Energy Efficiency

Electricity Generating Authority of Thailand

Dr. Somyot Tantipattarakul

Mr. Praditthon Patcharaubongaseam

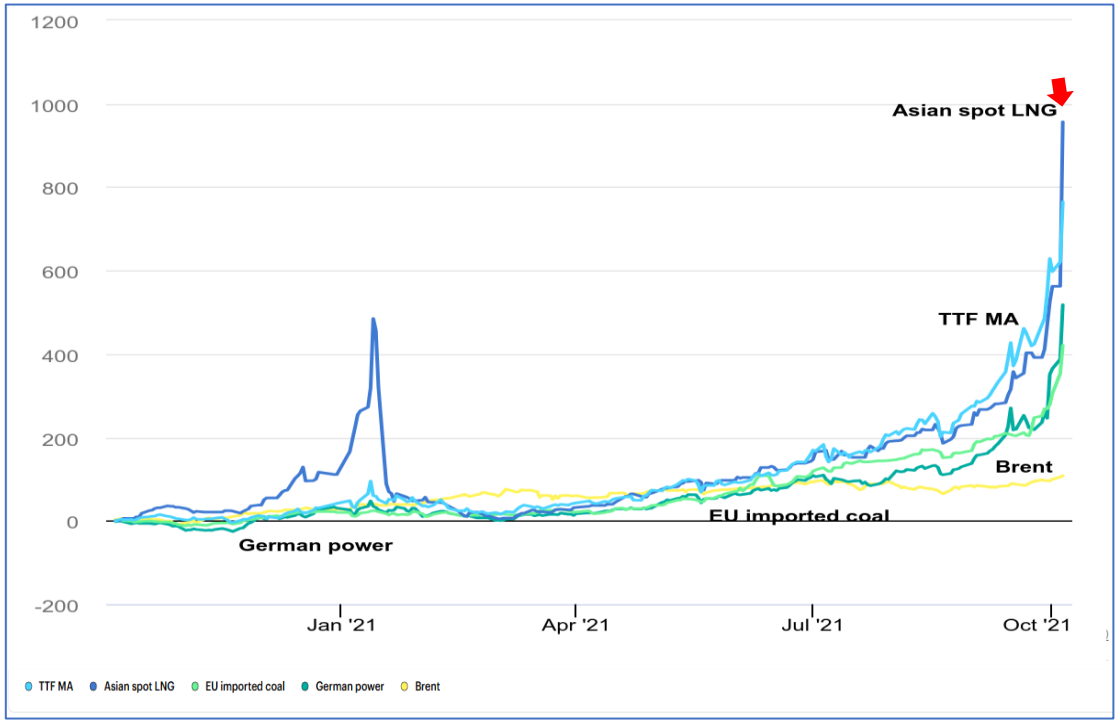
Outline

- Global Energy Crisis and the Effects on Businesses
- Surviving the Thai Energy Crisis Amid Global Energy Crisis
- What is Energy Efficiency?
- Efficient Energy Utilization Strategies
  - Renewable Energy Integration
  - Energy-Efficient Technologies
- EGAT ongoing projects beneficial to the Business

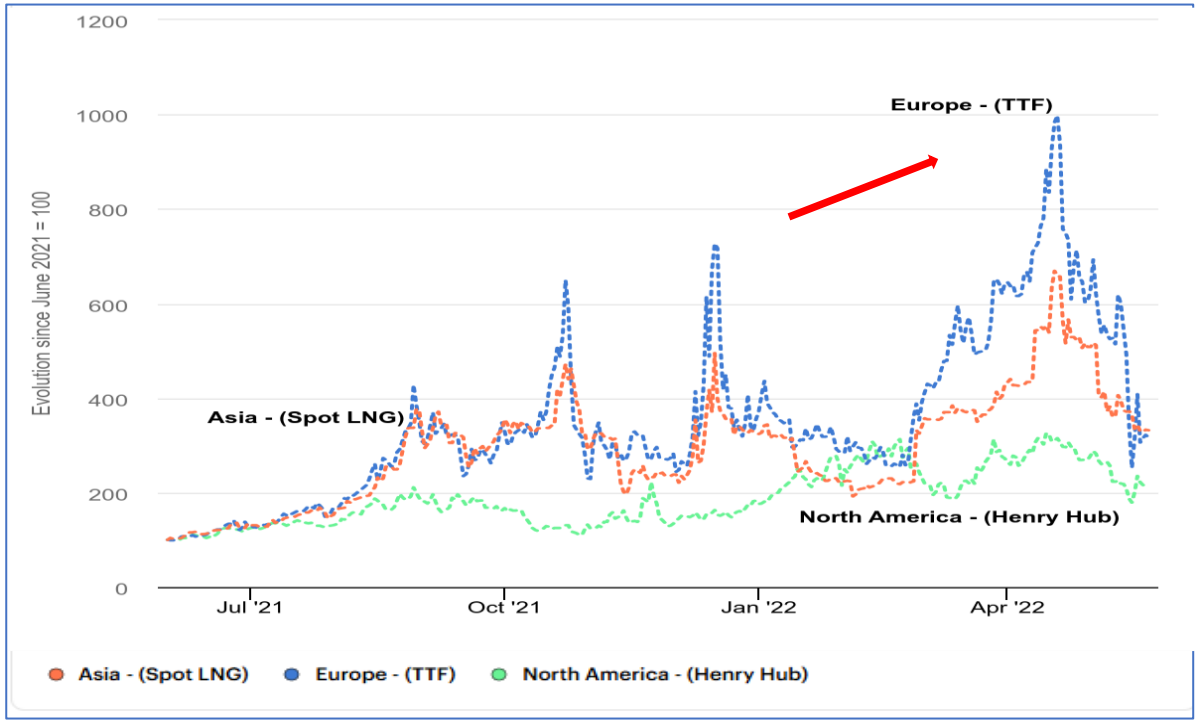
Global Energy Crisis and the Effects on Businesses

Global Energy Crisis Timeline

Evolution of energy prices, 2020-2021



Evolution of key regional natural gas prices, June 2021-October 2022



An exceptionally rapid global economic recovery
A cold and long winter in the Northern Hemisphere
A weaker-than-expected increase in supply.

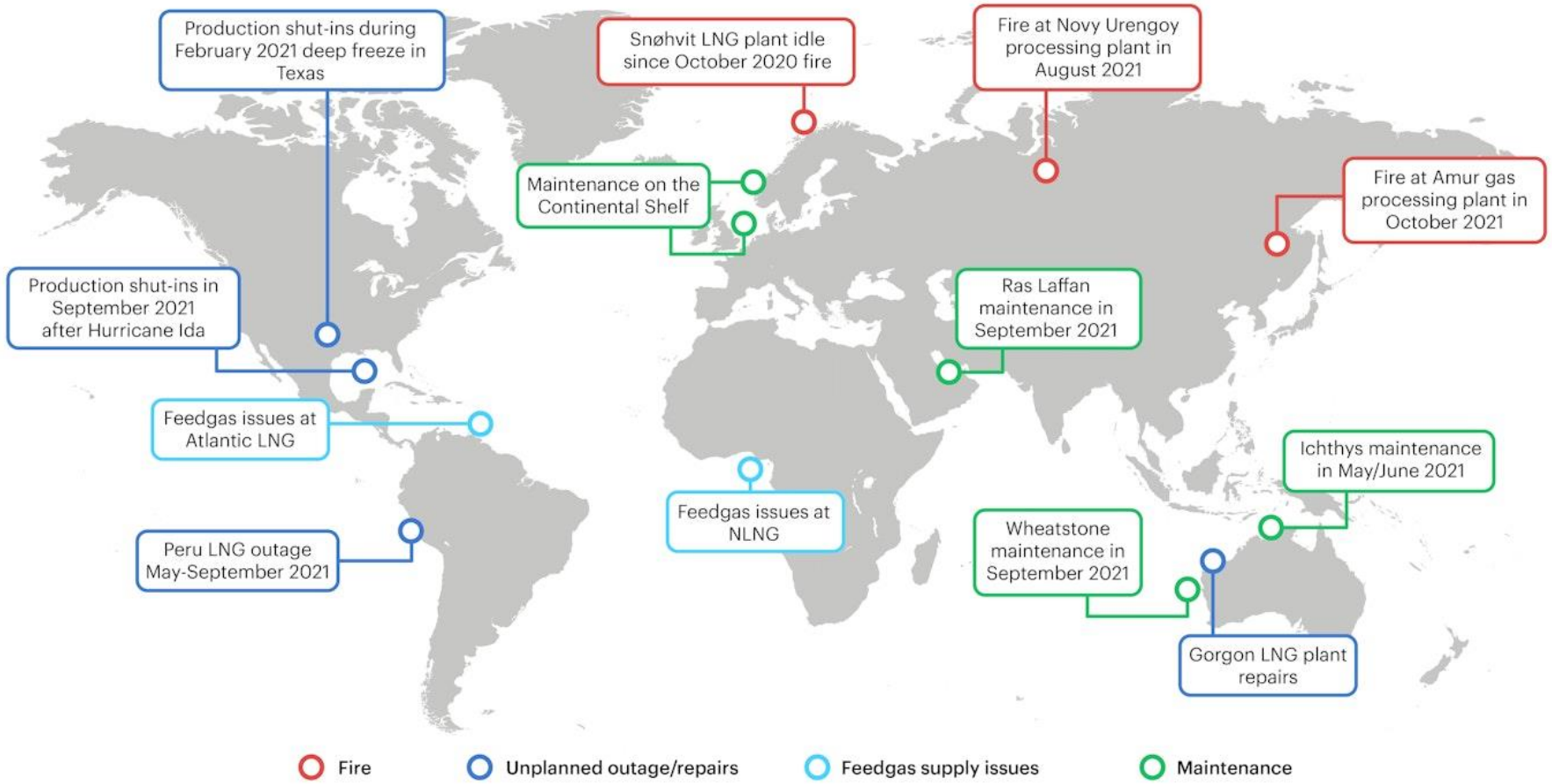
Ref: https://www.iea.org/commentaries/what-is-behind-soaring-energy-prices-and-what-happens-next

Russia's invasion of Ukraine drove European and Asian gas prices to record highs !

Ref: https://www.iea.org/topics/global-energy-crisis

Global Energy Crisis due to supply outage

Gas and coal production plants outage and maintenance globally



Ref: https://www.iea.org/commentaries/what-is-behind-soaring-energy-prices-and-what-happens-next

Energy Insufficient Factors and The Effects on Businesses

(1) An energy crunch caused by a combination of factors – on both the supply and demand sides

- Climate changes (lower-than-average water level sunlight and wind) causing power shortage, meanwhile increasing power demand (largely increase and decrease in temperature)
- Energy Supply Shortage as gas and coal production plants outage and maintenance globally from 2020-2021 related to COVID-19 pandemic and unplanned events (e.g. plant maintenance and accidences or war), causing delayed and lowered gas and coal production.

(2) Economics concerns for Consumers and Businesses via increase in electricity prices due to all-time highs for gas and coal prices since OCT 2021.

- Rising of energy cost affecting the business production cost
- Reducing business marginal cost
- A potential decline of consumer spending due to households' increased energy-related expenses.
- Shutdown production due to power shortages
- Coal and Gas Shortage affecting the electricity production cost (Only power generation business)

Ref: https://www.iea.org/commentaries/what-is-behind-soaring-energy-prices-and-what-happens-next

Ref: https://www.iea.org/topics/global-energy-crisis

Energy Crisis Causes and Effects to The Business Solutions

Causes

Global Factors

1. Climate Changes
2. Energy Supply and Demand
3. Economy and Geopolitics
4. Energy Transition
5. Type of Energy Markets

Local Factors

1. Shining bright
2. Keeping temperature in check
3. Inefficient equipment and operation
4. Peak time demand

Effects

1. Increase Production Cost
2. Reduce Marginal Cost
3. Reduce Sale Volume
4. Shutdown Production
5. Reduce Competitive Ability

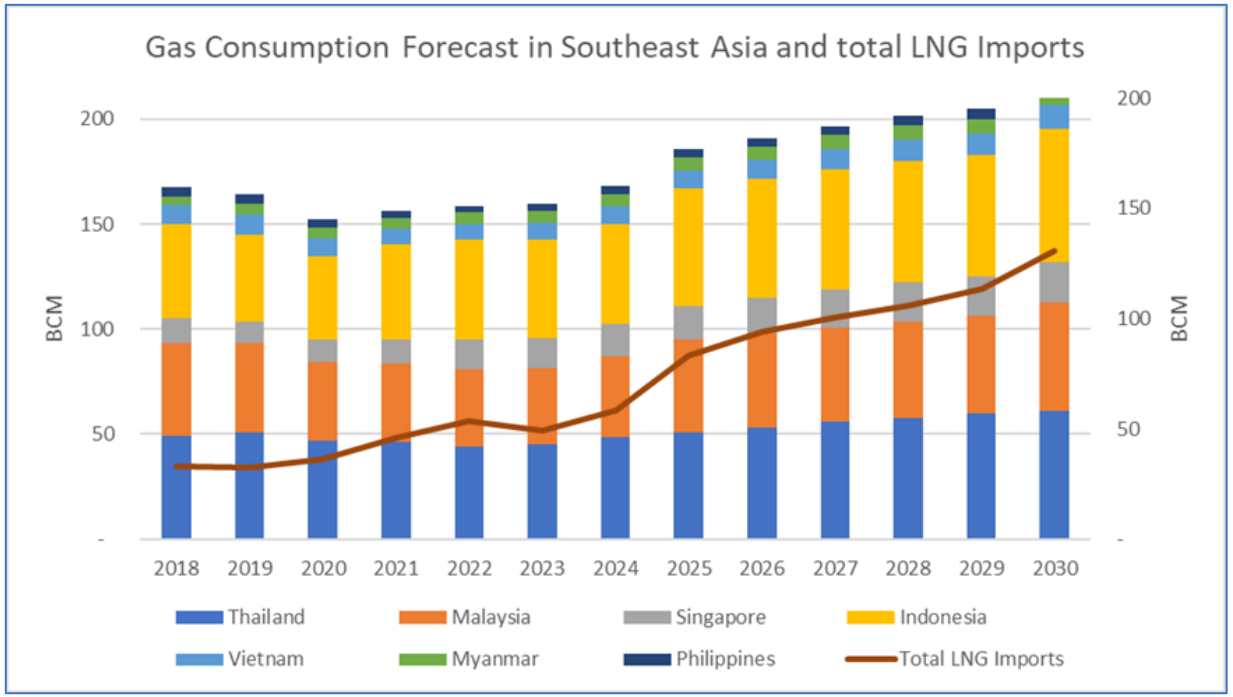
Solutions

1. Energy transition to Renewable Energy Sources
2. Energy efficiency and conservation

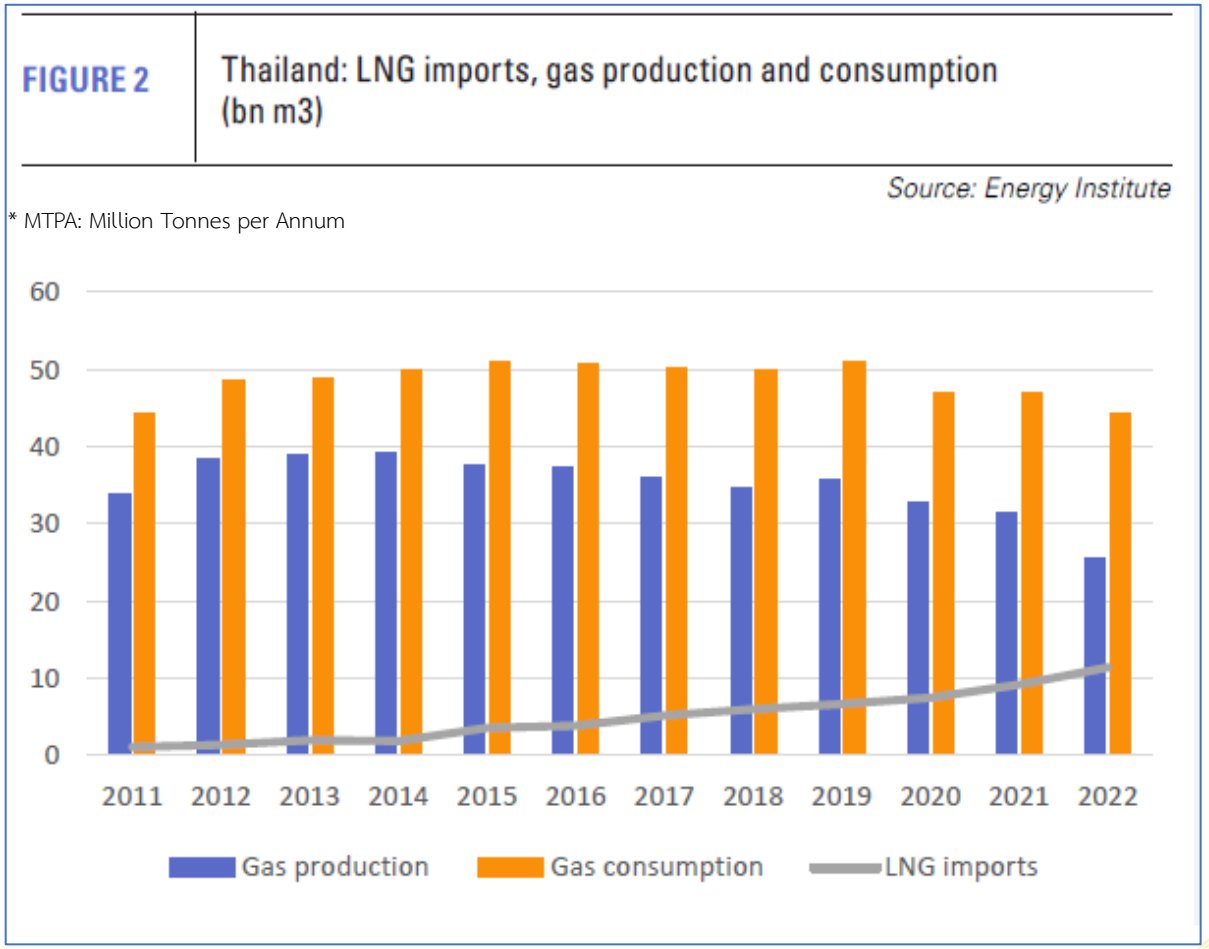
Ref: https://energy.atco.com/blog/factors-affecting-business-energy-costs

Surviving the Thai Energy Crisis Amid Global Energy Crisis

Thailand LNG Spot Importing Situation

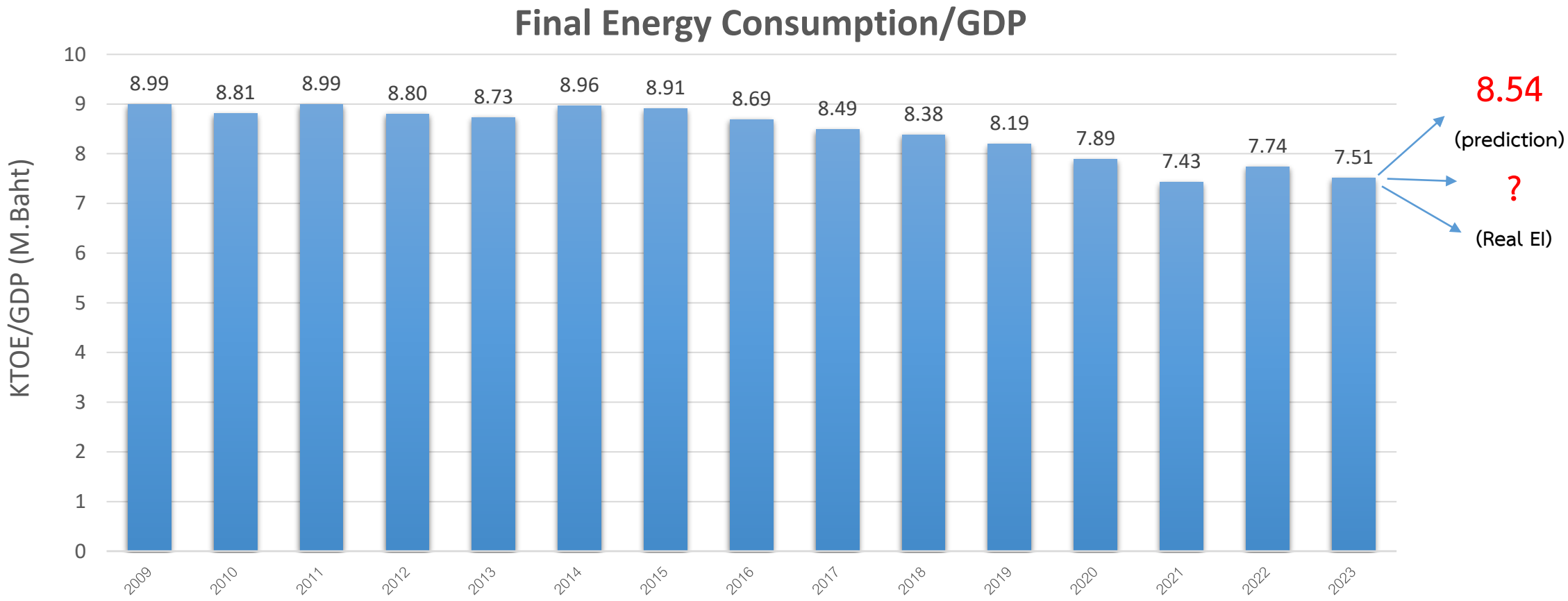


Ref: https://www.reuters.com/business/energy/easing-prices-revive-lng-interest-asias-emerging-gas-markets-2023-02-01/



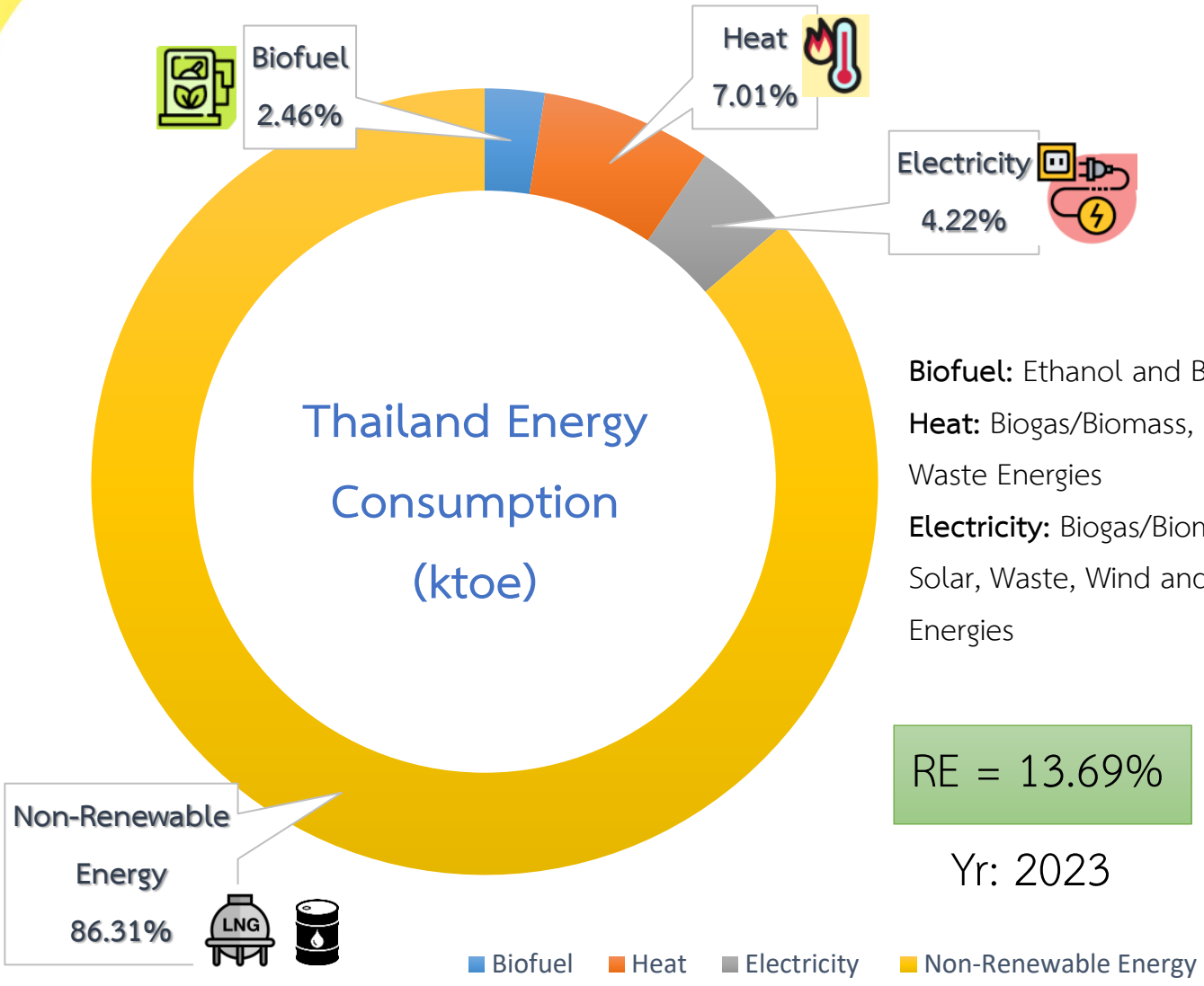
Thailand Energy Intensity Trend from 2019-2023

Thailand Energy Intensity (EI)



https://www.eppo.go.th/index.php/en/en-energystatistics/indicators?issearch=1&category_id=912&xf_39=2

Thailand Renewable Situation & Policy



Biofuel: Ethanol and Bio Diesel

Heat: Biogas/Biomass, Solar, Waste Energies

Electricity: Biogas/Biomass, Solar, Waste, Wind and Hydro Energies

RE = 13.69%

Yr: 2023

Target for Renewable Energy in 2037

RE ≥ 30%

Biofuel ≥ 11%

Heat ≥ 70%

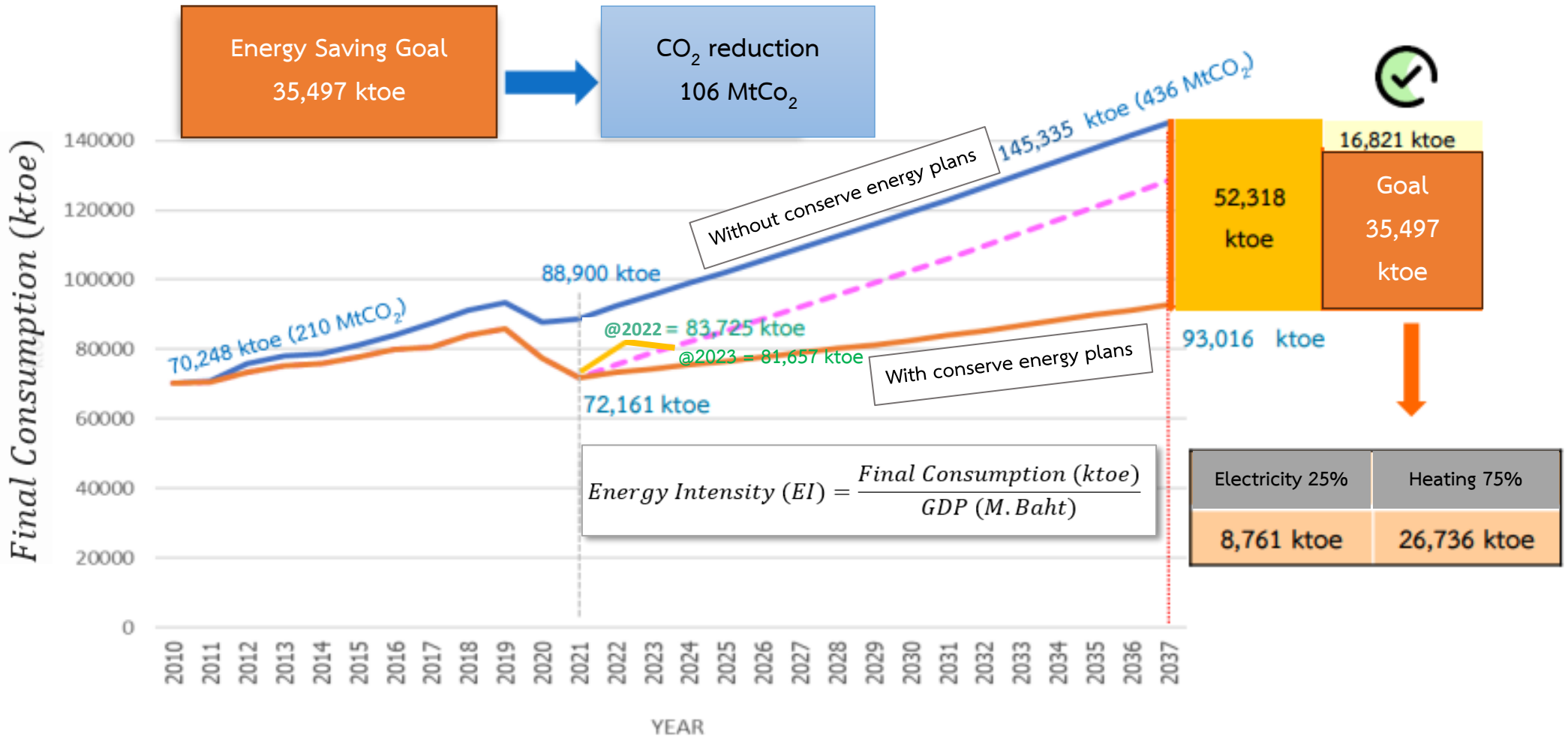
Electricity ≥ 19%

(22.21% total Electricity demand in Q1,2023 and 63% in 2037)

Ref: 4_SIT_Apr_66 (dede.go.th)

Ref: PowerPoint Presentation (thailand-energy-academy.org)

Thailand Conserve Energy Situation and Policy



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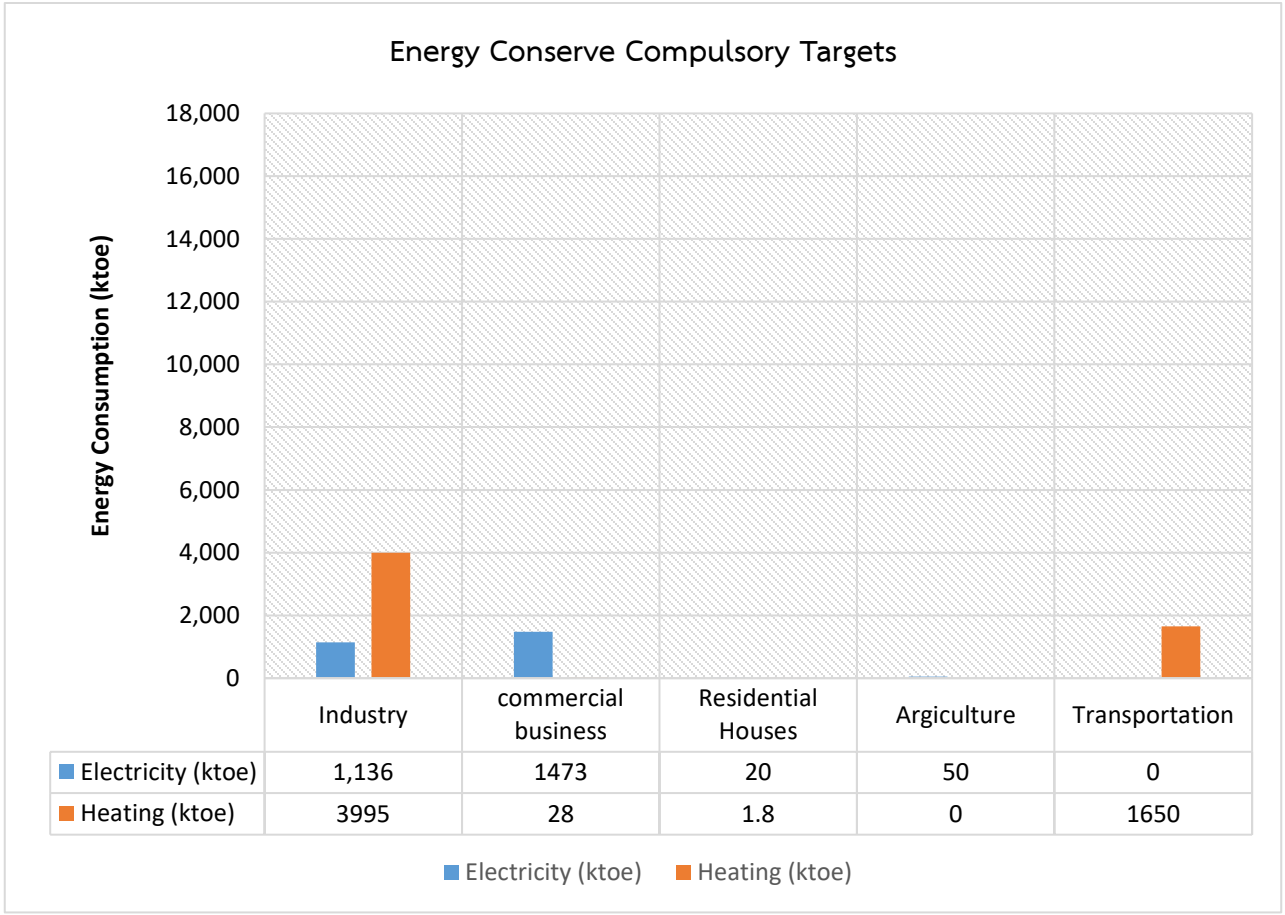
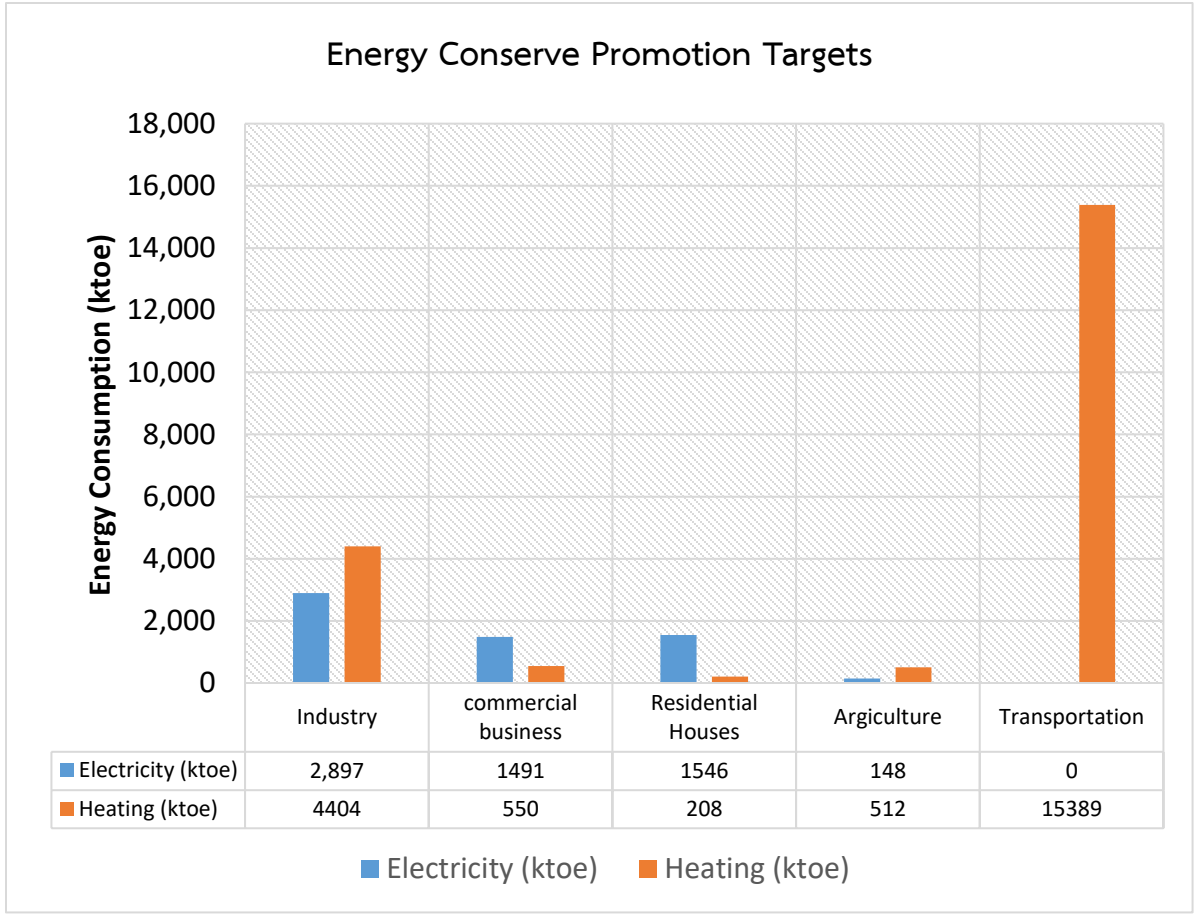




Ref: PowerPoint Presentation (thailand-energy-academy.org)

Thailand Conserve Energy Situation and Policy

Ref: PowerPoint Presentation (thailand-energy-academy.org)

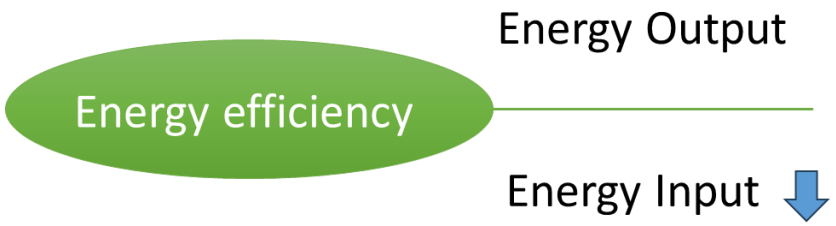
Energy Conserve Compulsory Sector	Energy Conserve Promotion Sector
1. Enforce to use the standards of energy management in Factory/Building (5,764 ktoe) 2. Enforce to use the standards of energy code for industry, building, residential house, agriculture (937 ktoe) 3. Enforce to use Conservative Energy Measures via road transportation sector (1,650 ktoe)	1. Benchmarking and labeling of equipment performance (3,568 ktoe) 2. Financial Incentive (4,904 ktoe) 3. Innovation Promotion such as IOTs, Smart Technology, Big Data and AI (317 ktoe) 4. Energy Conservation via land, air, water and rail transportation systems (15,341 ktoe) 5. Energy Conservation for agriculture via smart farming and switch to machinery etc. (660 ktoe) 6. Energy Conservation for residential houses via conserved energy house, smart home etc. (1,754 ktoe)

Support Sectors
1. Research and Development of Innovative Energy Conservation (R&D) 2. Development of Human Resource for Energy Conservation (HRD) 3. Public Relationship for Energy Conservation (PR)

Energy Efficiency Introduction

Energy Efficiency Meaning and Concept

(15) what data need to be required for energy efficiency ,for organization those who do some activities for energy efficient operation? | LinkedIn



Energy efficiency is called the "first fuel" in clean energy transitions, as it provides some of the quickest and most cost-effective CO2 mitigation options while lowering energy bills and strengthening energy security.

Energy efficiency is the single largest measure to avoid energy demand in the Net Zero Emissions by 2050 (NZE) Scenario, along with the closely related measures of electrification, behavioural change, digitalisation and material efficiency.

Ref: Energy Efficiency - Energy System - IEA

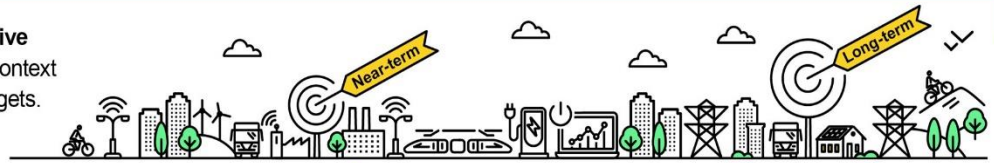
Energy Efficiency General Policies

Policy Packages for Energy Efficiency

In all sectors the greatest efficiency gains are achieved by a package of policies that combine three main types of mechanisms: Regulation, information and incentives. Careful design and implementation will deliver efficiency's full potential to enhance energy security, create jobs, increase living standards, cut energy bills and reduce emissions.

Targets

Policies are more effective when they are set in the context of clear strategies and targets.

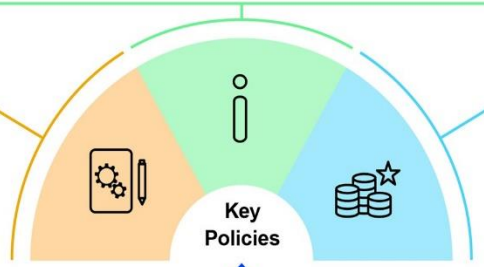


Essential elements

Regulation is essential to exclude the worst performing equipment and practices from the market, to drive average efficiency levels up, and to set rules for measurement of performance.

Information helps people make more efficient choices in what they buy and how they use energy.

Incentives make efficient options more attractive and speed up the upgrade and replacement of appliances, buildings and vehicles. They also encourage the use of new technologies and practices.



Implementation is as important as policy design.

Ensuring that the **resources** are in place to put policies into action.

Address **vital elements** such as capacity building, enforcement, monitoring.

It is important to continually assess **policies and programmes** so as to keep up to date with technology developments.

Ref: Policy Toolkit – The value of urgent action on energy efficiency – Analysis - IEA

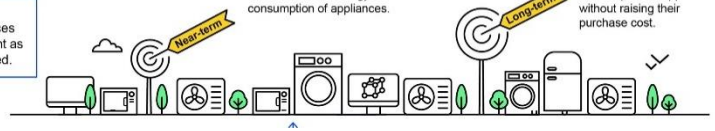
Appliance Energy Efficiency Policy Package

Immediate opportunities

In most markets, it is possible to buy appliances that are twice as efficient as those typically purchased.

The **Net Zero** Scenario milestone for 2030 is a 25% reduction in unit energy consumption of appliances.

Long-term appliance policies can halve the consumption of appliances without raising their purchase cost.



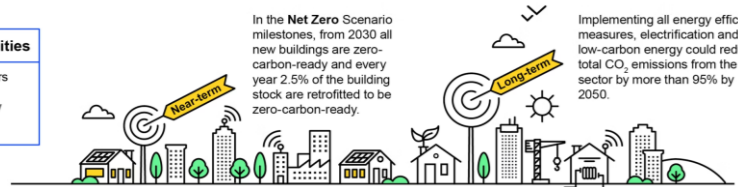
Buildings Energy Efficiency Policy Package

Immediate opportunities

Replacing fossil fuel boilers with high efficiency heat pumps can reduce energy use by up to 75%.

In the **Net Zero** Scenario milestones, from 2030 all new buildings are zero-carbon-ready and every year 2.5% of the building stock are retrofitted to be zero-carbon-ready.

Implementing all energy efficie measures, electrification and low-carbon energy could reduc total CO_2 emissions from the sector by more than 95% by 2050.



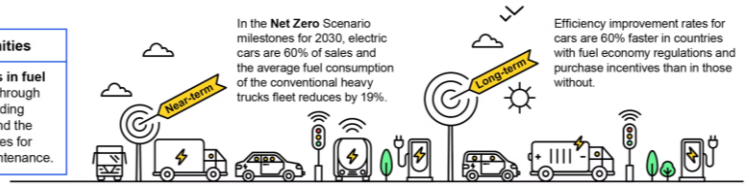
Vehicle Energy Efficiency Policy Package

Immediate opportunities

Significant reductions in fuel demand are available through immediate actions including lowering speed limits and the adoption of best practices for driving and vehicle maintenance.

In the **Net Zero** Scenario milestones for 2030, electric cars are 60% of sales and the average fuel consumption of the conventional heavy trucks fleet reduces by 19%.

Efficiency improvement rates for cars are 60% faster in countries with fuel economy regulations and purchase incentives than in those without.



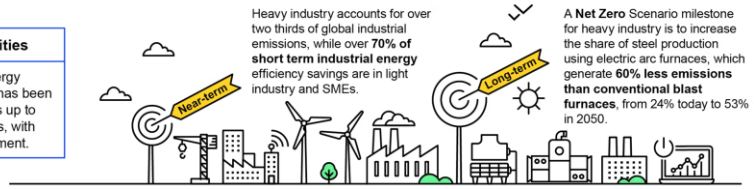
Industry Energy Efficiency Policy Package

Immediate opportunities

Implementing better energy management practices has been shown to deliver savings up to 15% in the first 1-2 years, with little or no capital investment.

Heavy industry accounts for over two thirds of global industrial emissions, while over **70% of short term industrial energy** efficiency savings are in light industry and SMEs.

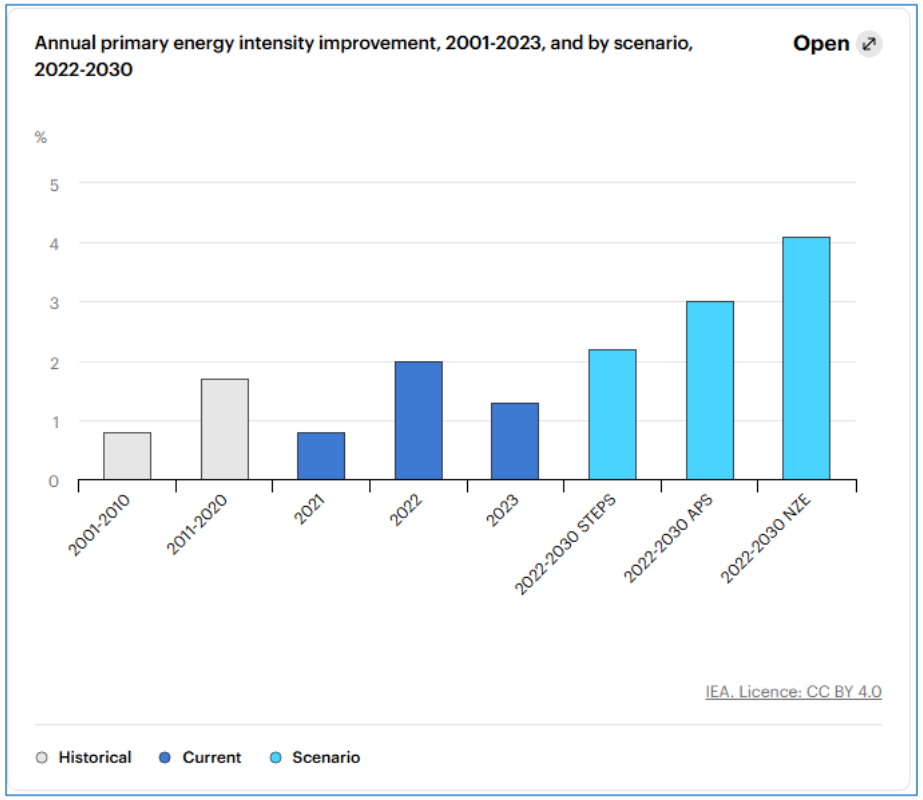
A **Net Zero** Scenario milestone for heavy industry is to increase the share of steel production using electric arc furnaces, which generate **60% less emissions than conventional blast furnaces**, from 24% today to 53% in 2050.

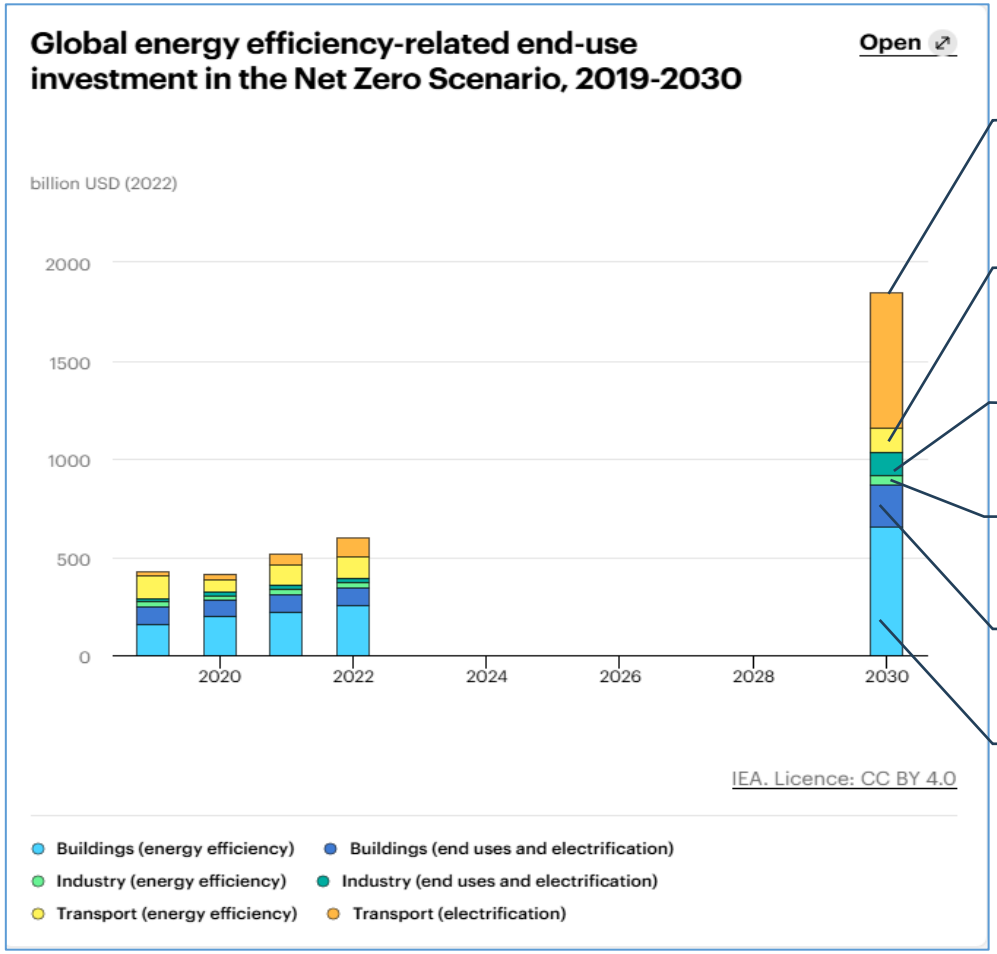


Energy Efficiency Policy Package for Smart and Efficient Cities

National policy makers play an important role in accelerating urban energy transitions. Cities connect directly with communities and people to enhance implementation and better inform policy. Smart cities use digital means to improve planning, design and operations of energy services.

Energy Efficiency Outlook





Transport 2030 (Electrification) 688.90 Billion USD

Transport 2030 (Energy Efficiency) 123.00 Billion USD

Industry 2030 (End uses and Electrification) 122.90 Billion USD

Industry 2030 (Energy Efficiency) 43.30 Billion USD

Buildings 2030 (End uses and Electrification) 218.70 Billion USD

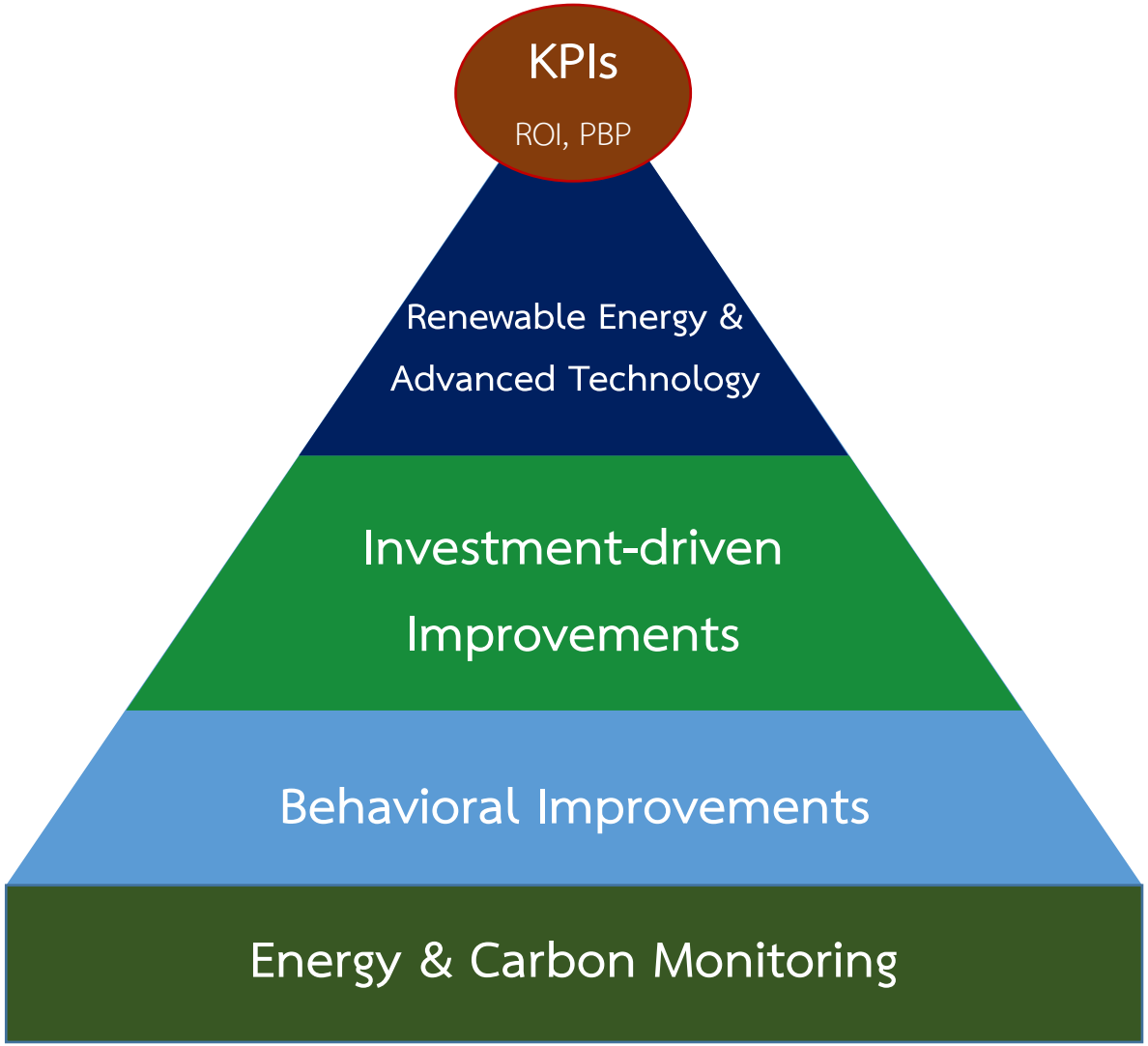
Buildings 2030 (Energy Efficiency) 653.00 Billion USD

[Ref: Energy Efficiency - Energy System - IEA]

Efficient Energy Utilization Strategies

High investment

Low investment



- Solar PV
- BESS
- High efficiency equipment changes

- Energy management System
- Automate-self driving
  Air compressors, Split type, Chiller
- LED changes, Insulation

- Re-schedule Operation
- Factory/Building user behavior improvements

Efficient Energy Utilization Strategies

Example

LED Lighting 200W 20 ea

- Initial Investment Cost: **120,000 THB**
- Annual Energy Savings: **40,128 THB**
- Maintenance Costs: 0 THB per year
- Lifespan: 10 years

ROI: 334%

Payback Period: ~2.99 years

Solar Rooftop 25 kWp

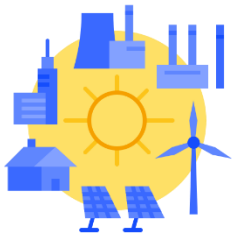
- Initial Investment Cost: **700,000 THB**
- Annual Energy Savings: **109,440 THB**
- Maintenance Costs: 7,000 THB per year
- Lifespan: 25 years

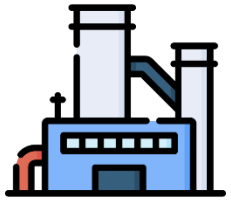
ROI: 365%

Payback Period: ~6.83 years

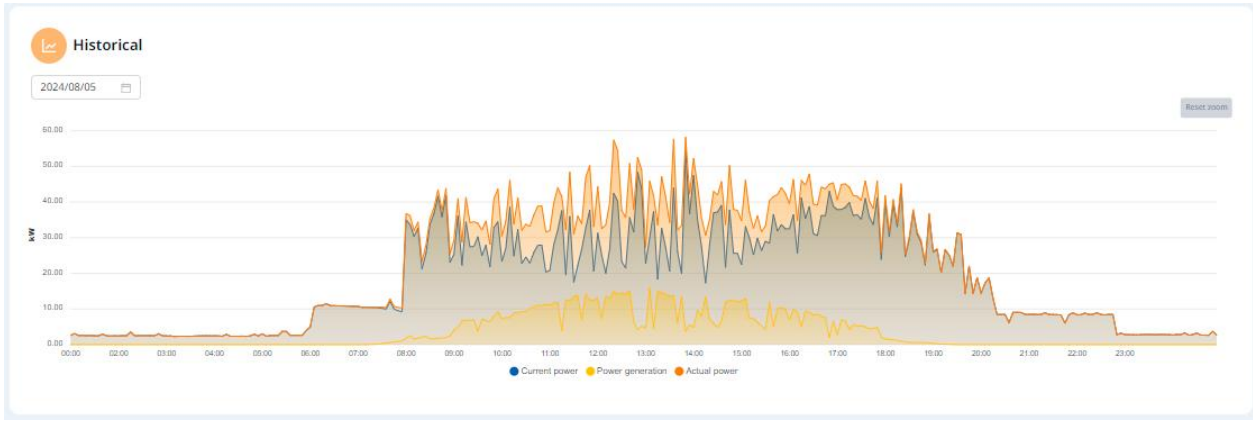
Conclusion : These calculations can help guide decisions depending on whether you prioritize quicker returns (LED) or higher long-term savings (Solar Rooftop).

EGAT ongoing projects beneficial to the Business



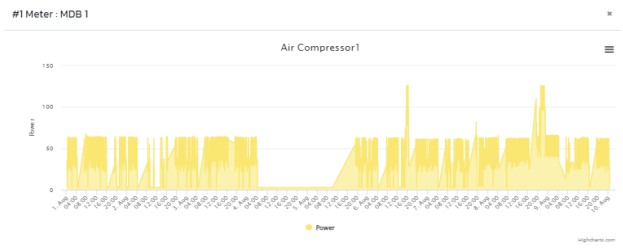


Energy & Carbon Monitoring

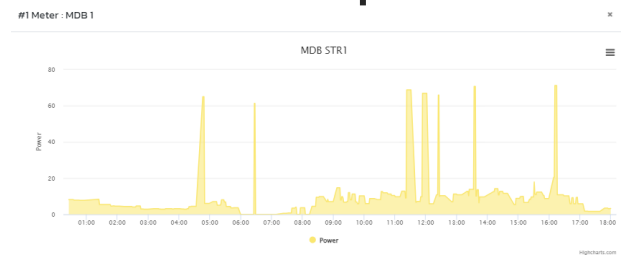


Solar & Load Consumption

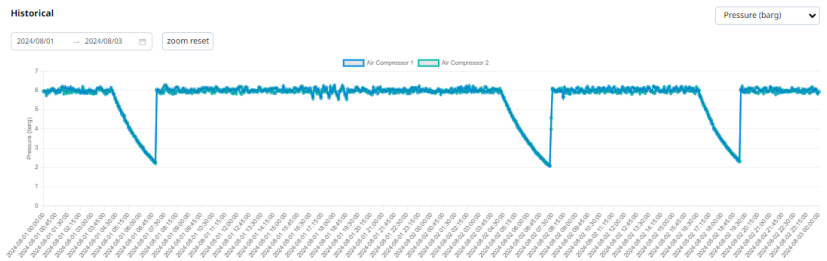
Overview Dashboard



Air Compressor



Forging (Motor)

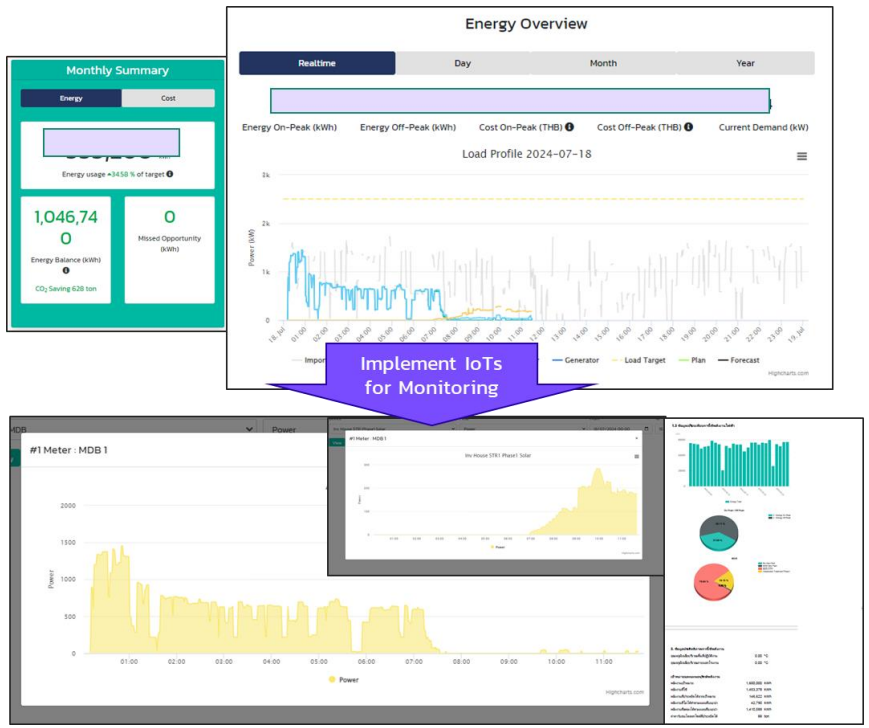


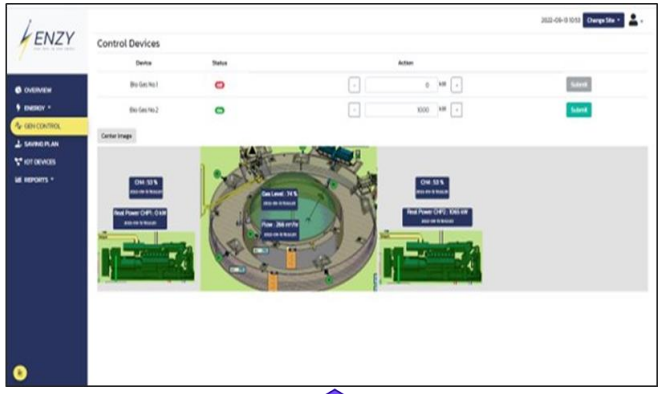
Pressure (barg)

- Cost Reduction
- Convenience

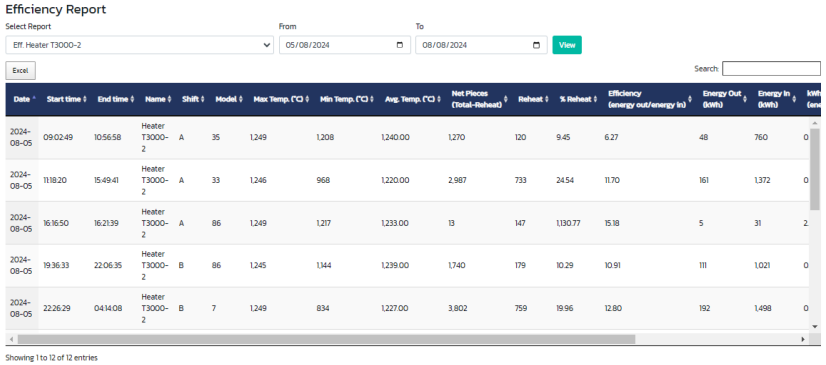
EGAT ongoing projects beneficial to the Business

- Re-schedule Operation
- Notifications

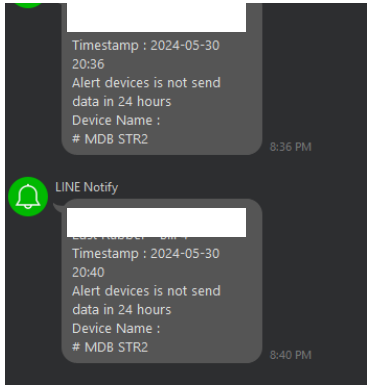




Re-schedule Operation



Efficiency & KPI Monitoring



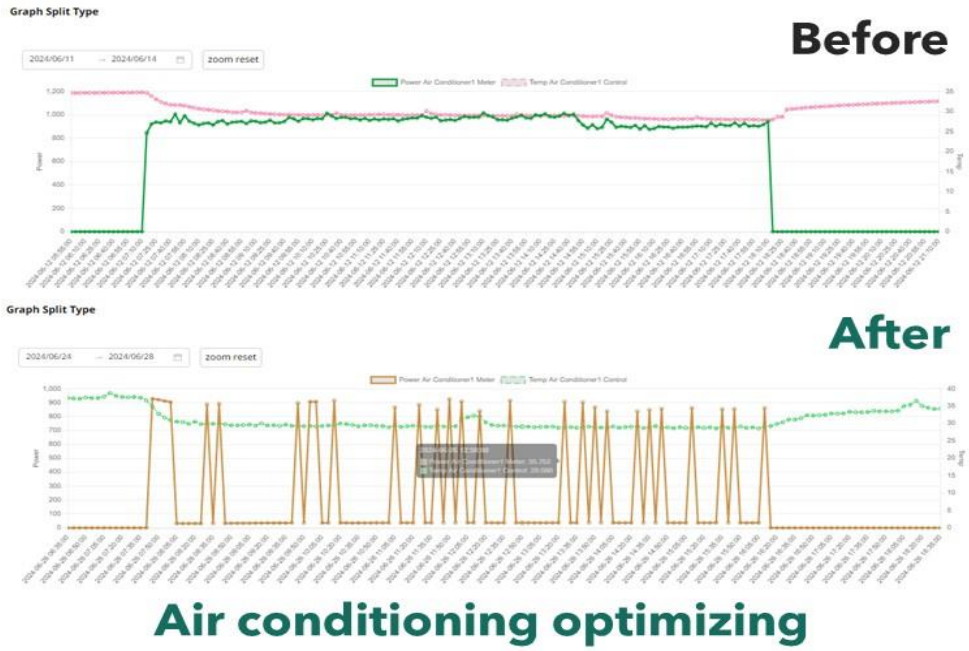
Notifications

Cost Reduction Convenience

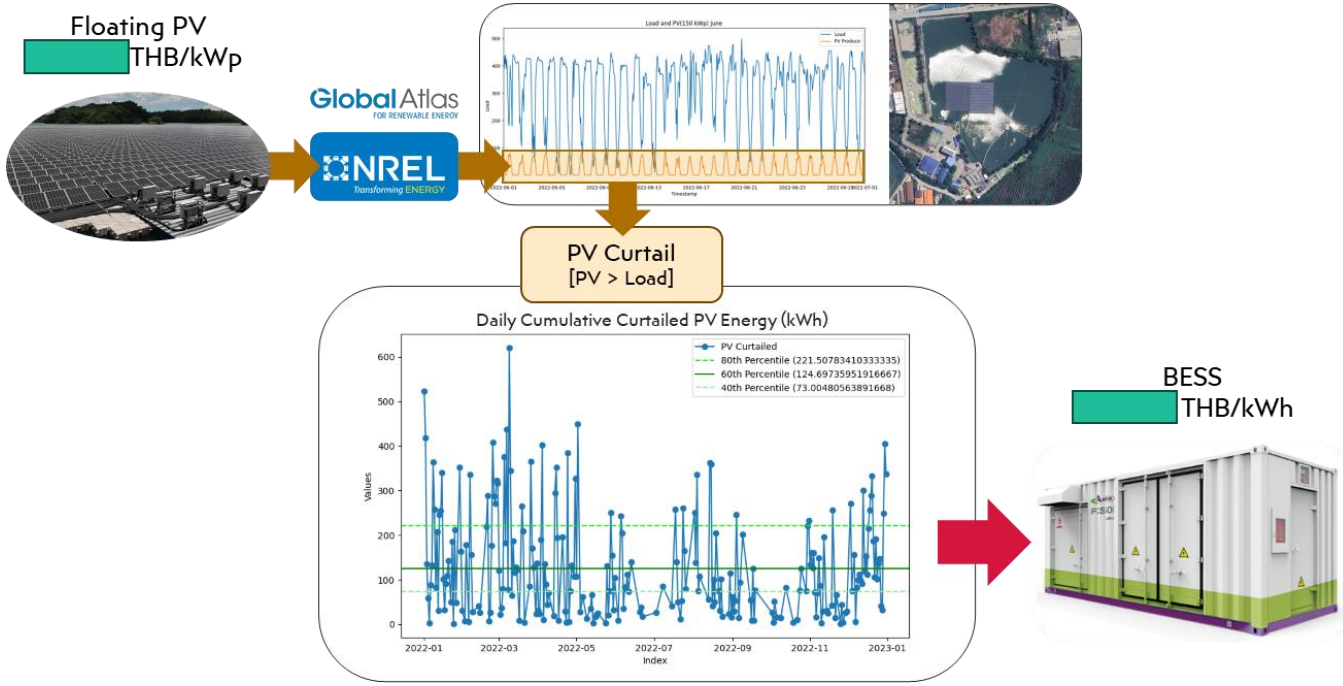
EGAT ongoing projects beneficial to the Business

Automate-self driving

Air Conditioning (Split type)

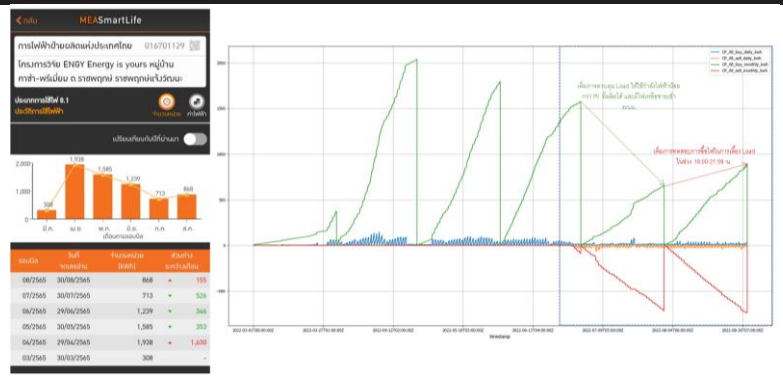


- Solar PV
- BESS
- Energy management– Integrated system



Cost Reduction Sustainability

EGAT ongoing projects beneficial to the Business



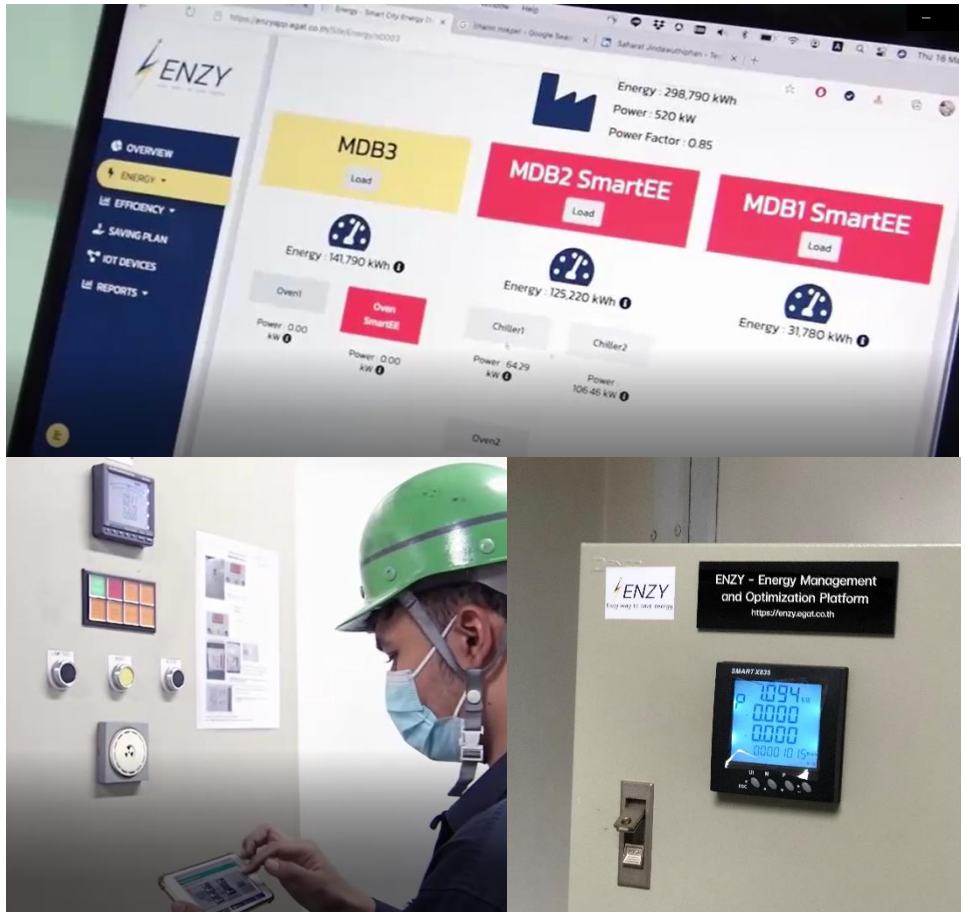
Smart Energy Solutions

3 Villages Project (ERC Sandbox)

Smart Energy Solutions

Thammasat University (ERC Sandbox)

EGAT ongoing projects beneficial to the Business



Energy Efficiency Project – Factory & Building

Solar Rooftop Project – Commercial & Industrial

EGAT ongoing projects beneficial to the Business

Hydro-floating Solar Hybrid Project

- Ubol Ratana Dam

Wind Power Plant Project

- Lam Takhong Dam

Battery Energy Storage System Project

- EGAT Bamnet Narong 230KV

Contact us

Tel: 02-436-7910

Email: energysolutions@egat.co.th

https://energysolutions.egat.co.th/