ASEAN Energy Awards 2021 & 2023

Best Practices in Coal and Clean Coal Technology

April 2025

ASEAN Energy Awards 2021 & 2023

Best Practices in Coal and Clean Coal Technology

April 2025

Published by:

ASEAN Centre for Energy

Soemantri Brodjonegoro II Building, 6th Fl.
Directorate General of Electricity
Jl. HR. Rasuna Said Block X-2, Kav. 07-08
Jakarta, 12950, Indonesia

Tel. (62-21) 527 9332 | Fax. (62-21) 527 93350
E-mail: secretariat@aseanenergy.org
www.aseanenergy.org

Acknowledgement

ASEAN Energy Awards 2021 & 2023: Best Practices in Coal and Clean Coal Technology was prepared by the ASEAN Centre for Energy (ACE) under the overall guidance and supervision of Dato' Ir. Ts. Razib Dawood, Executive Director of ACE to support the accomplishment of the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II 2021-2025 target to strengthen the collaboration among ASEAN nations in the coal industry, encourage intra-ASEAN coal trade, share best practices widely and boost the adoption of clean coal technology (CCT) across the region to support energy transition and low-carbon economic development. Specifically, this report supports ***Outcome-based Strategy No. 1 in "Promoting the role of CCT and CCUS towards energy transition and low carbon economy",*** and ***Action Plan 1.1 on "Dissemination of CCT best practices through the ASEAN Coal Awards".***

This report is a collaborative effort by ACE and the ASEAN Forum on Coal (AFOC) Council, which together have constituted the Board of Judges, comprised of esteemed representatives from each ASEAN Member State (AMS). We would like to express our gratitude to the APAEC team for their assistance in facilitating communication with the AMS. We would also like to extend our thanks to AFOC for providing their review of the report.

This publication was prepared by Bayu Jamallulael, Zahra Hanifah Budiman, and Lintang Ambar Pramesti with valuable inputs from Shania Esmeralda Manaloe, Suwanto, and Rizky Aditya Putra. The cover layout, content design and media assistance were led by Lintang Ambar Pramesti.

Foreword

I am delighted to present the ASEAN Coal Awards 2021 and 2023 report with heartfelt enthusiasm. The ASEAN Centre for Energy (ACE) is committed to fostering the growth of clean coal technology within the private sector across the ASEAN region. This report is a clear indication of the significant progress we have made in this vital area. As we witness significant shifts in our energy systems, it becomes increasingly imperative to advance clean coal technology. Our shared endeavours are now more important than ever, especially as ASEAN aims to reduce its energy intensity by 32% by 2025 from the 2005 level, noting that we have reached a 24.5% reduction as of 2021.

The ASEAN Coal Awards are more than just a prestigious event; they are a celebration of exceptional efforts that embody our region's strong dedication to sustainable energy practices. This report's goal is to share valuable knowledge, pioneering strategies and motivating success stories that will encourage continued progress in clean coal technology throughout the ASEAN region.

In the face of a dynamic and complex energy landscape, it is inspiring to see the earnest commitment and creativity of individuals, organisations and governments across our Member States. The initiatives and methods detailed in this report represent a wide spectrum of tactics used to improve clean coal technology, mirroring our community's vast range of experiences.

By showcasing the exemplary practices detailed in this report, we aspire to promote the exchange of knowledge, enhance cooperative efforts and support the implementation of groundbreaking solutions. These joint efforts are crucial for achieving the lofty sustainability objectives set forth in the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II: 2021-2025.

Dato' Ir. Ts. Razib Dawood
Executive Director

ASEAN Centre for Energy

List of Winners

Coal Mining 2021

Category: Surface

Coal Mining 2023

Category: Medium

Category: Large

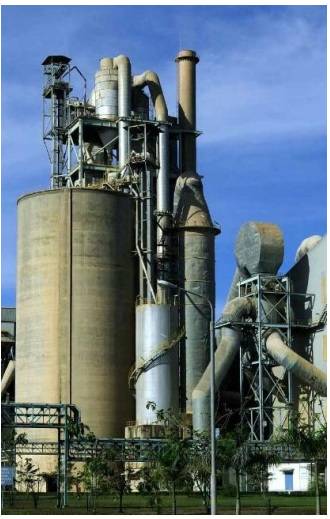
CCT Utilisation for Power Generation 2021

Category: Small

Category: Medium

Category: Large

CCT Utilisation for Industry 2021



Category: Small

Category: Medium

Category: Large

CCT Utilisation for Power Generation 2023

Category: Small

Category: Large

CCT Utilisation for Industry 2023

Category: Medium

Coal Handling and Distribution 2021

Coal Handling and Distribution 2023

Corporate Social Responsibility (CSR) 2021

Corporate Social Responsibility (CSR) 2023

Category: Small

Category: Medium

Category: Large

Special Submission 2021

Special Submission 2023

Abbreviations

A	**ACE**	ASEAN Centre for Energy
	ADB	Adimitra Baratama Nusantara
	adb	air-dried basis
	AEI	Adaro Energy Indonesia
	AFOC	ASEAN Forum on Coal
	AFT	ash fusion temperature
	AGE	Asia Green Energy
	AMD	acid mine drainage
	AMS	ASEAN Member States
	APAEC	ASEAN Plan of Action for Energy Cooperation
	APO	advanced planning and optimisation
	ASEAN	The Association of Southeast Asian Nations
B	**BCM**	bank cubic metre
	BFPT	boiler feed pump turbine
	BIB	Borneo Indobara
C	**CCoW**	coal contract of work
	CCT	clean coal technology
	CCTV	closed circuit television
	CCUS	carbon capture utilisation and storage
	CEDC	Cebu Energy Development Corporation
	CEMS	continuous emission monitoring systems
	CF	capacity factor
	CFB	circulating fluidised bed
	CMMS	computerised maintenance monitoring system
	CO	carbon monoxide
	CO_2	carbon dioxide
	CORS	continuous operating reference stations
	CPBL	coal processing and barge loading
	CSR	corporate social and responsibility
	CSTA	coal supply transportation agreement
	CV	calorific value
D	**daf**	dry ash-free basis
	DEIA	detailed environmental impact assessment
	DMT	direct model transportation
	DOM	detect odour monitoring
	DTR	Duta Tambang Rekayasa
E	**EAF**	equivalent availability factor
	EAM	enterprise asset management
	EGAT	Electricity Generating Authority of Thailand
	EFOR	equivalent force outage rate
	ESP	electrostatic precipitator
F	**FABA**	fly ash and bottom ash
	FGD	flue gas desulphurisation
G	**GAR**	gross as received
	GCG	good corporate governance
	GCP	ground control point
	GHG	greenhouse gas
	GJ	gigajoule
	GNSS	global navigation satellite system
	GPS	global positioning system
	GW	gigawatt
H	**HSE**	Health, Saferty, and Environment
I	**IDR**	Indonesian rupiah
	IPP	independent power producer
	ISO	International Organisation for Standardisation
	ISP	intermediate stockpile
	ITB	Institut Teknologi Bandung
	IUP	Izin Usaha Penambangan
K	**KPC**	Kaltim Prima Coal
	KPI	key performance indicator
	LFA	landscape function analysis
L	**LTI**	lost time injury
M	**MA**	Mitrabara Adiperdana
	MCDA	multi-point combustion diagnostic analysis
	MHU	Multi Harapan Utama
	MJ	megajoule
	MMM	Mae Moh Mine
	MMPP	Mae Moh Mine Power Plant
	MSL	mean sea level
	MW	megawatt
N	**NERC**	North American Electric Reliability
	NOx	nitrogen oxides
	NPHR	net plant heat rate
	NTB	Nusa Tenggara Barat
	NZE	net zero emission
P	**PEDC**	Panay Energy Development Corporation
	PGU	power generation unit
	PLN	Perusahaan Listrik Negara
	PT	Perseroan Terbatas
R	**RCM**	reliability-centered maintenance
	REOC	reliability efficiency optimisation centre
	RFID	radio frequency identification
	RHP	retractable head pulley
	RMS	root mean square
	ROM	run-of-mine
	RTK	real-time kinematic
S	**SAINS**	Syarikat Air Negeri Sembilan
	SCADA	supervisory control and data acquisition
	SCG	Siam Cement Group
	SCGP	Siam Cement Group Packaging
	SDG	sustainable development goals
	SGA	smelter grade alumina
	SIBA	Social Impact Business Alliance
	SJTM	Stesen Janakuasa Tuanku Mukhriz
	SK	Surat Keputusan
	SKIC	Siam Kraft Industry Company
	SME	small and medium enterprises
	SMK	Sekolah Menengah Kejuruan
	SMPC	Semirara Mining and Power Corporation
	SOx	sulphur oxides
	SPAM	Sistem Penyediaan Air Minum
	SPGA	single point gas analyser
	SRF	solid recovered fuel
	SSR	slope stability radar
T	**TAT**	Tourism Authority of Thailand
	TFEC	total final energy consumption
	THB	Thailand baht
	TIA	Tunas Inti Abadi
	TLS	terrestrial laser scanner
	TNB	Tenaga Nasional Berhad
	TOP	Telen Obit Prima
	TPES	total primary energy supply
U	**UAV**	unmanned aerial vehicle
	UIKL	Unit Induk Pembangkitan dan Penyaluran
	UPDK	Unit Pelaksana Pengendalian Pembangkitan
	USC	ultra super critical
	USD	United States dollar
	UST	unit service transformer
	UTG	ultrasonic thickness gauge
W	**WCPD**	wholistic system for coal planning and distribution
	WPC	work planning control

Introduction

The Association of Southeast Asian Nations (ASEAN) faces significant energy challenges due to surging energy demand driven by rapid economic growth, urbanisation and population increase. The 8th ASEAN Energy Outlook (ACE, 2022) projects a 25% increase in total final energy consumption (TFEC), from 432.2 Mtoe in 2022 to 489.9 Mtoe by 2025. By 2050, energy demand is expected to triple from 2022 levels, highlighting the urgent need to make current energy sources cleaner and more sustainable to ensure energy security and meet the escalating demand.

Currently, fossil fuels dominate ASEAN's energy consumption, accounting for an overwhelming 80% of the total primary energy supply (TPES). This heavy reliance on fossil fuels highlights the pressing necessity for a transition towards more sustainable and energy-efficient practices. Recognising the critical role of energy efficiency in meeting energy demands, reducing GHG emissions and enhancing energy resilience, the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II: 2021 – 2025, has set a target to reduce energy intensity by 32% by 2025 compared to 2005 level. However, by 2021, only 24.5% of this target had been achieved, indicating the need for further effort.

Within the APAEC Phase II, the ASEAN Member States (AMS) are planning to promote the roles of clean coal technology (CCT) and carbon capture, utilisation and storage (CCUS) towards energy transition and low-carbon economic development. The capacity of CCT, including supercritical, ultra-supercritical and other advanced technologies, is to reach 56 GW by 2040. To ensure a smooth transition in the coal industry, an analysis is done on the technical and socio-economic impacts of CCT and CCUS on energy security and on the growth of a low-carbon emissions economy.

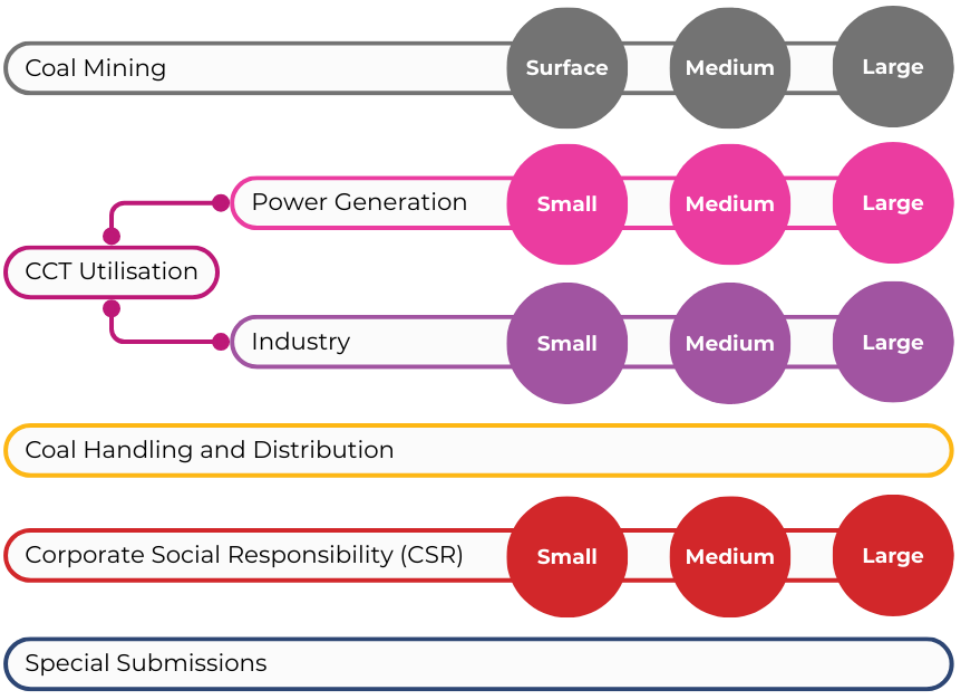
ASEAN's heavy reliance on coal must be the focus of efforts towards low-carbon transition. CCT is one way to maintain carbon neutrality while ensuring affordable, reliable energy security during the transition. It will mitigate the serious environmental impacts of coal while retaining coal as a financially viable necessity to support economic growth and eradicate poverty. CCT enables the use of less coal to produce electricity, thereby reducing GHG emissions. Many AMS are considering both CCT and CCUS technologies to help meet their energy security and carbon neutrality targets.

Several CCT initiatives have been implemented. The ASEAN Forum on Coal (AFOC) is responsible for promoting the development and utilisation of clean coal technologies and facilitating intra-ASEAN coal trade towards enhancing regional energy security and sustainable development. A noteworthy project under their purview is the APAEC, of which one of the outcome-based strategies is to promote the role of CCT and CCUS towards energy transition and low-carbon economic development. ASEAN will continue the dissemination of CCT best practices through the ASEAN Coal Awards on a biannual basis.

The inaugural meeting of the Board of Judges (BOJ) for the ASEAN Coal Awards in conjunction with the 10th Council Meeting of the AFOC was hosted by Indonesia on 8 May 2012. In cooperation with the AFOC Council Members, ACE called upon the BOJ to draft the guidelines, evaluate the submissions and select the award winners.

The awards are divided into several categories, as illustrated in the figures below. The report will follow this same structure. In 2021, a total of 28 submissions were received, with 22 winners and runners-up being awarded at the ASEAN Energy Business Forum 2021. In 2023, there were 27 submissions, and 20 winners and runners-up were awarded at the ASEAN Energy Business Forum 2023.

This report, with its thorough examination of outstanding case studies, strategies and technological advancements, is intended to serve as a guide for ASEAN's coal and clean coal technology sectors. It encourages these industries to adopt proven practices and carve out a trajectory towards enhanced energy efficiency and sustainability.



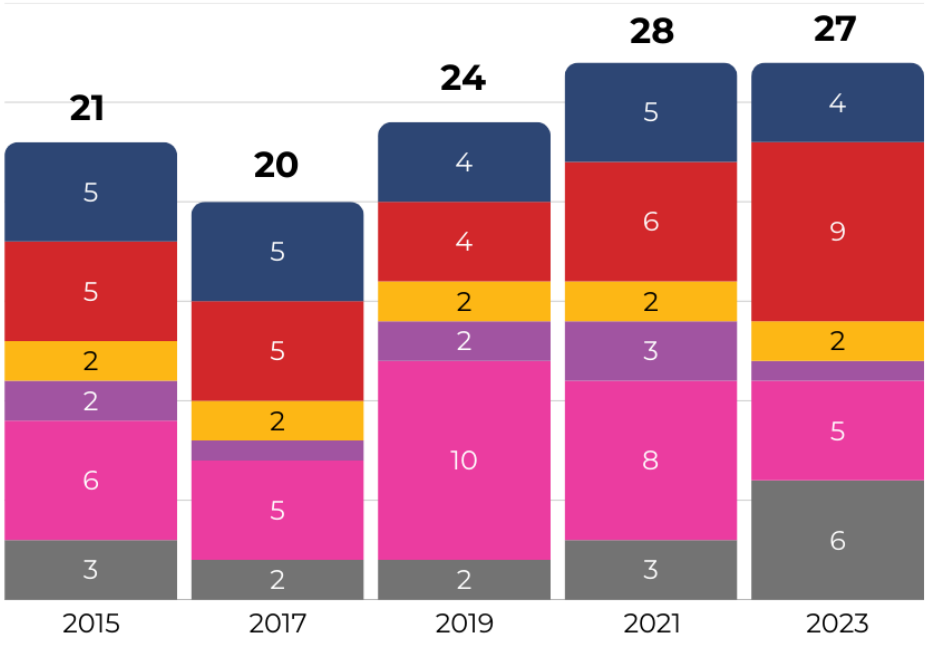


Figure 1. Submission of Entries for the ASEAN Coal Awards 2015-2023

Coal Mining (2021)

Category: Surface Coal Mining

PT Adaro Indonesia

Advancing Growth through Empowerment and Synergy

PT Adaro Indonesia is one of the largest mining companies in Indonesia. *It employs three main mining services contractors responsible for providing equipment, tools, and manpower required in the production area. Adaro has become a significant supplier to the global transoceanic thermal coal market. It produces sub-bituminous coal with medium calorific value from 4,000 kcal/Kg to 5,000 kcal/Kg GAR.*

Adaro's low-rank coal trademark, Envirocoal, has an ash content of 2% - 3% (air-dried basis or “adb”), sulphur 0.10% - 0.25% (adb) and NOx 0.9% - 1.0% (dry, ash-free basis or "daf"). It has been widely used since 1992 in Europe, Asia and America, and has been used domestically for power generation, cement production and industrial use. Each of these sectors apply very strict regulations on environmental emissions. Sometimes Envirocoal is mixed with other coals that have high ash and sulphur content.

Adaro's Envirocoal, a cleaner energy source with low ash, sulphur and nitrogen content, demonstrates the company’s commitment to environmental stewardship and sustainable mining practices, as well as its contribution to a greener future.

PT Kideco Jaya Agung

Kideco Coal Mining on Preserving Natural Sustainability

Established in 1982, PT Kideco Jaya Agung is a coal mining company situated in Paser, East Kalimantan, Indonesia *on a 47,500-hectare concession site with 1.5 billion tonnes of coal resources.*

Kideco uses a haul-back trip mining method to maintain a uniform stripping ratio and efficient waste management and carries out reclamation and revegetation with the aim to preserve natural sustainability and mitigate the impacts of climate change and mining activities.

Kideco has been recognised in the coal industry as one of the best companies in Asia. In the post-mining stage, it strives to create business opportunities for the miners' families. To restore land which has been disturbed by mining operations, Kideco also conducts reclamation activities, specifically revegetation with pioneer and local plants.

Kideco preserves natural sustainability by employing a **haul-back trip mining method** to maintain a uniform stripping

EGAT's Mae Moh Mine

Transformations to Sustainability

Mae Moh Mine (MMM) is one of the largest lignite (open pit) mines in Southeast Asia. *It covers a 28 km^2 area with 827 million tonnes of mineable reserves and 1,188 million tonnes of total coal reserves.*

The primary mission of Mae Moh Mine is to supply in-situ lignite to the nearby Mae Moh Power Plants. It supplies 10% of the Electricity Generating Authority Thailand's (EGAT) fuel.

There are continuous challenges in the deep mining areas as the elevation of the mean sea level seems to be deeper. To continually extend its operations, it uses new and smart technologies such as slope stability radar (SSR), real-time monitoring and warning systems, unmanned aerial vehicles (UAV), supervisory control and data acquisition (SCADA) and closed-circuit television (CCTV) for waster conveyor and pumping systems.

In addition to the mining activities, Mae Moh Mine has contributed to society and community development. It is a well-liked place for visitors, including governmental agencies, educational institutes and other people involved in various mining businesses.

Mae Moh Mine maintains sustainable mining operations by integrating advanced technologies like **SSR, UAVs, SCADA and real-time monitoring systems** to address deep mining challenges.

Coal Mining (2023)

Category: Medium

PT Asmin Bara Bronang

Unlocking and Optimising Growth for Sustainable Performance

PT Asmin Bara Bronang (Asmin) is one of Indonesia's high-calorie coal producers *that has directly provided energy within the country, in ASEAN and globally since 2015. The export destinations in Asia include Japan, China, India, Taiwan and the Philippines.*

Asmin runs its operations with a unique system called the A-Plus Integrated Management System, which is in line with national and international management systems in mining, work safety, environmental management, quality management, laboratories, CSR and good corporate governance.

It has developed a series of employee management systems ranging from recruitment processes to acquiring reliable talent, employee competence development, employee services, employee engagement and company culture development processes. Employees are trained to carry out company operations in various industrial conditions that may affect them.

The company has built an innovation culture based on individual employees, groups, inter-company collaboration, and collaboration with other companies. As its innovation results have successfully overcome several different operational challenges, other companies have adopted some of its strategies.

Asmin achieves sustainable performance through **the A-Plus Integrated Management System, f**ostering innovation, continuous improvement and adaptability to ASEAN and global industrial conditions for energy provision.

***PT Tunas Inti Abadi (TIA)'s open-pit mines are located in Kusan Hulu and Sungai Loban Districts, Tanah Bumbu Regency, South Kalimantan Province, Indonesia**, about 204 km southwest of Banjarmasin. It's total mining concession area is 3,085 hectares, and its coal reserves are estimated to be 52 million tonnes*

Since its first year of operation in 2009, TIA has met its annual coal production, transport (hauling) and shipping target of 53 million tonnes. The total production target for 2023 is 2.4 million tonnes.

The TIA concessions have major syncline structures that extend north-south to northeast-southwest, with the slope of the wing folds ranging from 10° to 60°. In some places they are vertical. TIA operates a haul-back trip mining method to maintain a uniform stripping ratio and waste removal cost.

In the post-mining stage, TIA strives to find measurable ways to assist the communities in the surrounding mining area maintain their standard of living and develop new economic activities.

TIA's responsible mining practices are underscored by the **haul-back trip mining method**, which ensures a uniform stripping ratio, alongside mine planning optimisation and conservation efforts post mining.

Coal Mining (2023)

Category: Large

Established on 16 March 1982, PT Kaltim Prima Coal (KPC) has an area of 61,543 hectares located in the East Kutai Regency, East Kalimantan. *KPC has a production capacity of 70 million tonnes/year with a total estimated coal resource of 5,800 million tonnes and total coal reserves of 1,000 million tonnes*

KPC continues to adapt and change the way it works with digital transformation technology to maintain the company's competitiveness in the global mining industry and develop effective strategies capable of presenting the appropriate technological value.

The use of smartphones as work tools has become a requirement for work processes to be faster, more transparent and more responsive to repairs. The digitisation pilot project has been in operation since 2019. Real-time information can be used to make quick decisions which are expected to increase company productivity.

KPC's commitment to environmental, social and (corporate) governance (ESG) principles **are demonstrated through its digital transformation initiatives**, which include **the use of smartphones for efficient work processes, a digitisation pilot project for real-time decision-making**, and **strategies that enhance technological value**, all contributing to sustainable and competitive mining.

PT Multi Harapan Utama

Towards Sustainability and Resiliency through Good Mining Practices

PT Multi Harapan Utama (MHU) is an open pit coal mine established in 1986, located about 50 km from Samarinda City in East Kalimantan, Indonesia. *It spans an area of 30,409 hectares and produces various coal qualities. The mine employs around 7,800 employees, both local and non-local, and collaborates with several mining contractors.*

In collaboration with numerous stakeholders, one of MHU's post-mining initiatives is the provision of support to the food security programme through plantation and livestock activities. Solar power is used to meet some of the energy needs. There are plans for the construction of several new economic activity centres post-mining,

In terms of work safety, since 21 December 2014, MHU has maintained an outstanding safety record in terms of zero lost time Injuries (LTI) and fatalities over a period equivalent to nearly 114 million working hours. This is one of the highest awards in the field of mining safety presented by Indonesia's Ministry of Energy and Mineral Resources.

MHU is advancing sustainability and resiliency by exceeding compliance standards, fostering local food security, harnessing solar energy, planning new economic centres post-mining, and maintaining an exemplary safety record with zero LTI and fatalities.

EGAT's Mae Moh Mine

Embracing Carbon Neutrality

The operation of Mae Moh Mine complies with laws and occupational health and safety standards *by holding regular safety promotion activities. It has won awards for its environmental control measures. The surrounding communities willingly participate in environmental monitoring.*

The mine is certified as being able to capture carbon dioxide using biomass in accordance with the outcome of the mine rehabilitation work as outlined in the mine closure plan.

Under the 3S (Sources Transformation, Sink Co-creation, and Support Measures Mechanism) policy for Source Transformation and Sink Co-creation, concrete examples include the solar power plant project which will minimise carbon dioxide emissions from the source and increase the use of clean energy in mining activities, and cooperation in the conceptual study of potential carbon storage of Mae Moh Basin. Also, EGAT Mae Moh has the capability to combine solar power with electricity generated from biomass.

Mae Moh Mine is embracing carbon neutrality by implementing a 3S policy, engaging in solar power projects, using biomass for CO_2 capture and fostering community participation in environmental initiatives.

CCT Utilisation – Power Generation (2021)

Category: Small

PT PLN UIKL Sulawesi UPDK Gorontalo

Eco-lifecycle System Uses Renewable Energy and Waste Energy to Maintain Sustainable Operations and Excellent Performance at Anggrek Coal-fired Steam Power Plant

Sulawesi's main generation and distribution unit (UIKL Sulawesi) is one of PLN's (Indonesian state-owned electricity company) units *under the Sulawesi Regional Business Directorate that focuses on electricity generation and distribution.*

PT PLN modified the Anggrek Power coal-fired steam power plant to use circulating fluidised bed (CFB) technology. This power plant plays a crucial role providing electricity to homes and businesses in North Sulawesi.

Anggrek Power Plant consumes low-rank coal from various mines throughout Indonesia. It has taken several steps to improve the heat rate performance, such as making minor modifications to the existing dry coal shelter, using Lamtoro (*Leucaena leucocephala*) trees for co-firing, building a temporary coal shelter to increase the shelf lifetime of drying coal, and using rotary dryer technology developed by PLN itself to reduce surface moisture in the coal.

This condition results in fluctuations in coal consumption and has reduced the net plant heat rate from 4,797 kcal/kWh in January 2020 to 4,438 kcal/kWh at the end of 2020. Within a year of commercial operation, PLN UPDK Gorontalo won an award for best performance.

UIKL Sulawesi has an eco-life system at Anggrek Power Plant which improves heat rate performance through innovative methods like **dry coal shelter modifications, co-firing with Lamtoro trees and rotary dryer technology** to enhance coal efficiency.

CCT Utilisation – Power Generation (2021)

Category: Medium

PT Indonesia Power's Lontar Power Station Operation and Maintenance Unit

Digital Technology for Coal Optimisation
And Performance Excellence

PT. Indonesia Power Lontar Power Station Operation and Maintenance Unit is located in Lontar, Tangerang, Banten, Indonesia. *PT Indonesia Power is trusted with managing and operating the 3 x 315 MW coal-fired subcritical power plant.*

The company has contributed to the national electricity generation system since December 2011 and has and has won numerous awards for its continuous improvements and innovations, such as digital technology for coal optimisation.

Starting its designation as one of the Digital Implementation Pilot Units in the 4.0 industrial era, the management has adopted the latest digital technology for servicing the operation and maintenance works.

This involves engaging in international standardisation (ISO) 50001:2018. In 2019, a 92.94% equivalent availability factor (EAF) was achieved, as well as a 2,688.9 kcal/kWh net heat rate (NPHR). In 2020, energy efficiency programmes successfully saved 2,546 GJ/MWh, and a 3.67% equivalent forced outage rate (EFOR) was achieved, as well as a production cost of USD 4.5 cents per kWh.

They also managed to achieve annual GHG emission reductions of approximately 40 tonnes/GWh CO_2eq.

The Lontar Power Station improved its operations with **advanced digital technology**, achieving ISO 50001:2018 standards. In 2020, it saved 2,546 GJ/MWh in energy and reduced greenhouse gas emissions by 40 tonnes/GWh CO2eq annually.

Panay Energy Development Corporation

PEDC's Boiler Tube Management Programme to Improve Plant Reliability and Availability

Panay Energy Development Corporation (PEPDC) *owns and operates 167.4 MW and 150 MW coal-fired power plants (CFPPs) with CFB boiler technology in Iloilo City.*

PEPDC enhanced its boiler tube operations and maintenance practices in response to the recurring boiler tube leak incidents that the power generation company encountered in 2014 and 2015.

Outages were reduced by 71% in the following two years. Key initiatives in tube life management included calibration and identification of the best opening for the primary air dampers; application of thermal coating; tube mapping to forecast tube life; installation of erosion shields; redesign of furnace nozzles and improvements in vortex finder design to better withstand thermal and mechanical stresses.

PEDC also implemented reliability-centered maintenance to extend the lifespan of critical assets and set up in-house scaffolding services to reduce downtime. It hopes to contribute to the promotion of CCT that not only provide reliable, dependable and cost-efficient baseload capacity but also address the need for low-carbon energy solutions.

PEPDC improved plant reliability and availability through its **Boiler Tube Management Programme** by eliminating boiler tube leaks, reducing outages by 71%, **and implementing key initiatives** such as calibration of air dampers, thermal coating, tube life forecasting and design enhancements to withstand thermal and mechanical stresses.

Cebu Energy Development Corporation and Toledo Power Co.

Preventive Maintenance Interval Optimisation Programme

Cebu Energy Development Corporation (CEDC) and Toledo Power Co. (TPC) are subsidiaries of Global Business Power Corporation (GBP).

Both continuously develop preventive maintenance intervals as a part of the optimisation programme. CEDC owns and operates a 246-MW clean CFPP in Toledo City, whereas TPC owns and operates an 82-MW clean CFPP (TPC1A) that uses CFB boiler technology.

CEDC and TPC1A's key initiatives to enhance operational efficiency and plant reliability include the creation of Technical Services and Maintenance Services Departments. The establishment of CCT-baseload plants provided the island with an ample power supply. They strived to improve its operational efficiency and plant reliability by optimising its operations and management (O&M) practices. This led to improved and more reliable quality service and lower operating costs for plant facilities.

These initiatives allowed CEDC and TPC1A to prolong their annual preventive maintenance when needed, without foregoing plant reliability. This is especially useful when forced outages occur in the Visayas grid, resulting in a change in the planned generation and transmission outage schedule.

CEDC and TPC1A improved efficiency and reliability by creating **Technical and Maintenance Services Departments and optimizing O&M practices**. This enhanced service quality, reduced costs, and extended preventive maintenance intervals without compromising reliability, especially during forced outages in the Visayas grid.

Jimah East Power Sdn. Bhd.

STJM Sharing of Best Practices in Clean Coal Use and Technology Innovations

Jimah East Power Sdn. Bhd, ("JEP"), a subsidiary of Malaysia's power utility company, Tenaga Nasional Berhad ("TNB"), owns and operates a 2 x1,000 MW Ultra Super Critical (USC) CFPP. *JEP is a joint venture between TNB (70%) and 3B Power Sdn. Bhd. (30%), co-owned by Japanese companies, Mitsui & Co. Ltd. and Chugoku Electric Co. Inc.*

Named after the state's ruler, Stesen Janakuasa Tuanku Mukhriz ("SJTM"), the plant aims to supply electricity to TNB. It is among the USC CFPPs in Malaysia that use the latest and state-of-the-art clean coal combustion technology.

As the latest CFPP, SJTM is the most efficient coal-based plant in Malaysia, achieving a high efficiency of almost 40%, surpassing the global standard average of 36% for other thermal conventional plants. Operating at extreme temperatures and pressures above the critical point has improved the boiler combustion process, converting water directly into steam that turns the turbines to generate electricity with significantly reduced emissions and related operational costs.

The deployment of the most modern CCT significantly reduces SO_2 emission levels to 200mg/Nm^3. Before its construction, a thorough environmental impact assessment (EIA) study was carried out to conserve the local flora and fauna. An environmental management plant (EMP) was established to closely monitor and assess the environmental impacts during the operational phase.

SJTM employs **USC technology for coal-based electricity generation**, achieving nearly 40% efficiency, enhancing combustion, reducing emissions and lowering operational costs, while ensuring environmental conservation through **rigorous environmental impact assessment and EMP protocols.**

PT Indonesia Power PLTU Jateng 2 Adipala Operation and Maintenance Services Unit (OMU)

Green and Clean Supercritical Steam Power Plant Uses Low

***PLTU Jateng 2 Adipala Operation and Maintenance Service Unit (OMU) is the first supercritical steam power plant owned by PLN**. It uses low rank coal and has been operating since 13 September 2016 (operation date) with an installed power of 660 MW and a net capability of 615 MW.*

In the transferring of coal from the ship to the boiler furnace, which is about 1,200 metres away, coal dust can pollute the surrounding environment and pose a fire hazard, especially during the summer. Therefore, PLTU Jateng 2 Adipala innovated a dry fogging system. This system has succeeded in reducing coal dust and the risk of hazards. An environmental management programme was also carried out through the installation of paranets and implementation of ne-man-one-tree programmes around the coal ash yards.

The combustion process of low-rank coal also poses a risk to the environment due to flue gas emissions of CO, CO_2, NOx, SOx and coal ash waste. To reduce this risk, PLTU Jateng 2 Adipala OMU carried out innovations and improvements which increased the operational efficiency of the power plant. Now used as a construction material, FABA (fly ash bottom ash) began to be seen as having economic value. The cleaner air around the plant is greatly benefitting the surrounding communities.

PLTU Jateng 2 Adipala's innovations, including a **dry fogging system** and **environmental programmes** like the installation of paranets and the implementation of the one-man-one-tree programme, reduced coal dust and fire hazards. By **enhancing equipment that handles low-ranked coal**, they cut CO, CO_2, NOx, SOx and coal ash waste, increasing operational efficiency. **FABA** is repurposed as a construction material, benefiting the local community.

EGAT's Mae Moh Mine Power Plant

Environmental Innovation for Better Life: EGAT for All

The Electricity Generating Authority of Thailand's (EGAT's) Mae Moh Power Plant (MMPP) is the largest lignite-fired power station in Southeast Asia. *Using domestic lignite, the 2,400-MW power station consists of two main groups, including four 150-MW and six 300-MW generating units.*

In 2018, it used 16 million tonnes of lignite to generate 19,000 GWh of electricity. MMPP strictly applies various international standards to minimise its environmental impacts as much as possible. In 1995, to ease the problem of SO_2 emissions, MMPP implemented a flue gas desulphurisation (FGD) system and built a boiler.

The principle of the FGD system is to treat inlet flue gas which contains high density SO_2 from the combustion process, by using limestone as an absorbent to capture SO_2 and convert it into gypsum via a chemical reaction within the FGD absorber tower.

To ensure the safety of emissions, 16 air quality monitoring stations have been installed since 1992 in different areas around MMPP which instantly transmit environmental information to the Mae Moh air quality monitoring stations network for monitoring the real time air quality in Mae Moh District.

The EGAT GHG Scan system is an online tracking system which shows the results of the main raw materials in production, as well as the by-products from the power generation process. These are used as a reference for the analysis. All of the data will be used to develop and improve the system so as to further reduce CO_2 emissions from CFPP in the future.

EGAT's environmental innovations at Mae Moh Power Plant include the implementation of a **FGD system to reduce SO_2 emissions**, the establishment of **16 air quality monitoring stations for real-time air quality tracking**, and the development of the **EGAT GHG Scan system** for monitoring and reducing CO_2 production.

CCT Utilisation – Industry (2021)

Category: Small

Cosmos Brewery Co. LTd,

Replacing a Fuel Oil Boiler with a Clean Coal Fired Boiler Improves Efficiency and Reduces Fuel Costs

Cosmos Brewery belongs to the Thaibev Group of companies that use fuel-fired boilers *to produce beer, drinking water, soda and other by-products.*

It had been using fuel oil to produce steam. The average thermal energy consumption had been 21 TJ/year. As the cost of fuel oil were rising in line with the increasing oil price per unit, the company decided to replace the use of fuel oil for bituminous CCT. Coal fuels have high thermal energy efficiency and lower environmental impacts.

The boiler's main function is to produce steam pressure to supply 6.5-7 barg to the plants for the production process. The 15,000 kg/hour fire tube boiler has now been replaced with an 8,000 kg/hour combined water tube with a fire tube boiler using CCT. The consumption of coal has dropped from 64 million THB/year to 16 million THB/year. Production efficiency has also improved with the use of less coal.

Cosmos Brewery has also installed a multi-cyclone air treatment unit to reduce dust particles by creating centrifugal force when air is entering the cyclone. The company's commitment to bringing benefits to the community include providing computer training courses for children, providing fresh drinking to youth and releasing a million fish for breeding and harvesting.

Cosmos Brewery improved energy efficiency and reduced fuel costs by **transitioning from a fuel oil boiler to a clean coal-fired boiler**, which reduced thermal energy consumption costs significantly and enhanced production efficiency, while also implementing a **multi-cyclone system** to minimise environmental impacts.

CCT Utilisation – Industry (2021)

Category: Medium

PT Well Harvest Winning Alumina Refinery

Advanced Coal Gasification Process is a Reliable and Sustainable CCT for Mineral Processing

PT. Well Harvest Winning Alumina Refinery (PT WHW-AR) is the first smelter-grade alumina (SGA) producer in Indonesia and the largest in Southeast Asia *with a production capacity of one million tonnes of alumina/year. This capacity will be increased to two million tonnes/year using the Bayer Method. The company installed a CFB Gasifier to improve the coal gasification process.*

PT. WHW-AR's operation is supported by multiple facilities, including a power plant, disposal plant, dedicated port, and coal gas plant. The company implemented coal gasification technology for several reasons. Firstly, it produces coal gas as combustion fuel for the aluminium hydroxide calcination process. Additionally, it integrates high-efficiency combustion with low pollutant emissions, allowing for a cleaner operation. This technology also enables the mixing of low and high-calorie coal to overcome operational problems. Furthermore, it promotes greener operations by enabling the reuse of coal gasification residue in power generation. These features make the technology economically and environmentally advantageous for the company's operations.

PT. WHW-AR provides social and economic opportunities to local communities. It will continuously comply with government regulations and make improvements and/or innovations in operation and maintenance to improve energy savings, clean coal operations and high-quality operations safety.

.

PT. WHW-AR advances CCT by using a **CFB gasifier for coal gasification**, producing low-emission coal gas for alumina production, and enhancing operational efficiency with a mix of coal grades, contributing to sustainable and environmentally- friendly mineral processing.

Siam Kraft Industry Co. Ltd,

Maximise Overall Power Plant Efficiency

Siam Kraft Industry Company Ltd. (SKIC) is a subsidiary of SCG Packaging Public Company Limited (SCGP), *which uses coal to generate steam and electricity for paper packaging production.*

The SKIC – Ratchaburi plant originally had three power boilers (total capacity 370 tonnes/hour) one back-pressure steam turbine and two extraction condensing steam turbines (total capacity 71 MW) which can supply steam and electricity for its internal use.

To maximise the overall power plant efficiency, the engineering team reduced the plants emissions by replacing the manual valves with needle valves. The use of needle valves was seen as the best way to control boiler water blowdown. They resulted in reduced coal usage, reduced heat and boiler water loss and reduced risk of lower stocking coal in the area.

Needle valves also help minimise downtime and save almost USD 1 million in electrical costs each year. Moreover, the high-quality fly ash leftover at the CFB boiler can be used as the main raw material for producing cement brick with the trade name “Problock”.

SKIC supplies electricity for packaging paper production. It optimizes efficiency by **using needle valves to control boiler water blowdown, reducing coal usage, heat, and water loss.** This also minimizes downtime, saving nearly USD 1 million annually in electricity costs. Additionally, **high-quality fly ash from the CFB boiler is recycled into cement bricks called "Problock.".**

CCT Utilisation – Industry (2021)

Category: Large

PT Indocement Tunggal Prakarsa Tbk.

Sustainable Use of Coal for a Better Life by Reducing SOx Emissions from the Power Plant at Tarjun Factory

PT Indocement Tunggal Prakarsa Tbk. (Indocement), is a part of Heidelberg Cement Group, located in South Kalimantan.

It is the second largest cement company in Indonesia, with a total production capacity of 24.9 million tonnes/year within 13 facilities. To promote CCT, the company installed FGD in 2018 at Tarjun Factory's 55-MW CFPP to reduce production costs as well as the SOx emissions and their associated health risks.

Flue gas containing SOx used to be released directly into the atmosphere, but now it is directed to a scrubber system before being released. The reagent gypsum slurry is a by-product of the raw meal and is commonly used as raw material for cement production.

Indocement uses **FGD technology** at its Tarjun Factory to reduce SOx emissions from its 55-MW CFPP, reducing health risks and recycling gypsum slurry which is a crucial material in cement production.

CCT Utilisation – Power Generation (2023)

Category: Small

PT PLN Indonesia's Jeranjang Power Plant

Improving CFB Technology to Increase Reliability and Sustainability While Reducing CFPP Emissions

Jeranjang Power Plant was built in December 2007 on an area of 36 ha in Jeranjang, West Lombok Regency, West Nusa Tenggara Province. *Jeranjang Power Plant, crucial for Lombok Island's electricity, was part of the government's FTP-1 programme.*

Operational since 2012, it is managed by PT PLN Indonesia Power. This CFPP is relatively economical, with production costs of USD 0.080/kWh compared to USD 0.20/kWh at an oil-fired plant.

As Jeranjang is very concerned about environmental issues, it decided to make various improvements and learn about CFB boiler technology. Basically, CFB boiler technology can produce lower exhaust gas emissions (SOx and NOx) because combustion in the furnace operates at a temperature range of 850°C and uses limestone injection as an effective SOx and NOx binder. These exhaust gas emissions are monitored continuously through a Continuous Emission Monitoring System (CEMS) device.

The Jeranjang Power Plant has enhanced its **CFB boiler technology** for increased reliability and sustainability. It operates at 850°C and uses limestone as an effective SOx and NOx binder, reducing emissions and helping the company adhere to environmental goals.

Jimah East Power Plant Stesen Janakuasa Tuanku Muhriz (SJTM)

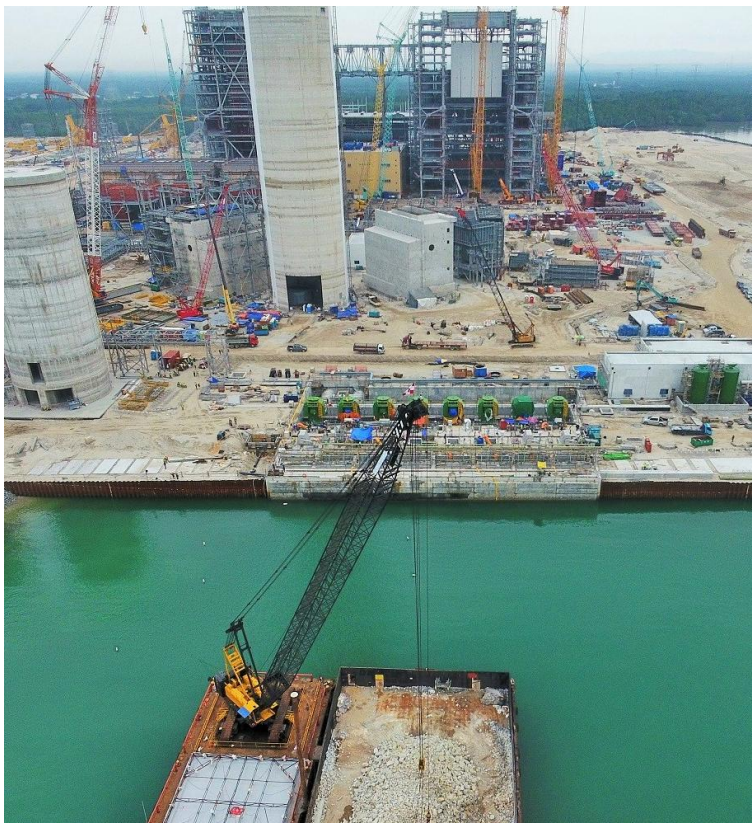
Role of SJTM in Advancing Energy Transition and Sustainability through Enhanced Creativity and Collaboration

SJTM has the highest efficiency of any CFPP, at nearly 40 to 42%, compared with the average efficiency of 36% for conventional thermal plants worldwide.

The combustion process in boilers has been enhanced by operating at temperatures and pressures above the critical point, allowing for direct water-to-steam conversion, which then drives the turbines to produce electricity with drastically reduced emissions and operational costs. With the use of cutting-edge CCT, the plant's SO_2 emissions have been cut to 200 mg/Nm^3, which is well below the standard set by the World Bank and Malaysian Department of Environment (DOE).

A detailed environmental impact assessment (DEIA) study was carried out prior to the power plant's construction phase to protect flora, particularly the mangroves and other local wildlife. The EMP was established to keep a close ey e on and evaluate environmental impacts during the operational phase.

SJTM is using **CCT** to boost energy transition and sustainability by achieving a plant efficiency of 40-42%. With **supercritical temperatures and pressures for efficient water-to-steam conversion,** SO_2 emissions are down to 200 mg/Nm.



PT PLN Indonesia Power's Suralaya

Suralaya's 39-Year Existence: Ensuring Reliability and Sustainability

Suralaya Power Generating Unit (PGU) is located in Suralaya (100 KM from Jakarta), Banten Province, Indonesia. *It is one of the largest and oldest pulverised CFPPs in Southeast Asia with a total installed capacity of 3,440 MW.*

Suralaya PGU has implemented various innovation and improvement programmes, such as uprating of Units 1 and 2 from 400 MW to 420 MW, modification of the Coal Feeder Kopling Encoder, re-engineering of the Gland Washer and Gland Follower of PCV reheat spray, construction of coal storage cover, modification of the low-profile grinding element and the rotary throat ring on the pulveriser, and modification of the insulation material for the HP Heater.

The plant also runs management of operation and maintenance programmes such as Reliability Centered Maintenance, Predictive Maintenance and Life Cycle Management which involves replacement of Generator Transformer (GT) and Unit Service Transformer (UST), rewinding of the Stator Generator, partial re-blading of the LP Turbine, and retubing of the Tube Boiler). Other steps include the Reliability Efficiency Optimization Center (REOC), change in the cold start operation pattern of Units 5, 6 and 7 and changing the boiler feed pump turbine (BFPT) operation pattern.

To maintain sustainability, Suralaya PGU has implemented several initiatives such as 3% co-firing biomass, planting energy forests equivalent to the amount of biomass used, establishing a solid rf (SRF) plant at the Bagendung Cilegon disposal site to address the waste management issues in the city of Cilegon, installing solar panels with a capacity of 1,243 kWp, and implementing various CSR programmes.

Suralaya Power Generating Unit (PGU) prioritises reliability and sustainability by **upgrading infrastructure, optimising maintenance strategies and implementing advanced management programme**s. It also promotes sustainability **through co-firing biomass, planting energy forests, solid recovered fuel plant, solar panels**, and CSR initiatives.

.

PT PLN UP Paiton Unit 9

CCT Using Combination Tuning for Less Polluting Power

The implementation of the A-BOOT programme at Paiton 9 Power Plant, which had been in operation for over ten years, greatly improved its efficiency within only eight weeks.

The coal flow was previously 385 tonnes/hour but fell to 376 tonnes/hour, leading to savings of USD 3,167,240 per year.

The efficiency of boilers is influenced by several factors, including changes in coal and imperfect combustion processes that result in slagging and fouling inside the boiler tubes. The build-up in the boiler tubes results in the heat transfer not being maximised. A combination (comb) tuning programme that uses A-BOOT is needed to prevent the build-up.

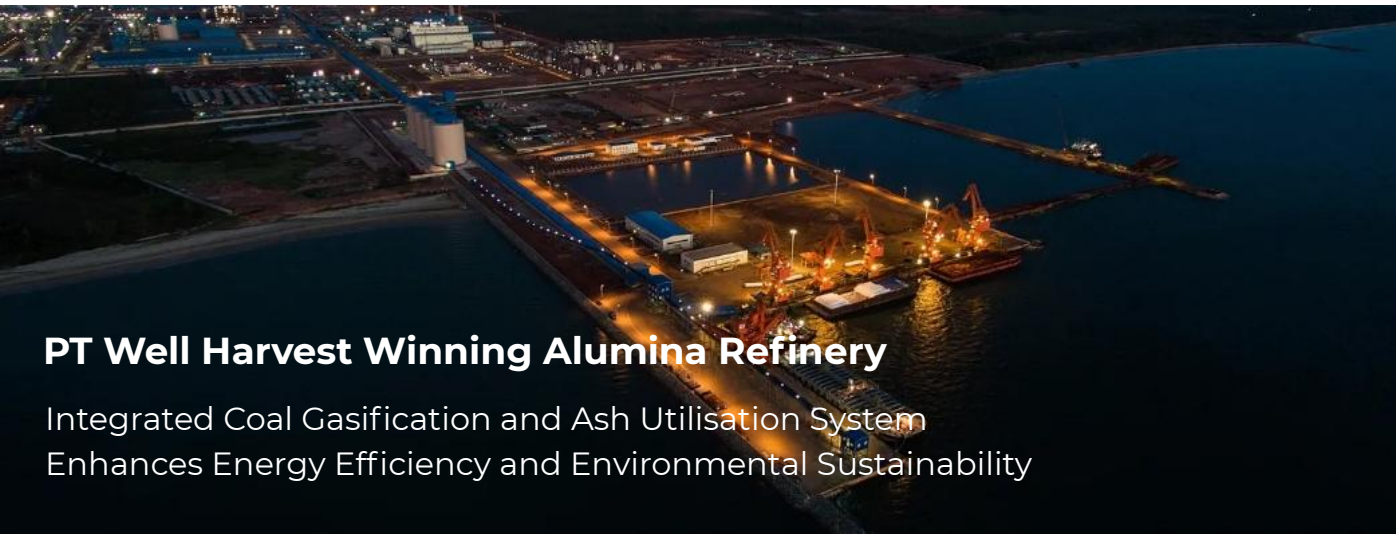
A-BOOT is a strategic programme designed by PT PLN Nusantara Power to increase the efficiency of power plant boilers and thereby reduce production costs and provide reliable, efficient, cheap and environmentally friendly electricity for the community in line with government policy through the regulations of the Ministry of Finance and Ministry of Energy and Mineral Resources.

A-BOOT is a multi-channel combustion tuning consisting of air flow measurement, coal sizer, coal flow, single point gas analyser (SPGA), and multi-point combustion diagnostic analysis (MCDA). In addition to carrying out the above measurement, A-BOOT modelling is also carried out, namely the analysis and modelling stages to determine the suitability of the operating parameters, how to operate, and compare current conditions with commissioning conditions.

Paiton 9 Power Plant addressed the boiler efficiency problem with **a comb (combination) tuning programme using A-BOOT** which is a strategic programme by PT PLN Nusantara Power that includes **multi-channel combustion tuning and modelling**. After eight weeks of implementation, generator efficiency improved, reducing coal consumption from 385 to 376 tons/hour, saving USD 3,167,240 per year.

CCT Utilisation – Industry (2023)

Category: Medium



PT Well Harvest Winning Alumina Refinery

Integrated Coal Gasification and Ash Utilisation System Enhances Energy Efficiency and Environmental Sustainability

Located in Ketapang Regency, West Kalimantan Province, Indonesia, PT Well Harvest Winning Alumina Refinery (PT WHW–AR) is the first and largest producer of smelter grade alumina (SGA) in Southeast Asia.

The large amount of residue from coal gasification plants that produce SGA is a problem for the environment if not managed properly. The fly ash utilisation programme at the power plant has been implemented since 2019. To increase the percentage of fly ash utilisation to 100%, PT WHW-AR built an ash conveying system project.

From 2019 to March 2023, that programme and project succeeded in reducing energy consumption to produce steam from 2.90 to 2.64 GJ per tonne of steam which was then followed by a decrease in coal consumption from 94.98 to 81.39 kgbm (kilogram bank cubic meter) per tonne of steam.

This decrease in coal consumption had a positive impact, namely reducing coal and fly ash CO_2 emissions from 0.2688 to 0.2448 tonnes per tonne of steam and increasing cost savings by up to USD 8 million in 2022. In addition, the percentage of residue (fly and bottom ash) sent to disposal also decreased from 69.88% to only 7.02% because 100% of the fly ash had been successfully utilised.

PT WHW-AR improves energy efficiency and environmental sustainability by **integrating coal gasification with an advanced ash utilisation system**. This reduces coal consumption, energy costs and CO_2 emissions. At the same time the amount of fly ash residue was greatly diminished.

Coal Handling and Distribution (2021)

SCG Packaging Public Company Limited

Wholistic System for Coal Planning and Distribution (WPCD)

Siam SCG Packaging PCL is an ASEAN-leading company in the packaging solution business and has been providing goods and services since 1965. The company has several manufacturing plants located all over Thailand and other ASEAN countries.

Each manufacturing site is situated with a heat and power production plant with several coal-fired boilers for internal energy usage. In order to improve the quality of life around the associated areas, the Wholistic System for Coal Planning and Distribution (WCPD) was designed to reduce adverse impacts on the environment caused by coal storage or transport.

SCG Packaging is facing a challenge with respect to coal management costs due to the reliance on individual site manager experiences. Thus, the innovation of the WCPD, comprising the Advanced Planning and Optimisation Model (APO) and Direct Mode Transportation (DMT), was created to address the issues. It was designed to optimise and standardise coal storage, logistics and distribution management for all SCG Packaging subsidiaries in Thailand. The APO can maximise overall DMT incorporated with each manufacturing site's constraints, and the maximum DMT can reduce additional costs in transportation as well as storage costs and reduce potential dust and emissions.

In terms of corporate social responsibility, SCGP organises sports activities for the community as well as community area cleaning activities. It also makes donations of Problock (bricks made from power plants' fly ash) and runs a scholarship programme.

Siam SCG Packaging PCL uses the **WCPD** to optimise coal storage, logistics and distribution across ASEAN manufacturing sites. This system, including **the Advanced Planning and Optimisation Model and Direct Mode Transportation**, reduces environmental impacts, reduces costs and minimises emissions, improving local communities' quality of life.

PT Borneo Indobara

PT BIB Keep Operations Efficient, Productive and Innovative Operations during the COVID-19 Pandemic through Reimagining Relevance in All Aspects

With 24,100 hectares of working area, PT BIB's mine concession is located in Tanah Bumbu Regency, 180 km from the capital city of Banjarmasin, South Kalimantan Province, Indonesia.

To sustain profit margins amid declining coal prices caused by slow global economic growth during the COVID-19 pandemic, PT BIB implemented continuous improvements to enhance operational efficiency. The company focused on cost reduction by producing low-rank calorific value coal and upgrading the coal handling facility. Operations were centralized using a new SCADA system, and generator sets were replaced. The hauling road surface was paved, and small shovel trucks were replaced with larger ones.

Additionally, small dump trucks were upgraded to single and double trailers, and barge loading facilities were enhanced. The coal loading port was dredged, and trans-shipments were developed. PT BIB maintained coal quality and reduced fly-ash, completed the installation of a truck loading system, relocated a unit crushing plant, improved the fleet management system, and initiated truck payload measurement.

These measures helped PT BIB maintain efficiency and manage costs effectively during challenging times. PT BIB manages its CSR activities on the basis of being environment-friendly and though community empowerment. On a day-to-day basis, there are a total of eight CSR pillars that are aligned and integrated with the local government's strategic plans and are executed in collaboration with the local government, companies and communities.

PT BIB has been enhancing its operations through continuous improvements to maintain its efficiency by **upgrading facilities, centralising systems with SCADA, optimising transportation and improving coal quality management.**

Coal Handling and Distribution (2023)

Operational control at PT Adaro Indonesia is applied comprehensively all the way from coal handling to distribution.

The chip sealing of the 90-km hauling road has reduced road construction time by nine days compared to the use of hot mix. GPS and RFID have been installed in coal trailers for real-time and optimum monitoring, generating a 3% increase in coal hauling speed, a 128.3% decrease in weighing time and a 3.4% reduction in cycle time.

At coal processing and barge loading (CPBL) facilities, Adaro has SCADA technology and a condition-based monitoring system to prevent components' damage and detect potential breakdowns, which contributed to the 98.41% plant availability of CPBL. Another notable innovation is installing rubber curtains and microwave sensors to handle coal spillage. With this system, the coal spilt at the chute will fall into the coal trap (monitored online) so that the spilt coal will not be wasted.

royalty to the government. From CPBL, coal is barged along the Barito River, where Adaro puts signs separating anchor and floating points before the loading process takes place at the jetty and uses GPS to navigate the barges to prevent collisions

Adaro Indonesia uses advanced technologies like **GPS and RFID for real-time coal transportation monitoring, SCADA systems for operational control,** and **innovative spillage management** with **rubber curtains and sensors** to enhance productivity, reduce waste and increase coal value.

PT Bukit Asam

Mining System and Information of Bukit Asam (MISTER BA) – Driving a Sustainable Low-Carbon Transformation through Mining Digitalisation

PT Bukit Asam Tbk (PTBA) is a state-owned enterprise (BUMN) in the coal mining industry in Tanjung Enim, Muara Enim Regency, South Sumatra Province, Indonesia.

One of the innovations is digitalisation in the entire monitoring and control process from the pit to the port through the MISTER BA (Bukit Asam Mining System and Information) application.

MISTER BA is a web-based mobile application developed independently by the company. This app can input, monitor and report all production data, such as production realisation, operating hours, fuel consumption, production equipment performance, operating constraints, safety features and other data.

Data in MISTER BA can be analysed and presented in real time in one practical dashboard. This application can directly optimise the process of monitoring, evaluating, and making decisions by integrating and controlling all coal handling and distribution of operational data, which impacts cost efficiency compared to previous business processes.

This application can reduce energy consumption by 87,691 GJ and reduce fuel consumption by 2,266,738 litres. It has an impact on reducing GHG emissions by 6,071.31 TCO_2e and can reduce company costs b up to USD 10,908,681.

PTBA's MISTER BA is a web-based mobile application that integrates the entire monitoring and control process from the pit to the port, aiming to drive sustainable low-carbon transformation through mining digitalisation, and resulting in significant cost savings.

Corporate Social Responsibility (2021)

Mae Moh Mine (MMM) influence extends beyond energy production, with significant regional contributions that include a robust volunteer programme. *This initiative sees EGAT employees actively participating in community events and providing expert assistance to local residents.*

The company's commitment to social welfare is further demonstrated through its Organic Agriculture Promotion Programme, which supports local farmers by introducing sustainable practices such as using natural weeds as fertilisers and producing effective microorganism (EM) Balls to enhance soil quality. Health and well-being are also a priority, with EGAT operating mobile medical units and establishing a Health Surveillance Fund to support community health.

During the challenging times of the COVID-19 pandemic, EGAT's response was swift and compassionate, providing essential supplies to those affected. In parallel, the mine's reclamation projects have been pivotal in reducing GHG emissions, while also fostering community engagement through regular meetings. The reclaimed areas have been repurposed into a tourist destination and a centre for learning, highlighted by the establishment of the Lignite Mine Study Centre Museum in 2007. These areas now offer recreational facilities like a slider field, botanical garden and golf course, allowing visitors to appreciate the lush green surroundings.

EGAT's efforts also reach cultural preservation and development. The organisation contributes to the upkeep of the Doi Pha Toop painted cliff and Chank Puank Cave and supports the local tradition of the Chao Pho Pratu Pha Worship Ceremony. Looking to the future, EGAT is conducting feasibility studies for post-mining land use and exploring pilot projects for solar and biomass energy, aiming to transition Mae Moh into a smart city that harmonises its rich history with innovative energy solutions and community-focused development. The annual Mae Moh Festival, hosted in the reclaimed EGAT area, embodies this spirit of sustainable progress and community harmony.

EGAT's CSR efforts at MMM include **community engagement** through **volunteerism and agricultural support, healthcare initiatives, environmental reclamation for green tourism, cultural preservation** and **sustainable energy projects** to foster a smart city transition.

PT Bukit Asam

Creating Sustainable Shared Values for a Better Future

PTBA's approach to community development and empowerment is multifaceted. *It initiated the Bukit Asam Industrial Centre Development in 2013, aiming to develop local business potential and encourage the creation of a supply chain for PTBA's goods and services.*

This programme is complemented by the establishment of small and medium enterprise (SME) partnership programmes, health promotion activities including free healthcare and cataract surgeries, nutritional support for infants and pregnant women, and the One Family One Bachelor's programme, which provides educational opportunities to underprivileged families.

In addition, the Social Impact Business Alliance (SIBA) conducts social mapping of 25 nearby villages in Tanjung Enim to support PTBA's operations and meet community needs. PTBA also prioritises local hiring, with 68% of employees coming from the local area, demonstrating its commitment to providing job opportunities to residents.

Environmental conservation is another key aspect of PTBA's CSR activities, with initiatives such as acid mine drainage (AMD) recycling and the establishment of a plant nursery centre. Post-mining activities are also a focus, with the development of utilisation blocks, protection and plant cultivation blocks, civil work provision and the creation of a reception zone featuring a mining museum, all aimed at preserving the region's heritage and promoting sustainable practices.

PT Bukit Asam Tbk (PTBA) creates sustainable shared values for a better future by **fostering local business development through the SIBA initiative, supporting community health and education, prioritising local employment** and **implementing environmental conservation measures**.

Corporate Social Responsibility (2023)

Category: Small

Cosmos Brewery (Thailand) Co., Ltd

Cosmos Contributes to the Social Development of Our Community

***Cosmos Brewery (Thailand) Co., Ltd, an affiliate of ThaiBev, is a beverage manufacturer that has made a significant investment of USD 25.50 million in social development initiatives**. These initiatives have been instrumental in enhancing the community's quality of life, contributing more than USD 65,000 annually.*

The company's commitment to community development is evident through a variety of programmes. It has implemented computer literacy programmes for children, ensured access to clean drinking water and supported local food production by releasing fish into water bodies. Additionally, Cosmos Brewery upholds cultural traditions by backing local events and providing practical skills training to community members.

In terms of environmental stewardship, the company has undertaken vetiver grass cultivation and tree planting, with a remarkable 56,750 new plants added for conservation purposes and educational outreach. These efforts are complemented by the promotion of biological agricultural practices and the development of effective microorganism (EM) Balls within school communities.

Cosmos Brewery also focuses on energy and waste management, aiming to reduce its carbon footprint by minimising GHG emissions, CO_2 release, coal combustion, and electricity consumption. A meticulous water measurement system is in place to ensure the surrounding water quality remains pristine.

Prioritising public health, the company enforces strict regulations, collaborates with Nopparat Rajathanee Hospital, and supports the Chang Clinic Project. These comprehensive initiatives reflect Cosmos Brewery's dedication to fostering a holistic approach to community development, which encompasses education, environmental conservation, sustainable practices and healthcare.

Cosmos Brewery contributes to community development by **implementing educational and environmental initiatives**, such as computer training for children and tree planting, alongside health programmes that include partnerships with hospitals and support for local food production.

PT Duta Tambang Rekayasa

Opening the Golden Portal in Sei Menggaris Sub-District, Nunukan Regency, North Kalimantan Province, Indonesia

PT Duta Tambang Rekayasa (DTR) tries to engage the power of a penta helix, including government, community, private sectors, media and especially the academics *from ITB, focusing on developing new areas through increasing human resource capacity, providing basic needs infrastructure in harmony with environmental preservation, and jointly designing new economic initiatives.*

The "Golden Portal" program aims to develop innovation and technology for the economic growth of border communities. It focuses on three main areas: human resources development, community clean water management, and tourism development.

The first is the establishment of Sekolah Menengah Kejuruan, a vocational middle-grade school, which has educated 1,870 students and is the only school in the sub-district.

The second program provides clean water to improve community sanitation and health through community clean water management (SPAM). PT DTR is helping the community rebuild SPAM infrastructure, providing technical assistance and environmental conservation.

The third program encourages new economic opportunities from tourism through branding design and transferring bridges and roads to the local population. The infrastructure provision is carried out in line with the post-mining plan document, with a 60-meter bridge and 9.3-km road providing access to black water river ecotourism.

PT DTR's "Pintu Emas" initiative, a penta- helix approach, focuses on three major programmes: human resource development through strategic educational partnerships, improving community health and sanitation through clean water infrastructure, and creating new economic opportunities in tourism through essential infrastructure like bridges and roads.

Corporate Social Responsibility (2023)

Category: Medium

PT Mitrabara Adiperdana (MA) is a coal mining company located in the Malinau Region of North Kalimantan Province, Indonesia. *MA has been producing coal since 2008 and is one of the largest coal mining companies in Malinau.*

MA launched the "MAssive Recovery, Movement Towards Sustainability" campaign in an attempt to recover from the COVID-19 pandemic. Another programme, the Post-Mining Project focuses on the sustainability of the company's activities when it no longer conducts coal mining.

One such activity is integrated farming of livestock, fisheries and agriculture. One offshoot is the Indigofera plantation for natural dye pasta production, in collaboration with Bluesville (a fashion startup) and vegan leather production utilising coffee husk waste, taking raw materials from the community, and collaborating with the Bell Society (a fashion startup) for the international market.

In addition, to contribute to the company's efforts to achieve SDG Goal 7, MA began to use the void area to install floating solar panels to generate electricity for office activities.

MA's "MAssive Recovery: Movement Towards Sustainability" campaign promotes post-pandemic recovery and sustainability through initiatives like the **Post-Mining Project, Indigofera cultivation, vegan leather creation** from coffee husk waste and **floating solar panels,** in partnership with Bluesville and the Bell Society.

PT Adimitra Baratama Nusantara

Towards a Better Society: Empowering Community with ABN

PT Adimitra Baratama Nusantara (ABN) is a subsidiary of PT TBS Energi Utama Tbk Group (TBS Group. *The company believes that its role as a business is to make positive contributions to society. In 2021, the TBS Group announced a bold commitment to achieve carbon neutrality by 2030, marking a pivotal year for the group.*

Through the implementation of TBS2030 and the existing Blueprint of Community Development and Empowerment Programme (Rencana Induk Program Pengembangan dan Pemberdayaan Masyarakat), which is promulgated every five years (the previous one covered 2019 to 2024), the company is actively working to support local and regional economies, as well as the lives and livelihoods in the communities where it operates.

This is achieved by focusing on two stretch goals: 1) increasing the impact of social investment, and 2) enabling the community to grow and be resilient to change. These goals are crucial for the host community, providing support during the transition phase.

While TBS2030 covers only two key focus areas, education and livelihoods, the health and well-being of the host community have always been prioritised. Some of the company's programmes made slow progress during the three years (2020-2022) of the pandemic. However, when business started to pick up again and community restrictions were eased, the company was able to resume its previous work.

TBS Group and ABN are driving societal progress through their **TBS2030 goal of carbon neutrality,** and a strategic development programme that **prioritises education, livelihoods and health, while overcoming pandemic-related delays** to reinforce community support and empowerment.

Asia Green Energy Public Company

AGE's "We Care" Grow Up Together with the Development of Sustainable Community-based Quality of Life

Over the past 19 years, Asia Green Energy Public Company Limited (AGE) has become a leader in importing and distributing coal in Thailand *with an annual coal sales volume of more than 5 million tonnes.*

The company's operations consist of closed-system coal plants, and ports and warehouses with a large coal storage area of up to 1 million tonnes, located in community areas where the majority of the population are elderly and children.

With a focus on sustainable development, AGE has undertaken a project to enhance the quality of life in the communities and support livelihoods. The "Wat Chan Pattana Farmer Housewives Group" is a community located at AGE's main warehouse, consisting of seven housewives dedicated to preserving the traditional knowledge and experience of making *kanom kong* (cartwheel candy). AGE has supported the group with an initial investment of THB 15,000 and assigned community relations staff to provide assistance and advice.

Through these efforts, the group has been able to register their product as an OTOP (One Tambon [local government], One Product) and has won first prize in the Provincial Outstanding Farmer Housewives Contest for two consecutive years. Additionally, AGE has initiated a project to promote and expand the production of soap made from used *kanom kong* frying oil, reducing environmental impacts while creating jobs and generating income for the community.

AGE's "We Care: Grow Up Together with the Development" initiative promotes sustainable growth and community support, **supporting the "Wat Chan Pattana Farmer Housewives Group" in preserving "kanom kong" traditions, and participating in local contests**. It also invests in **environmental projects** like soap production from used frying oil.

Corporate Social Responsibility (2023)

Category: Large

PT PLN Indonesia Power's Lontar Station

Inpower-care Programmes for Sustainability of People, the Planet and Profits

***Lontar Power Station processes FABA waste into paving blocks, bricks and precast concrete**. These products, tested and ready for distribution, improve public facilities, renovate homes and construct community buildings in Banten Province.*

Lontar also educates village-owned enterprises (BUMDES) in creating SMEs for mass production and the marketing of FABA products.

Bottom ash is also used by the Kembang Mayang batik group, one of the beneficiaries of Lontar Power Station, as a filter media in batik waste-water treatment plants (WWTPs) to produce environmentally friendly batik. T The filtering process uses bottom Ash, and the filtered sediment is also used as an additional planting medium by the Agria Lestari women farmer group for the cultivation of butternut squash.

The use of bottom ash filter media is a novel innovation for the Indonesian batik industry. It has been found that bottom ash waste can be used in various sectors, including small and medium enterprises (SME), the textile industry and agriculture.

Indonesia Power's Lontar Power Station is promoting sustainability by **converting FABA waste** into construction materials, **improving infrastructure and living conditions** in Banten Province, **educating local enterprises** on eco-friendly products, supporting the **Kembang Mayang batik group**, and assisting **Agria Lestari women farmers.**

PT Borneo Indobara

Building COALition with Stakeholders for Sustainable Development

PT BIB faces many challenges in its CSR efforts, including transitioning the local economy from mining to sustainable sectors like agro-industry, trade and tourism.

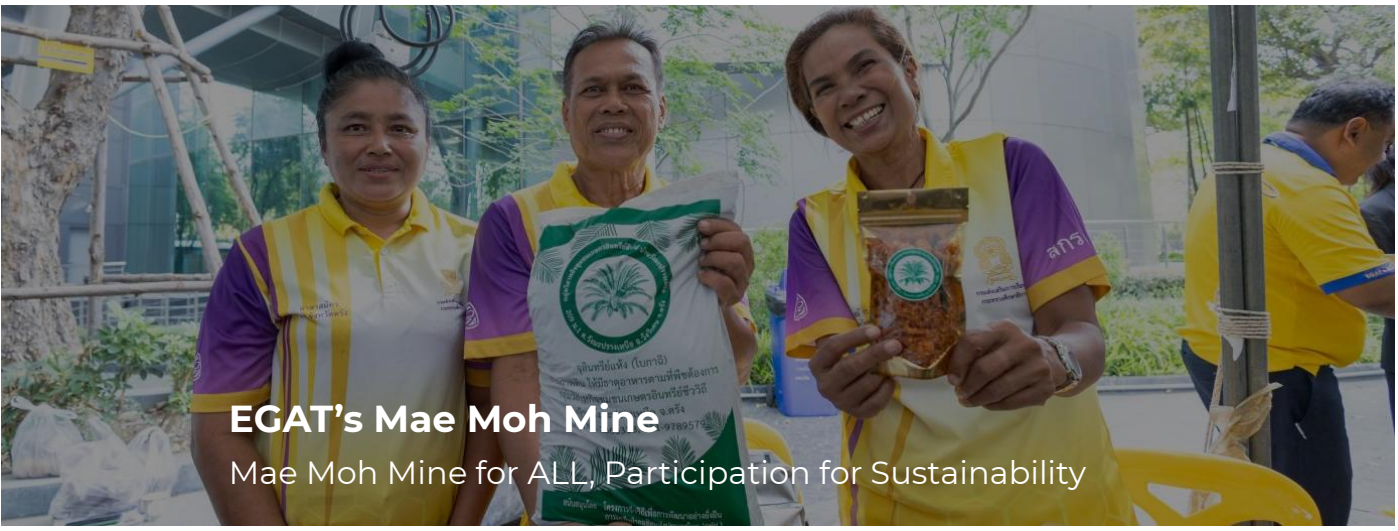
Environmental management is another significant challenge, requiring effective measures to maintain biodiversity and reduce carbon emissions. In addition, there is a need to develop a skilled and adaptable workforce to support sustainable economic activities beyond mining.

To tackle these challenges, PT BIB has initiated several programmes. For economic diversification, they have launched agro-eco-tourism projects and MSME development centres, fostering entrepreneurship and employment. Environmental efforts include biodiversity conservation programmes and the implementation of innovative technologies to reduce emissions and energy consumption. In human capital development, PT BIB offers scholarships, vocational training and digital empowerment initiatives to enhance the skills and opportunities of local youth.

These efforts have yielded notable results. Economic transition initiatives have led to the establishment of new activities like edu-tourism and self-sustaining businesses in local villages.

Environmentally, PT BIB has achieved positive biodiversity trends and reduced carbon emissions. In human capital development, the community now has a more skilled workforce and improved access to technology, leading to better economic opportunities and quality of life. PT BIB's CSR initiatives demonstrate effective strategies for sustainable development in the mining industry.

PT BIB is promoting sustainable development in South Kalimantan by **transitioning the local economy from mining to agro-industry, trade and tourism.** It is also implementing **environmental management programmes** and **developing human capital** through education and digital empowerment.



EGAT’s Mae Moh Mine

Mae Moh Mine for ALL, Participation for Sustainability

***The mine contributes significantly to the local community's development through various channels**, including power development funds, mineral royalties and a Village Development & Health Surveillance Fund.*

These projects focus on community wealth enhancement, infrastructure, environmental conservation, religious and cultural preservation, public relations, occupational growth, healthcare and educational advancement. The mine's integration with the community is celebrated through the annual Mae Moh Festival, which strengthens community bonds, stimulates the local economy, promotes tourism and generates employment.

MMM places a strong emphasis on involving the community and society, particularly areas in close proximity to the mine. This inclusive policy fosters participation in both operational and post-operational stages, cultivating trust and confidence. MMM's commitment to environmental stewardship is reflected in its rigorous management of dust, odour, noise, vibration and water quality, and encourages community participation in environmental oversight.

MMM's dedication to sustainability extends to its investment in research and innovation, including efforts to enhance stability, reduce failure risks and develop award-winning water management and drilling technologies.

It also implements digital tools for safety and environmental monitoring and is exploring new frontiers in energy transition and eco-farming, with research into energy grass and leonardite.

EGAT's Mae Moh Mine promotes sustainable mining practices **by involving the community, ensuring environmental stewardship and embracing digital tools.** It also **conducts research** in stability technologies, water management and **eco-farming** for responsible resource utilisation.

CCT Special Submission (2021)

Semirara Mining and Power Corporation (SMPC)

Accelerated Coal Mine Rehabilitation

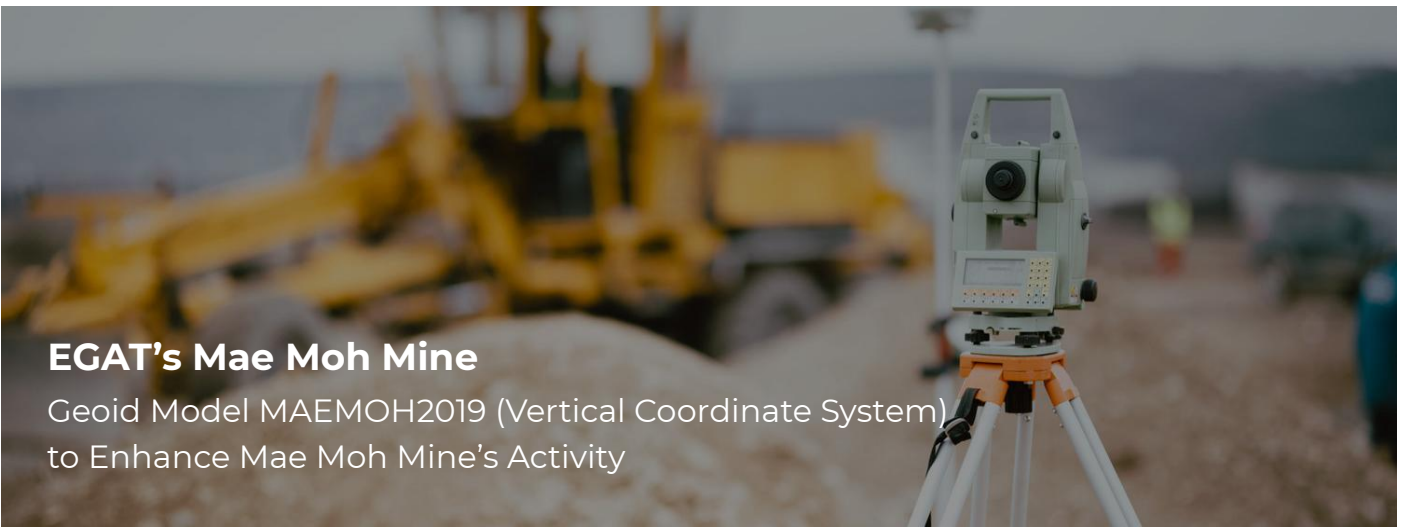
Semirara Mining and Power Corporation (SMPC) is an integrated energy company that owns and mines its fuel source. *It has become the largest coal producer in the Philippines, accounting for 99% of the country's coal production.*

The acceleration of mine rehabilitation at the 124-Ha Panian Pit in Semirara Island, Caluya, Antique Province, was expected to take 5-10 years. However, the work was finished in less than two years, and it became the fastest mine rehabilitation known in the Philippines.

One of SMPC's sites, The Panian Pit, was closed in September 2016 following the depletion of its mineable coal reserves as certified by the Department of Energy (DOE). Following its closure, SMPC readily answered the DOE's challenge to accelerate its rehabilitation in 2017. The massive scale of this project required substantial financial and manpower investments, as well as fleet capacity away from core mining activities.

Today, the South Panian mine continues to be a model for open mine rehabilitation in the Philippines, a further testament to the company's unwavering dedication to environmental stewardship and responsible mining, and successful public-private partnership with the DOE and their host communities.

SMPC completed the **Panian Pit coal mine rehabilitation project** in less than two years, making it the fastest such project in the Philippines. This was achieved through **significant financial and manpower investments, prioritising environmental stewardship over profitability.** The company's commitment and public-private partnership transformed the mine into a leading example.



EGAT's Mae Moh Mine

Geoid Model MAEMOH2019 (Vertical Coordinate System) to Enhance Mae Moh Mine's Activity

Geoid Model MAEMOH2019 is the vertical coordinate system used to encourage activity in Mae Moh Mine.

EGAT's Mae Moh Mine introduced modern survey technologies and terrestrial laser scanners (TLS) for excavated volume determination, and UAV for aerial topography. The self-monitoring Global Navigation Satellite System (GNSS) base station monitors stability and movement in the pit and wasteland and also serves as an echo sounder for underwater topography.

It covers more than a 10-km radius around the mine and surrounding area and is sustainable and dependable until posted mining goes on. Its measurement and 1st order levelling data were merged with the Thailand geoid model (TGM2017), resulting in the local geoid, MAEMOH2019.

The existence of MAEMOH2019 carries out GNSS positioning with real-time kinematic (RTK) high-accuracy measurements. This is a huge development in the surveying of mine activities. It also benefits many spatial data-related activities in the mine and neighbourhood effectively and sustainably.

The Geoid Model MAEMOH2019 improves Mae Moh Mine operations by **integrating modern survey technologies, including a GNSS base station and an echo sounder**, providing high-accuracy measurements for mine surveying and spatial data-related activities, covering a 10-km radius.

EGAT's Mae Moh Mine

The Improvement of the Ash and Gypsum Conveyor Belt System

Since Mae Moh Power Plant is a thermal power plant that uses lignite coal, there are by-products from the power generation process such as fly ash, wet ash and products from the sulphur dioxide removal process (gypsum).

Mae Moh Power Plant processes these by-products and sells them to private companies and landfills at coal ash and gypsum ponds. The Ash and Gypsum Handling Department is responsible for removing the coal. Therefore, the management of Mae Moh Power Plant established a team to improve the conveyor system for coal ash and gypsum, and to find a solution to the problem of Collecting Conveyor No. 2.

The team found a solution by using the five methods or the '5M principle' which includes Manpower, Machine, Material, Method, and Management. When the team made corrections in accordance with the five methods, the belt could handle loads of more than 600 tonnes per hour and there was no fall of wet ash, fly ash and gypsum along the belt.

The team spent less than USD 3,225, which is more cost-effective than renovating the structure along the belt which would have cost USD 354,838. Hence the team likewise renovated the other conveyors.

Mae Moh Power Plant processes byproducts like fly ash, wet ash and gypsum from its lignite CFPP. A team was formed to improve the conveyor system, focusing on Collecting Conveyor No. 2. Using the **5M principle**, they enhanced the belt's capacity to over 600 tonnes/hour without spillage. This cost-effective solution (USD 3,225) was adopted for other conveyors, avoiding a costly USD 354,838 renovation.

CCT Special Submission (2023)

PT PLN Indonesia Power's Pelabuhan Ratu PGU II

Boosting Low-Carbon Sustainable Energy through Advanced Coal-Biomass Blends and Fuel Stock Management Digitalisation

The Pelabuhan Ratu Power Plant, operated by PT PLN Indonesia Power, is a steam power generation facility with an installed capacity of 3 x 350 MW. *In line with the PLN Transformation programme's GREEN aspect and the "Green Boosters" initiative by PT PLN Indonesia Power, the plant has focused on enhancing its environmental performance.*

CFPPs in Indonesia face challenges in implementing co-firing due to inefficient biomass handling methods and potential reductions in fuel calorific value. Conventional blending techniques, which involve heavy equipment, restrict biomass utilisation and are becoming inadequate as co-firing targets increase. Higher biomass percentages in the fuel mix can reduce energy content, potentially reducing power generation capacity.

To address these challenges, the Pelabuhan Ratu Power Plant has developed an advanced coal-biomass blending method. Instead of blending the fuels in the coal yard, they are blended on the belt conveyor. Unblended biomass is directly reclaimed onto belt conveyor line B using a stacker reclaimer, while coal is transported via belt conveyor line A. The coal and biomass are mixed at the retractable head pulley (RHP).

This advanced blending method is resulting in a 169.1% increase in biomass utilisation. The monthly average stands at 109.3% and the daily average is 168.6%. This result led to a 127.4% increase in green energy production and GHG emission reductions. The fuel stock management system provided optimal blending recommendations, minimising potential derating losses due to low calorific value blends.

Pelabuhan Ratu Power Plant is enhancing low-carbon sustainable energy by **implementing an advanced coal-biomass blending method and digitalising fuel stock management,** resulting in increased biomass utilisation and green energy production, minimising energy losses and derating losses.

Conclusion

This report highlights the best practices of the Awardees of the ASEAN Coal Awards 2021 and 2023, serving as a concerted effort undertaken by the ASEAN region to explore progressive coal initiatives. These initiatives aim to achieve a secure and affordable energy supply while fostering sustainability for a greener and more resilient future.

This comprehensive report which covers the coal sectors across the ASEAN member states, describes the implementation of cutting-edge technologies and sustainable practices ranging from coal mining and CCT efforts, to the handling and distribution of coal while committing to fulfil corporate sustainability and environmental responsibilities. It demonstrates the serious dedication and vision of the ASEAN region in managing the coal industry in the most environmentally and safe way.

The report explains the continuing, pivotal role that coal must play in the energy transition era. The report has various categories, and coal mining initiatives are one of these. ASEAN's coal-mining countries are using innovative mining methods to boost coal output in an environmentally friendly way. These include the design and implementation of a digitalisation technology system such as the Integrated Mining Information System, ISO-Based Integrated Management System and Digital Transformation, as well as improving mining efficiency and reclamation to optimise operational performance and fulfil environmental responsibilities.

Furthermore, the report underscores the notable initiatives of CCT in the power generation and industry. Replacing the manual valves with needle valves was found to be the best way to control boiler water blowdown. It also reduced coal consumption costs and emissions, and increased production efficiency. CFB is widely used to achieve clean coal facilities and stable power plants. It also reduces air pollutants by removing SOx and NOx from the units. Other initiatives, such as the co-firing biomass programme also helps in reducing emissions.

Moreover, the report highlights the critical role of efficient coal handling and distribution mechanisms. By streamlining logistics, optimising infrastructure and integrating advanced technologies, coal use in the AMS can be done more effectively and its environmental footprint can be minimised. The Advanced Planning and Optimisation Model (APO) plays a critical role in optimising coal management.

Besides CCT efforts, each company also contributes to CSR as part of its commitment to empower community development. Various programmes have been launched, such as volunteer projects for the community, agriculture promotion programmes, tourism and festival projects and local business initiatives. Community wastes have also been diverted to lucrative activities.

The ASEAN Coal Awards recognise exceptional initiatives through its Special Submissions category. This unique award category is designed to accommodate innovative projects and approaches that fall outside the traditional categories of coal mining, CCT, coal handling and distribution and CSR. The Special Submissions category provides a platform for showcasing cutting-edge ideas, emerging technologies or novel approaches in the coal industry that might not fit neatly into other categories. This flexibility allows the ASEAN Coal Awards to capture and celebrate a wider range of advancements and contributions to sustainable coal practices, ensuring that groundbreaking work in the field does not go unrecognised.

In conclusion, **the ASEAN Coal Awards report embraces diverse perspectives that project the coal industry's substantial contributions to the region's energy landscape.** Beyond merely being a fuel source, coal is at the heart of the carbon neutrality and sustainable development goals.

By fostering innovation, collaboration and responsible stewardship, the ASEAN region can continue to harness the full potential of coal to drive its economic development forward and serve as a secure form of energy for generations to come.

Contact

ASEAN Centre for Energy
Soemantri Brodjonegoro II Building, 6th Fl.
Directorate General of Electricity
Jl. HR. Rasuna Said Block X-2, Kav. 07-08
Jakarta, 12950, Indonesia
Tel. (62-21) 527 9332 | Fax. (62-21) 527 93350
E-mail: secretariat@aseanenergy.org
www.aseanenergy.org

aseanenergy.org

aseanenergy

aseanenergy

ASEAN Centre for Energy

ASEAN Centre for Energy