ASIA CLEAN ENERGY FORUM 2025

Empowering the Future: Clean Energy Innovations, Regional Cooperation and Integration, and Financing Solutions

2–6 June | ADB Headquarters

ASIA CLEAN ENERGY FORUM 2025

Empowering the Future: Clean Energy Innovations,
Regional Cooperation and Integration, and Financing Solutions

2–6 June | ADB Headquarters, Manila

ADB

DEEP DIVE WORKSHOP

Towards a Cleaner Future: Accelerating Global Cooperation and Innovation for Sustainable Energy

4 June 2025 | 2:00p.m. – 5:30 p.m.

ADB ASIAN DEVELOPMENT BANK

KOREA ENERGY AGENCY

ASIA CLEAN ENERGY FORUM 2025

Empowering the Future: Clean Energy Innovations,
Regional Cooperation and Integration, and Financing Solutions

2–6 June | ADB Headquarters, Manila

ENERGY AUDIT
Designing change for Decarbonization with Global Cooperation

4 June 2025

ASIAN DEVELOPMENT BANK

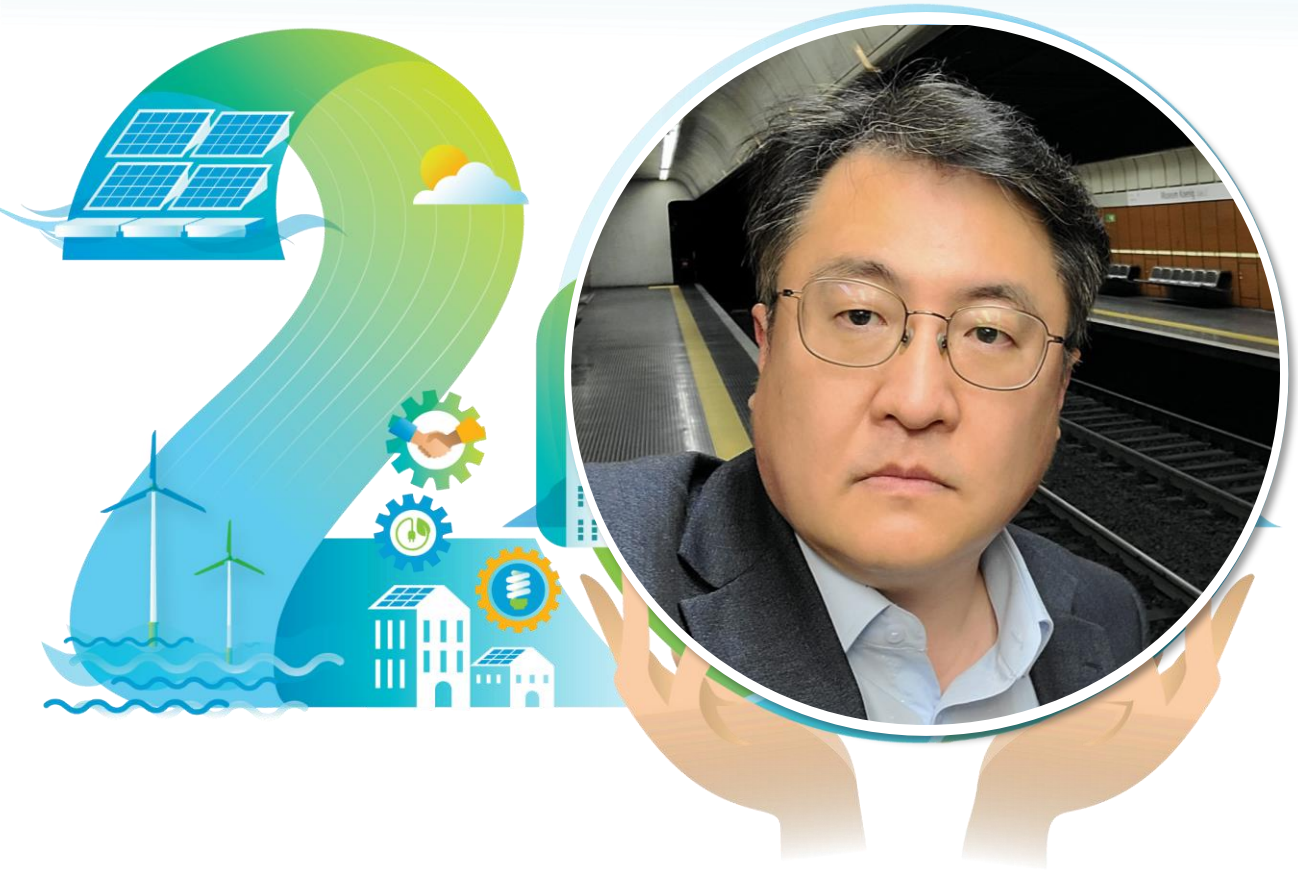
KOREA ENERGY AGENCY

ASIA CLEAN ENERGY FORUM 2025

Empowering the Future: Clean Energy Innovations, Regional Cooperation and Integration, and Financing Solutions

2–6 June | ADB Headquarters, Manila

ADB



Seok-Jai CHOI

Director General, Energy Audit Division
Korea Energy Agency

Featured Speaker


ADB
ENERGY AUDIT
Designing change for Decarbonization
with Global Cooperation
KOREA ENERGY AGENCY

Korea Energy Agency

KOREA ENERGY AGENCY ADB

The Korea Energy Agency is a public entity under the Ministry of Trade, Industry and Energy aims for reducing GHG emissions and improving quality of life by promoting rational energy use and dissemination of new and renewable energy of Republic of Korea.

Name	KEA (Korea Energy Agency)
President	Lee Sang-hoon
Staff	758
Organization	20 Divisions, 1 Affiliated(5 Divisions), 12 Regional HQ

Main Role

01	02	03	04
Improve energy efficiency	Disseminate new and renewable energy	Respond to climate change	Energy welfare

Budget	1.2 billion dollars (1.673 trillion KRW)
Founded	July 4, 1980 (Article 45, *Energy Use Rationalization Act)*
Type	Quasi-governmental organization

AS of 31. DEC. 2024

What Korea Energy Agency does

KOREA ENERGY AGENCY ADB

EE in industry

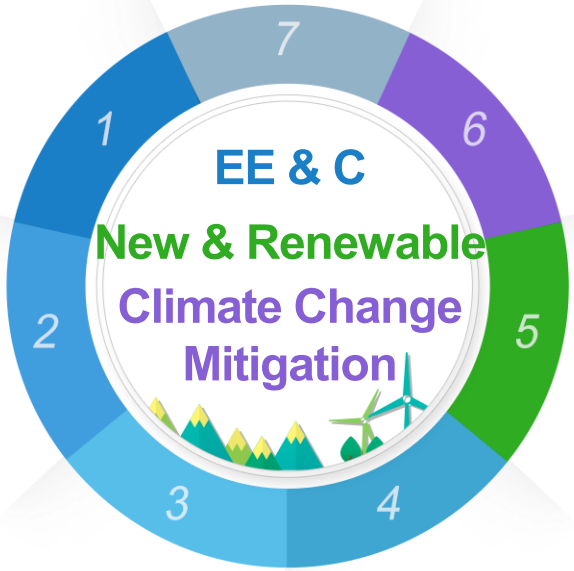
- Voluntary Energy Efficiency Target System
- Negotiation of large-scale Energy use plan
- Reporting System of Energy Intensive Business Entities (EIBE)
- Energy Audit (Mandatory & Consulting)
- Energy Saving through Partnership (ESP)
- Inspection of Heat-using Machinery, Equipment or Materials
- Soft Loan & Tax Credit
- Energy Service Company (ESCO)
- Investments in Energy Suppliers' Demand-side Management (DSM)
- Factory Energy Management System (FEMS)
- GHG-Energy Target Management Scheme
- SME's support Program
  (GGP / Green Credit / Energy Supporter / Eco-Best)

PR, Education, Welfare

- Korea Green Energy Show
- Energy Exhibition Center (NEXTAGE)
- Education & Training
- Energy Voucher Program

Climate Change Mitigation

- International Cooperation
- Energy GHG Total Information Platform Service (EG-TIPS)
- External business of ETS
- Industrial GHG reduction support
- National Inventory and Statistics in the industrial process sector
- CDM Validation and Verification
- Oversea GHG mitigation project for NDC



EE in Building

- Building Energy Code
- Building Energy Efficiency Rating Certification
- Zero Energy Building Certification
- Building Energy Management System (BEMS)
- Rational Energy Use in public institutions
- Building Energy Assessor

NRE Development/Use/Deployment

- Subsidy for Deployment of NRE
- Soft loans for NRE
- Feed in Tariff (FIT)
- Renewable Portfolio Standard (RPS)
- Auction System
- NRE mandatory use for Public buildings
- K-RE100
- Statistics establishment of the NRE's supply and industry
- Regional NRE development
- Certification NRE development

EE in Transport

- Energy Efficiency Labeling and Standard on vehicle
- Average Fuel Economy
- Tire Efficiency Standards and Ratings
- Vehicle Energy Testing Laboratory

EE in Power and Appliances

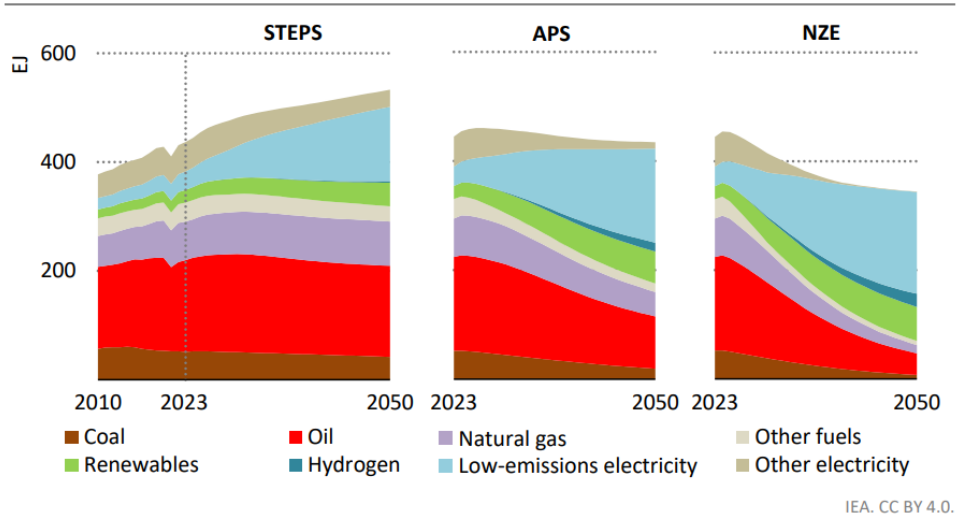
- Energy Efficiency Labeling & Standard
- High-Efficiency Appliance Certification
- E-Standby Power Reduction

Global Decabonization in Energy

KOREA ENERGY AGENCY ADB

Paris Agreement: Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels

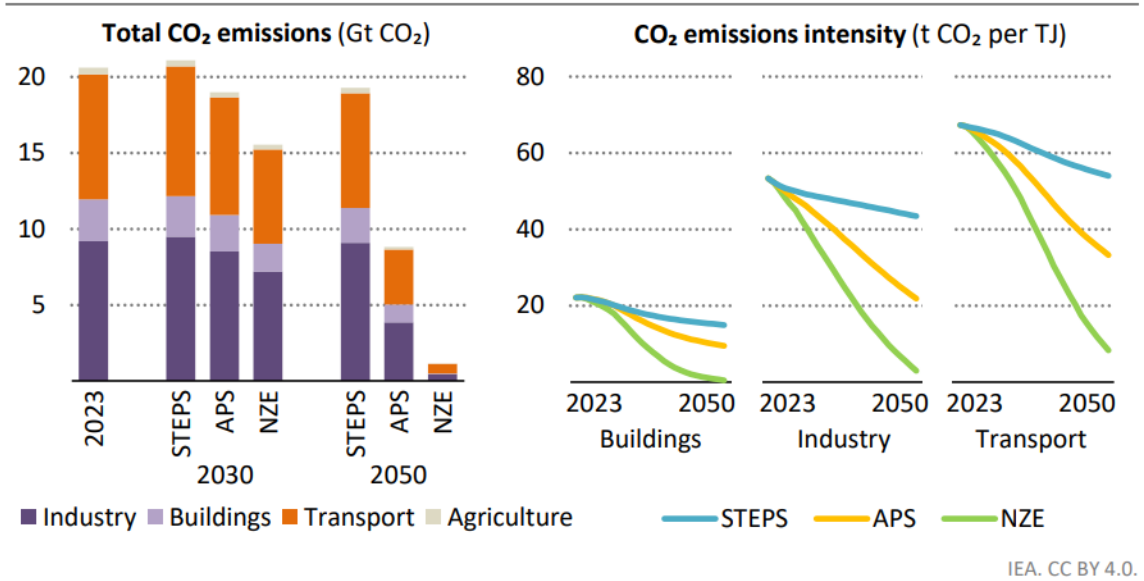
Total final consumption by fuel and scenario, 2023-2050



The share of fossil fuel use in final consumption declines this decade in all scenarios, and falls from 66% today to 55% in 2050 in the STEPS, declining faster in other scenarios

Notes: Renewables refers to the direct use of renewable energy sources. Hydrogen includes hydrogen-based fuels, such as ammonia and synthetic fuels. Low-emissions electricity includes output from renewable energy technologies, nuclear and fossil fuel-fired power plants fitted with CCUS, hydrogen and ammonia. Other fuels includes traditional use of biomass, district heat, non-renewable waste and fossil fuel methanol.

CO_2 emissions and emissions intensity by end-use sector and scenario, 2023, 2030 and 2050



Industry and transport contribute most of the total emissions from final consumption, but transport sees the biggest drop in emissions intensity thanks to rising electrification

Note: Gt CO_2 = gigatonnes of carbon dioxide; t CO_2 per TJ = tonnes of carbon dioxide per terajoule.

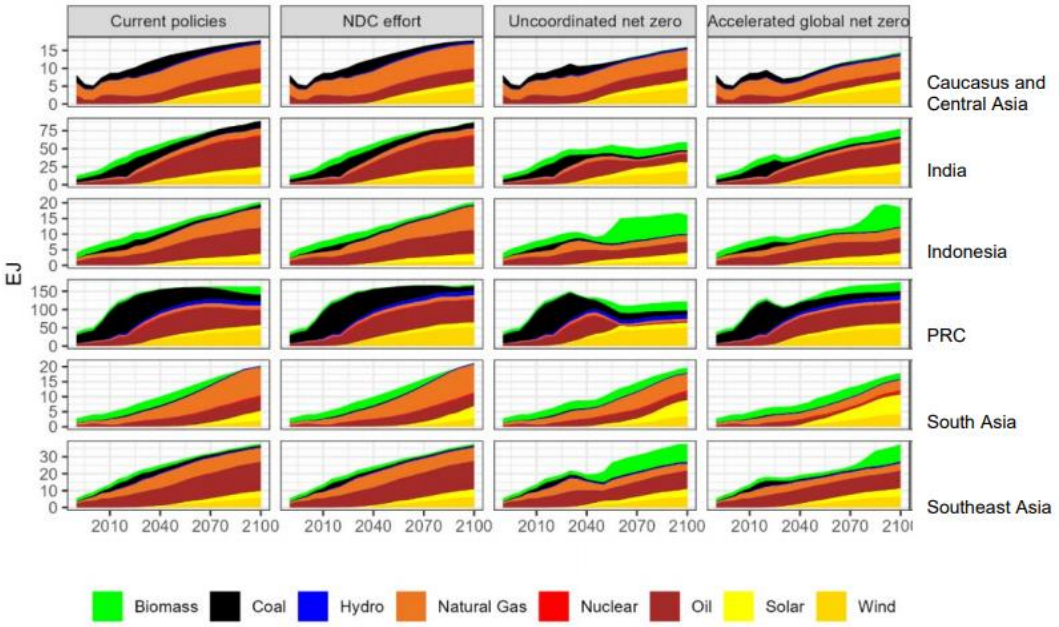
Resource: World Energy Outlook 2004(IEA, Dec. 2023)

Developing Asian Decabonization in Energy

KOREA ENERGY AGENCY ADB

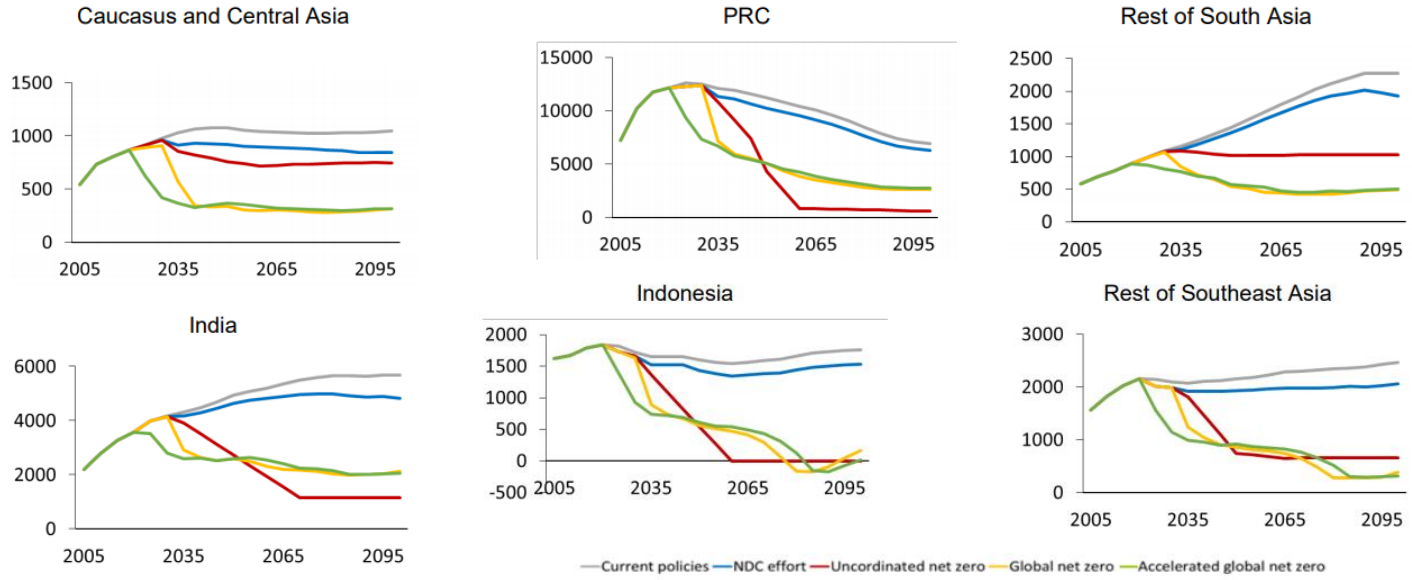
Outcome of the first global stocktake(CMA5): Tripling renewable energy capacity globally and doubling the global average annual rate of energy efficiency improvements by 2030

Primary Energy Mix in Developing Asia



GHG Emission Pathways for Subregions of Developing Asia under the Modeled Scenarios

($MtCO_2e$/year)



$MtCO_2e$/year = million tons of carbon dioxide equivalent per year, NDC = nationally determined contribution, PRC = People's Republic of China.

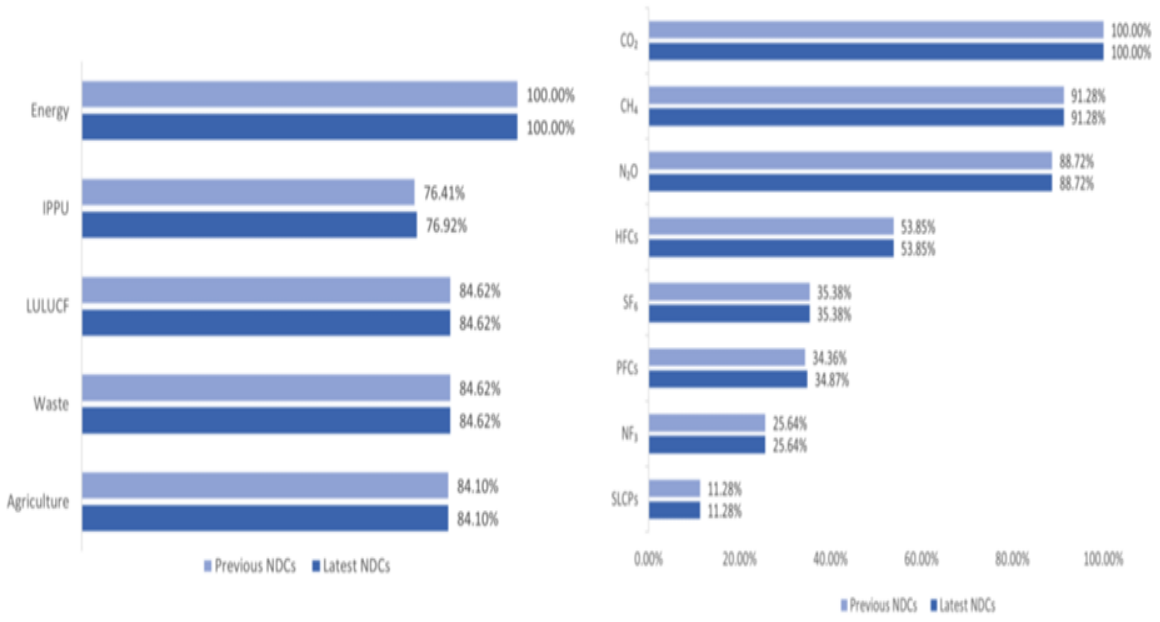
Resource: Assessing the Implications of a Global Net-Zero Transition for Developing Asia: Insights from Integrated Assessment Modeling(ADB, Dec. 2023)

Nationally Determined Contribution

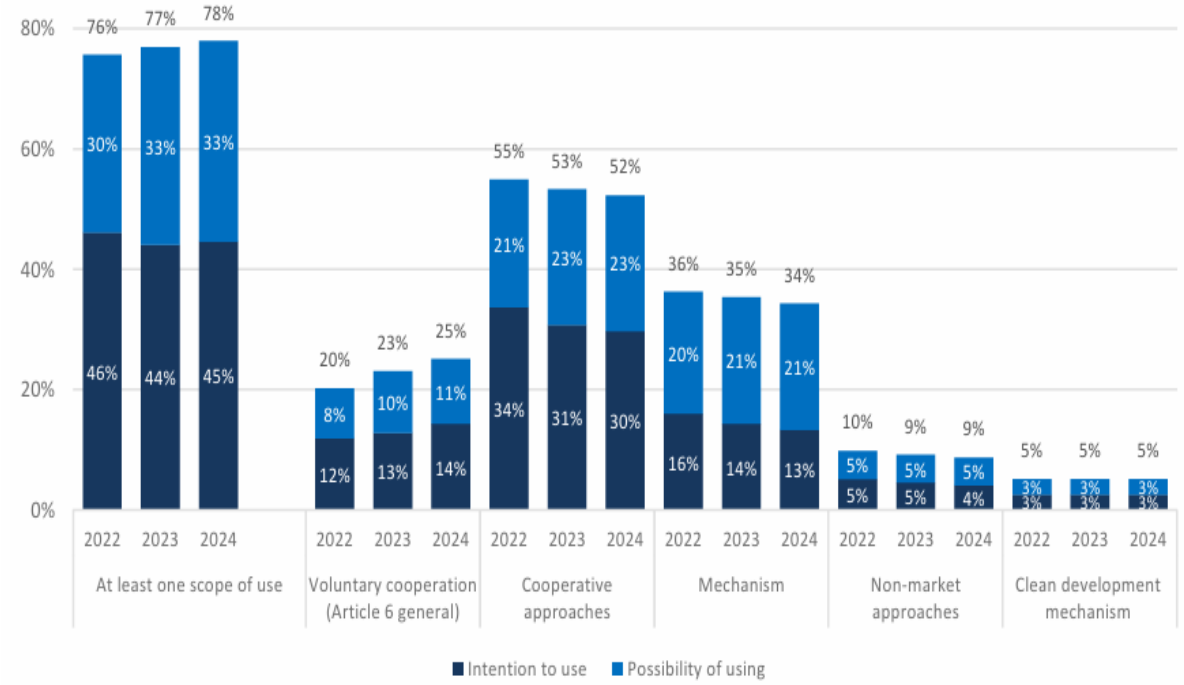
KOREA ENERGY AGENCY ADB

Paris Agreement: Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve.

Sectors and greenhouse gases covered by Parties that communicated them in nationally determined contributions



Share of Parties indicating in nationally determined contributions the intention to use or possibility of using specific scopes of voluntary cooperation under Article 6 of the Paris Agreement



Resource: Nationally determined contributions under the Paris Agreement, Synthesis report by the secretariat (CMA6, Baku)

Energy Audit

KOREA ENERGY AGENCY ADB

The Energy Audit is a technical consulting service, aiming to identify practical energy-saving solutions and GHG emission reduction projects.

Improving energy efficiency is the most cost-effective and reliable approach to reduce GHG emissions, and the first step in your decarbonization roadmap.

01 Baseline Modeling

Build a digital twin model in simulation environment

02 ESI Target Assessment

Assess an overall ESI Index and quantitative energy target
(Thermal integration performance by pinch theorems, Combustion performance rating by firing simulation, Hydraulic performance rating with VSD possibility)

03 Phase I Mature Tech

Identify and evaluate project feasibilities for technologies of TRL 9 -11
(mature technologies)

04 Phase II Developing Tech

Identify and evaluate project feasibilities for technologies of TRL 5 -10
(developing technologies)

05 Phase III Emerging Tech

Identify and evaluate project feasibilities for technologies of TRL 1 –4
(future technologies)

Why Energy Audit with KEA ?

KOREA ENERGY AGENCY ADB

The optimization by KEA's Energy Audit has contributed to the rapid industrialization and economic growth of Korea.

Since the Republic of Korea relies on imports for about 96% of its energy needs, energy efficiency has been a significant requirement.

For over 40 years, KEA has successfully implemented projects that have helped our customers reduce energy costs by 10–20%, enhance their profit margins, and significantly lower GHG emissions.

Extensive Experience

Since 1980, KEA energy audit has been a flagship energy optimization solution for industrial and building sectors, with over 2,800 projects.

Advanced Methodology

KEA's Energy Audit offers precise process simulation models utilizing advanced software such as Aspen ONE, Thermoflex, and more.

Knowledge Sharing

The passionate KEA specialists in sharing knowledge and experience, and fostering a culture of continuous improvement.

Evolution of Energy Audit with KEA

KOREA ENERGY AGENCY ADB

KEA has transformed energy audits from utility focused approach to software-driven audit, now integrating Energy Sustainability Initiative(ESI) approach for the decarbonization

1st Generation 1980-1995

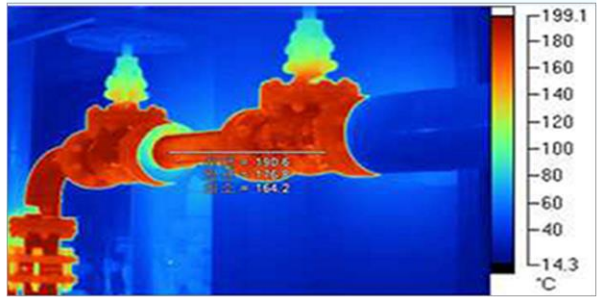
Starting of energy audit service, focusing on Utility System

Conduct energy audits using measurement tools, such as optimize cooling water flowrates by ultrasonics, adjust excess O2% by flue gas analyzers, etc.

2nd Generation 1996-2005

Introduce standardized Methods by highly intensive equipment and Introduce rigorous process simulation software, e.g. HYSYS in Petrochemicals sector

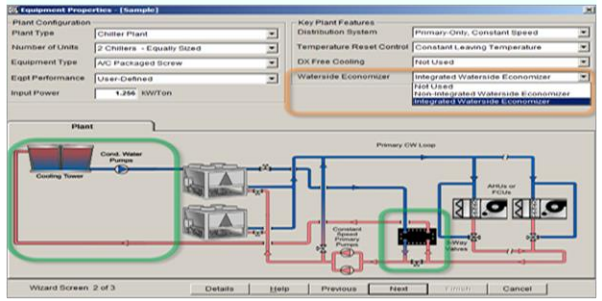
Prepare KS Heat Balancing standards of thermal facilities, Heat setting machines in textile industries, evaporators in foods industries, and so on.



3rd Generation 2006-2020

Advance to software-based energy audit methodologies

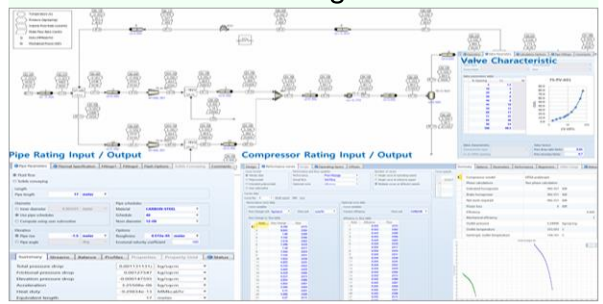
Application of Thermoflex in power plants, the concept of pinch technologies in industries, customized energy auditing for investment-grade assessments using rigorous simulations and design tools, and integrated energy audits for greenhouse gas (GHG) emission reduction projects and energy management systems (ISO 50001)



4th Generation 2021-

Introduce & Develop ESI (Energy Sustainable Initiative) Audit for unlocking Decarbonization

Approach to improving the overall Energy Intensity Index (EII), heat integration performance through pinch technology, optimization of combustion equipment for thermal efficiency, and studies on rotating machinery for electricity savings based on software simulation as digital twin



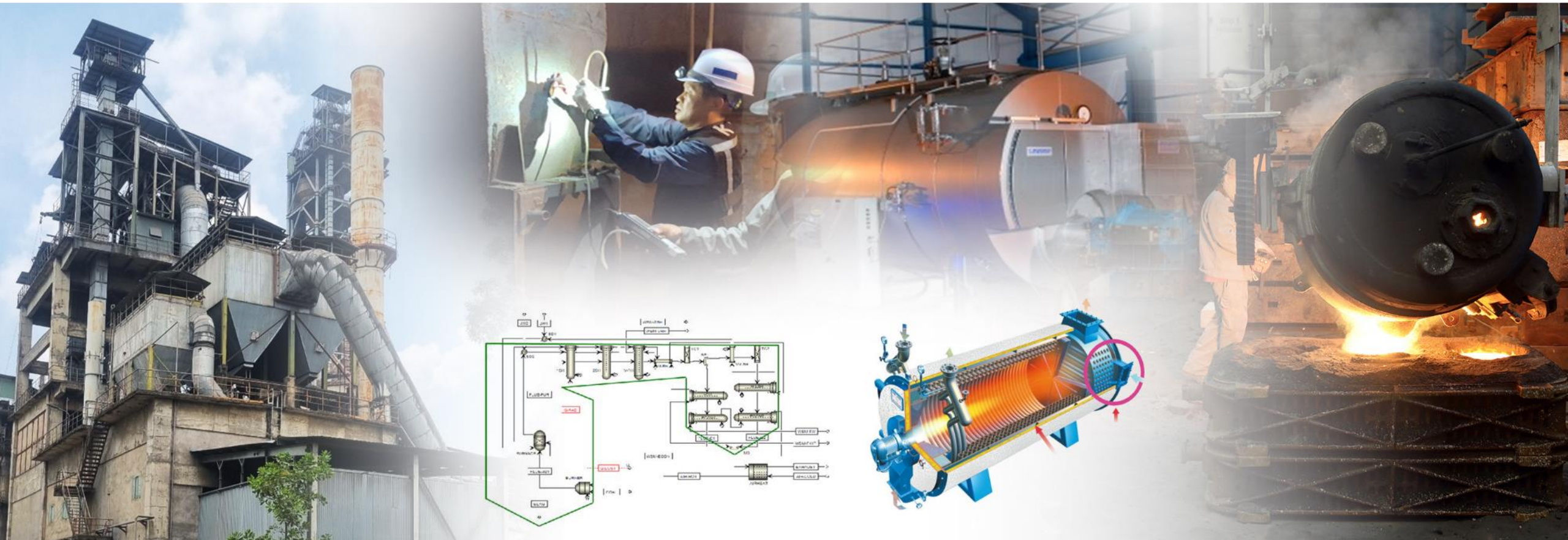
ESI Index

KOREA ENERGY AGENCY ADB

Combustion ▸ Optimize Thermal Efficiency for firing equipment

Boiler / Fired System

Through rigorous modeling on boiler system of combustion, deaeration, boiler feed water, and relevant facilities, KEA experts will identify EE projects such as 'optimize air-fuel ratio', 'heat recovery by air-preheater and/or economizer', and other thermal efficiency improvement ideas.



ESI Index

KOREA ENERGY AGENCY ADB

Heat Flow and Recovery ▸ Maximize heat recovery by optimizing heat integration

Heat Exchange Network

Through pinch technologies with rigorous modeling on process heat integration, KEA experts will propose economically/technically feasible EE projects for MER (maximum energy recovery or minimum energy requirement)

Heat Integration Optimization

Through rigorous modeling on target unit process, KEA experts will identify EE projects for optimizing heat integration, and heat recovery maximizing ideas, through pinch technologies, and exergy analysis.

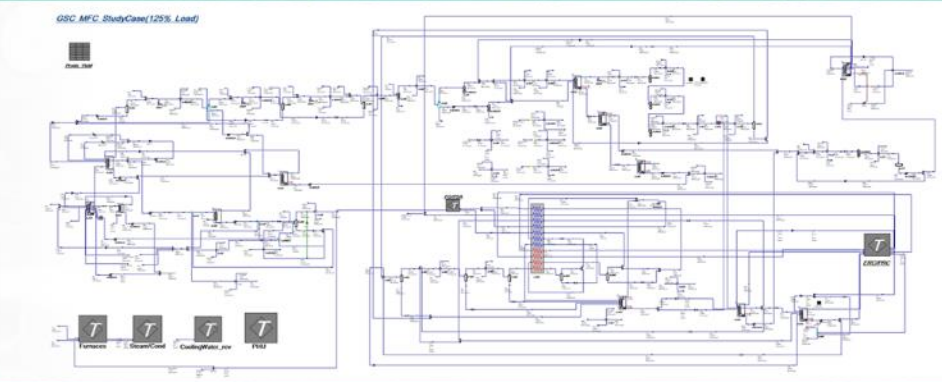
ESI Index

KOREA ENERGY AGENCY ADB

Rotating Machinery ▸ Optimize pressures & VSD(Variable Speed Drive) possibilities on machines

Pump/Fan System Optimization

Through rigorous modeling on hydraulic performance for fluid transportation equipment such as pump, fan, blowers, and compressors, KEA experts will identify EE projects for saving brake horsepower of them.



KEA is performing energy audit service for diverse industry customers around the world

01 Ceramic coating feasibility

- Increase furnace radiation heat flux
- +/- Effect on radiation and convective heat transfer

02 Heat transfer coefficient boost

- Turbulator application on dryer cylinders of paper machines
- Heat exchangers tube inserts, such as twisted tape
- High performance exchangers, such as twisted tube, plate, etc.

03 High Performance distillations

- High performance trays
- Heat pump, MVR applications
- Column targeting; side exchangers(reboiler/condensers), feed conditioning, reflux optimization

04 Lower grade thermal energy recovery

- ORC(Organic Rankine Cycle)
- Absorption chillers
- MVR(Mechanical Vapor Re-compressions)

05 Renewable energies such as PV solar power, wind turbines, geo-thermal energy, and so on.

Recent Energy Audit Practice 1

KOREA ENERGY AGENCY ADB

Overseas Training Program: 2Weeks, a week each in Uzbekistan and Korea

1st Week	Curriculum(21st~25th April, Tashkent, Uzbekistan)
1st Day	Energy audit system and operation status in Korea (Mandatory audit, audit assistance project, KEA Audit program)
	(Heat) Understanding and audit case of boiler systems, waste heat recovery systems
2nd Day	(Electricity) Understanding and Audit cases of Pump, Blower, Air Compressor, Air Dryer, Refrigerator, Air Conditioner
	Characteristics and Measurement Cases by measuring instruments
	Understanding metal/chemical energy-intensive facilities (furnaces, distillation towers, reactors, etc.) with practical cases
	Understanding ceramics/textiles energy-intensive facilities (kiln, tanner, dyeing machine, etc.) with practical cases
3rd Day	Understanding food/paper energy-intensive facilities (dryers, evaporators, herbicides, etc.) with practical cases
	Understanding of building energy-intensive facilities (constant temperature and humidity, insulation/heating, etc.) with practical cases
	Preparing an energy audit report
	audit techniques utilizing simulation software (process simulation using Aspen Hysys)
4th Day	On-site Training: industrial practice(focused on utility)
5th Day	On-site Training: industrial practice(focused on industry-specific facilities)

2nd Week	Curriculum(23st~27st June, Ulsan, Korea)
1st Day	Sharing and analyzing the results of On-site Training - intensive industries(1 companies) and practice training on preparing an audit report
2nd Day	Sharing and analyzing the results of On-site Training - intensive industries(1 companies) and practice training on preparing an audit report
3rd Day	Training on the principle, usage and practice of the industry-specific energy savings estimation tool(Excel-based)
4th Day	Site-visit: Practical cases of Implementation of proposed items and advanced energy efficient technologies on specific sector requested
5th Day	Site-visit: Practical cases of Implementation of proposed items and advanced energy efficient technologies on specific sector requested

* Detail curriculum can be adjusted by the request of trainees

Recent Energy Audit Practice 2

KOREA ENERGY AGENCY ADB

Energy Audit with ODA program of Korean Government / MDB Support Program

Thai Lube Oil

- Lube Base Oil Manufacturing Plant, Petroleum Refinery, Thailand
- Implementation of a 5-Day Energy Audit under the GGGI Project (June 2011)
- Identified **energy saving ideas totaling 376.2 TJ/year, representing 14.9% of the total energy consumption**

Bangchak Petro Company

- Crude Oil Refinery Plant, Petroleum Refinery, Thailand
- Implementation of a 6-Day Energy Audit under the GGGI Project (June 2012)
- Identified **energy saving ideas totaling 212.41 TJ/year, representing 3.2% of the total energy consumption**

Garment & Textile Enhancement

- 10 companies of garment & textile industry, Guatemala
- Implementation of a 10-Day Energy Audit under the World Bank Project (July 2014)
- Identified **energy saving ideas totaling 8,448 toe/year, representing 6% of the total energy consumption**

GREENPYME in Bolivia

- 6 Industries of Cement, Cooling Oil, Sugar, Bolivia
- Implementation of a 10-Day Energy Audit under the World Bank Project (October 2014)
- Identified **energy saving ideas totaling 8,448 toe/year, representing 6% of the total energy consumption**

EE Improvement in Peru

- 2 Industries of Food, Asphalt Manufacturing, Peru
- Implementation of a 10-Day Energy Audit under the MINEM Project (September 2016)
- Identified **energy saving ideas totaling 17,482 toe/year, representing 20.5% of the total energy consumption**

EE Improvement ODA in Vietnam

- **2nd phase project('21-'25)** following the 1st phase('17~' 19) **as a KOICA ODA program**
- **Joint Energy audit** with KEA and Vietnam team on **20 SMEs, 15 economic feasibility study, 1 demonstration project**
- **Preparing another program for Morocco** sharing the experience and output from Vietnam

Recent Energy Audit Practice 3

KOREA ENERGY AGENCY ADB

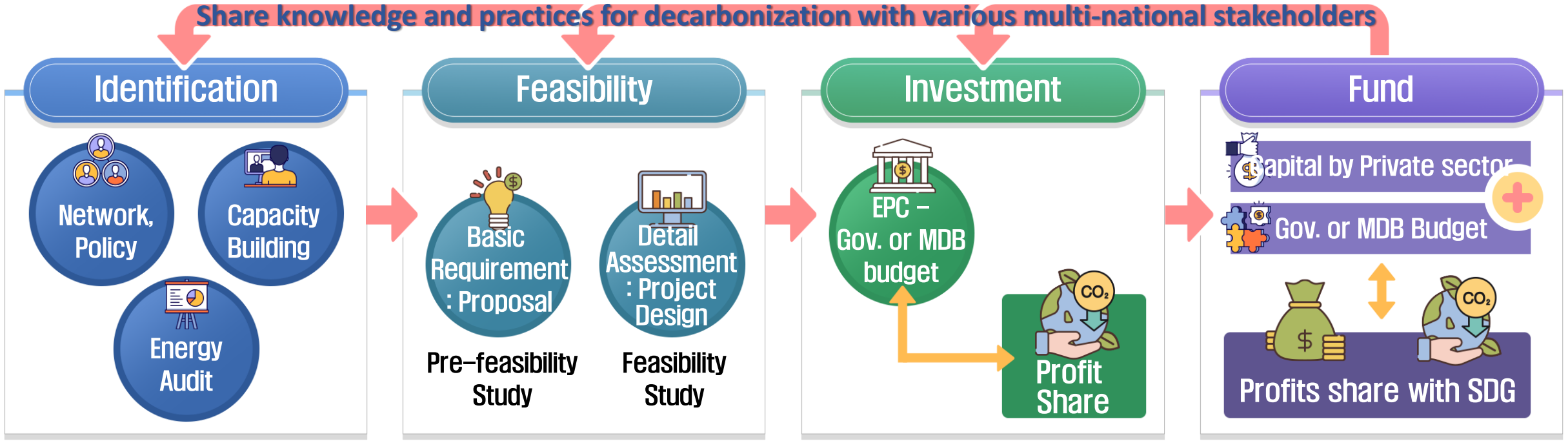
Energy Audit cases in industry sector of Korea

No	Year	Company Name	Process Unit	Major Energy Saving Projects Identified
1	2024	POSCO POHANG Steel Works	Hot Rolling Mill	Slab preheating optimization, Inverter (VSD) application on rollers and pumps, Waste heat recovery boiler (WHRB)
2		GS Caltex Refinery	VSD Application Study for Rotating Equipment in Entire Plant	VSD application on pumps and fans, Efficiency diagnostics of rotating machines, Load-based operation control
3		Korea Zinc	Roaster, OF, Leaching, etc. in Entire Plant	Waste heat recovery from flue gas, Reaction temperature optimization, Inverter application on leaching pumps
4		KCC 2Plant	Gypsum Board Production Plant	Waste heat recovery from dryer, Inverter application on fans, Optimization of drying temperature and time
5		HUVIS Jeonju Plant	PET	Optimization of cooling water system, Inverter application on compressors, Process integration for energy reuse
6		Samsung Electronic PyeongTek	Semiconductor	Optimization of chiller and cooling tower operation, Cleanroom air volume control (VAV/VSD), HVAC heat recovery
7	2023	KCC Monosilane	Monosilane	Heat recovery from reaction gases, Inverter application on vacuum pumps, Process pressure optimization
8		Hyosung T&C	Nylon, Spandex, etc.	Efficient steam usage in polymerization, Heat recovery from cooling section, Inverter application on air compressors
9		SK Energy Refinery	No4 CDU-MDU	Preheat train optimization, Furnace efficiency improvement, Steam trap inspection and repair
10		Lotte chemical Ulsan 1 Plant	PX, MEX, PET, etc.	Reflux ratio optimization, Heat integration across distillation columns, VSD for cooling water pumps
11		Lotte chemical Dasan Plant	Ethylene, etc.	Furnace heat recovery, Steam system optimization, Flare gas minimization
12		Lotte chemical Yeosu Plant	BTX	Preheater optimization, Column insulation improvement, Compressor load control
13		Hyundai Oilbank	#2Plant – HOU	Hydrogen recovery improvement, Process heat recovery, Inverter application on pumps and fans
14		S-OIL Refinery	VSD Application Study for Rotating Equipment in Entire Plant	VSD application, Pump system redesign, Equipment downsizing for partial load operation

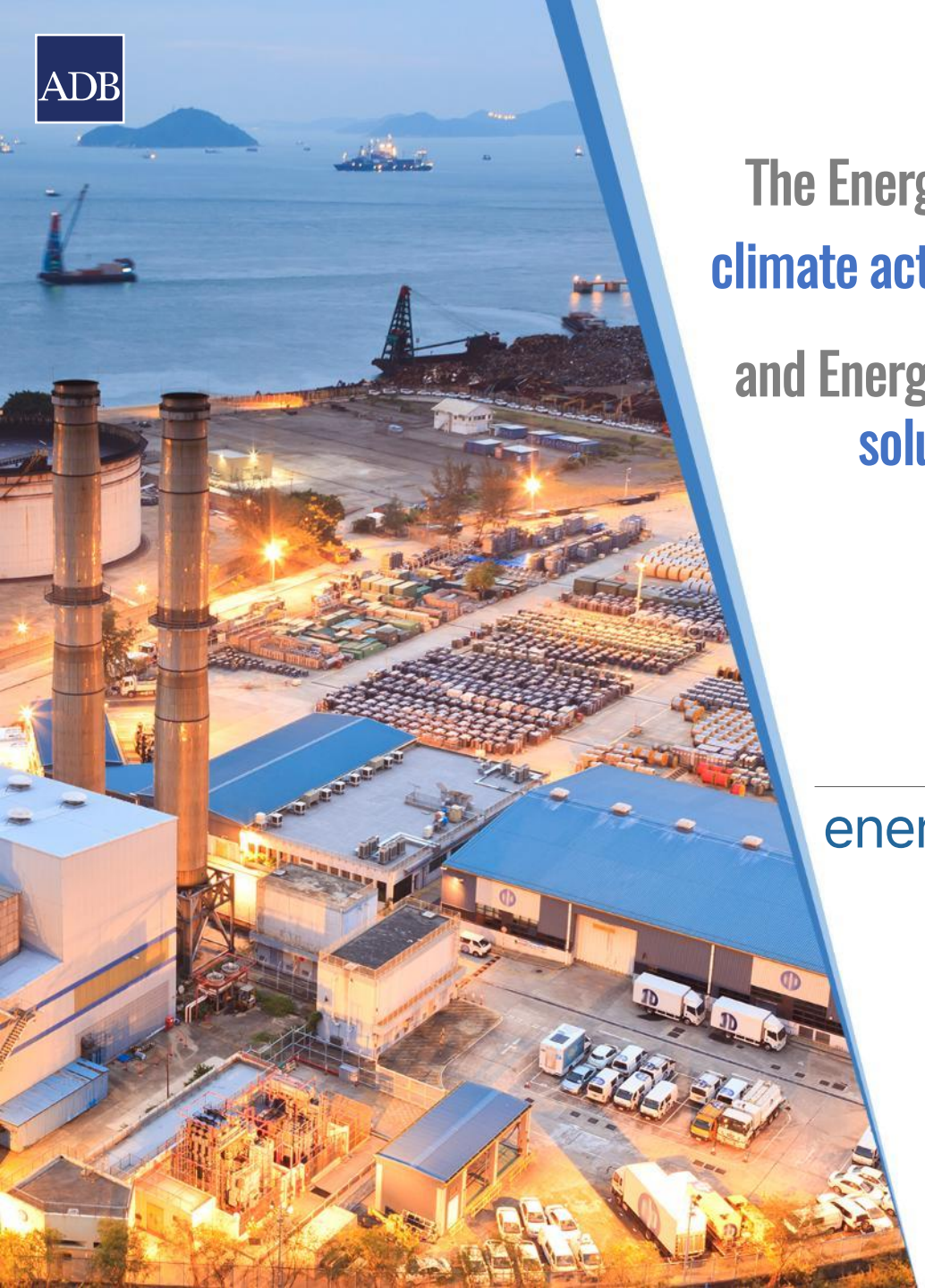
Possible opportunities for intl. cooperation

KOREA ENERGY AGENCY ADB

Identified items by energy audit are realized to common solution through multi-country cooperation using the ODA program of Korea, MDB funds, carbon market, ESCO and etc.



- Identify item to save
- Assess feasibility of item
- Implement item to project
- Program to common solution



The Energy Audit is an **initial step toward climate action** in Energy and Industry sector,

and Energy Audit provides **various tailored solutions for decarbonization.**

Contact

energyaudit@energy.or.kr

KOREA ENERGY AGENCY