ENERGY MANAGEMENT

INITIATIVE 2024

INTRODUCTION

Energy serves as a foundational pillar for industrial development, economic performance, and societal advancement. Amid escalating climate risks, evolving regulatory frameworks, and increasing expectations from stakeholders, effective energy management has become a strategic necessity for companies globally.

For Berli Jucker Public Company Limited (BJC), energy is indispensable to the seamless operation of its diverse business portfolio. It powers manufacturing processes, sustains retail and logistics networks, maintains temperature-sensitive supply chains, and supports digital infrastructure. As such, the efficient, reliable, and sustainable use of energy is not merely an environmental obligation but a critical business requirement that directly influences operational resilience, cost efficiency, and service excellence.

The integration of renewable energy is a core component of BJC's energy strategy. Transitioning to clean energy sources not only advances the Company's climate objectives but also mitigates risks associated with fossil fuel price volatility and energy supply disruptions. Furthermore, it enhances regulatory readiness and strengthens BJC's ability to meet rising expectations from investors, customers, and regulators regarding climate responsibility. In this context, renewable energy is viewed not only as a technological solution but as a strategic enabler of long-term business transformation and sustainable value creation.

This Energy Management Initiative Report provides a comprehensive overview of BJC's progress, key achievements, and forward-looking plans in advancing energy efficiency and accelerating the adoption of renewable energy. It outlines the governance structures, operational measures, and performance metrics that form the foundation of the Company's energy transition strategy.

Recognizing the intrinsic link between energy performance and corporate sustainability, BJC has adopted a structured and forward-looking approach to energy governance. This approach is aligned with the Group's Environmental Management Policy and underpinned by the commitment to achieve net-zero greenhouse gas (GHG) emissions by 2050. As part of this overarching ambition, BJC has established a medium-term target to reduce non-renewable energy consumption by 15 percent by 2032, using 2021 as the baseline. These objectives are embedded within the Company's strategic framework, the "1+5 Strategy," which integrates environmental performance with core business functions across all operating units.

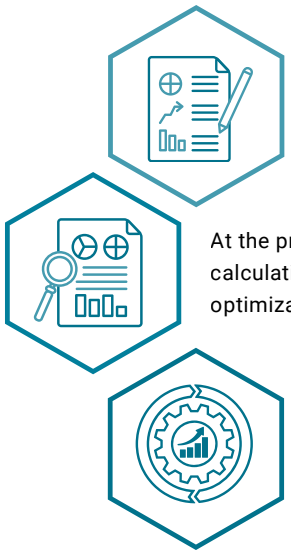
BJC's energy management system is aligned with international best practices, particularly ISO 50001, and is guided by the principles of continuous improvement, risk-informed decision-making, and stakeholder engagement. Core initiatives implemented under this framework include:

- Conducting regular and comprehensive energy audits across key operational sites to identify opportunities for improvement
- Setting quantified targets to address energy saving
- Implementing actions to reduce the amount of energy use
- Evaluation of progress in reducing energy consumption
- Expanding the use of clean or green energy
- Investing in innovation and research and development to decrease energy consumption
- Procuring Renewable Energy Certificates (RECs) to support the transition to low-carbon electricity
- Providing energy efficiency training to employees to raise awareness of energy consumption reduction
- Systematically monitoring, analyzing, and reporting energy data to ensure transparency, accountability, and informed decision-making

Comprehensive Energy Audits to Identify Opportunities for Improvement

As part of its commitment to reduce the use of non-renewable energy, BJC conducts comprehensive energy audits to identify opportunities for improving energy performance and energy conservation potential across all levels of operation.
The audits follow a systematic methodology that includes the inspection and analysis of significant energy consumption to detect energy losses and establish corrective actions. Key evaluation criteria include total energy use, hours of operation, and the technical and operational potential for improvement, consistent with ISO 50001's requirements for energy performance indicators and baselines.

Assessments are conducted across three organizational levels:



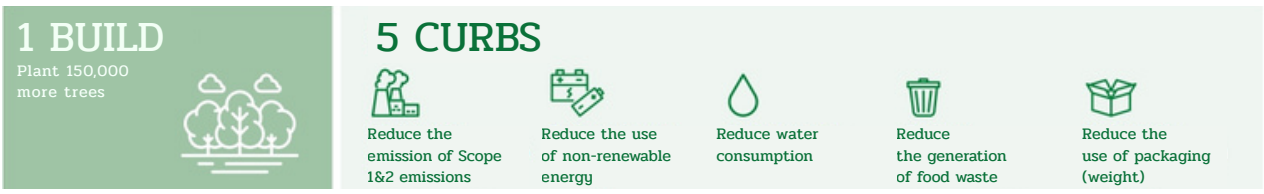
At the organizational level, data is compiled on energy consumption related to electrical systems, core production or service activities, and supporting infrastructure over a 12-month reporting period.

At the product or service level, energy performance is evaluated through process analysis and the calculation of Specific Energy Consumption (SEC), enabling benchmarking and process-level optimization.

At the equipment level, significant energy-consuming assets are analyzed to determine efficiency, identify operational losses, and prioritize areas for retrofit or replacement.

The findings from these assessments are compiled into BJC's Energy Management Report and serve as a critical foundation for prioritizing efficiency upgrades, technology investments, and operational adjustments aimed at reducing the Company's environmental footprint and supporting its long-term sustainability objectives.
In 2024, BJC Big C expanded its retail and packaging businesses, bringing the total number of Big C branches to 1,811 stores across various formats to meet growing operational demand. This includes 153 Big C Hypermarkets, 50 Big C Market and Big C Foodplace stores, 11 Big C Depot and Big C Food Services outlets, and 1,597 Big C Mini stores. Additionally, the Company launched Thai Beverage Can Factory 2 to further strengthen its packaging capabilities.
In 2024, BJC's manufacturing plants implemented energy audits covering 100% of operations, while Big C Hypermarkets completed energy audits for approximately 90% of their total 153 stores.

Quantified Targets to Address Energy Savings



To support the transition toward a sustainable business model, BJC remains firmly committed to reducing greenhouse gas emissions, with a strategic focus on decreasing reliance on non-renewable energy sources. In alignment with the Company's long-term ambition to achieve Net Zero emissions by 2050, BJC has, since 2022, established defined objectives under its "1+5" Sustainable Environmental Strategy.
As part of this framework, BJC has set a quantified targets to address energy saving, which entails a 15% reduction in non-renewable energy consumption and a concurrent increase in the use of renewable and green energy sources. These initiatives are designed to enhance overall energy efficiency and support measurable reductions in greenhouse gas emissions.
Importantly, this target has been expanded to encompass all business units under BJC, including newly established and future business operations, ensuring that energy and climate objectives are fully integrated across the entire organization. This forms a central pillar of BJC's comprehensive approach to energy management, environmental stewardship, and long-term sustainability.

Actions to Reduce the Amount of Energy Use

In 2024, BJC Group, invested over of THB 63 million in research and development (R&D) and green technology innovations to advance its sustainability agenda. This strategic investment focused on two key objectives: reducing overall energy consumption and increasing the use of clean and renewable energy across its operations.
The R&D initiatives were directed toward enhancing energy efficiency in core business processes, optimizing building and equipment performance, and developing environmentally friendly technologies tailored to retail and logistics operations.
In parallel, BJC accelerated the deployment of clean energy solutions, including solar rooftop systems, energy-saving infrastructure, and smart energy management systems.

Key action:

Upgrading to high-efficiency equipment and smart technologies to reduce energy consumption.

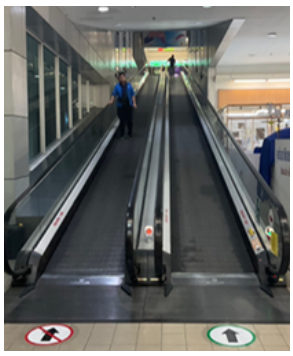
Machine replacement with energy-efficient equipment to reduce power usage and maintenance costs.

Green and Clean Energy

Investments in innovation or research and development to decrease energy consumption

Project related :

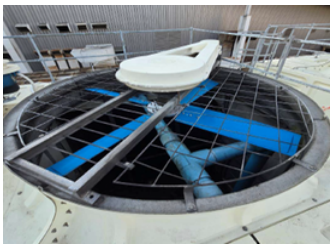
Big C Variable speed (VSD) for Auto Walk control Auto Start-Stop



In 2024, Big C installed 158 Variable Speed Drives (VSDs) across 52 branches. These VSDs were implemented to optimize the operation of motors for auto walks and escalators under varying load conditions, and to enhance the energy efficiency of cooling tower fans.
The project required an investment of THB 17.39 million.
Electricity consumption before installation: 4,273,118.13 kWh/year
Electricity consumption after installation: 1,709,247.25 kWh/year
Total electricity savings: 2,563,870.88 kWh/year
Annual cost savings: THB 10.89 million
GHG emissions reduction (Scope 2): 1,281.68 tCO_2e/year

This project not only resulted in substantial cost savings but also significantly contributed to Big C's environmental goals by reducing indirect greenhouse gas emissions and improving overall energy performance.

Upgrading High Efficiency Fan Cooling Tower



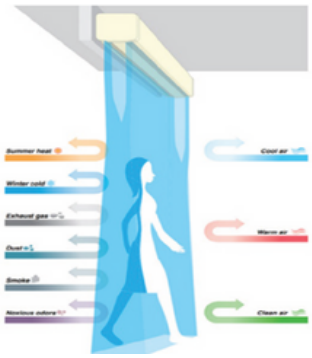
Big C upgraded 161 cooling tower fan blades across 27 branches, replacing traditional aluminum blades with fiberglass blades.
The fiberglass blades are significantly lighter, enhancing the system's operational efficiency and reducing energy consumption.
The project required a total investment of THB 11.13 million.
Electricity consumption before installation: 4,807,955.88 kWh/year
Electricity consumption after installation: 3,526,286.40 kWh/year
Total electricity savings: 1,281,669.48 kWh/year
Annual cost savings: THB 5.45 million
GHG emissions reduction (Scope 2): 640.71 tCO_2e/yea

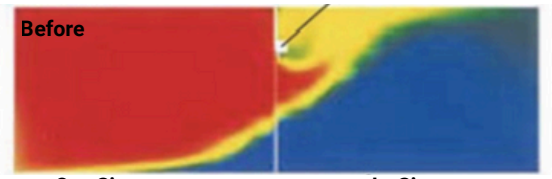
Air Curtain Installation for Frozen Room

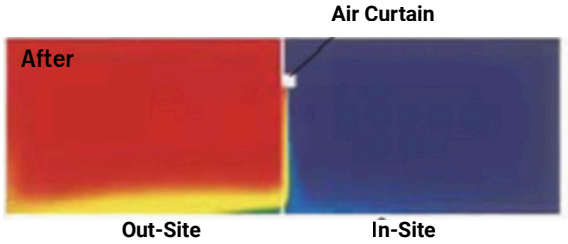
To improve energy efficiency in cooling systems, Big C installed 74 air curtains across 36 branches. These devices help prevent cool air loss from air-conditioned spaces, thereby reducing the workload of compressors and lowering overall energy consumption.

The project involved an investment of THB 1.85 million.
Electricity consumption before installation: 1,201,911.55 kWh/year
Electricity consumption after installation: 999,106.56 kWh/year
Total electricity savings: 202,804.99 kWh/year
Annual cost savings: THB 0.86 million
GHG emissions reduction (Scope 2): 101.38 tCO_2e/year

This project contributed to both energy and cost savings while supporting Big C's climate targets by reducing indirect greenhouse gas emissions through improved thermal efficiency in store operations.

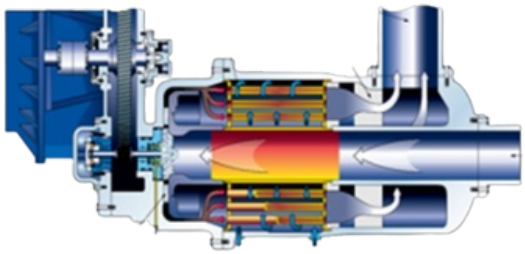






Compressed Air Optimization Project – Demand Side (HP) Pressure Reduction @ BJC Glass

In this project, the low-pressure air compressor SB4 No.1 was found to be underperforming, unable to reach the pressure levels achieved by other units. This limited the efficiency of the compressed air system, resulting in suboptimal energy allocation.
To address this, a preventive maintenance (PM) operation was carried out on the air cooler of compressor LP4/1 to restore its ability to generate adequate pressure.



After the maintenance, the system was able to deliver more compressed air, allowing operators to shut down higher-energy-consuming compressors and instead run those with greater energy efficiency. Additionally, material loading operations were shifted to use low-pressure air (LP) without requiring extra compressors.

The project involved an investment of THB 119,819 for air cooler maintenance.
Electricity savings: 112 kW
Annual energy cost reduction: THB 3,638,515
GHG emissions reduction (Scope 2): 478 tCO_2/year

Clean room ventilation fan improvement@ Thai Glass

As part of the energy efficiency initiative, six low-efficiency IE1 motors (11 kW, 3-phase, 415 V), which had been in operation for over 10 years, were replaced with high-efficiency IE3 motors.
The aging motors had experienced a performance decline of approximately 20–30% due to prolonged use.
An investment of THB 168,600 was made for the upgrade.
After installation, the system achieved an electricity saving of 11.53 kW, resulting in a significant reduction in energy consumption.

This improvement contributed to an estimated greenhouse gas emissions reduction of 49.8 tCO_2 per year, supporting the company's climate and energy efficiency goals.

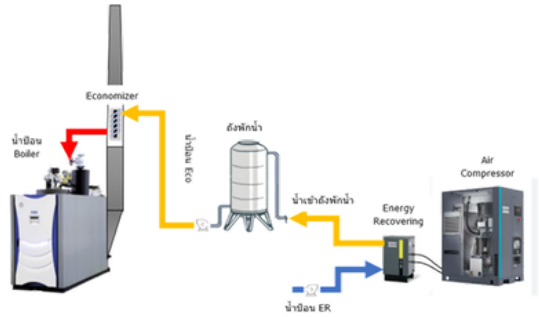
High-efficiency Refiner @ CPC

Old Refiner

New Refiner

At the CPC facility, the pulp refiner on PM3 had begun to deteriorate, consuming excessive electrical current and operating inefficiently. Additionally, the blade mounting system had corroded and become damaged, resulting in suboptimal pulp refining performance and affecting the paper's strength quality.
To address this, the existing 250 kW refiner was replaced with a new high-efficiency 160 kW model, which significantly reduced energy consumption and improved operational reliability.
Investment: THB 3.52 million
Annual electricity cost savings: THB 0.76 million
GHG emissions reduction (Scope 2): 95.34 tCO_2e/year
This upgrade improved energy efficiency in the production process while enhancing product quality and supporting the company's greenhouse gas reduction goals.

High Efficiency Air Compressor and Heat recovering Development @ RIL



As part of efforts to enhance energy efficiency, outdated equipment was replaced with high-performance systems that integrate energy recovery features:
High-Efficiency Air Compressor: Equipped with a heat recovery system, which captures waste heat from the compressed air process to preheat water for the feedwater tank.
High-Efficiency Boiler: Integrated with an economizer, utilizing exhaust heat to preheat boiler feedwater, thereby reducing fuel consumption.
The total investment for this equipment upgrade was THB 1.7 million.

Estimated energy savings: 300,000 kWh/year
Improved overall system efficiency and reduced energy costs through heat recovery utilization.
This project demonstrates Big C's commitment to sustainable operations by reducing energy consumption and optimizing resource use through waste heat recovery technology.

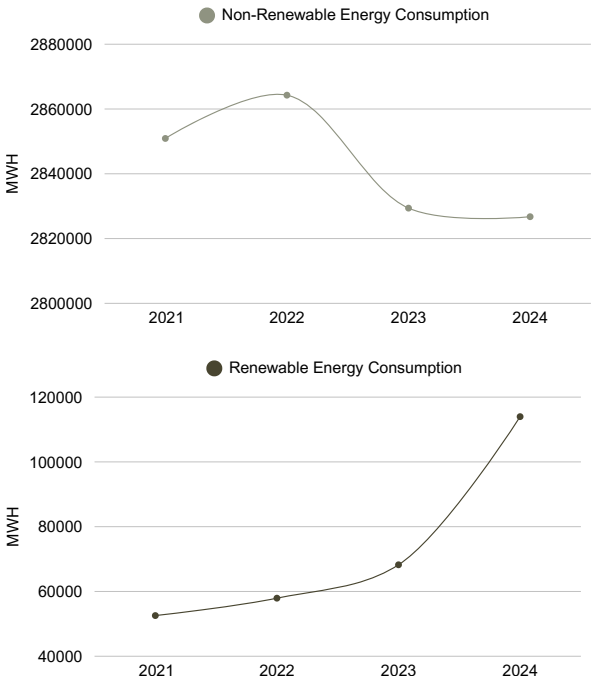
Heat Recovery System Installation for Frying Process @ BJF

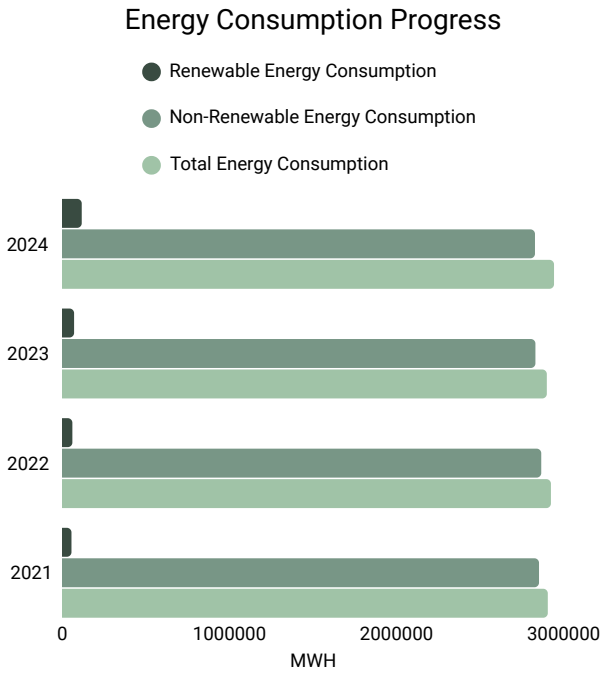
BJF implemented a heat recovery system to capture waste heat emitted from the potato frying process and repurpose it to preheat frying oil in a closed-loop system, thereby reducing reliance on natural gas (NG).
Total investment: THB 2.5 million
Reduction in NG consumption: Approximately 1.19 MMBtu per ton of fried potato product
Annual cost savings: THB 1.99 million (equivalent to a 7.5% reduction)

GHG emissions reduction: 307 tCO_2e per year
This project significantly enhances energy efficiency by utilizing waste heat from production and contributes to both cost savings and reduced greenhouse gas emissions, supporting BJF's sustainability and climate goals.

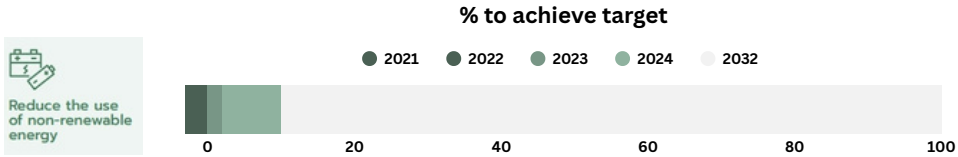
Evaluation of Progress in Reducing Energy Consumption

As part of BJC's commitment to continuous improvement and environmental responsibility, the Company places strong emphasis on the regular evaluation of progress in reducing energy consumption. This process plays a critical role in ensuring that energy efficiency initiatives are effectively implemented, monitored, and aligned with the Company's long-term sustainability targets. By systematically assessing energy performance across operations, BJC is able to identify areas of improvement, verify the effectiveness of implemented measures, and guide strategic decisions that contribute to achieving its quantified energy-saving targets and net-zero emissions goal by 2050.





According to the 2024 evaluation, BJC's total energy consumption reached 2,940,725 MWh, representing an increase of 1.48% compared to 2023, when total consumption stood at 2,897,629 MWh. This increase was primarily attributed to the expansion of retail operations and manufacturing facilities, in conjunction with BJC Glass's strategic investment in the installation of electric glass furnaces—a measure aimed at reducing reliance on fossil fuel-based energy sources.



Despite the overall rise in energy consumption, the evaluation indicates significant progress toward BJC's non-renewable energy reduction targets. Since 2021, the Company has successfully decreased its non-renewable energy consumption by more than 32,000 MWh, which equates to an approximate 8% reduction relative to its defined target.

This progress contributes directly to BJC's target to reduce non-renewable energy consumption by 15% by 2032, using 2021 as the baseline year. This target, established under the "1+5" Sustainable Environmental Strategy, forms a critical part of the Company's commitment to climate action and sustainable resource management.

Concurrently, BJC has made notable advancements in the adoption of renewable energy. In 2024, renewable energy consumption increased from 52,554 MWh to 113,973 MWh, accounting for approximately 4% of total energy consumption. Furthermore, the proportion of electricity sourced from renewable energy rose from 4% in 2020 to 10% in 2024, underscoring the Company's commitment to clean energy transition and long-term environmental sustainability.

Scaling Up the Use of Clean and Green Energy

Project related :

PPA Solar Cost Saving Project – WH Rental @ Thai Glass

To reduce electricity consumption from the grid, solar-powered lamps were installed throughout all rental warehouse areas. A total of 48 solar lamps were installed to replace conventional grid-powered lighting.

Electricity savings: 42,120 kWh/year

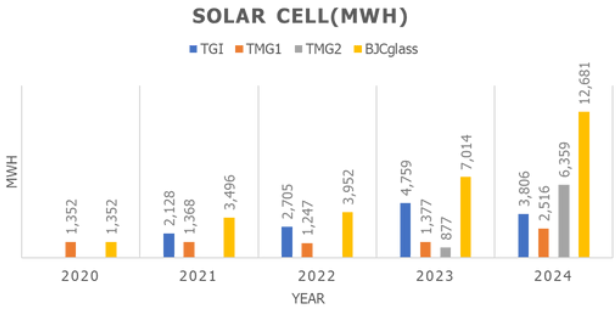
Annual cost savings: THB 226,608

GHG emissions reduction (Scope 2): 21.05 tCO_2e/year

This project contributes to operational cost reduction and supports environmental sustainability by reducing reliance on grid electricity and lowering indirect greenhouse gas emissions.

To support BJC's commitment to reducing the use of non-renewable energy, in 2024, BJC Glass collaborated with Gulf Energy to promote the adoption of renewable energy through the expansion of solar photovoltaic (PV) systems at the TMG2 factory, with an installed capacity of approximately 5 MWDC.

This initiative is a key part of BJC's long-term strategy to transition toward clean energy and reduce Scope 2 greenhouse gas emissions. The solar PV system is expected to generate a significant portion of the factory's electricity demand, helping to reduce reliance on grid-supplied electricity derived from fossil fuels.



Solar Project @ CPC

CPC has installed solar panels as part of its renewable energy initiative, helping to reduce reliance on electricity generated from coal. This effort increases the share of clean energy in the company's operations, thereby minimizing the environmental impact associated with energy consumption. The system has achieved an electricity reduction of 981.72 kWh, and more importantly, it contributes to a reduction in greenhouse gas emissions—further supporting CPC's sustainability goals.

Solar Rooftop Project @ Big C (2024)

In collaboration with BJC Power and Impact Solar Group Limited, Big C launched a large-scale Solar Rooftop installation project in 2024 to increase clean energy usage across its retail network.
Hypermarket (92 sites): 76.19 MW
Mini Big C (2 sites): 46 MW

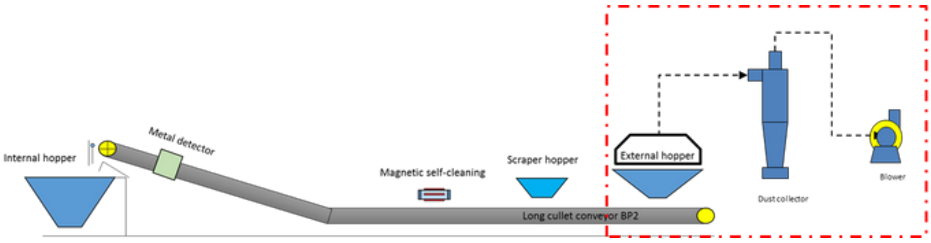
Total energy savings: 91,385,819 kWh/year
Annual cost savings: THB 158.23 million
GHG emissions reduction (Scope 2): 45,684 tCO_2e/year
This initiative plays a key role in Big C's clean energy transition strategy, supporting both cost reduction and long-term carbon neutrality goals through the use of renewable energy.

Investments in Innovation or R&D to Decrease Energy Consumption

Project related :

Cyclone Operation Optimization Project for External Hopper @ Thai glass

Previously, the cyclone motor of the external hopper operated continuously, resulting in unnecessary energy consumption. However, the feeding of cullet into the external hopper occurs only at intervals using a front loader.
To optimize energy use, a sensor system was installed to detect cullet loading activity and allow the motor to operate only during actual material feeding.
Investment cost: THB 5,947
Electricity savings: 6.57 kW
Annual cost savings: THB 248,156.78
GHG emissions reduction (Scope 2): 28.32 tCO_2e/year
This low-investment project demonstrates an effective way to reduce energy consumption and greenhouse gas emissions by aligning equipment operation with actual usage needs.



The Glass Cycle Project:

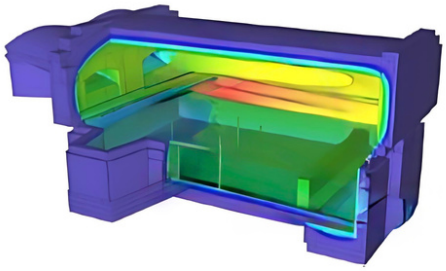
BJC Glass has embedded circular economy principles into its manufacturing process to reduce energy consumption, minimize environmental impact, and ensure long-term sustainability.
The initiative operates through a closed-loop system that recovers and recycles used glass bottles into new products, reducing virgin material usage, energy demand, and emissions, all in alignment with ESG commitments.

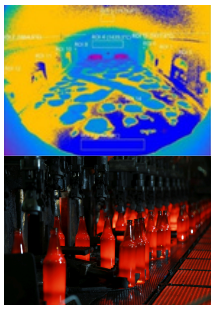
To drive further efficiency, BJC Glass has invested in innovation and R&D focused on three key pillars:

C3Leng Application:

A digital platform that connects individuals and businesses with recycling services.
It improves collection efficiency by linking local waste collectors with recycling centers across 21 Grungthai Group branches and promotes community participation in over 8 provinces.
In 2024, over 1,161,383.72 kg of glass was recycled through the platform.

AI-powered ESIII Smart Glass Furnace system



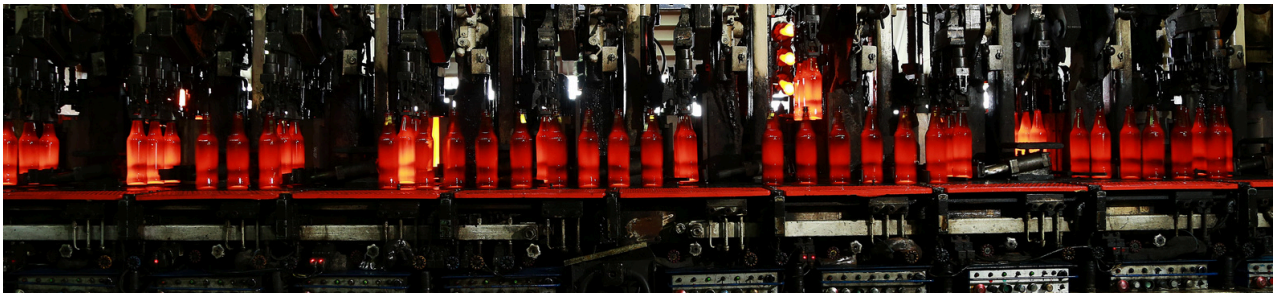


BJC Glass has implemented the AI-powered ESIII Smart Glass Furnace system to analyze data from primary energy sources and optimize energy usage in the glass melting furnace.

This innovation has led to energy savings of over 300 million MJ and a reduction in Scope 1 GHG emissions by approximately 17,490,000 kg CO_2. In 2024, the project achieved energy cost savings of over THB 2.5 million.

Glass Recycling (Cullet):

BJC continues to increase cullet use in production. Every 10% increase in cullet can reduce energy consumption by 3% and GHG emissions by 5%, contributing directly to cleaner, more sustainable operations.



Procuring Renewable Energy Certificates (RECs) to Support the Transition to Low-Carbon Electricity

As part of BJC's commitment to achieving its environmental targets—specifically the reduction of Scope 1 and 2 greenhouse gas emissions and non-renewable energy consumption by 15% by 2032—the Company has continued to expand its use of clean energy instruments across its subsidiaries.

In 2023, Thai Malaya Glass, began procuring International Renewable Energy Certificates (I-RECs) by acquiring 1,224 MWh sourced from wind energy, generated by the Electricity Generating Authority of Thailand (EGAT) and traded through Innopower Company Limited. This early initiative formed part of BJC's broader decarbonization roadmap and demonstrated tangible progress toward its 2032 energy transition targets.
In a similar effort, in 2024, BJC subsidiary Thai Glass purchased 3,878 MWh of I-RECs, representing electricity generated from hydropower by EGAT. This initiative reinforces the Company's strategy to reduce reliance on non-renewable energy sources while actively supporting national clean energy development.
Together, these actions underscore BJC's ongoing commitment to accelerating the transition to renewable energy, while reinforcing alignment with international sustainability standards, national energy policies, and global climate goals.

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Energy Efficiency Training Provided to Employees to Raise Awareness of Energy Consumption Reduction

BJC annually implements energy efficiency training programs aimed at raising awareness among employees regarding responsible energy use and consumption reduction. The training covers essential topics such as energy conservation and efficient energy use, equipping participants with both theoretical understanding and practical tools to identify inefficiencies and adopt sustainable practices in their daily operations.
These training programs are conducted across all factories and business units under the BJC Group, with particular emphasis on operations where energy plays a critical role. For example, in BJC Glass, where energy consumption is a significant factor in production, 100% of employees have received energy efficiency training, ensuring full alignment with the company's energy management framework.

The program not only supports BJC's broader energy and sustainability objectives but also empowers employees to contribute meaningfully to the Company's long-term goal of reducing greenhouse gas emissions and achieving net-zero emissions by 2050.

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