHK No. 15/2019”



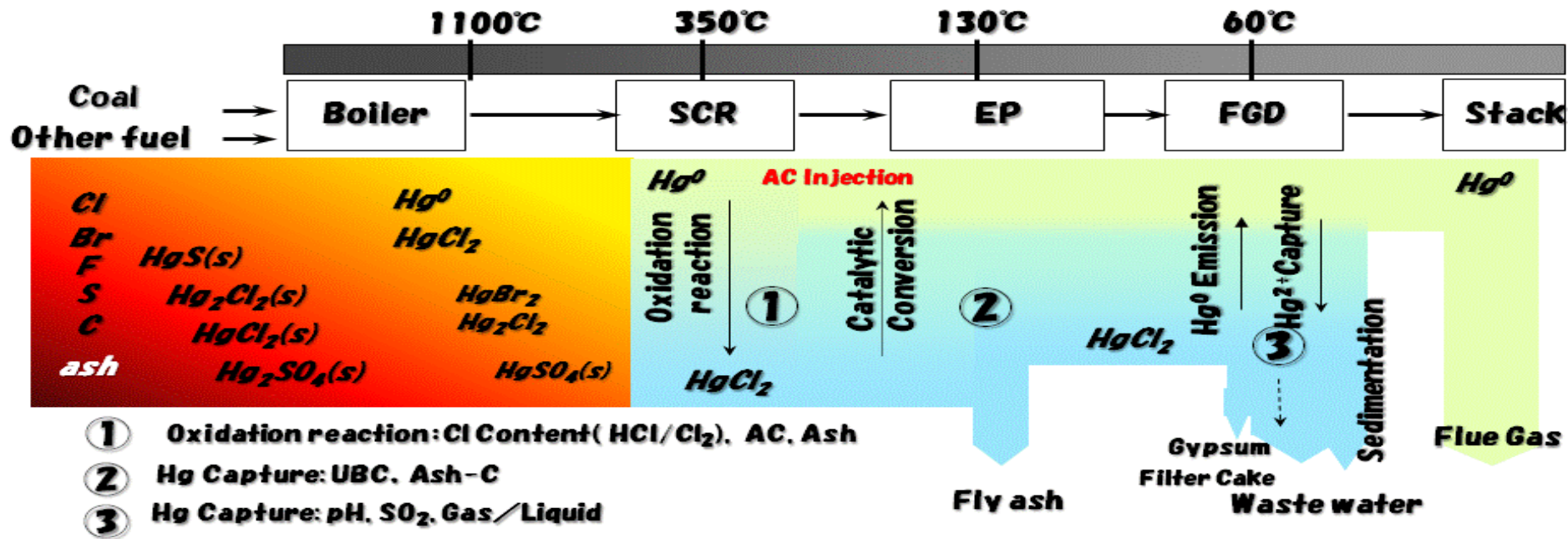
- Clear understanding of input and output of mercury is the first step for efficient emission control at coal-fired power plant.
- In response to “Regulation of KLHK No. 15/2019”, many power plants in Indonesia face challenges;
 - To meet updated (tightened) emission standards on SO₂
 - To install Continuous Emission Monitoring System (CEMS) on mercury
- Indonesia faces a serious problem for utilization/disposal coal ash.

➔The FGD focused on sharing Japan’s know-how or techniques relevant to the following keywords which are important to improve overall operation of coal-fired power plants in Indonesia.

- **Mass-balance analysis**
- **Co-benefit approach (e.g., reduction of mercury and SO₂)**
- **Continuous Emission Monitoring System**
- **Utilization of coal ash**

Mass-balance analysis

- Coal-fired power plants in Japan measured mercury in fuel, ash, flue gas and waste water. This allows the concentration of mercury in the flue gas to be estimated from the properties of the coal.



SOURCE: Moritomi, MEEL, Mechanism of atmospheric mercury emission from coal-fired power plants (effect of Cl, S and etc..) & Experience of emission control and mass balance analysis at coal-fired power plants in Japan

- As mercury is water-soluble in the exhaust gas, the water used in the desulfurization unit can remove mercury from the flue gas.

GORE's technology is a modular type of desulfurization unit. Therefore, the installation of the desulfurization unit can be adapted to the conditions of the power plant. It is also possible to obtain crude sulfuric acid as a by-product.

Mitsubishi Power's technology is an orthodox wet-type desulfurization unit. The technology and performance are guaranteed, and the company has the largest share of the global market for desulfurization unit. In addition, gypsum can be obtained as a by-product.

- The measurement of nine items, including mercury and SO₂ in exhaust gases, is described in “Regulation of KLHK No. 15/2019”.
- **HORIBA**'s technology allows all of these to be measured continuously.

Utilization of Coal Ash

- **“Fukushima Eco-Crete”**, in which JCOAL has a stake, produces crushed stone from coal ash.
- Cumulative production volume as of the end of December 2019 is approximately 135,000 tons.
- Available as construction materials for **reconstruction works after the Fukushima earthquake**.



- In order to contribute to the NAP on coal sector,
 1. Conduct detail feasibility study in cooperation with PLN
 - Cost/benefit
 - Mapping of Hg and SO₂ emission from each power plant and specification
 - Identify available local resource/partner
 - Identify other legal and technical barrier to transfer Japanese technology
 - Consider other necessary measures (training, etc.)
 2. Implement pilot/demonstration project
 - Select a few power plants for pilot project from the following view points
 - ✓ existing or new
 - ✓ type of coal used
 - ✓ emission of other pollutants (e.g., SO_x)
 - Install Japanese technology and monitor Hg and SO₂ emission
 - ✓ evaluate applicability and summarize lesson learned
 3. Consider possible approach to disseminate pilot experience to other plants or other sectors.
 4. More detail survey on flow of coal in Indonesia

Thank you
Terima kasih

- The workshop was held on 12th February 2020 in Jakarta (71 people participated) with aims to;
 - To enhance mutual understanding of efforts made by two countries for the implementation of the Minamata Convention on Mercury.
 - To deepen understating of importance and usefulness of **mass-balance assessment** and **co-benefit approach**.
 - To share Japan's experience, technique or know-how that can be useful for both Government and industry.
 - To discuss applicability of Japan's technique and way to match "**seeds**" and "**needs**".
- ➔ PLN calls for urgent action on SO₂ regulation, and we found that addressing this motivation could lead to reduced mercury emissions from the coal sector due to the co-benefit effect of SO₂ and mercury.

Session	Speakers
Session1: Policy by Government to reduce mercury emission from coal combustion	KLHK, ESDM, MOEJ, Kementerian Perindustrian
Session 2: Mass-Balance Assessment of Mercury	BCRC-SEA, EXRI, MEEL
Session 3: Mercury Management Techniques and Co-benefit Approach	JCOAL, PLN, ITB, Gore, Horiba

Introducing specific technologies

- We held Focus Group Discussion (FGD) with PLN on 22-23rd December 2020 (over 50 people participated) .
 - The FGD sorely focused on co-benefit techniques for the reduction of mercury and SO₂ emission at coal-fired power plant, in particular with a view to respond to Regulation of KLHK No. 15/2019.
 - **The objective of the FGD is to introduce co-benefit approaches including their technical characteristic, advantages, details, etc.**
 - Indonesia participants were limited to PLN affiliated companies (PLN, Indonesia Power, Pembangkitan Jawa Bali)
- ➔ Using coal, facilities, surrounding environment, etc. differ depending on the power plant. So, in order to implement the technology, not only make the technology known to the PLN, but also understand the power plant specifications and customize the technology accordingly.

Session	Speakers
Day 1: Co-benefit approaches for effective reduction of emission of mercury and other pollutant	EXRI, PLN, MEEL, Gore, MHPS(MP), Horiba, JCOAL
Day 2: separate online meeting between PLN with each companies that own the technology	Gore, MHPS(MP), Horiba