# SAGE

Selangor Agenda for Green Economy 2025 - 2035

Booklet

# VOLUME 1 :
# CLEAN ENERGY

# Selangor Agenda for Green Economy (SAGE)

## Overview of SAGE

SAGE
SELANGOR AGENDA FOR GREEN ECONOMY
LEADING THE GREEN INDUSTRIAL REVOLUTION
2025 – 2035 Roadmap

## Visions

- Low Carbon Economy
- Clean Energy Foundation
- Green Innovation Hub
- Just Transition

## 5 guiding principles

1. Strong Governance and Coordinated Action
2. Self-Sufficient Energy Supply
3. Just and affordable
4. Environmental Sustainability
5. Economic Growth and Opportunities

**7.4 GW**
additional clean energy capacity by 2035

**35%** clean energy mix

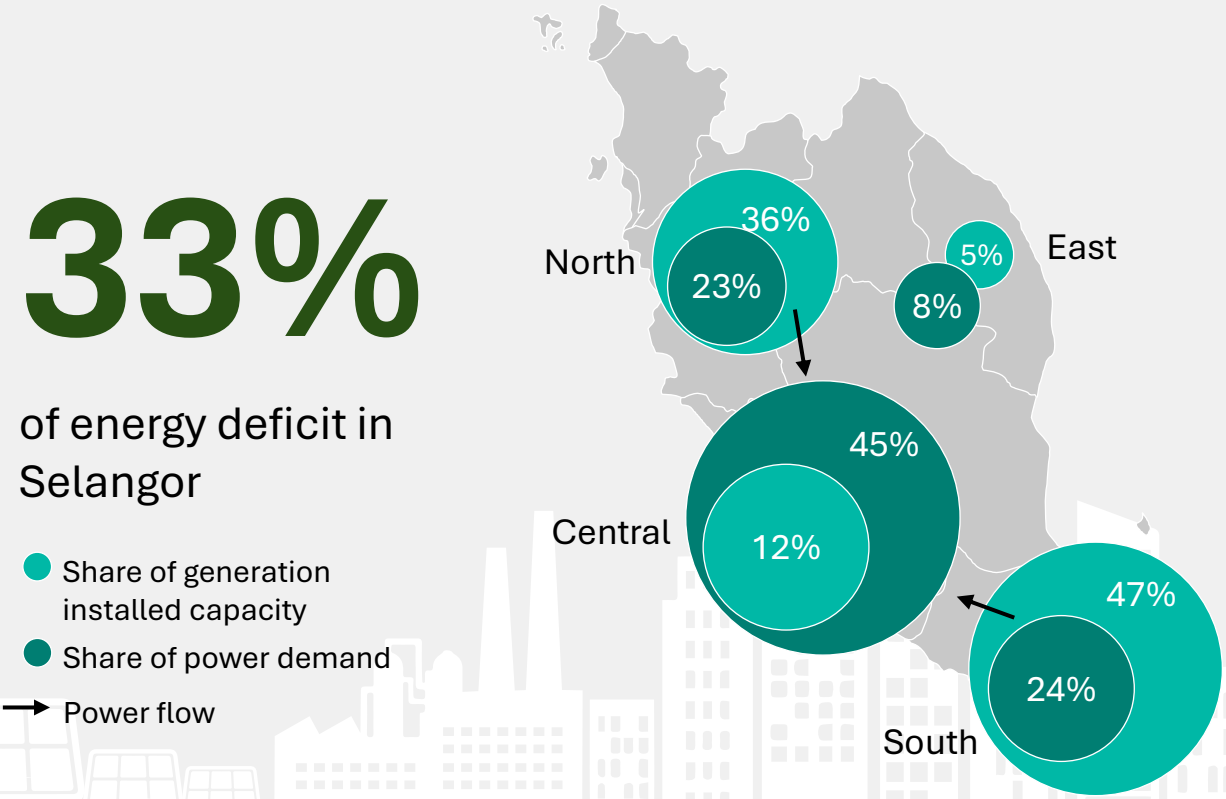
Up to
**RM 63 bn**
projected investments by 2035

# Selangor Agenda for Green Economy (SAGE)

## Case for SAGE

**33%**

of energy deficit in Selangor




Selangor's annual carbon emissions amount to

**59.2 million $tCO_2e$**

**~20%**

of Malaysia's total carbon emission

**or**

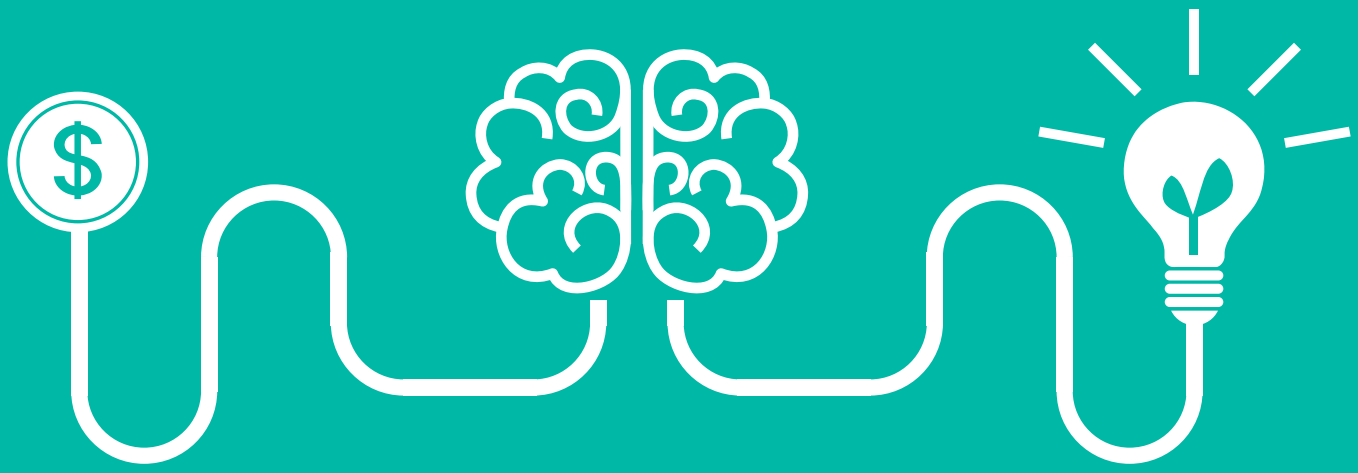
Carbon emissions from

**11 m**

of ICE cars

# Selangor Agenda for Green Economy (SAGE)

**Case for SAGE**



## **Benefits** of energy transition for Selangor:

### 1 Economic growth

A cleaner energy profile enhances Selangor's attractiveness to multinational corporations and foreign direct investors that prioritize ESG commitments

### 2 Job creation

SAGE's clean energy transition is expected to create around 26,000 jobs

### 3 Environmental impact

Adoption of renewable energy reduce $CO_2$ emissions, helping Malaysia reach Net Zero by 2050

### 4 Energy security

Developing local renewable energy reduces reliance on power imports from other states

# 4 key levers and 7 key enablers of SAGE

## 1 Brown energy



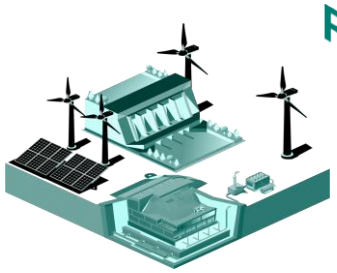
- Natural gas supply
- Green combined cycle gas turbine

## 2 Sustainable energy



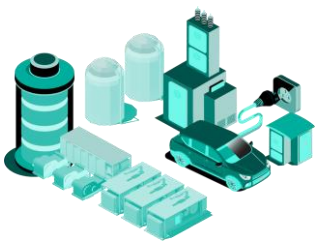
- Waste to energy incinerator
- Anaerobic digestor
- Landfill gas engine
- POME biogas power plant

## 3 Renewable energy



- Solar PV
- Run-off-river hydropower
- Geothermal power
- Wind power

## 4 Energy storage system



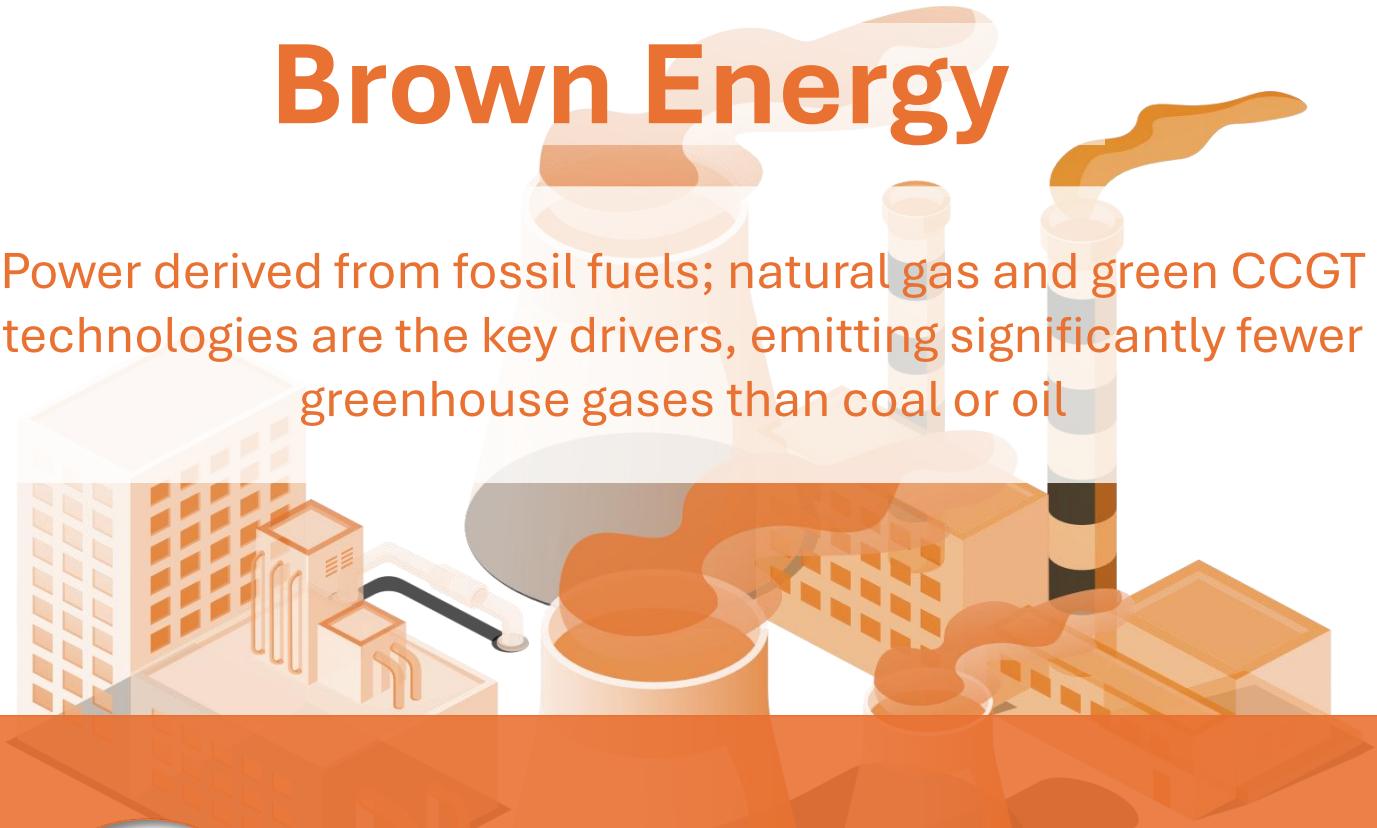
- Battery energy storage systems
- Hydrogen production (incl. conversion into ammonia and methanol)
- Pumped hydro energy storage

## Key enablers:

- Green infrastructure
- Green mobility
- Green workforce and literacy development
- Green optimization & energy efficiency
- Green policies & incentives
- Green reporting
- Green finance & investment

# Brown Energy

Power derived from fossil fuels; natural gas and green CCGT technologies are the key drivers, emitting significantly fewer greenhouse gases than coal or oil



## Natural Gas Supply

Reduce carbon emissions by up to 50% per unit of electricity generated compared to coal or oil

## Green CCGT

Achieve greater efficiency and lower emissions compared to conventional fossil fuel power generation

# Brown Energy Initiatives

## Natural Gas Supply

LNG landing TPA via SelGas
**3 MTPA**

## Green CCGT

Pulau Indah PP
**1.2 & 1.05 GW**

Kuala Langat PP
**675 MW & 750 MW**

Kapar New PP
**2.1 GW**

# Sustainable Energy




Energy generated by utilizing waste products or by-products from human activities

## Waste-to-Energy Incinerator

Burn municipal solid waste at high temperatures to generate electricity

## POME Biogas Power Plant

Treat the liquid waste from palm oil processing to produce biogas

## Landfill Gas Engines

Capture methane released by rotting waste in landfills and convert it into electricity

## Anaerobic Digester

Convert organic waste into energy through a natural process in oxygen-free environments

# Sustainable Energy Initiatives

## Waste-to-Energy Incinerator

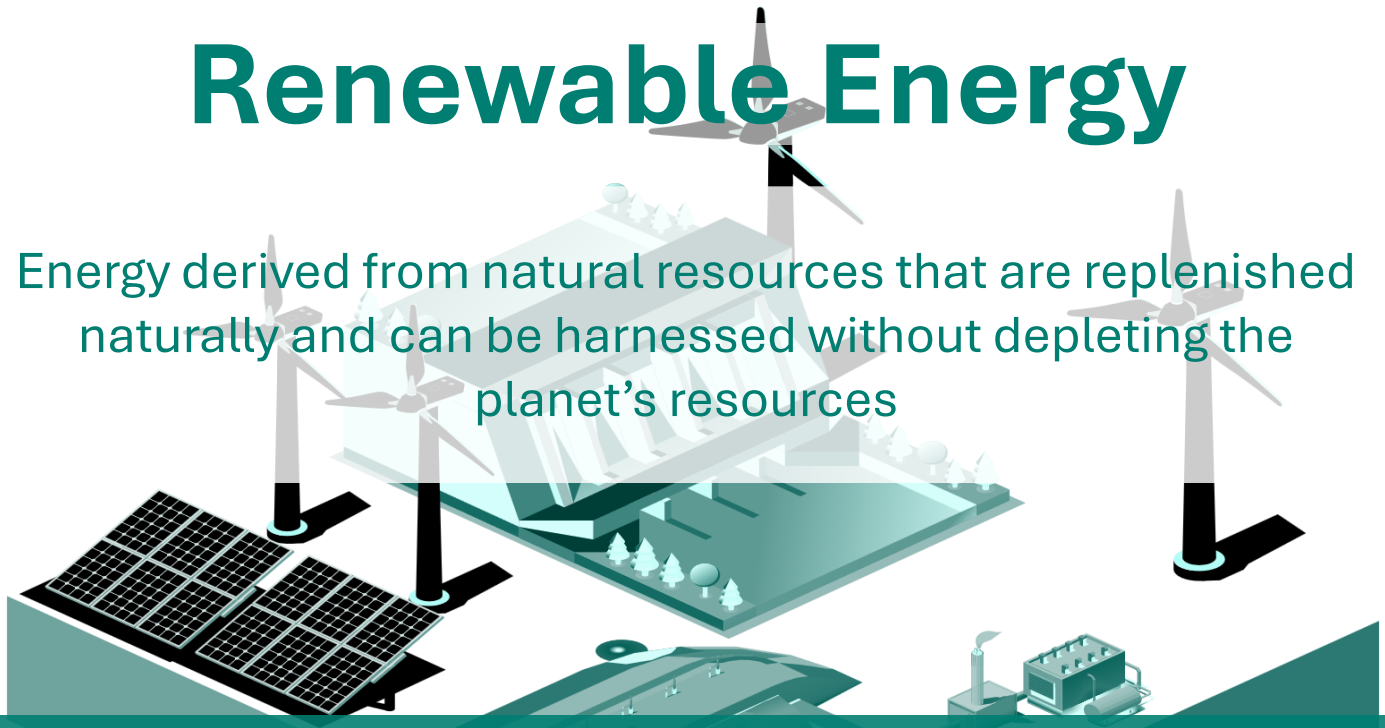
- Jeram WTE
  **58 MW**
- Tanjung Duabelas WTE
  **42 MW**
- Sultan Idris Shah WTE
  **58 MW**

## Anaerobic Digester

- Jeram anaerobic digester
  **1.3 MW**
- Tanjung Duabelas anaerobic digester
  **1.3 MW**

# Renewable Energy

Energy derived from natural resources that are replenished naturally and can be harnessed without depleting the planet's resources



## Geo-thermal Power

Harness the Earth's internal heat through geothermal systems

## Run-off-River Hydropower

Utilize the natural flow of rivers to spin turbines

## Solar PV

Harness the sun's light and heat to through solar panels and thermal systems

## Wind Power

Capture wind to spin turbines

# Renewable Energy Initiatives

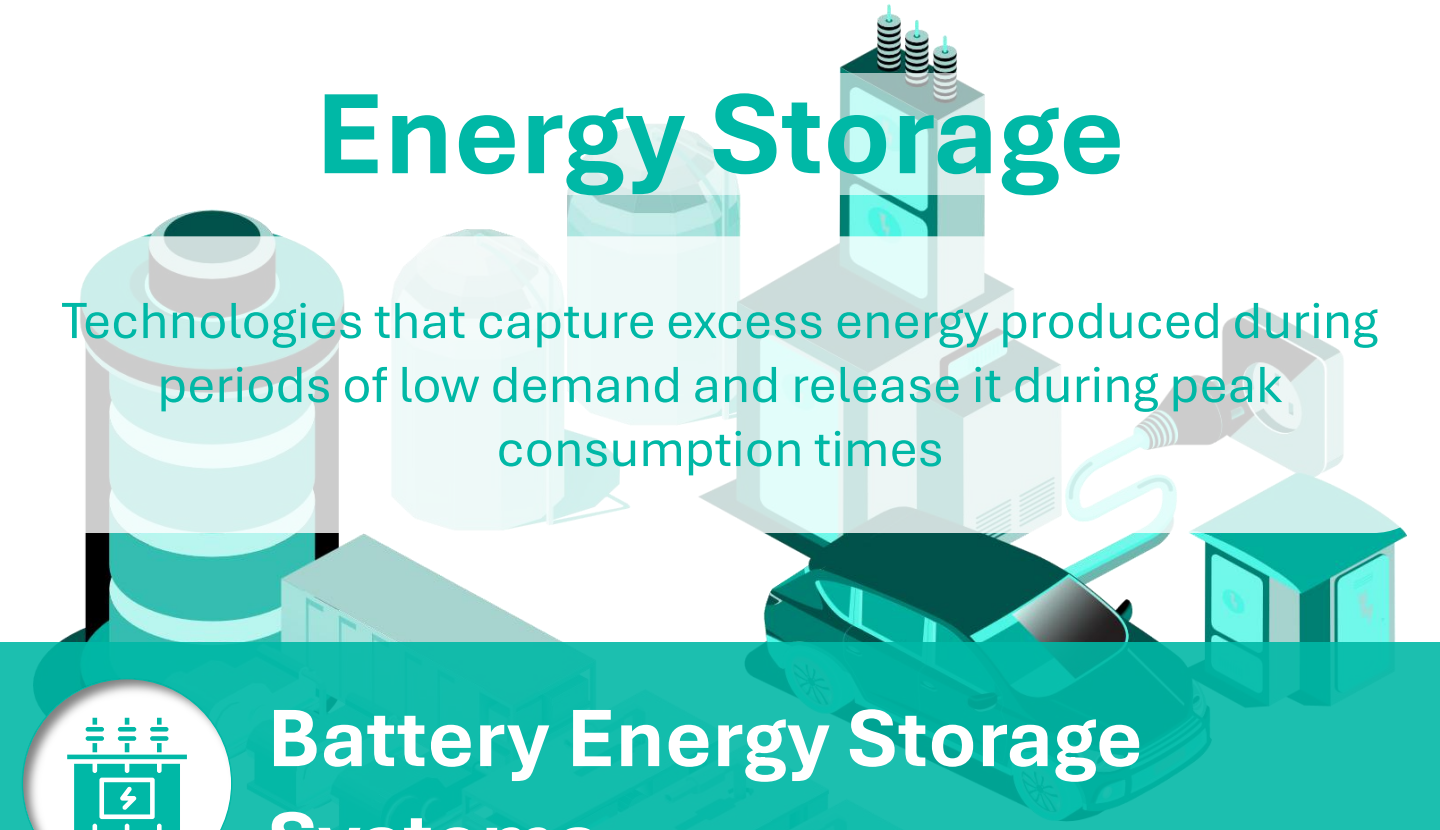
## Solar Power

- LSS Payung — **150 MW**
- LSS-*X* — **535 MW**
- LSS CRESS-*X* — **600 MW**
- LSS ENEGEM — **30 MW**
- SelCo LSS — **15 MW**

## Hydro-power

- Batang Kali — **5.1 MW**
- Kuala Kubu Dam — **10 MW**
- Lower Sungai Kerling — **4.5 MW**
- Bernam Scheme — **8.5 MW**
- Sungai Bernam — **6 MW**
- Ulu Pangsun — **2.1 MW**

# Energy Storage



Technologies that capture excess energy produced during periods of low demand and release it during peak consumption times

## Battery Energy Storage Systems

Store surplus electricity in batteries for release during peak demand

## Pumped Hydro Energy Storage

Pump water to a high reservoir using excess electricity, then release it through turbines during high demand

## Hydrogen production (incl. conversion into ammonia & methanol)

Hydrogen, as Selangor's key energy vector, is produced via water electrolysis using surplus electricity, then stored for use in fuel cells or co-combustion with natural gas to generate power

# Key Enablers

## Green infrastructure

- Advanced grid
- CCUS

## Green mobility

- Electric public transportation
- Green logistics
- Bicycle-friendly zones
- Micromobility
- EV chargers
- $H_2$ refueling stations

## Green workforce & literacy development

- Vocational training
- Academic programs
- Entrepreneur support scheme
- International green experts
- Public awareness campaigns
- Research collaborations
- Reforestation

# Selangor Agenda for Green Economy (SAGE)

## Enablers

### Green optimization & energy efficiency

- Building energy codes
- Industrial energy audits
- Retrofit government buildings
- Smart township
- District cooling
- Energy saving awareness

### Green policies & incentives

- Carbon tax
- Scope 3 emissions reporting
- Green technology incentives
- EV purchase rebates

### Green reporting

- Dashboard tracking
- Selangor government green reporting
- Corporate green reporting

### Green finance & investment

- Green technology financing
- Public-private partnerships
- Green bonds

# Flagship Catalysts

GAPS Green Energy Aggregator Programme for Selangor

## GAPS (Green-energy Aggregator Programs for Selangor)

Aims to position solar energy as a cornerstone of the state's clean energy transition

SELGAS Natural Gas Roadmap for Selangor

## SelGas (Natural Gas Roadmap for Selangor)

Aims to develop an integrated gas infrastructure system anchored around the regasification terminal

SHORE Selangor Hydrogen Oriented Resources

## SHORE (Selangor Hydrogen Oriented Resources)

Aims to build a comprehensive hydrogen economy framework spanning the full value chain

ISWM Selangor Integrated Solid Waste Management

## ISWM (Selangor Integrated Solid Waste Management)

Aims to transform the state's waste management ecosystem into a sustainable system

SEL-Hydro Selangor Hydro Power Resources

## SEL-Hydro (Selangor Hydro Power Resources)

Aims to harness the untapped potential of Selangor's river systems to generate power

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