

BUSINESS REVIEW



**RENEWABLE
ENERGY**

Read more on pages 90 to 94.



Business Review

Renewable Energy

WHO WE ARE AND WHAT WE DO

As Malaysia accelerates its renewable energy (RE) transition, Malakoff remains committed to expanding its clean energy portfolio. Malakoff Radiance Sdn. Bhd. (MRSB) supports this commitment by focusing on commercial and industrial (C&I) solar projects while the Group manages a broader RE portfolio, including large scale solar (LSS) and small hydro projects.

Our RE capacity of 173 MW reflects Malakoff's strategic focus on leveraging cutting-edge technologies and supportive regulatory frameworks to drive sustainable growth and contribute to Malaysia's energy transition. These initiatives align with Malaysia's National Energy Transition Roadmap and broader national policies, reinforcing our role in strengthening energy security and reducing carbon emissions.



Rooftop Solar Project at UMW Aerospace

Business Review

Renewable Energy

KEY FOCUS AREAS

Commercial and Industrial (C&I) Solar	Large Scale Solar (LSS)	Renewable Energy Certificates (RECs)	Small Hydropower Plant (SHP)
Battery Energy Storage System (BESS)	Biogas	Biomass	Carbon-Free Mobility Infrastructure

BUSINESS ENVIRONMENT

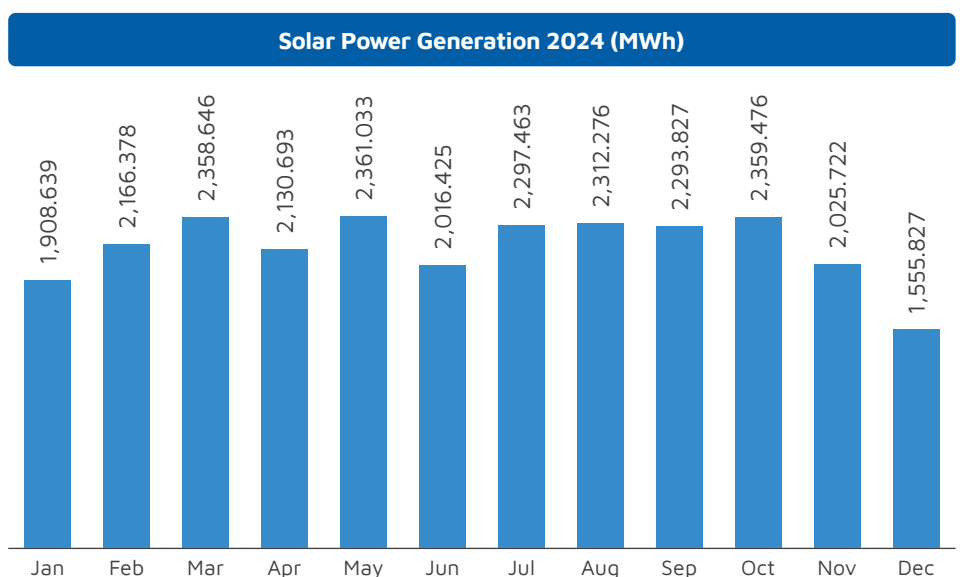
In 2024, the RE landscape saw significant momentum globally and regionally, driven by an escalating focus on sustainability and green energy adoption. Governments improved incentives and introduced progressive policies to encourage the shift toward renewables while businesses and consumers increasingly prioritised climate-conscious choices. Rising electricity costs bolstered the adoption of alternative energy solutions with solar power emerging as a preferred option for its scalability and cost-effectiveness.

The solar segment experienced significant growth, largely driven by increased investments from the commercial and industrial including residential sectors seeking to reduce energy costs and carbon footprints. This growth was further supported by the rising adoption of Building Integrated Photovoltaic System (BIPV) carport systems, which gained momentum as electric vehicle (EV) infrastructure and BESS expanded.

Technological advancements, including higher-efficiency solar panels, solar safety devices and improved energy storage solutions, further enhanced the competitiveness in the commercial and industrial solar landscape. Additionally, regulatory frameworks and government policies such as tax incentives and quota expansions under the Net Energy Metering scheme played a pivotal role in shaping market trends and driving wider adoption of solar solutions.

OPERATIONAL RESULTS FOR COMMERCIAL & INDUSTRIAL SOLAR

States	Size Capacity (kWp)
Perlis	42.18
Kedah	1,267.86
Penang	306.36
Selangor	19,449.54
Melaka	5,419.44
Johor	6,056.52
Pahang	4,924.84
WP KL	2,317.00
Total	39,783.74

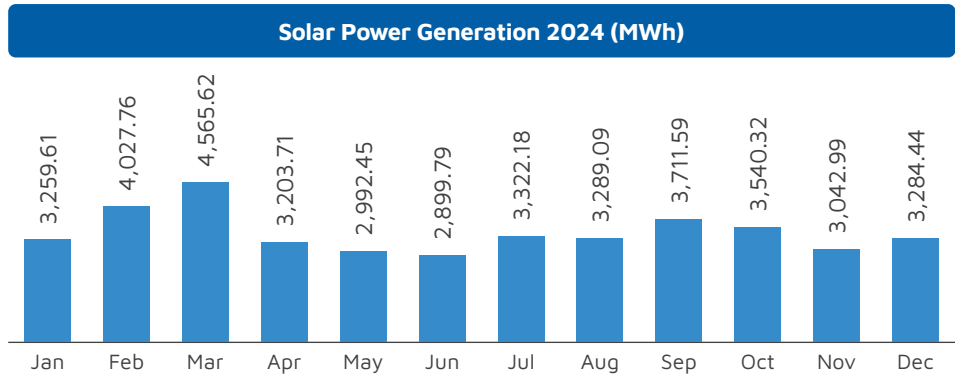


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OPERATIONAL RESULTS FOR LSS (ZEC SOLAR)

State	Size Capacity (MW)
Johor	29



PERFORMANCE REVIEW

Objectives

Revenue Enhancement

Initiatives

- ▶ Acquired the remaining equity interest in ZEC Solar Sdn. Bhd. (ZEC Solar) and TJZ Suria Sdn. Bhd. (TJZ Suria)
- ▶ Zec Solar owns and operates a 29 MW large-scale solar facility in Kota Tinggi, Johor, under a 21-year SPPA, while TJZ Suria provides operations and maintenance services to ZEC Solar

Progress/Outcomes

- ▶ Completed the acquisition of 51% equity interest in ZEC Solar and 49% equity interest in TJZ Suria, increasing Malakoff's total effective RE capacity to 148 MW

Delivery of Operational Excellence

- ▶ Integrated new solar assets seamlessly into the existing energy portfolio
- ▶ Implemented stringent quality control measures to optimise system reliability and performance
- ▶ Strengthened collaboration with key stakeholders to ensure compliance with regulatory and environmental standards

- ▶ As of 2024, MRSB has secured a C&I solar portfolio of 60 MWp. Of this, 39.8 MWp has been installed and commissioned, with the remaining capacity targeted for completion in 2025
- ▶ Monitored system efficiency and reliability through the in-house operation and maintenance team

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Renewable Energy

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Intensifying Competitive Landscape	<ul style="list-style-type: none"> ▶ Enhanced cost optimisation strategies to offer more competitive pricing without compromising on quality ▶ Strengthened strategic partnerships with Engineering, Procurement, Construction and Commissioning contractors and technology providers to improve efficiency and value proposition ▶ Focused on differentiation through superior operation and maintenance services and performance guarantees
Expanding Market Presence	<ul style="list-style-type: none"> ▶ Strengthened relationships with property developers and building owners to secure large-scale installations ▶ Prioritised improvements in solar panel efficiency and energy storage capabilities ▶ Expanded direct client engagement and marketing efforts to drive awareness of solar benefits ▶ Entered new market segments, including industrial and logistics hubs
Growth in BIPV Carport System	<ul style="list-style-type: none"> ▶ Leveraged the increase in EV adoption by integrating EV charging solutions into BIPV solar carport designs ▶ Developed standardised modular designs to lower costs and enhance scalability ▶ Collaborated with government agencies and corporate clients to promote BIPV carports as part of sustainability initiatives
Adapting to the Shifting Regulatory and Policy Landscape	<ul style="list-style-type: none"> ▶ Monitored policy changes and aligned incentives, policies and regulations accordingly ▶ Engaged actively with regulatory bodies and industry associations to provide input on policy frameworks ▶ Strengthened internal compliance processes to ensure seamless project execution within the regulatory framework ▶ Developed contingency strategies to mitigate risks from policy shifts
Market Saturation and Demand Fluctuations	<ul style="list-style-type: none"> ▶ Public and Private Sector Partnerships <ul style="list-style-type: none"> - Strengthened collaborations with governments, municipalities and private enterprises seeking to adopt RE solutions - Leveraged policy incentives such as tax breaks, subsidies and RE targets for large-scale projects ▶ Market Segmentation <ul style="list-style-type: none"> - Focused on underserved or emerging niche markets such as commercial rooftops, community solar projects and off-grid applications to drive growth in a competitive landscape

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Renewable Energy

KEY ACHIEVEMENTS

- ▶ Secured 22.1 MWp of C&I solar projects across various locations in Peninsular Malaysia consisting of rooftop solar projects and BIPV projects, with several installations completed and others scheduled for completion in 2025
- ▶ Won the Green Achievement Enterprises Awards at the third Solar Energy Storage Future Malaysia 2024

OUTLOOK

We are committed to achieving a net-zero future through cutting-edge innovations in clean energy. Malaysia's RE sector is poised for strong and sustained growth, driven by robust government policies, rapid technological advancements and increasing corporate and consumer demand for sustainable energy solutions.

Solar photovoltaic (PV) remains the fastest-growing RE source, supported by declining PV panel costs, advancements in BESS and improved efficiency. The introduction of the Corporate Green Power Programme, LSS initiatives and the Corporate Renewable Energy Supply Scheme are key enablers driving the expansion of Malaysia's solar industry. These mechanisms provide businesses with greater access to RE, supporting corporate sustainability commitments and accelerating the adoption of clean energy across industrial, commercial and residential sectors.

In addition, the growing emphasis on energy storage solutions and smart grid integration is enhancing grid stability, optimising energy consumption and supporting the long-term viability of RE deployment in Malaysia. The industry also benefits from strengthened safety regulations with Fire and Rescue Department of Malaysia issuing new safety guidelines in 2024 for solar PV systems. These guidelines play a crucial role in safeguarding solar PV assets for consumers and investors by ensuring compliance with stringent fire safety standards and risk mitigation measures.

By harnessing these advancements and a supportive policy framework, we remain committed to accelerating the nation's transition towards a cleaner, more sustainable energy future while contributing to Malaysia's RE and carbon reduction targets.



Rooftop Solar Project at Syarikat Motosikal dan Enjin Nasional Sdn. Bhd. (Modenas)

BUSINESS REVIEW



ENVIRONMENTAL SOLUTIONS

Read more on pages 96 to 103.

WATER DESALINATION

Read more on pages 104 to 107.



Business Review

Environmental Solutions

WHO WE ARE AND WHAT WE DO

Malakoff Environmental Solutions is committed to creating a sustainable future by focusing on waste management, recycling and comprehensive environmental services that benefit communities and the planet. In 2024, it expanded its offerings to drive forward-thinking practices and innovative solutions that promote a greener tomorrow.

Alam Flora Sdn. Bhd. (Alam Flora) is a leading environmental management company in Malaysia, committed to helping communities manage and reduce waste with minimal environmental impact. As one of the largest concession holders under Malaysia's national solid waste management and public cleansing privatisation initiative, Alam Flora provides comprehensive waste management services across its concession areas, including the Federal Territories of Kuala Lumpur and Putrajaya, as well as the state of Pahang. Its wholly-owned subsidiary, Alam Flora Environmental Solutions (AFES) offers integrated environmental solutions designed to enhance quality of life and promote sustainable development goals. Backed by ISO 9001, 14001 and ISO 45001 certifications, AFES continuously innovates in areas such as Infrastructure Cleansing and Waste Solutions, Waste Management Facilities and Port Reception Facilities (PRF).

Genesis Facility Solutions complements our Environmental Business by specialising in facility and energy management. With tailored solutions that integrate cutting-edge technologies, data-driven insights and sustainable practices, Genesis helps clients reduce energy consumption, optimise asset performance, lower costs and minimise environmental impact.

We are committed to managing a waste volume of 10,000 tonnes per day by 2031, with a recycling rate of 15% to 20% by 2025. This demonstrates our commitment to responsible waste management and environmental stewardship, driving sustainable practices that contribute to a cleaner, greener Malaysia.



Business Review

Environmental Solutions

KEY FOCUS AREAS

Circular Economy	Infrastructure Cleansing and Waste Solutions (ICWS)	Waste Management Facilities (WMF)	Expansion of Concession Business	Exploring Opportunities in Non-Concession Business
Marine Waste Management and Scheduled Waste Management	Facility Management	Quality Management	Energy Audits	Waste-To-Energy (WTE)

BUSINESS ENVIRONMENT

Alam Flora operates in a dynamic business environment, facing both external and operational challenges that impact its efficiency, sustainability and financial performance. One of the key external challenges is the increasing operational cost without a corresponding tariff increase by the government. Rising fuel prices, maintenance expenses and overall operational costs have also placed financial pressure on the company, making it difficult to sustain service quality without tariff adjustments.

Rising operational costs, evolving workforce dynamics and infrastructure constraints continue to challenge efficiency and sustainability efforts. At the same time, changing weather patterns and limited public awareness of waste segregation and recycling have contributed to higher landfill volumes and increased pollution risks. On the operational front, ageing assets and evolving industry regulations have affected service effectiveness, highlighting the need for continuous investment in technology, workforce development and innovation. To navigate these complexities, we continue to drive proactive engagement with stakeholders and policymakers to build a more resilient and sustainable operational ecosystem.

OPERATIONAL RESULTS

Plant	2024 (tonnes)	2023 (tonnes)	2022 (tonnes)
Domestic Waste Collected	1,174,600	1,142,600	1,118,300
Recycling Tonnage for Kuala Lumpur, Putrajaya and Pahang	7,026.7	6,108.9	5,324.1
Total Waste Handled	61,744.3	452,156.1	924,237.7

Business Review

Environmental Solutions

WASTE HANDLED IN TRANSFER STATIONS, LANDFILLS AND INCINERATORS

	2024 (tonnes)	2023 (tonnes)	2022 (tonnes)
Landfill	53,850.6	67,989.2	85,002.8
Kuala Lumpur Transfer Station (Contract expired on 14 June 2023)	-	372,830.6	798,309.7
Cameron Highlands Incinerator (Contract expired on 23 July 2023)	-	3,424.5	16,069.2
Pulau Pangkor Incinerator	4,990.1	5,107.9	4,938.1
Port Reception Facilities	2,903.5	2,803.9	3,527.9
Green Waste	-	-	16,390.0
Total	61,744.3	452,156.1	924,237.7

NON-INDUSTRIAL MATERIALS – RECYCLABLE ITEMS

ITEMS	2024 (tonnes)	2023 (tonnes)	2022 (tonnes)
Paper	4,617.7	4,096.4	3,607.2
Aluminium	26.4	22.9	26.8
Metal	507.5	454.8	391.2
Plastic	842.4	811.0	662.4
Beverage Carton	34.2	20.9	18.9
E-Waste	124.2	31.8	32.9
Used Cooking Oil	424.0	229.7	149.3
Other	450.3	441.4	435.5
Total (tonne)	7,026.7	6,108.9	5,324.2

ELECTRICAL ENERGY REDUCTION

	2024	2023	2022
Pos Mel Nasional under EMEER 2008 Regulation	66.5% reduction 8,626,349kWh=RM3.1mil	72.1% reduction 10,719,282kWh=RM3.8mil	70.9% reduction 10,276,077kWh=RM3.6mil
Senai International Airport under EMEER 2008 Regulation	9.7% reduction 499,110kWh=RM179k	10.2% reduction 507,726kWh=RM182k	14.9% reduction 694,464kWh=RM250k
Total Energy Savings (RM)	RM3.279mil	RM3.982mil	RM3.850mil

Business Review

Environmental Solutions

PERFORMANCE REVIEW

Objectives

Initiatives

Progress/Outcomes

Business Expansion

- ▶ Appealed for third cycle tariff increase and requested concession contract extension beyond 2032

- ▶ Engaged with government officials through appeal letters
- ▶ Strategised with other concessions regarding proposed tariff increases and contract extensions
- ▶ Proposed service improvements through the latest technology and digitalisation

- ▶ Supported co-firing initiatives by producing EFB pellets as fuel while exploring biomass business opportunities

- ▶ Established Build-Operate-Own agreement with revenue sharing

- ▶ Participated in government tenders for operation and maintenance (O&M) of landfills as part of the strategy

- ▶ Developed a strategic plan to enter the O&M tender market, leveraging over 10 years of AFES' industry experience

- ▶ Increased incoming recycling volume at AFES MRF
- ▶ Established onsite PRF at all MMC Ports to secure feedstock

- ▶ Implemented the new Separation at Source collection system
- ▶ Expanded recycling collection from commercial entities
- ▶ Established partnership with shipping liners
- ▶ Collaborated with government agencies to shape marine waste management frameworks
- ▶ Embraced digital transformation for operational efficiency

- ▶ Expanded service offerings by implementing food waste collection and treatment through Anaerobic Digestion technology

- ▶ Collected food waste from markets in Putrajaya, supported by Putrajaya Corporation

- ▶ Installed advanced sorting and processing technologies to improve operational efficiency and increase material recovery rates

- ▶ Upgraded recycling efficiency by introducing a sorting line, plastic shredder and press machine into existing processes

Business Review

Environmental Solutions

PERFORMANCE REVIEW

Objectives

Initiatives

Progress/Outcomes

Business Expansion

- ▶ Partnered with MMC Engineering Sdn. Bhd. and Shanghai Tunnel Engineering Co. Ltd. to identify tunnel and bridge maintenance opportunities

- ▶ Identified potential projects for 2025-2027

- ▶ Expanded asset management capabilities and entered the shopping mall facilities management sector

- ▶ Partnered with CA Cleaning for facility management solutions at CapitalLand Group malls
- ▶ Achieved Registered Electrical Energy Manager, Bosch SI and Service Technician Programme certifications

Enhance Sustainable Waste Management

- ▶ Continued progress of the Group's first WTE project

- ▶ Concluding the Concession Agreement between Ministry of Housing and Local Government and SWCorp
- ▶ Obtaining necessary approvals for the development of the facility

- ▶ Partnered with local businesses and non-profit organisations to promote recycling efforts

- ▶ Extended the Nestlé and AFES Kerbside Collection Programme for another year
- ▶ Introduced incentives, including cash rewards and the "Scan n Score" programme to increase recycling efforts

- ▶ Rolled out a food waste treatment initiative

- ▶ Implemented anaerobic digestion and mechanical composting to improve waste treatment capabilities

Strengthen Energy Audit Portfolio

- ▶ Expanded service portfolio to include the oil and gas industry
- ▶ Pursued the Explore Energy Audit Conditional Grant (EACG) by Sustainable Energy Development Authority

- ▶ Secured a three-year contract with Petronas Dagangan Berhad for operations in the Sabah and Sarawak regions, completing four of the 18 locations
- ▶ Completed the EACG for Senai International Airport

Business Review

Environmental Solutions

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Cost Management	
Rising Operational Costs (Fuel, Maintenance and Labour)	<ul style="list-style-type: none"> ▶ Eliminated non-value adding activities to reduce costs ▶ Consolidated procurement activities to ensure best pricing for products and services ▶ Invested in technology to increase operational efficiency
Increase in Minimum Wages	<ul style="list-style-type: none"> ▶ Outsourced general worker recruitment to manage labour costs ▶ Launched productivity enhancement programmes through upskilling and reskilling initiatives
Contract Price Pressures	<ul style="list-style-type: none"> ▶ Managed facility management costs post-pandemic to align with client budgets ▶ Established a dedicated department focused on cost reduction to enhance competitiveness in bidding
Operational Efficiency	
Ageing Vehicles and Infrastructure	<ul style="list-style-type: none"> ▶ Alam Flora procured 308 new vehicles to be delivered by end of 2025 ▶ Enforced strict compliance with preventive maintenance for all vehicles ▶ Replaced bins as part of the third cycles bin programme ▶ Invested in Internet of Things and Robotics to reduce manual labour and improve operational efficiency ▶ Utilised Computerised Maintenance Management System to optimise daily operations
Labour and Manpower Issues (including supply and demand)	<ul style="list-style-type: none"> ▶ Promoted Health and Wellness programmes for employees ▶ Implemented mentorship and knowledge transfer programmes for experienced workers to train new entrants ▶ Outsourced recruitment of general workers and collaborated with institutions to supply skilled workers

Business Review

Environmental Solutions

CHALLENGES AND MITIGATING ACTIONS (CONTINUED)

CHALLENGES	MITIGATING ACTIONS
Operational Efficiency	
Contract Expiry of Incinerator of Cameron Highlands and KL Transfer Station	<ul style="list-style-type: none"> ▶ Engaged in government tenders by adjusting contract pricing to align with the government's indicative price and meet targeted margins
Rising Costs of Chemicals and Machineries for the Leachate Treatment Plant (LTP) and Landfill	<ul style="list-style-type: none"> ▶ Assessed new chemicals with similar efficacy for treating effluent from LTP ▶ Renegotiated rental terms with existing vendors and identified new suppliers near our facility/plant
Recycling and Waste Processing	
Feedstock Challenges and Waste Contamination	<ul style="list-style-type: none"> ▶ Implemented semi-automated sorting to boost recovery rates ▶ Segregated materials at MRF based on collection source
Market Dynamics	
Fluctuating Market Prices for Recyclables	<ul style="list-style-type: none"> ▶ Adjusted buyback prices in line with vendor purchase costs ▶ Enforced minimum tonnage requirements for customer collections ▶ Sourced new vendors to enhance competitiveness in material pricing

KEY ACHIEVEMENTS

- ▶ Secured the five-year O&M contracts for the LTPs at Jabor, Jerangau, Kuantan (500m³/day) and Ladang CEP, Simpang Renggam, Johor (300m³/day)
- ▶ Partnered in major events such as MotoGP 2024, KitaRun Putrajaya 2024, 7-Eleven Go Green, Malakoff's ENVIRONMENT Carnival and the Kuala Lumpur Standard Chartered Marathon while collaborating with prominent hotels including Zenith, Dorsett, The Everly Hotel and MiCasa Hotel to enhance sustainability
- ▶ Achieved a remarkable 7,026.7 tonnes of material contribution in 2024, a 15% increase over 2023 despite market challenges
- ▶ Secured a four-year extension for Integrated Facility Management at Immigration, Customs, Quarantine & Security Complex
- ▶ Received the 2024 Special Achievement In GIS Award in San Diego, California, in recognition of Alam Flora's M Flora Telematics Systems project
- ▶ Won the 'Excellent Waste Management Recognition and Waste Reduction & Circularity Award' at Waste Management Association of Malaysia 2024

Environmental Solutions

OUTLOOK

Our focus is on strengthening our position as a leading provider of sustainable integrated waste solutions, driving the circular economy and promoting environmental sustainability across Malaysia. We are expanding our presence in the central and eastern regions, with key concessions in Selangor, Kelantan and Terengganu, while also enhancing our footprint in the commercial and industrial sectors.

We will diversify into the integrated scheduled waste operations and treatment solutions within the industrial and energy sectors across the northern and eastern regions. The development of our Sustainable Facility and Eco-Park Centre (SAFE) in Terengganu as well as PRF will drive sustainable waste management initiatives and contribute significantly to Malaysia's environmental goals.

In facility management, we will prioritise opportunities within the Group and focus on selective partnerships to penetrate the private and commercial sectors, a key part of our strategy for growth and operational excellence.

The Group remains committed to advancing its first WTE project in close collaboration with the Government and relevant authorities. Moving forward, efforts will focus on securing key approvals and strengthening stakeholder engagement to ensure smooth transition into the development phase.

Our participation in government tenders for waste management facilities will continue. We are also focused on implementing cost optimisation strategies for existing contracts, particularly at the Pangkor Incinerator and Belenggu Halt Sanitary Landfill, to ensure operational efficiency and maintain profitability. Additionally, we are piloting plant capacities through IWFM, including regional landfills, transfer stations and leachate treatment plants, to enhance the waste management process from collection to recovery.

We will continue to strengthen recycling efforts by enhancing waste collection across all sectors and expand material processing. Through strategic collaborations with international firms, local businesses and environmental organisations, we aim to broaden our impact. The Recyclink mobile application will streamline processes, enhance customer experience and drive business growth. Additionally, we will improve data tracking and waste treatment initiatives, reinforcing our commitment to sustainability.

Through Genesis Facility Solutions, we will continue to drive organic growth and secure new revenue streams. Expanding into the commercial sector is a key priority, in addition to strengthening our facility management capabilities, particularly within the power plant sector. We are exploring opportunities for mergers or acquisitions to complement and broaden our existing business portfolio.

Business Review

Water Desalination

WHO WE ARE AND WHAT WE DO

The International & Investment Management department at Malakoff manages the Group's investments in Independent Water Plant (IWP) and Independent Water and Power Plants (IWPPs) across Saudi Arabia, Bahrain and Oman. These ventures, with a total effective capacity of 472,975 m³ per day, have a significant role in our portfolio, supplying clean water to approximately 42.7 million people across the region. We drive Malakoff's business growth by leveraging strategic acquisitions and greenfield developments, fostering strategic partnerships and prioritising innovative solutions in target projects.

Name	Location	Gross Capacity (m ³)
Shuaibah Phase 3 IWPP (SIWPP)	Saudi Arabia	880,000
Shuaibah Phase 3 Expansion IWP (SIWEP)	Saudi Arabia	150,000
Al-Hidd IWPP	Bahrain	410,000
Al-Ghubrah IWP	Oman	191,000



Business Review

Water Desalination

KEY FOCUS AREAS

- Oversee overseas assets, ensuring investments align with business goals
- Explore new investment opportunities, focusing on those aligned with business objectives
- Drive global expansion by investing in renewable energy-powered desalination initiatives
- Build strategic alliances across the Middle East and North Africa (MENA) region to strengthen our presence in the water and power markets

BUSINESS ENVIRONMENT

The MENA desalination market has experienced rapid growth and innovation over the past few decades, driven by the region’s acute water scarcity. With its arid climate and limited natural freshwater resources, desalination has become an essential solution for ensuring a reliable supply of potable water for both domestic and industrial needs.

One of the primary challenges in desalination is energy consumption, prompting a shift towards energy-efficient technologies such as solar-powered

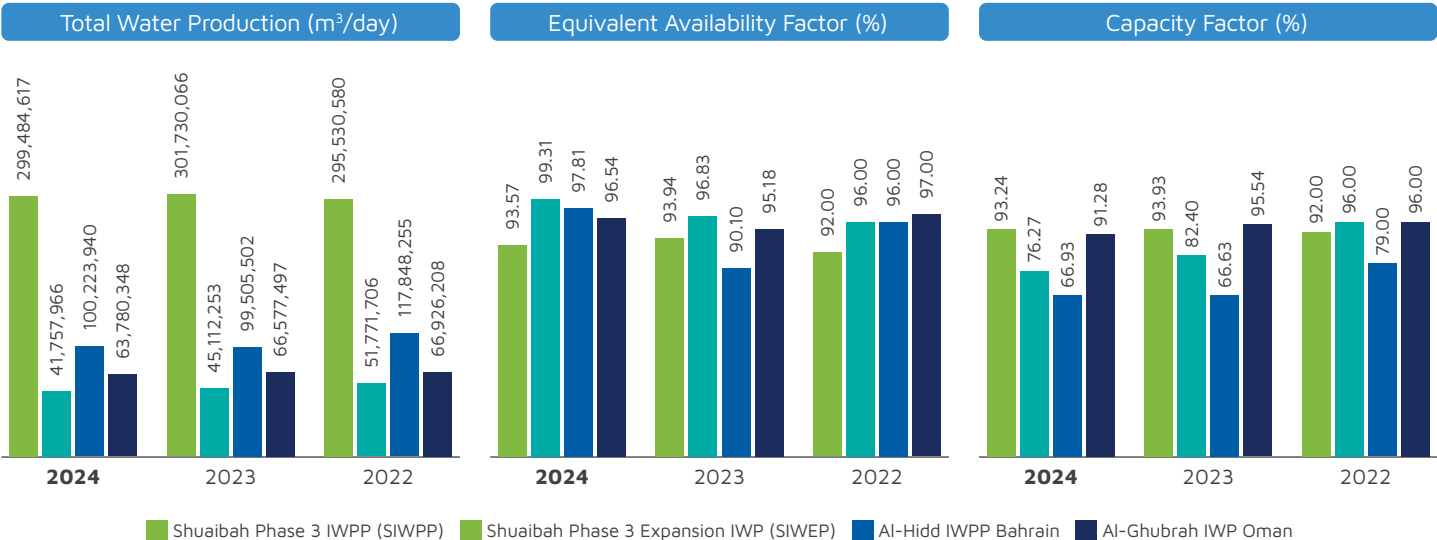
reverse osmosis (RO) desalination. The integration of renewable energy in desalination projects is becoming a key market differentiator.

At the same time, geopolitical risks, including political instability, regional rivalries, terrorism, economic volatility and policy shifts require careful navigation and are closely monitored. We mitigate these risks through rigorous due diligence, political risk insurance and strategic partnerships to ensure business resilience.

The competitive landscape in the MENA desalination market is equally dynamic, with state-owned utilities and private sector companies, both local and international, playing key roles. Governments are also driving local participation to boost job creation and economic growth.

Nevertheless, we remain committed to go beyond our current achievements in the MENA desalination industry, continuously exploring new investment opportunities within and beyond the region.

OPERATIONAL RESULTS



Business Review

Water Desalination

PERFORMANCE REVIEW

Objectives

Business Expansion

Cost Management

Initiatives

Explored strategic partnerships

Increased operational efficiencies

Progress/Outcomes

▶ Forged strategic alliances with global industry players to collaborate on upcoming power and water projects

▶ Optimised CAPEX project execution and implemented a systematic inventory reduction strategy based on utilisation rates

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Strong Competition from Leading Utilities, International Trading Companies and New Market Entrants	<ul style="list-style-type: none"> ▶ Pursued strategic alliances with experienced partners to enhance our competitive edge ▶ Actively collaborated with local and global financial institutions and export credit agencies to secure support
Heightened Regulatory Oversight and Government Attention on SWRO Energy Efficiency and its Ecological Effects on Marine Ecosystems	<ul style="list-style-type: none"> ▶ Strengthened internal policies to align with regulatory expectations and market best practices
Challenges in Expanding Into New Market Due to Political Instability, Policy Shifts and Uncertainties Specific to Each Region or Country	<ul style="list-style-type: none"> ▶ Closely monitored energy policies and emerging opportunities across various markets ▶ Participated in ongoing discussions and forums with key stakeholders ▶ Focused on high-priority countries and regions, carefully evaluating risks in relation to potential returns

Business Review

Water Desalination

KEY ACHIEVEMENTS

- ▶ Achieved zero Lost Time Injuries or Lost Time Accidents across Shuaibah Phase 3 IWPP, Shuaibah Phase 3 Expansion IWP, Al-Hidd IWPP and Al-Ghubrah IWP

Shuaibah IWPP

- ▶ Delivered over 40% of water demand during the Hajj period, in partnership with Shuaibah IWEP, achieving a Capacity Factor of 101%, surpassing operational benchmarks
- ▶ Secured ISO certifications such as ISO 17025, 22301 and 20400, driving operational excellence, strengthening resilience and establishing a global standard for efficiency and sustainability

Al-Hidd IWPP

- ▶ Attained recertification for ISO 14001 and ISO 18001
- ▶ Achieved the Royal Society for the Prevention of Accidents President's Award in 2024

OUTLOOK

The MENA region faces a widening supply-demand gap, driven by geopolitical instability, climate change and population growth. In response, governments are rolling out strategic initiatives to address these challenges.

As the industry adapts to these changes, there is a clear shift towards significant capital investment in energy-efficient technologies for water production, distribution and storage facilities. This is further supported by increasing collaborations with private investors to address the rising demand. Against this backdrop, the demand for services from our IWPs and IWPPs is expected to remain stable, with the potential for growth.

In 2025, we will remain focused on identifying investment opportunities that align with Malakoff's commercial and growth requirements, while optimising the efficiency of our existing facilities in our portfolio.

BUSINESS REVIEW



THERMAL POWER GENERATION

Read more on pages 109 to 114.

OPERATION AND MAINTENANCE (O&M)

Read more on pages 115 to 117.

PROJECT MANAGEMENT SERVICES

Read more on pages 118 to 120.

ELECTRICITY DISTRIBUTION AND DISTRICT COOLING SYSTEM

Read more on pages 121 to 122.



Business Review

Thermal Power Generation

WHO WE ARE AND WHAT WE DO

Our thermal power generation consists of five thermal power plants in Malaysia with a combined generation capacity of 5,342 MW. Each facility supplies energy to Tenaga Nasional Berhad under the individual Power Purchase Agreements (PPAs). Beyond Malaysia, our portfolio includes international assets such as the Shuaibah Phase 3 Independent Water and Power Producer (IWPP) in Saudi Arabia and the Al-Hidd Independent Water and Power Producer (IWPP) in Bahrain.

As part of our commitment to a cleaner, more sustainable future, we are accelerating efforts to green our thermal plants, ensuring a responsible and balanced energy transition. In line with this, we have demonstrated the capability for a co-firing rate of up to 2% biomass at our 2,100 MW coal-fired Tanjung Bin Power Plant (TBPP). Our target is to reach a 15% co-firing ratio by 2027, significantly reducing the nation's carbon footprint, enhancing grid stability and aligning with Malaysia's commitment to a Just Energy Transition. However, scaling up requires a range of critical factors to ensure the success of this National Energy Transition Roadmap (NETR) project. A concerted effort from all stakeholders, including policymakers and industry players, will be essential in driving this initiative forward and realising its full potential.



Prai Power Plant

Business Review

Thermal Power Generation

Plant	Location	Plant Type	Fuel Type	PPA	Generating Capacity (MW)	Effective Equity Participation	Effective Capacity (MW)
Prai Power Plant (PPP)	Penang	Combined-Cycle Gas Turbine (CCGT)	Gas	2024 (extended to 2025)	350	100.00%	350
SEV Power Plant (SEV)	Perak	CCGT	Gas	2027	1,303	93.75%	1,222
Kapar Power Plant (Kapar)	Selangor	Multi-Fuel	Gas/Coal/Oil	2029	2,200	40.00%	880
Tanjung Bin Power Plant (TBPP)	Johor	Coal	Coal	2031	2,100	90.00%	1,890
Tanjung Bin Energy Power Plant (TBEPP)	Johor	Coal	Coal	2041	1,000	100.00%	1,000
Shuaibah Phase 3 IWPP	Saudi Arabia	Fuel	Light Crude Oil	2030	900	24.00%	216
Al-Hidd IWPP Bahrain	Bahrain	Open Cycle Gas Turbine (OCGT)/CCGT	Natural Gas	2027	929	40.00%	372
Total Effective Power Generation Capacity (MW)					8,782		5,930

KEY FOCUS AREAS

Develop strategies for cost efficiency and risk mitigation to achieve performance goals

Implement continuous process optimisations to boost plant operational effectiveness

Collaborate with domestic and international partners to explore innovative technologies that enhance plant operations

BUSINESS ENVIRONMENT

In 2024, higher energy demand drove a year-on-year increase in power generation at our gas plant, demonstrating its essential role in meeting Malaysia's energy requirements. Meanwhile, the global coal market showed signs of stabilisation, with Indonesian sub-bituminous coal prices ranging between USD70/mt and USD80/mt, while Newcastle bituminous coal prices settling at USD110-USD150/mt.

The price stability translated into a more consistent Applicable Coal Price for TBP and TBE, a significant improvement from the volatility experienced in 2022 and 2023. Increased offtake, further supported by the unavailability of other major coal plants contributed positively to financial performance.

Business Review


Thermal Power Generation
OPERATIONAL RESULTS

Plant	Capacity Factor, CF (%)					Availability Factor, AF (%)				
	2024	2023	2022	2021	2020	2024	2023	2022	2021	2020
TBPP	75.87	70.61	67.29	72.19	86.36	86.07	88.31	86.69	93.92	94.63
TBEPP	84.80	73.76	62.74	66.2	80.54	93.44	80.54	84.93	90.41	97.54
SEV	20.65	4.59	1.82	2.23	7.68	92.83	97.81	94.37	94.82	95.51
GB3	-	-	4.73	6.49	9.63	-	-	96.16	96.46	95.90
PPP	33.03	18.01	17.21	12.43	19.62	95.16	93.60	95.33	92.73	80.34
Kapar	57.17	42.25	42.13	34.08	56.55	92.08	83.27	86.68	78.85	94.67
Shuaibah IWPP	91.94	94.20	93.00	88.00	88.00	91.34	93.70	92.00	88.00	89.00
Al-Hidd IWPP	62.25	59.40	70.00	72.00	71.00	98.10	86.70	94.00	93.00	94.00

Electricity Sold and Generated

Plant	Power Generated (GWh)					Electricity Sold (GWh)				
	2024	2023	2022	2021	2020	2024	2023	2022	2021	2020
TBPP	14,699	13,693	13,118	14,104	16,767	13,995	12,990	12,424	13,279	15,931
TBEPP	7,829	6,766	5,486	6,117	7,460	7,449	6,462	5,192	5,800	7,074
SEV	2,457	535	217	263	905	2,363	524	211	257	879
GB3	-	-	277	376	559	-	-	268	364	542
Prai	818	576	537	390	614	799	563	525	381	603
Kapar	11,171	8,418	8,395	6,609	10,852	10,434	7,676	7,629	6,150	10,193
Shuaibah IWPP	7,248	7,425	7,315	6,925	6,924	7,248	7,425	7,315	6,925	6,924
Al-Hidd IWPP	5,079	4,832	5,708	5,850	5,775	5,079	4,832	5,708	5,850	5,775

Business Review

Thermal Power Generation

PERFORMANCE REVIEW

In 2024, the Group advanced its decarbonisation agenda with the successful installation and commissioning of a 2% biomass co-firing system at TBPP. This milestone reinforces our commitment to cost efficiency and risk mitigation, ensuring a balanced transition towards cleaner energy without compromising operational stability.

As we focus on increasing biomass co-firing capacity, efforts are underway to evaluate alternative biomass fuels to gradually elevate co-firing capability, targeting a minimum of 15% co-firing readiness by 2027. At the same time, operational reliability remains a priority, supported by rigorous due diligence and planned maintenance outages. To strengthen execution, the Group has conducted comprehensive training programmes, equipping our employees with technical knowledge in biomass co-firing while enhancing their understanding of process risks and safety protocols. These enable them to manage operational challenges, assess hazards and adopt best practices in biomass handling and combustion.

In line with continuous process optimisations, we are also currently evaluating cutting-edge technologies and experiences from Japan and Europe in biomass handling, co-firing combustion systems and equipment optimisation to support the commercial phase. These efforts align with our broader strategy to drive efficiency while managing fuel variability and cost factors.

The achievement of this biomass co-firing hinges on securing the necessary funding, constant supply of biomass fuel and establishing a fuel cost pass-through mechanism, ensuring the long-term financial sustainability of biomass integration. Our ultimate goal is to achieve 15% biomass co-firing capability by 2027, reinforcing our commitment to reducing emissions while maintaining system resilience.

In addition to co-firing initiatives, the Group remains focused on optimising operational efficiency at TBEPP. Ongoing efforts are being made to improve the technical heat rate with rigorous maintenance practices in place to drive higher performance and ensure the plant's long-term reliability.

The Group has also secured an extension of the PPA for the Prai Power Plant (PPP) following the presentation of a comprehensive financial model assessment in our tender submission. The one-year extension, effective 6 September 2024, sets the foundation for potential further extensions, subject to regulatory approval.

By integrating structured training, advanced technology and robust process enhancements, we are future-proofing our assets and positioning the Group as a leader in Malaysia's clean energy transformation.



Lumut Power Plant

Business Review

Thermal Power Generation

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Maximise Value by the Strategic Closure of PPP Assets	<ul style="list-style-type: none"> ▶ Extended the PPP PPA with a one-year term until 5 September 2025, with an option for further extension, subject to electricity demand, supply and the Energy Commission's planning ▶ Streamlined workforce planning and relocation processes ▶ Optimised strategies to manage operations and maintenance before PPA expiration ▶ Investigated options for disposing of surplus assets and inventories through sale or lease ▶ Formed a dedicated task force to ensure effective management of asset and inventory disposal
Achieve On-Time Execution of All Scheduled Outages	<ul style="list-style-type: none"> ▶ Coordinated with the Grid System Operator and key stakeholders to optimise planned outages ▶ Developed efficient schedules for outages ▶ Held daily meetings for quick issue resolution and escalation, as needed
Ensure Plant Reliability and Performance to Secure PPA Extension	<ul style="list-style-type: none"> ▶ Executed enhanced borescope inspection with OEM ▶ Secured renewal of Certificate of Fitness for extension ▶ Completed pre-COD shutdown activities ▶ Assessed and restocked essential spare parts inventory ▶ Evaluated and extended key service agreements ▶ Conducted pit stop maintenance during brief outages ▶ Initiated corrosion control programme
Manage Manpower Turnover and Shortages Before PPA Extension	<ul style="list-style-type: none"> ▶ Facilitated internal staff reassignment and new recruitment ▶ Implemented staff training and development initiatives
Handling High Cyclic Operations	<ul style="list-style-type: none"> ▶ Executed strategies to ensure successful startup of Gas Turbine and Steam Turbine

Business Review

Thermal Power Generation

KEY ACHIEVEMENTS

- ▶ Recognised as a key player in Malaysia's NETR, driving Biomass Co-firing at the 2,100 MW TBPP, a central project within NETR's Catalyst Projects
- ▶ Launched the Biomass Co-firing Project, officiated by Deputy Prime Minister and Minister of Energy Transition and Water Transformation, Yang Amat Berhormat Dato' Sri Haji Fadillah Haji Yusof, marking a significant milestone in Malaysia's transition towards sustainable energy
- ▶ Effectively initiated a phased plan to achieve a 15% biomass co-firing capacity by 2027, ensuring technical readiness
- ▶ Exceeded 2023 energy generation levels in 2024, driven by higher demand from the offtaker throughout the year
- ▶ Increased net energy sold from 28,215 GWh in 2023 to 35,040 GWh in 2024, raising our contribution percentage from 21% to 25%

OUTLOOK

In 2024, we expect a modestly improved outlook, focusing on initiatives aligned with sustainability while exploring the potential for combined-cycle gas turbines and solar projects on Malakoff-owned or Group land.

We are also focused on expanding our biomass co-firing, evaluating alternative fuels and increasing co-firing ratios to achieve 15% readiness by 2027 under the NETR. Government support will be crucial in realising this goal by providing policy direction, regulatory frameworks, support mechanisms and financial incentives to address challenges such as feedstock adequacy and security, price volatility and supply chain efficiency. Public-private collaboration will also be essential for scaling up co-firing capability, securing funding and integrating alternative fuels at sensible prices.

At the same time, comprehensive due diligence and planned maintenance outages will ensure the ongoing reliability of our plants and their continuous contribution to the national energy supply, reinforcing Malaysia's long-term energy security and decarbonisation aspiration.

Business Review

■ ■ ■ ■ Operation and Maintenance

WHO WE ARE AND WHAT WE DO

Malakoff Technical Solutions Sdn. Bhd. (MTSSB), a wholly-owned subsidiary of Malakoff, specialises in delivering operation and maintenance (O&M) solutions to internal and external clients across various industries. Our portfolio includes notable names such as Kapar Energy Ventures Sdn. Bhd. (KEV), Jimah O&M Sdn. Bhd. (Jimah EDRA), Malaysia Marine and Heavy Engineering Holdings Berhad (MMHE), Petroleum Sarawak Berhad (PETROS) and China Northeast Electric Power & Engineering Services Co. Ltd. (NEPCS), serving both domestic and international markets.

Our core expertise encompasses technical advisory for due diligence in power plant assessments, deployment of skilled technical personnel for O&M activities, specialised training programmes, repair and replacement services and non-destructive testing (NDT) solutions.



Operation and Maintenance

Business Review

Operation and Maintenance

KEY FOCUS AREAS

Pursue O&M opportunities for a greenfield Combined-Cycle Gas Turbine (CCGT) power plant project by showcasing our key expertise and capabilities across various sub-services such as maintenance, repair and overhaul (MRO), technical advisory studies and tailored technical training programmes for clients

Strengthen marketing efforts for MRO services within the power generation and oil and gas sectors

BUSINESS ENVIRONMENT

In the O&M segment, demand for value-added offerings such as technical advisory and technical training services has grown steadily. MTSSB aims to establish long-term partnerships with the various plant owners by leveraging our technical expertise. In this regard, Malakoff has entered Bangladesh's energy sector, supplying technical manpower for Combined Cycle Power Plant projects. However, political uncertainties in the country present obstacles to securing new O&M contracts in the region.

For the MRO segment, the market continues to focus on services requiring swift execution, rapid response and niche technical capabilities. Additionally, MTSSB's ongoing NDT service contract with a key oil and gas client serves as a strategic foothold for exploring domestic projects and strengthening our presence in the oil and gas sector. A key challenge is ensuring prompt quotation processes and rapid client responses to capitalise on emerging opportunities.

PERFORMANCE REVIEW

Objectives

Operational Efficiencies

Initiatives

- ▶ Strengthened core operations and expanded market presence
- ▶ Fostered robust relationships with clients

Progress/Outcomes

- ▶ Secured repeat orders from a long-standing client, demonstrating trust in our services

Business Expansion

- ▶ Broadened service portfolio and diversified clientele
- ▶ Forged strategic alliances with key players to sustain market competitiveness
- ▶ Pursued new opportunities actively through ongoing engagement with current and prospective customers

- ▶ Secured a contract to supply skilled O&M personnel for the operation and maintenance of a CCGT power plant in Bangladesh
- ▶ Obtained a contract to conduct classroom and on-the-job training for CCGT power plant operations
- ▶ Identified potential opportunities to provide specialised maintenance training for CCGT power plants

Business Review

Operation and Maintenance

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Employee Assignment Impacted by Civil Unrest in the Host Country	<ul style="list-style-type: none"> ▶ Maintained close communication with employees, clients and the Malaysian Embassy in the impacted region to address challenges arising from civil unrest ▶ Actively monitored the evolving situation to ensure timely responses and safeguard operations
Loss of Skilled Personnel Affecting MTSSB’s Ability to Maintain Certification With the Energy Commission	<ul style="list-style-type: none"> ▶ Addressed shortage of specialised manpower affecting MTSSB’s certification with the Energy Commission by deploying Malakoff personnel to leverage their expertise

KEY ACHIEVEMENTS

- ▶ Secured repeat purchase orders for coal unloader bucket elevator maintenance and repair, along with extended NDT service agreements from a key client
- ▶ Received consistent purchase orders for Quality Control and NDT services at Malakoff’s coal power plants during scheduled and forced outages
- ▶ Awarded contract for supplying critical technical personnel to support CCGT power plants in Bangladesh
- ▶ Expanded market presence in East Malaysia by securing:
 - Operator training contract for a greenfield CCGT power plant;
 - Technical consulting contract for plant assessment services; and
 - Finalised contract terms and conditions for maintenance training agreements

OUTLOOK

We will continue strengthening our position for continued growth by maintaining strong relationships with existing clients. This approach aims to secure larger-scale contracts and additional O&M services in the future. However, there are challenges in sourcing and deploying qualified personnel for the various geographical locations.

Concurrently, we are enhancing our presence in the power and oil and gas sectors by actively identifying MRO opportunities. A key challenge, however, is ensuring timely responses to client requests while offering competitive pricing, without compromising the high service standards that our clients rely on. We remain focused on carefully managing the planning and execution of maintenance strategies for clients to further strengthen our reputation in the industry.

Business Review

■ ■ ■ ■ Project Management Services

WHO WE ARE AND WHAT WE DO

Malakoff Engineering Sdn. Bhd. (MESB), which leads our in-house Project Management Services division, provides tailored solutions for internal projects. Backed by over 25 years of experience and a proven track record, we specialise in the development, construction and commissioning of thermal and Combined Cycle Gas Turbine (CCGT) plants. Our portfolio also includes Large Scale Solar (LSS), Rooftop Solar (RTS) and managing decommissioning and demolition projects. We are expanding into innovative projects in waste-to-energy (WTE), Biomass co-firing, Small Hydropower Projects (SHP) and Battery Energy Storage Systems (BESS).



Project Management Services

Business Review

Project Management Services

KEY FOCUS AREAS

Development of the WTE project	Build Development of the CCGT plant in Port Dickson	Manage and deliver RTS projects
Execute the Biomass co-firing project at Tanjung Bin Coal Fired Power Plant	Deliver the Small Hydropower project in Kelantan	Co-lead Malakoff’s first venture into the BESS

BUSINESS ENVIRONMENT

In July 2024, MESB completed the demolition of an Open Cycle Gas Turbine (OCGT) plant. We achieved significant progress in developing a new CCGT plant and completed RTS projects at Toyota Assembly Services Sdn. Bhd. and Senai International Airport.

We successfully completed the 2% biomass co-firing initiative at the Tanjung Bin Power Plant, marking a step forward in our commitment to sustainable energy transition. However, progress remains constrained by the lack of a well-defined policy framework to support this initiative, along with the absence of a clear fuel-pass through mechanism. These challenges highlight the need for greater regulatory clarity to unlock the potential of biomass co-firing in driving cleaner energy solutions.

PERFORMANCE REVIEW

Initiatives

Ensure the Timely cCompletion of the RTS Project by Malakoff Radiance Sdn. Bhd. (MRSB)

Ensure On-Time Demolition of the Port Dickson Power Plant

Progress/Outcomes

▶ Completed the RTS projects at Toyota Assembly Service Sdn. Bhd. and Senai International Airport on schedule

▶ Completed the demolition project at Port Dickson OCGT plant to make way for new CCGT plant

Business Review

Project Management Services

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Uncertainties Regarding the Progress and Initiation of Large-Scale Power Plant Projects	<ul style="list-style-type: none"> ▶ Offered assistance and deployed team members to assist project development teams for WTE, CCGT and BESS
Decline in New Project Management Agreement and Manpower Service Agreement	<ul style="list-style-type: none"> ▶ Deployed workforce support to the O&M teams at Tanjung Bin Power Plant and Tanjung Bin Energy Power Plant during scheduled plant outages ▶ Offered manpower and technical expertise for critical CAPEX projects, including the development of RTS and CCGT projects

KEY ACHIEVEMENTS

- ▶ Successfully delivered the project management services for the RTS project and Port Dickson Power Plant demolition project on schedule

OUTLOOK

We are committed to securing new Project Management contracts through Project Management Agreements for upcoming CCGT developments and WTE as well as BESS initiatives. With our deep industry expertise, we will continue to optimise operations and implement sustainable strategies that drive meaningful progress.

Business Review

Electricity Distribution and District Cooling System

WHO WE ARE AND WHAT WE DO

Malakoff Utilities Sdn. Bhd., a fully owned subsidiary of Malakoff, plays a significant role in electricity distribution and district cooling in Malaysia. We exclusively supply power to the 72-acre Kuala Lumpur Sentral, with a licensed capacity of up to 153 MW and operate a district cooling plant that serves 10 buildings within the commercial and residential transit hub, offering greater energy efficiency compared to conventional cooling systems.



Electricity Distribution and District Cooling System – MUSB

KEY FOCUS AREAS

Enhance the reliability of our Electricity Distribution Network System (EDS)

Refine payment collection processes to boost efficiency

Continuously enhance the Condition of Supply agreement and customer charter

BUSINESS ENVIRONMENT

In 2024, electricity demand experienced a 7% improvement compared to the previous year, while demand for chilled water remained steady. However, the overall consumption for year 2024 has yet to reach the pre-pandemic levels seen in year 2019.

PERFORMANCE REVIEW

Objectives	Initiatives	Progress/Outcomes
Safety Manhours	▶ Ensure Zero Loss Time Injury	▶ Achieved 1,000,000 safe manhours in October 2024
Financial Stability and Sustainable Returns to Stakeholders	▶ Drive cost saving initiatives	▶ Increased Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) and Profit Before Tax (PBT) ▶ Enhanced dividend distribution
Operational Efficiencies	▶ Enhanced EDS reliability	▶ Implemented changes to the power supply sources from Tenaga Nasional Berhad (TNB) into the KL Sentral area ▶ Commenced the installation of an additional 33kV power cable within the KL Sentral area
Billing and Credit Control	▶ Streamline payment collection for greater efficiency	▶ Tracked payment collections to ensure aging remains within the targeted parameters ▶ Settled long outstanding amounts due from customers

Business Review

Electricity Distribution and District Cooling System

CHALLENGES AND MITIGATING ACTIONS

CHALLENGES	MITIGATING ACTIONS
Secure Additional Power Supply from TNB to Meet Increased Load Demands	▶ Coordinated with TNB to ensure an additional 33 kV power supply from PMU Menara 118
Address the Government's Imposition of an Additional Imbalance Cost Pass-Through (ICPT) for DCS	▶ Implemented ICPT mechanism for DCS customers
Manage the Rise in Maintenance Costs Driven by Increased Raw Material Prices	▶ Undertook extensive cost-reduction initiatives to effectively manage maintenance expenditures

KEY ACHIEVEMENTS

- ▶ Delivered outstanding operational performance and reliability in electricity and chilled water supply, maintaining zero major breakdowns in plant equipment
- ▶ Secured 96% in the Customer Satisfaction Index, reflecting strong service quality

OUTLOOK

The Government's redevelopment of Sentral Station, in collaboration with the Ministry of Transport, Unit Kerjasama Awam Swasta and Malaysian Resources Corporation Berhad, is expected to drive higher demand for utilities in KL Sentral from 2025 onwards. In response, we will optimise the district cooling plant's efficiency and improve the reliability of electricity distribution. On the customer service front, we will plan to implement the SmartApp to enable cashless transactions and communication to improve customer convenience and experience in the future.