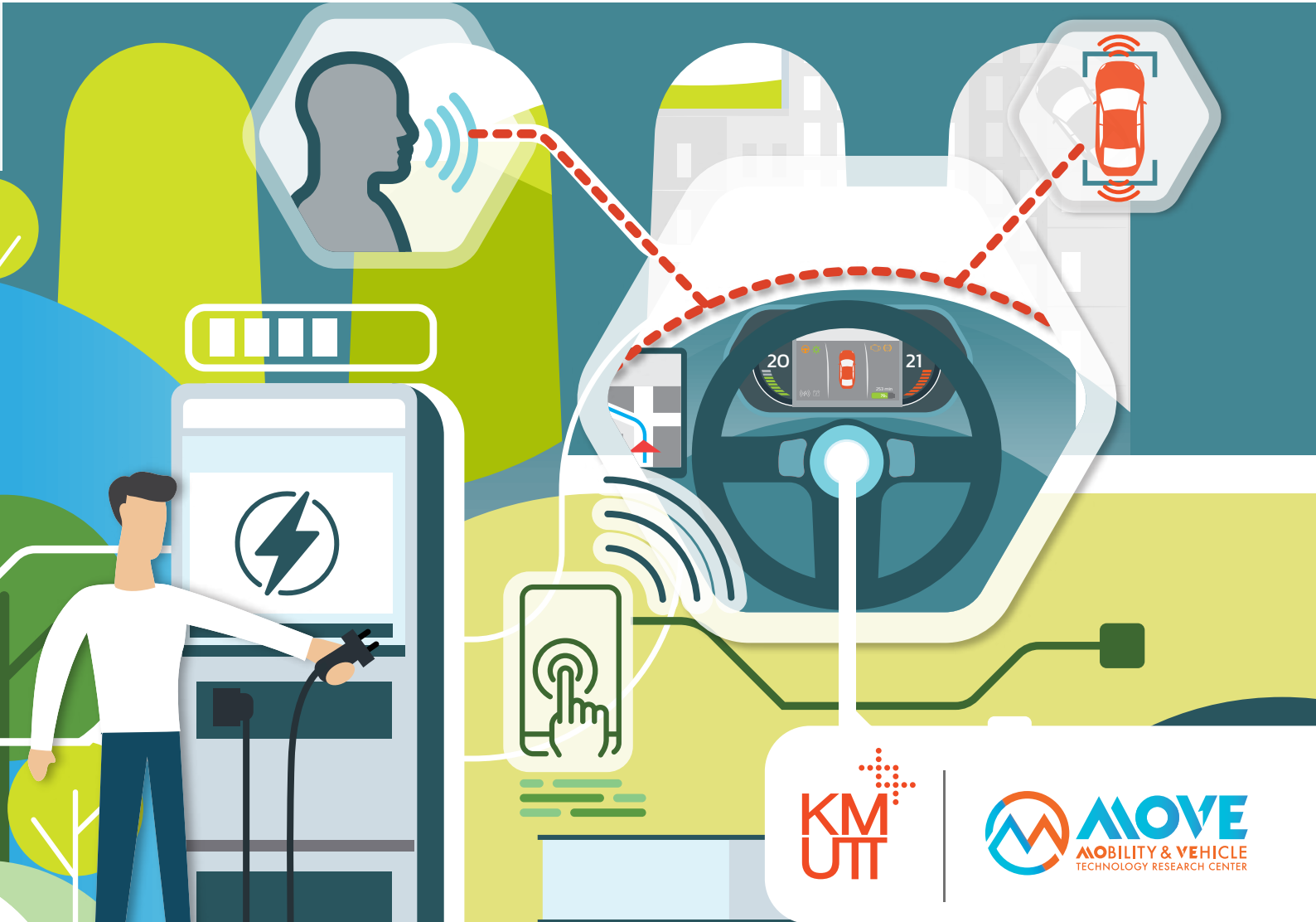


MOBILITY & VEHICLE TECHNOLOGY RESEARCH CENTER (MOVE)

SUMMARY REPORT

2020-2022

KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI (KMUTT)



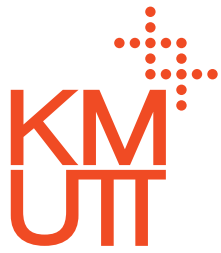




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MESSAGE

FROM THE PRESIDENT

Associate Professor Dr. Suvit Saetia

**President, King Mongkut's University of Technology Thonburi
(KMUTT)**

Currently many countries around the world recognize the importance and impact of climate change, which will become more severe every year. Many countries have signed the Paris Agreement of 2016 that addresses the effects of climate change. Thailand also ratified the Paris Agreement on 1 November 2021. The Prime Minister announced his intentions at the United Nations 26th Conference on Climate Change (COP26), in Glasgow, Scotland, to increase Thailand's efforts in solving climate change problems to reach its goal of carbon neutrality by the year 2050 and achieve zero greenhouse gas emissions by 2065.

King Mongkut's University of Technology Thonburi (KMUTT) recognizes the importance of reducing net carbon emissions to zero and it is ready to contribute to leading Thailand towards this goal. The university declared its mission to achieve net-zero carbon emissions by ๒๐๕๐ and formulate an action plan that will lead to that goal through its Mobility and Vehicle Technology (MOVE) Research Center. This is the primary unit that will work on electric vehicles, sustainable transportation and mobility at KMUTT. MOVE is also a research center that focuses on development of next-generation automotive technology to support Thai businesses and industry in this field during the transition from internal combustion engine vehicles to electric power technology. Additionally, the MOVE Research Center has undertaken several policy research projects in collaboration with government agencies and international organizations for the purpose of determining guidelines for promoting the production and use of electric vehicles in Thailand.

The Move Research Center has shown a steady growth in its operations. Additionally, it has a strong network of domestic and international researchers. On this occasion, I would like to commend and congratulate the MOVE Research Center on being an important part in helping the Thai automotive industry in technology development to compete at the international level and for leading the country to sustainable mobility.

Finally, I wish the MOVE Research Center success in its many projects and that it will lead KMUTT and Thailand to meet their goal of net-zero carbon emissions.

ASSOCIATE PROFESSOR DR. Suvit Seatia



***MESSAGE FROM
THE HEAD OF THE
MOVE RESEARCH
CENTER***

Associate Professor Dr. Yossapong Laoonual

Vice-President for Sustainable Development and Interim Head of the Mobility and Vehicle Technology (MOVE) Research Center

The automobile industry in Thailand is facing challenges of changing old technology (Internal Combustion Engine) to new automobile technology. Therefore, the National Economic and Social Development board office has issued its 13th National Economic and Social Development Plan.

In the 3rd milestone of the plan, Thailand is to become one of the world's important electric vehicle manufacturing bases. Therefore, the Thai manufacturers have to adapt to change to retain a sustainable competitive edge. Additionally, the Ministry of Higher Education, Science, Research and Innovation has drafted a plan for research and innovation for 2023-2027. Under this plan, Item 1.7 (Electric Vehicle Industrial Development) calls for enabling Thai manufacturers to develop high competitiveness to prepare for the expansion of transportation with the goal of Thailand becoming the largest electric vehicle producer in ASEAN.

The Mobility and Vehicle Technology (MOVE) Research Center of King Mongkut's University of Technology Thonburi (KMUTT) is a research center that is ready to conduct research and provide services for testing vehicles and their parts as well as supporting teaching and learning at the bachelor and graduate levels. This includes development of skilled labor (up-skill/re skill) in the industry in order to develop the technology and innovation for next-generation automobiles. It also helps Thai automotive manufacturers raise their international competitiveness.

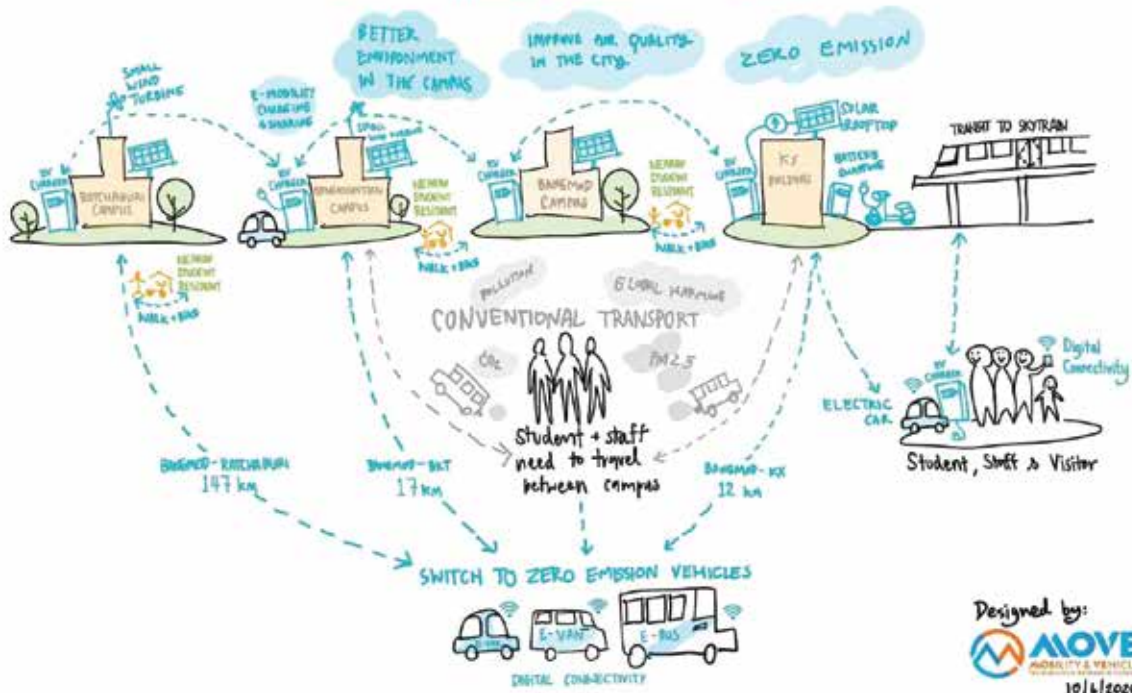


MOVE

KMUTT's Concept of Zero Emissions Transport Moving Towards Sustainable Mobility

1. Change all KMUTT vehicles (100%) to electrical vehicles
2. Change public transportation vehicles and university vans to 100% electric vehicles
3. Install public charging stations on the KMUTT campus to encourage employees to use electric vehicles
4. Promote ride sharing
5. Promote walking, bicycling and electric motorcycle use for intra-campus travel and its vicinity with safety as a consideration
6. Reduce the use of private vehicles by enabling commuting to the university by public transportation and use the KX building as a connecting point (hub)
7. Make university services accessible for students, employees and the public via online digital applications

KMUTT ZERO EMISSION TRANSPORT MOVING TOWARDS SUSTAINABLE MOBILITY



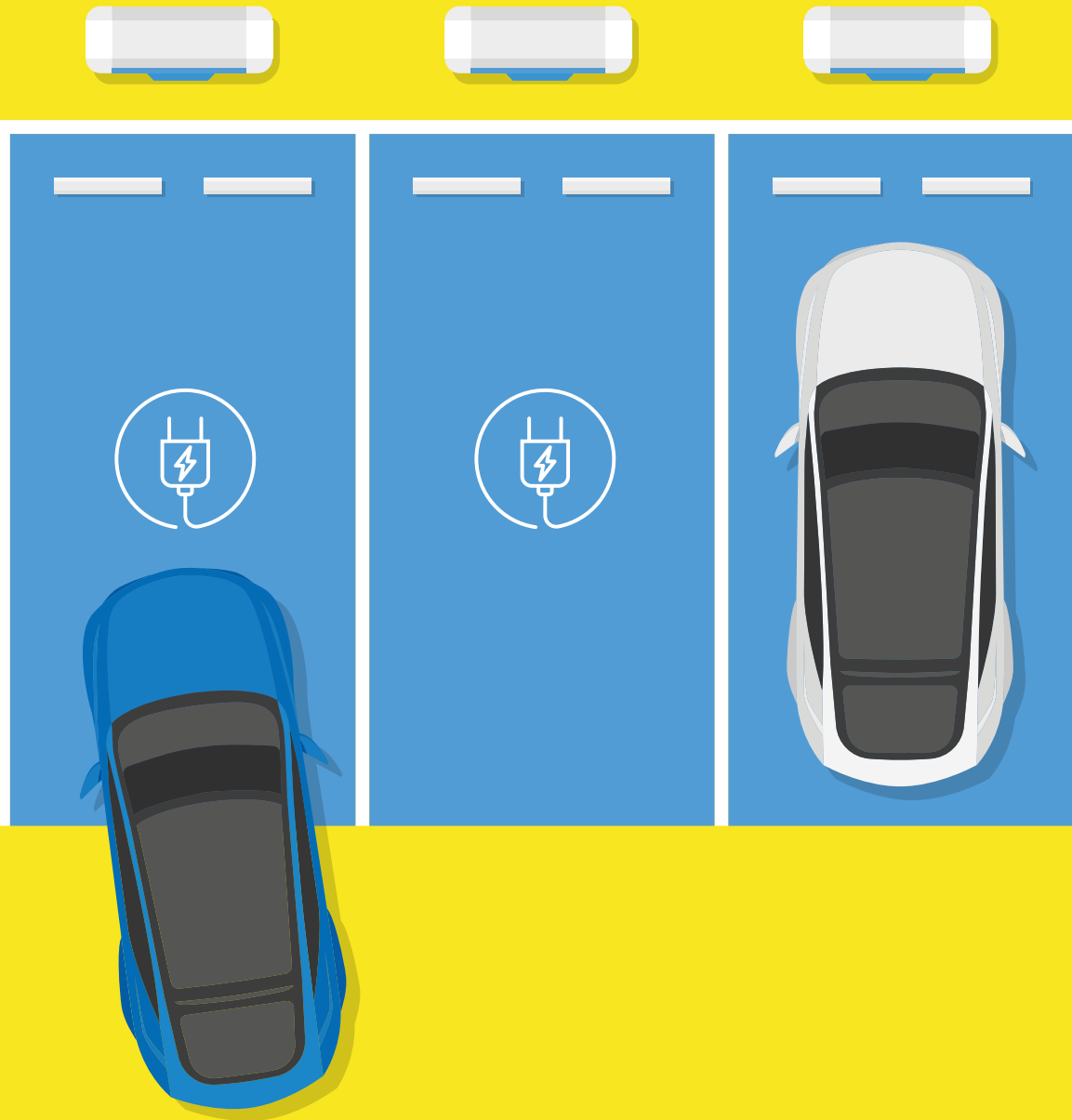
1

INTRODUCTION

MOV

E

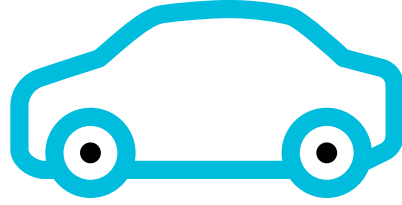
The automobile industry has been a major contributor to the Thai economy for more than five decades. This has made Thailand one of the world's important automobile producers. However, the Thai automobile industry is facing a challenge of transitioning from traditional automotive technology centered around internal combustion engines that use fossil fuels to next-generation automotive technology based on the concept of CASE.



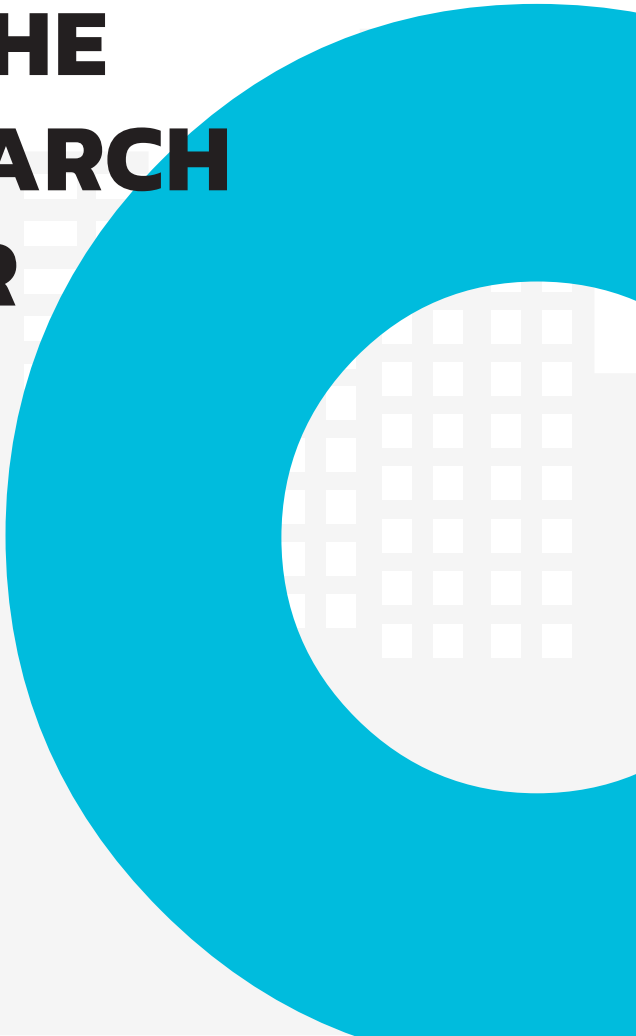
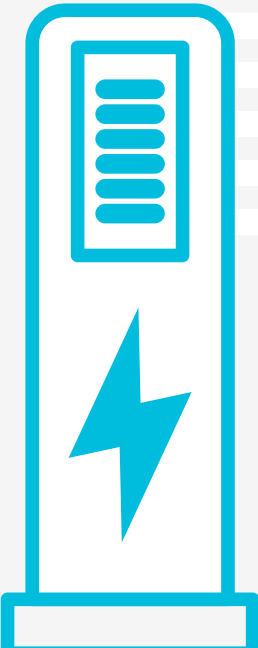
CASE refers to Connected Vehicles, Automated or Autonomous driving, Sharing vehicles and Electric vehicles. Since CASE encompasses all these things, the Office of the National Economic and Social Development Council has identified problems with the readiness of electric vehicle production in Thailand. They recognize the need to accelerate readiness in this area, especially in terms of technology and labor with the skills needed for electric vehicle production. They also need to adapt to meet the speed of technological change. If we lag, the country will lose its competitive edge. Additionally, a draft was prepared of the 13th National Economic and Social Development Plan (2023-2027), which includes Milestone 3: Thailand is to become one of the world's important electric vehicle manufacturing bases.

The Ministry of Higher Education, Science, Research and Innovation formulated a draft Science, Research and Innovation plan for 2023-2027, Plan No. 1.7 (Electric Vehicle Industrial Development Plan), which strives to enable Thai electric vehicle producers to compete, support the expansion of ASEAN transportation and to become self-reliant. The goal is to make Thailand the largest ASEAN electric vehicle producer. Additionally, the Ministry of Higher Education, Science, Research and Innovation is preparing to guide Thai electrical vehicle producers in the direction of the 13th National Economic and Social Development Plan. This will be done by integrating production and developing high-performance manpower. For Milestone 3 of the 13th National Economic and Social Development Plan, the Higher Education Commission has appointed King Mongkut's University of Technology Thonburi (KMUTT) as a coordinator.

King Mongkut's University of Technology Thonburi acknowledges the importance of promoting the electric vehicle industry. Additionally, they have personnel with experience in conducting research to improve electric vehicle technology. They understand government policies and the needs of private industry. KMUTT prepares to improve its physical learning space and modernize its laboratories to support research and development, provide testing of electrical vehicles and their parts as well as supplying test results to business owners. The Research Center also supports learning and research projects at the bachelor and graduate levels, and trains people in the industry so that they acquire necessary technical skills (up-skill/re-skill). Doing so helps the MOVE Research Center in its mission for research and development of next-generation automotive technology, providing engineering advice, training automobile industry personnel, testing and certification services for the automobile and automobile parts industry. In this way, business owners can adapt to rapid changes. The MOVE Research Center will become a center of excellence in next-generation automotive technology. The Research Center will lead KMUTT in their 20-year development plan for 2017-2036 (KMUTT Roadmap 2036) by focusing on developing quality education with the goal of supporting Working Adult Education (WAE). The MOVE Research Center has an important role in guiding KMUTT to achieve its goals of being a coordinator in supporting the development of electrical vehicles, in conjunction with other organizations, to achieve Milestone 3 of the 13th National Economic and Social Development Plan.



**ABOUT THE
MOVE RESEARCH
CENTER**

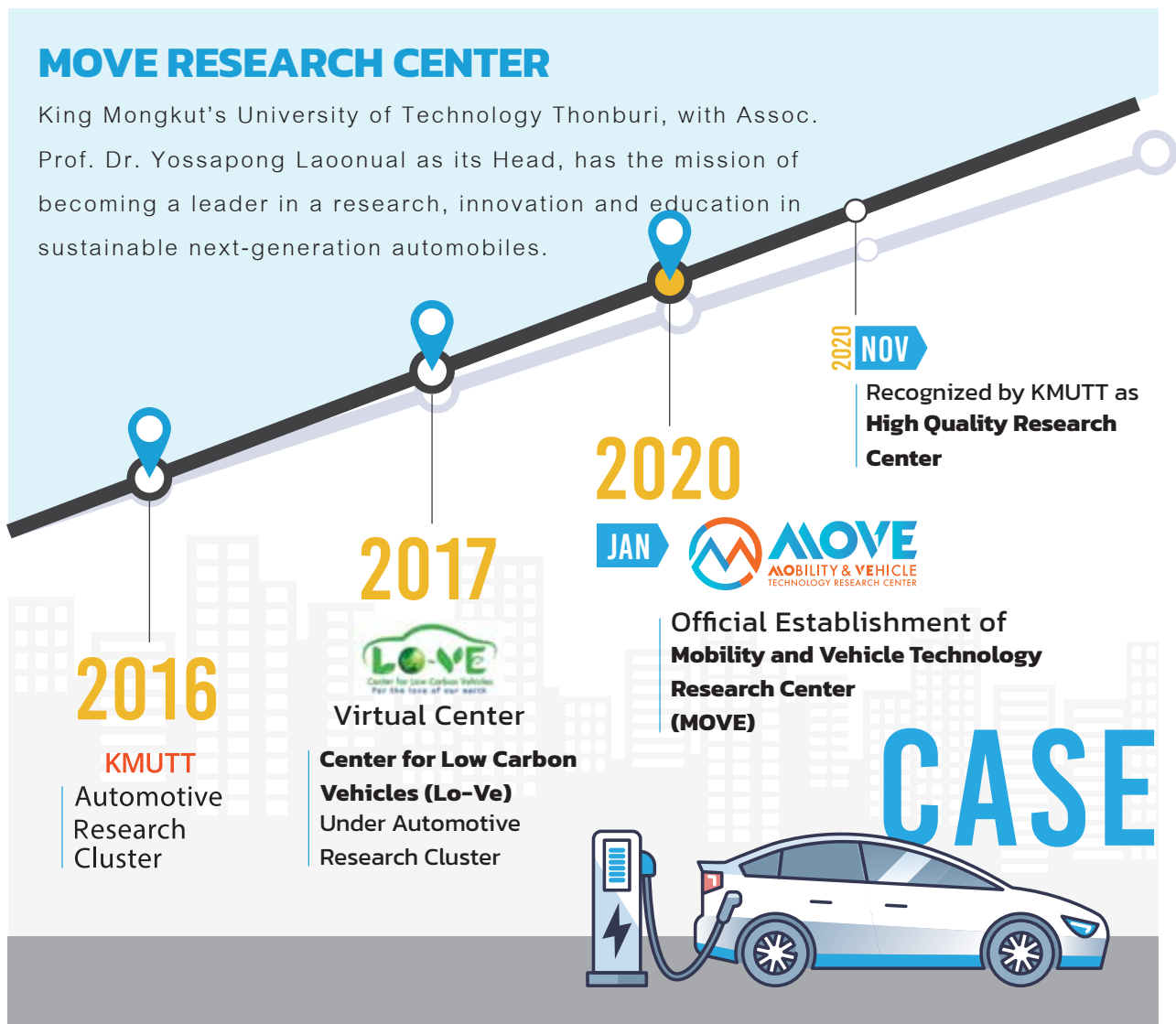


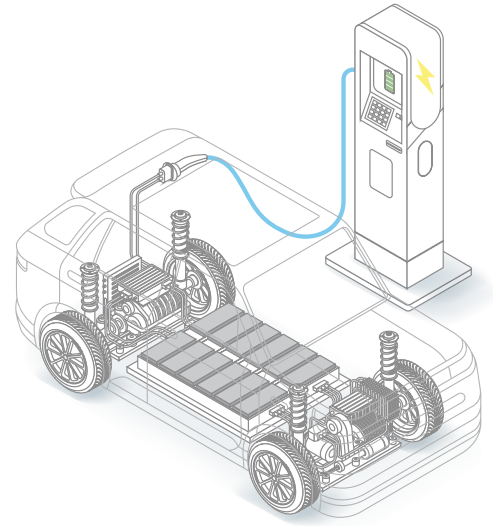
INTRODUCING THE MOVE RESEARCH CENTER

The MOVE Research Center at King Mongkut's University of Technology Thonburi, was established in 2020 with Associate Professor Dr. Yossapong Laoonual as its Head. The Center has the mission of becoming a research, innovation and education leader in sustainable next-generation automobile technology. Its main mission is to develop next-generation automotive technology and innovation based on the concept of CASE (Connected, Autonomous, Shared and Electrified). By operating as a collaborative network both within and outside the university, the Center is dedicated to transfer knowledge to Thai manufacturers for commercial applications, enabling them to raise their competitiveness on a global scale. Furthermore, the Center plans to develop modern laboratories specifically designed for testing and conducting research on next-generation automobiles.

MOVE RESEARCH CENTER

King Mongkut's University of Technology Thonburi, with Assoc. Prof. Dr. Yossapong Laoonual as its Head, has the mission of becoming a leader in a research, innovation and education in sustainable next-generation automobiles.

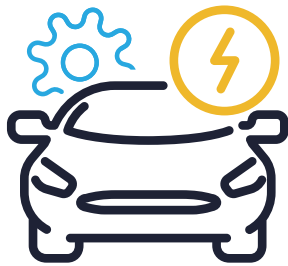




VISION

“ Aiming for technological excellence in automotive research and innovation for industry and businesses that will lead to sustainable transportation and mobility in Thailand ”

MISSION



CASE

01

Support technological development and next-generation automotive innovations based on the CASE concept (Connected, Autonomous, Shared and Electrified)

02

Transfer technology to the next-generation automotive industry for commercial use, enabling them to compete globally



03

Conduct research and provide academic services in conjunction with networks both inside and outside of the University



04

Build laboratories to support research and testing that meet international standards

STRATEGY

The MOVE Research Center has developed strategies employing the

3i concept



i

industry



ii

international infrastructure



iii

integration for innovation impact

industry

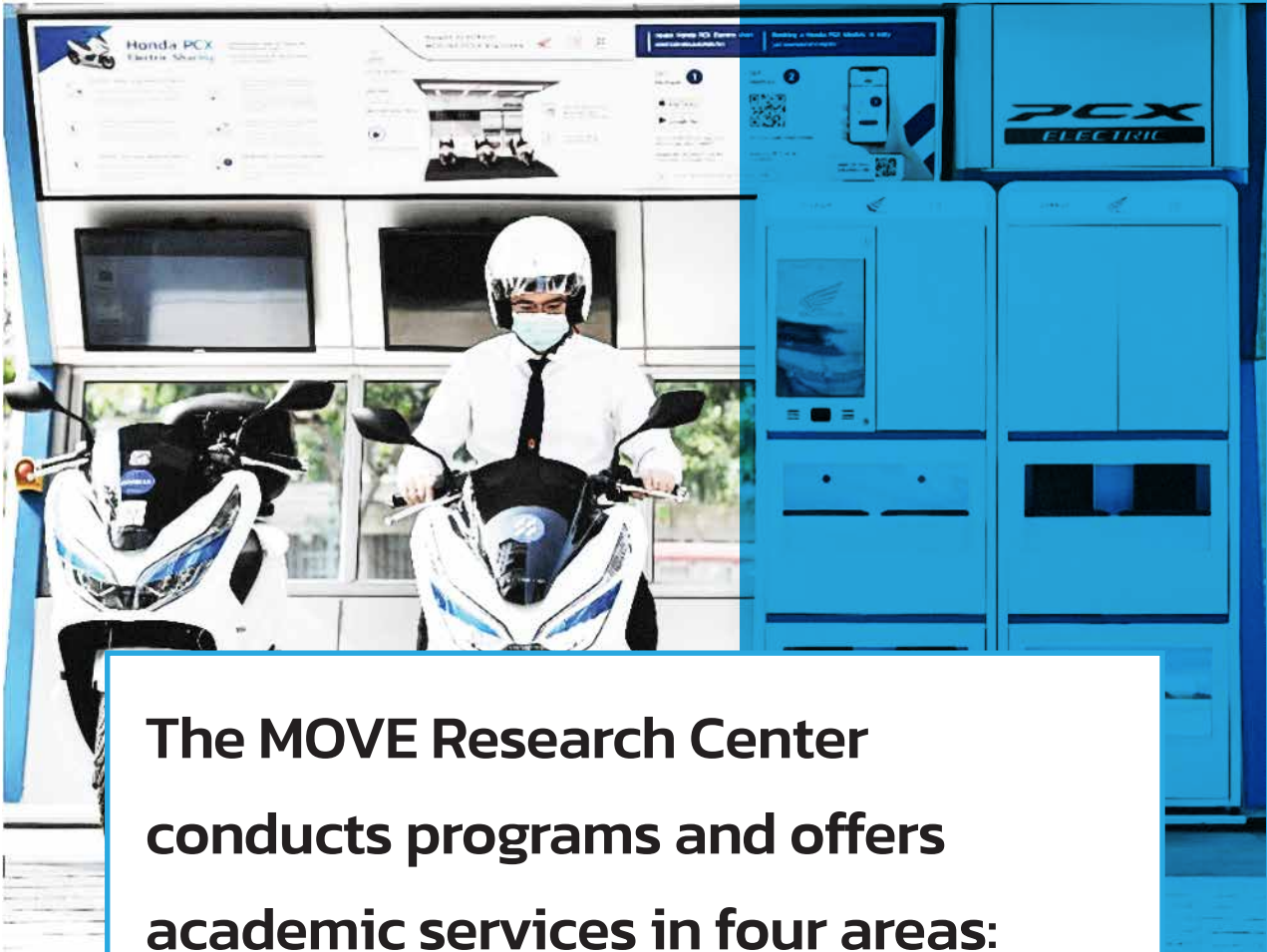
strong cooperation between industry and business owners

international infrastructure

developing an infrastructure that meets international standards

integration for innovation impact

integrate education, research and innovation that drives sustainable development



The MOVE Research Center conducts programs and offers academic services in four areas:

1



Power transmission and energy management

Focusing on powertrain technology and energy management to reduce automobile emissions

2



Automotive structural design for safety

Focusing on design and development of vehicle structures for performance and safety

3



Electric vehicles

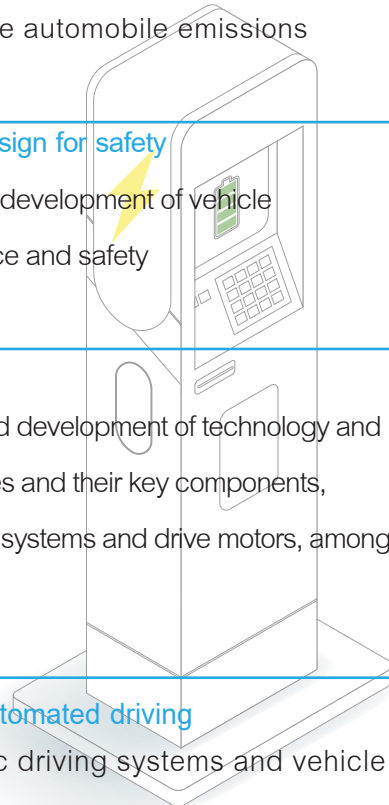
Focusing on research and development of technology and innovation in such vehicles and their key components, including energy storage systems and drive motors, among others

4



Communication and automated driving

Focusing on automatic driving systems and vehicle communications



NETWORK OF PARTNER AGENCIES

01 Agencies within KMUTT



KMUTT Faculty of Engineering



JGSEE - Joint Graduate School of Energy and Environment



FIET - Faculty of Industrial Education and Technology



FIBO - Institute of Field Robotics



REDEK - Research and Design Service Center



Pilot Plant Development and Training Institute

02 Government Agencies



Pollution Control Department, Ministry of Natural Resources and Environment



Thailand Automotive Institute



Office of Transport and Traffic Policy and Planning, Ministry of Transport



Department of Industrial Promotion, Ministry of Industry



National Science and Technology Development Agency (NSTDA)



Electricity Generating Authority of Thailand (EGAT)



Thailand Science Research and Innovation (TSRI)



National Research Council of Thailand (NRCT)

03 Private Sector



Electric Vehicle Association
of Thailand (EVAT)



Toyota Motor Thailand Co., Ltd.



Sammitr Motor Manufacturing
PLC



GP Motor (Thailand) Co.,
Ltd.



Thai Honda Co., Ltd.



Hauptcar Co., Ltd.



Nissan Motor
(Thailand) Co., Ltd.



Bangchak Corporation Public Co.,
Ltd.



i-Motor Manufacturing
Co., Ltd.

04 Universities and Research Centers



Imperial College - London,
UK



University of Ulsan – Republic
of Korea



Graz University of Technology –
Austria



Tokyo Institute of
Technology – Japan



University of Technology
Malaysia

05 International Organizations



United Nations Economic and Social
Commission for Asia and the Pacific
(UNESCAP)



Malaysia-Thailand
Joint Authority (MTJA)

MOVE

3

**NETWORK OF
RESEARCHERS
AND STAFF**

NETWORK OF RESEARCHERS AND STAFF



Head of the MOVE Research Center

Yossapong Laonual

Associate Professor

Ph.D., Imperial College London, UK, 2006

Research Areas

- Electric and hybrid vehicle
- Battery fire and explosion
- Internal combustion engine



Researcher

Thepparat Klamrassamee

Ph.D., King Mongkut's University of Technology Thonburi, Thailand, 2015

Research Areas

- Biorefinery technology & energy conversion
- Conversion of agricultural waste into value-added chemicals
- Waste energy technologies
- Transport, energy and environment policy



Postdoctoral Researcher

Kotchakarn Nantasaksiri

Ph.D., Osaka University, Japan, 2022

Research Areas

- Land potential evaluation using ecological modelling (SWAT model)
- Land suitability analysis
- Life-cycle assessment
- Cost-benefit analysis
- Energy policy for renewable energy

Research Assistant**Tanic Leunanonchai**

M.Eng., King Mongkut's University of
Technology Thonburi, Thailand, 2018

**Research Areas**

Machine design, finite element method

Research Assistant**Tewa Khansiriwong**

M.Eng., King Mongkut's University of
Technology Thonburi, Thailand, 2018

**Research Areas**

Finite element method and morphing airfoil

Research Assistant**Warunchit Chueprasert**

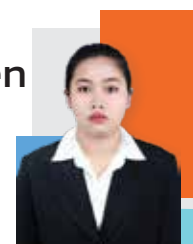
M.Eng., King Mongkut's University of
Technology Thonburi, Thailand, 2020

**Research Areas**

Electric vehicle technology, vehicle dynamic and
control system

Engineer**Areeya Suwannasaen**

B.Eng., King Mongkut's University of
Technology Thonburi, Thailand, 2021

**Research Areas**

Internal combustion engines
Analysis of pollution and particulate matter from fuel
used in engines

General Management**Attaya Ninjinda**

Master's degree, Silpakom University,
2017

**MOVE Research Center Staff****Pantira Jantano**

Bachelor's degree, Burapha University,
2022



NETWORK OF RESEARCHERS AND STAFF



Somchai Wongwises

Professor

Dr.- Ing. (Mechanical Engineering), University of Hannover, Germany, 1994

Research Areas

- Heat transfer
- Fluid mechanics



Savitri Garivait

Associate Professor

Ph.D., University of Paris 7, France, 1995

Research Areas

- Aerosols from biomass burning to the atmosphere.
- Air and climate pollutants emission inventory and projection
- Emission and long-range transport of carbonaceous aerosols from biomass open burning and anthropogenic sources.
- GHG and aerosols emissions from agriculture and land use change and forestry.



Researcher

Pongpan Kaewtatip

Associate Professor

D.Eng., Nippon Institute of Technology, Japan, 2000

Research Areas

- Metal forming technology (sheet metal stamping, tube and wire drawing, hot and cold forging, application of ultrasonic vibration)
- Energy policy in industry and transportation

NETWORK OF RESEARCHERS AND STAFF



Researcher

Poj Tangamchit

Associate Professor

Ph.D., Carnegie Mellon University, USA, 2003

Research Areas

- Robotics
- Machine learning / robot learning
- Multirobot systems
- Artificial intelligence



Researcher

Wishsanuruk Wechsathol

Associate Professor

Ph.D. (Mechanical Engineering), Duke University, USA, 2005

Research Areas

- Construal theory
- Optimal and intelligent design of multiscale thermal and fluid flow systems
- Cryogenic technology and cold storage
- Cooling of electronic packages
- Emerging power generation technology
- Solar thermal engineering hydrogen production and storage
- Digital microfluidic lab-on-a-chip



Researcher

Pattaramon Jongpradist

Associate Professor

Ph.D., Memorial University, Canada, 2006

Research Areas

- Lightweight structural design and optimization
- Automotive design for crashworthiness and safety



Researcher

Benjamas Panomruttanarug

Associate Professor

Ph.D., Columbia University, USA, 2006

Research Areas

- Iterative learning control, vision based control in robotic manipulators, autonomous vehicles



Researcher

Komkrit Chomsuwan

Associate Professor

Ph.D. (Electrical Engineering), Kanazawa University, Japan, 2006

Research Areas

- Manpower development
- Applied electromagnetics



Researcher

Marong Phadoongsidhi

Assistant Professor

Ph.D. Electrical and Computer Engineering, University of Wisconsin Madison, U.S.A., 2004

Research Areas

- Deep sub-micron integrated circuit testing
- Fault-tolerant systems
- High dependability distributed systems (with focus on blockchain-based platforms)



Researcher

Vasin Kiattikomol

Assistant Professor

Ph.D., University of Tennessee, USA, 2005

Research Areas

- Transportation impact analysis
- Highway engineering and design
- Transportation system planning and design



Researcher

Sujin Jiracheewanun

Assistant Professor

Ph.D., The University of Sydney, Australia, 2009

Research Areas

- Alternative fuel engine
- Aerodynamic design
- Computational fluid dynamics



Researcher

Manon Sooklamai

Assistant Professor

D.Eng., Shibaura Institute of Technology, Japan, 2009

Research Areas

- Teaching methods in mechanical technology
- Thermal radiation transfer
- Solar energy
- Dual fuel and alternative fuels for engine



Researcher

Piyatida Trinuruk Kaewchinda

Assistant Professor

D.Eng., Tokyo Institute of Technology, Japan, 2013

Research Areas

- Energy conservation in industry and building
- Heat exchanger and heat transfer enhancement
- Battery thermal management system
- Renewable energy and energy policy



Researcher

Kitchaon Ruangjirakit

Assistant Professor

Ph.D., Imperial College London, UK, 2014

Research Areas

- Composite materials
- Adaptive structures
- Electric vehicles
- Automotive structural design



Researcher

Anusit Anmanatarkul

Assistant Professor

Ph.D. Old Dominion University, USA, 2003

Research Areas

- Control of Automatic Mechanical Systems
- Systems Identification
- Learning Management in Mechanical Technology



Researcher

Patcharapit Promoppatum

Assistant Professor

Ph.D. (Mechanical Engineering), Carnegie Mellon University, USA, 2018

Research Areas

- Additive manufacturing
- Heat transfer
- Finite element analysis



Researcher

Yanin Sukjai

Assistant Professor

Ph.D., (Nuclear Science and Engineering), Massachusetts Institute of Technology, USA, 2018

Research Areas

- Nuclear reactor design and simulation
- Cold energy utilization, waste heat recovery, printed circuit heat exchanger, and pulverized biomass burner



Researcher

Jirasak Srirat

Lecturer

D. Eng., Graduate School of Natural Science and Technology, Kanazawa University, Japan, 2012

Research Areas

- Application of the optimization methods
- Mechanical design
- Finite Element Analysis (FEA)
- Sheet metal forming



Researcher

Kanjane Budthimedhee

Lecturer

Ph.D., University of Illinois at Urbana Champaign, USA, 2003

Research Areas

- Visualization of planning information and effective user interfaces for planning support systems
- Ecological architecture, sustainable development, participatory design and the role of the architect
- Sensory design and Well-being, Alternative transportation planning and Micromobility potential, Designing Resilience in Asia, Sea level and climate change effect on Bangkok waterfront city and Geodesign



Researcher

Kamthon Septham

Lecturer

Ph.D., Imperial College London, UK, 2018

Research Areas

- Road Vehicle Aerodynamics
- Fluid Dynamics
- Computational Fluid Dynamics
- Turbulence and Flow Control



Researcher

Nutthapon Wongyao

Lecturer

Ph.D., King Mongkut's University of Technology Thonburi, Thailand, 2011

Research Areas

- Fuel cells (electrochemistry & application)
- Solar cells (application)
- Hydrogen production



Researcher

Suphanut Kongwat

Lecturer

Ph.D. (Functional Control Systems), Shibaura Institute of Technology, Japan, 2020

Research Areas

- Structural optimization,
- Finite Element Analysis(FEA), Solid mechanics
- Computer-Aided Design



Researcher

Patcharawat Charoen-amornkitt

Lecturer

Ph.D. (Mechanical Engineering), Osaka University, Japan, 2020

Research Areas

- Reaction and transport phenomena in electrochemical systems
- Electroanalytical methods
- Mathematical modeling and optimization of electrochemical systems



Researcher

Jakrapop Wongwiwat

Lecturer

Ph.D. (Mechanical Engineering), University of Southern California, USA, 2019

Research Areas

- Combustion
- Micro thruster
- Internal combustion engine
- Computational fluid dynamics
- Reacting flow and power generation
- Extraction process
- Heat transfer

FOREIGN SPECIALISTS



Visting Professor

Prof. Dr. Srithar Rajoo

Director of UTM Centre for Low Carbon Transport (LoCARtic), Universiti Teknologi Malaysia, Malaysia

Field of Expertise

- Turbocharging/supercharging
- Internal combustion engines
- Waste heat recovery with specific focus on low carbon Technologies for transport applications



Visting Professor

Prof. Dr. Ock Taeck Lim

University of Ulsan, Republic of Korea

Field of Expertise

- New Fuels for vehicles
- Vehicle Technology, and Electric Vehicle technology



Visting Professor

Assoc. Prof. Dr. Mario Hirz

Head of the Department of Automotive Mechatronics
Institute of Automotive Engineering
Graz University of Technology, Austria

Field of Expertise

- Transport Innovations and Environment
- E-Mobility and Alternative Drivetrains
- Automated Driving and Driver



Visting Professor

Dr. Alexander Kreis

Institute of Automotive Engineering
Graz University of Technology, Austria

Field of Expertise

- Computer Aided Design and 3D Printing
- Sensors and Data for Automotive Applications

ABILITY & VELOCITY
MOVE

4

SUMMARY OF PROJECTS 2020–2022



01

A STUDY ON ELECTRIC MOTORCYCLE USAGE BEHAVIOR IN A SHARED SYSTEM PHASE 2

PROJECT DURATION

1 August 2020 – 31 July 2021

FUNDING SOURCE

A.P. Honda Co., Ltd. (presently Thai Honda Co.,Ltd.)

PROJECT OBJECTIVES



1. Study an electric motorcycle sharing service with a battery swapping system
2. Study the use behavior of electric motorcycles and energy consumption of charging stations for electric motorcycles under a shared ecosystem
3. Develop accessible central database of electric motorcycle use and their energy consumption

PROJECT RESULTS

1. Evaluated use patterns and driving behavior of people using electric motorcycles and replenishing power through a battery swapping system
2. Collected and studied information on problems and obstacles in the use of electric motorcycles and battery swapping systems
3. Studied a battery swapping cabinet prototype
4. Studied a prototype of central data website (Data Center Platform)
5. Evaluated preliminary study results of an electric motorcycle taxi project



02

ENERGY RECOVERY IN PETROLEUM PROCESSING VIA INTEGRATED HIGH-PERFORMANCE TECHNOLOGIES

PROJECT DURATION

1 August 2018 – 31 December 2022

FUNDING SOURCE

Malaysia-Thailand Joint Authority (MTJA)

PROJECT OBJECTIVES



1. To study the use of excess energy from petroleum production processes for higher efficiency use of energy
2. To study energy consumption in petroleum production processes for energy savings
3. Develop a prototype for recovering excess energy for use in petroleum production processes

PROJECT RESULTS



The project, Energy Recovery in Petroleum Processing via Integrated High-Performance Technologies, is a collaborative effort between the Universiti Teknologi Malaysia (UTM) and Imperial College London, UK, under the research support of the Malaysia-Thailand Joint Authority (MTJA) who allocated funds for the 2019 fiscal year. The project is ongoing until 2022. The work of the project involved:

1. Comprehensive analysis of overall energy use in petroleum production processes, both upstream and downstream. For example, a model for analyzing and evaluating different aspects in this project was developed. These aspects include the use of energy in each part of production, commercial aspects, and energy consumption when different technologies are employed.
2. Determine the optimal technological approaches for petroleum production. For example, integrated technology for producing petroleum was evaluated. Suitable conditions integrating various technologies were studied and analysis of key technologies in the production process were done along with identifying limitations.
3. Prototype development and practical demonstration of heat recovery processes was accomplished.

03

xEV COMPREHENSIVE RESEARCH**PROJECT DURATION**

1 January – 30 June 2021

FUNDING SOURCE

Toyota Motor Thailand Co., Ltd.

PROJECT OBJECTIVES

The effects of driving patterns and the use of air conditioners were studied in four types of vehicles. These vehicles include those with internal combustion engines, hybrid electric vehicles, plug-in hybrid electric vehicles and battery electric vehicles. Their effect on emissions and energy efficiency were evaluated in the laboratory. This was done using a test bench (chassis dynamometer) employing the European Driving Cycle (NEDC) and Bangkok (BKK) Driving Cycle.

PROJECT RESULTS

1. A comparison was made of the results of emission levels and fuel/energy consumption of these four types of vehicles under the European Driving Cycle and the Bangkok Driving Cycle, with an air conditioner operating.
2. The study results were presented at two seminars to disseminate project information to government agencies involved in electric vehicle production.

04

A FEASIBILITY STUDY OF REPLACING DIESEL ENGINE VEHICLES WITH ELECTRIC VEHICLES, NATURAL-GAS-FUELED VEHICLES, OR EURO 6-COMPLIANT VEHICLES IN BANGKOK AND ITS VICINITY TO REDUCE THE AMOUNT SMALL PARTICULATE MATTER (PM2.5) IN THE ATMOSPHERE**PROJECT DURATION**

18 September 2020 – 14 September 2022

FUNDING SOURCE

National Research Council of Thailand (NRCT)

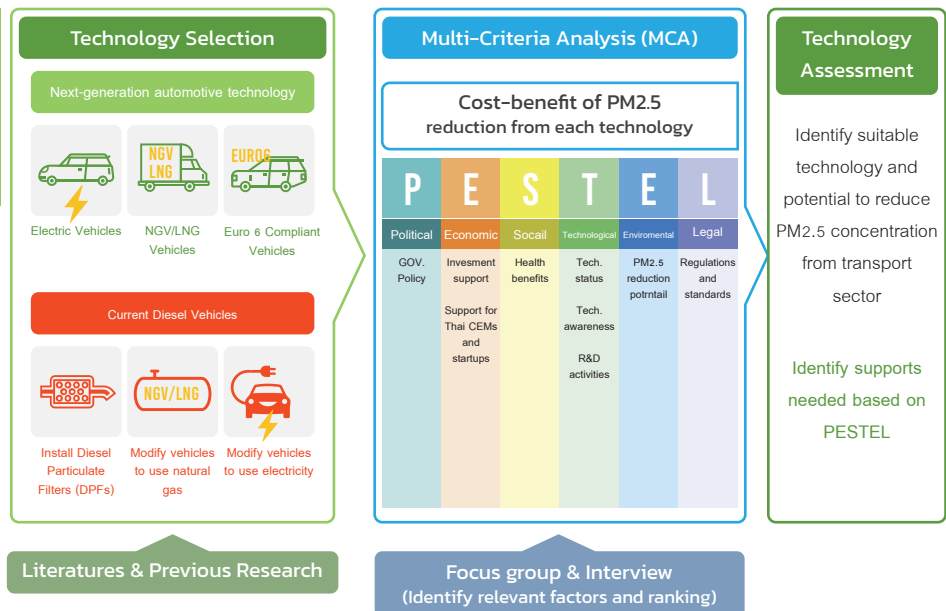
PROJECT OBJECTIVES

1. Technology and Engineering Assessment – a study and assessment of engineering aspects of the current technology and the trends in development of future technology
2. Scenario Building – analyze situations and factors affecting air pollution in the future
3. Emission Assessment and Evaluation – study pollution emissions data and evaluate investment feasibility

PROJECT RESULTS

1. Information about suitable technology for replacing diesel engines vehicles was obtained.
 2. Useful information on the economic, social and health aspects of projected future scenarios was obtained. A feasibility study of replacing diesel engine vehicles was done.
 3. A Road Transport Emission Inventory System Database was developed.
 4. Dissemination of information was done through public relations.
 5. Policy recommendations and action plans to promote the replacement of diesel engine vehicles were developed.
- Implementation started in 2021 and will be completed in 2024.

Framework of Technology Assessment

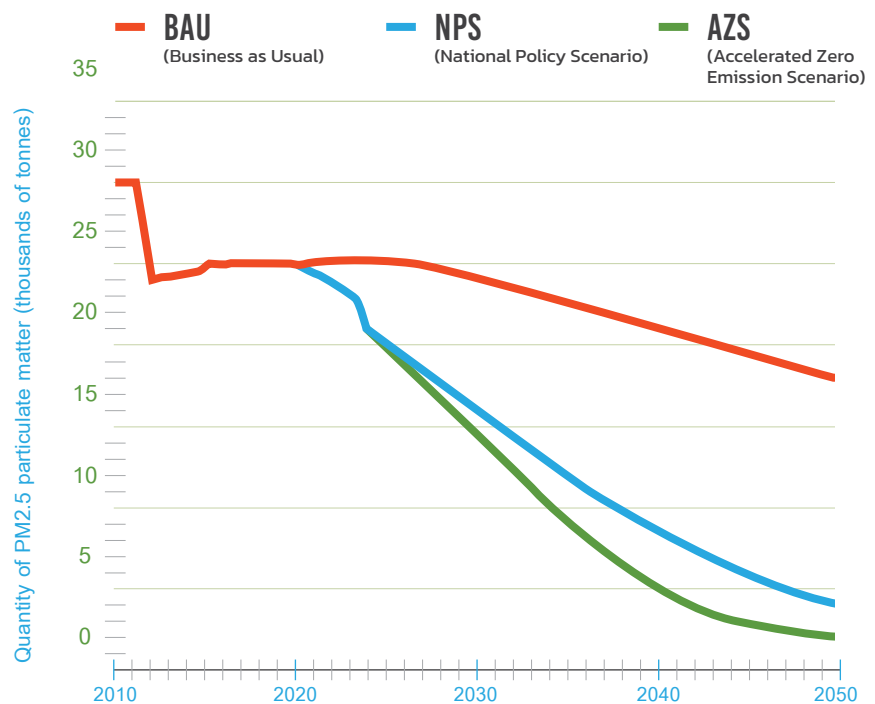


PARTICULATE MATTER EMISSIONS TREND

PARTICULATE MATTER PM_{2.5} IN THE FUTURE

PM_{2.5} reduction
(Compared with BAU)

Scenario	2025	2050
BAU - NPS	20%	87%
BAU - AZS	21%	90%



PROJECT ACTIVITIES

STUDY THE FEASIBILITY OF REPLACING DIESEL ENGINE VEHICLES WITH ELECTRIC, NATURAL-GAS-FUELED OR EURO 6 COMPLIANT VEHICLES IN BANGKOK AND ITS VICINITY TO REDUCE THE AMOUNT PM2.5 IN THE ATMOSPHERE

1. A forum to launch the project, “Study the feasibility of replacing diesel engine vehicles with electric vehicles, natural-gas-fuel vehicles or Euro 6 compliant vehicles in Bangkok and its vicinity to reduce the amount PM2.5 in the atmosphere”.

On 21 April 2020, the MOVE Research Center of KMUTT, in cooperation with the Pollution Control Department, held a forum to examine the feasibility of replacing diesel engine vehicles with electric, natural-gas-fueled or Euro 6 compliant vehicles to reduce the amount PM2.5 in the atmosphere. Additionally, solutions for the “Breathe Particulate-free Air” initiative were proposed. Associate Professor Dr. Yossapong Laoonual, Vice-President of Sustainable Development and Head of the Mobility and Vehicle Technology (MOVE) Research Center, King Mongkut’s University of Technology Thonburi (KMUTT), organized a forum to “Study the feasibility of replacing diesel engine vehicles with electric, natural-gas-fueled or Euro 6 compliant vehicles in Bangkok and its vicinity to reduce the amount PM2.5 in the atmosphere.” Dr. Pornsri Suttanarak, Director of Air Quality and Noise Management Division, Pollution Control Department participated in this forum.



In the forum, an idea of setting emissions standards to reduce PM2.5 was proposed for Bangkok and its vicinity. Currently, Thailand is using the Euro 4 standard for small diesel engine vehicles and Euro 3 for large diesel vehicles. There is a plan to adopt Euro 5 and Euro 6 emissions standards, which are more stringent. This includes improving fuel quality to limit its sulfur content to not more than 10 parts per million (ppm). Additionally, diesel engine vehicles will be replaced by electric vehicles or natural-gas-fueled vehicles to reduce PM2.5 generated by road transportation.

2. **An online forum was conducted to brainstorm solutions for air pollution problems arising from the transportation sector. Ideas discussed were on using vehicles that meet Euro 6 emission standards and zero-emissions vehicles (ZEV) under the project entitled, “A Feasibility Study of Replacing Current Diesel Engine Vehicles with Electric Vehicles, Natural-Gas-Fueled Vehicles or Euro 6 Compliant Vehicles in Bangkok and its Vicinity to Reduce the Amount PM2.5 in the Atmosphere”**

On 2 June 2021, Assoc. Prof. Dr. Yossapong Laoonual, Vice-President of Sustainable Development and Head of the Mobility and Vehicle Technology (MOVE) Research Center, King Mongkut’s University of Technology Thonburi (KMUTT) organized a second online forum to gather ideas under the project “A Feasibility Study of Replacing Current Diesel Engine Vehicles with Electric Vehicles, Natural-Gas-Fueled Vehicles or Euro 6 Compliant Vehicles in Bangkok and its Vicinity to Reduce the Amount PM2.5 in the Atmosphere”, in cooperation with the National Institute of Development Administration (NIDA) and the Pollution Control Department with support of a research grant from the National Research Council of Thailand (NRCT).

The objective of this forum was to gather diverse ideas from the participants and evaluate their ideas to determine technical feasibility and cost-benefit using battery electric vehicles (BEV), natural gas vehicles (NGV), and Euro 6 compliant vehicles to replace both new and currently-in-use diesel engine vehicles. This includes installing diesel particulate filters (DPF) that can reduce particulates from diesel exhaust by more than 85%.



↳ The MOVE Research Center, KMUTT, organized online forum to gather ideas about solving air pollution problems arising from the transportation sector using Euro 6 compliant vehicles and zero-emissions vehicles (ZEV).

3. An online seminar presenting the results of the project “A Feasibility Study of Replacing Current Diesel Engine Vehicles with Electric Vehicles, Natural-Gas-Fueled Vehicles or Euro 6 Compliant Vehicles in Bangkok and its Vicinity to Reduce the Amount PM2.5 in the Atmosphere”

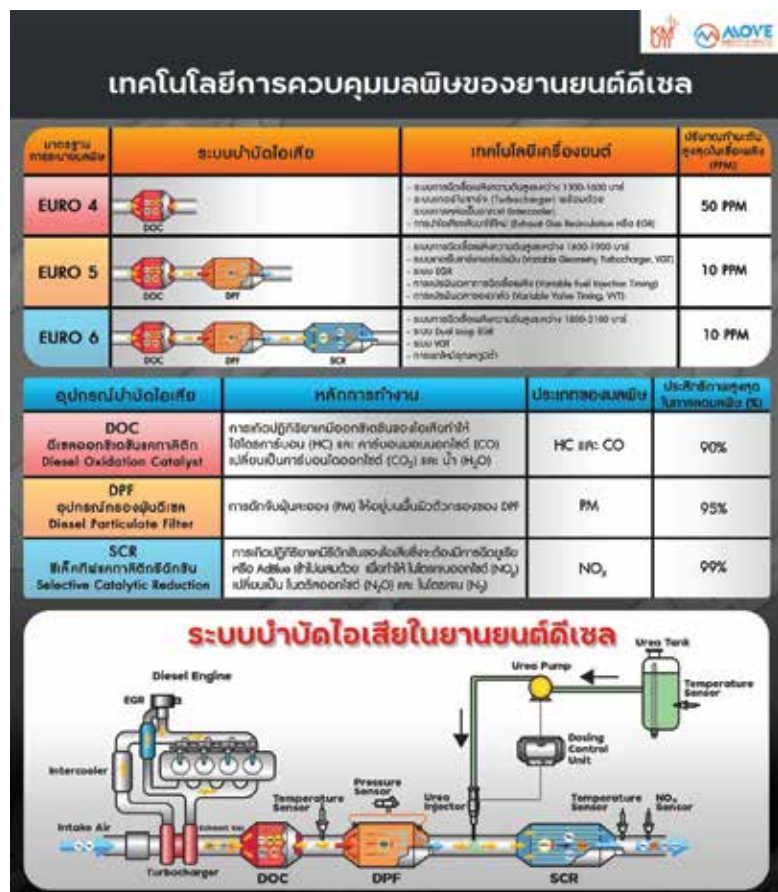
On 10 September 2021, Assoc. Prof. Dr. Yossapong Laonual, Vice-President of Sustainable Development and Head of the Mobility and Vehicle Technology (MOVE) Research Center, King Mongkut’s University of Technology Thonburi (KMUTT) in collaboration with the Pollution Control Department and the National Institute of Development Administration (NIDA), with the support of research funding from the National Research Council of Thailand (NRCT), organized an online seminar.

Dr. Wiparat De-ong, Director of the Research Council of Thailand, gave the opening remarks for the seminar with Khun Thalerngsak Petchsuwan, Deputy Director of the Pollution Control Department, jointly opening the seminar

In this online seminar, the study results of this project were summarized as follows: The Thai government announced a plan for new vehicles to comply with Euro 5 and Euro 6 emission standards by 2021 and 2022. Diesel particulate filters (DPFs) will need to be installed in all diesel vehicles. This can reduce particulate emissions from vehicles by as much as 95%.

In older diesel vehicles, there are no DPFs and natural gas vehicles have 90% lower emissions than diesel engines of the same size. Thailand has promoted the use of natural gas vehicles since 2000. In 2016, the Thai government allowed the price of natural gas to float. This made using natural-gas-fueled vehicles less attractive. Hence, this reduced the numbers of natural-gas-fueled vehicles and compressed natural gas (CNG) stations. Thailand has firm plans to promote the use and production of battery electric vehicles (BEVs). The country is determined to achieve the goal of using 100% BEVs by 2035. This potentially leads to zero emissions of small particulates since there is no direct emissions from automobiles. According to the model detailed in the National Policy on Reducing Emissions from Vehicles in the Future (NPS), this activity can reduce PM2.5 by 20%.

↳ The MOVE Research Center of KMUTT organized an online seminar to publicize their study on replacing current diesel engine vehicles with BEVs, NGVs and Euro 6 compliant vehicles in Bangkok and its vicinity to reduce the amount of small particulates in the atmosphere.





4. Launch of charging stations for electric vehicles supported by the research project, “Hope for PM2.5 Reduction”

On 1 October 2021, Prof. Dr. Suwit Saetia, President of KMUTT, together with Ajarn Thanitsorn Jirapornchai, Vice President for Planning and Information, and Assoc. Prof. Dr. Yossapong Laonual, Vice President of Sustainable Development, visited a charging station that was installed by the MOVE Research Center for collecting data on energy use of electric vehicles. It was a 25 kW DC charging station with CCS Type 2 and CHAdeMO chargers.



Installing a charging station is part of the research project “A Feasibility Study of Replacing Current Diesel Engine Vehicles with Electric Vehicles, Natural-Gas-Fueled Vehicles or Euro 6 Compliant Vehicles in Bangkok and its Vicinity to Reduce the Amount PM2.5 in the Atmosphere”. It was conducted in conjunction with Pollution Control Department and the National Institute of Development Administration (NIDA) with funding from the National Research Agency (NRCT). At the end of the research project, the university plans to use it to provide electrical charging services to the public

05

RESEARCH AND DEVELOPMENT ON TESTING OF A MOTORCYCLE PROTOTYPE UNDER THE PROJECT OF “DESIGN OF A (NATIONAL) PROTOTYPE OF A SMART ELECTRIC MOTORCYCLE WITH THE IOT”

PROJECT DURATION

1 July 2021 – 30 June 2022

FUNDING SOURCE

GP Motor (Thailand) Co., Ltd.

PROJECT OBJECTIVES

1. To study the structural strength of electric motorcycles and their safety in collisions under different forms of use
2. To study the effects of aerodynamics on energy consumption and battery cooling
3. To test the performance and energy consumption of an electric vehicle prototype based on actual driving and standard laboratory testing
4. To study test methods that can be used to evaluate collision safety of future electric vehicles prototypes



PROJECT RESULTS

1. Simulations of different types of collisions were done to test strength of electric motorcycles. Data was collected from simulations.
2. Guidelines for improving the structural design of electric motorcycles for increased collision safety were proposed.
3. Results of aerodynamic simulation of energy consumption and battery air cooling of electric motorcycles were obtained.
4. Test results on performance and energy consumption of electric motorcycles from actual driving and standard laboratory tests were developed.
5. A study report on structural safety assessment and aerodynamic simulation of performance and energy consumption of electric motorcycles was written.

06

RESEARCH AND DEVELOPMENT OF SIX-WHEEL MULTI-PURPOSE ELECTRIC TRUCKS UNDER A PROJECT TO EXTEND FOREIGN TECHNOLOGY TO DEVELOP THIS STRATEGIC INDUSTRY

PROJECT DURATION

From 1 July 2021 – 31 December 2022

FUNDING SOURCE

1. Office of the National Higher Education Science Research and Innovation Policy Council
2. Sammitr Motors Manufacturing Public Co., Ltd

PROJECT OBJECTIVES



1. To develop a six-wheel multi-purpose electric truck from Sammitr Motors Manufacturing Public Co., Ltd., with a light weight structure (chassis) that meets the requirements for truck registration in Thailand.
2. To develop and improve a GEN 1 electric truck to a GEN 2 electric truck.

PROJECT RESULTS

1. A light weight truck structure was designed and developed with a safety factor, bending stiffness and torsional stiffness that meets Thai standards.
2. Various types of batteries were evaluated to determine a suitable battery type for use in six-wheel multi-purpose electric trucks.



SUMMARY OF RESEARCH PROJECTS DURING

2020-2022

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Number	Project	Project Leader	Funding Source	Project Dates
1	A Study on Electric Motorcycle Usage Behavior in a Shared System	Assoc. Prof. Dr. Yossapong Laoonual	A.P. Honda, Co., Ltd.	17 June 2019 – 31 July 2020
2	Development of Electrical Generation Units Managing in a Virtual Power Plant	Dr. Yanin Sukjai	Electricity Generating Authority of Thailand	1 November 2019 – 31 October 2020
3	A Study on Electric Motorcycle Usage Behavior in a Shared System Phase 2	Assoc. Prof. Dr. Yossapong Laoonual	A.P. Honda Co., Ltd.	1 August 2020 – 31 July 2021
4	Energy Recovery and Reuse to Increase Efficiency in Petroleum Processing with Advanced Technology	Assoc. Prof. Dr. Yossapong Laoonual	Malaysia-Thailand Joint Authority (MTJA)	1 August 2018 – 31 December 2022
5	xEV Comprehensive Research Project	Assoc. Prof. Dr. Yossapong Laoonual	Toyota Motor Thailand Co., Ltd.	1 January – 30 June 2021
6	A Feasibility Study of Replacing Current Diesel Engine Vehicles with Electric Vehicles, Natural- Gas-Fueled Vehicles or Euro 6-Compliant Vehicles in Bangkok and its Vicinity to Reduce the Amount PM2.5 in the Atmosphere	Assoc. Prof. Dr. Yossapong Laoonual	National Research Council of Thailand	18 September 2020 – 14 September 2022
7	Research and Development on Testing of a Motorcycle Prototype Under the Project of “A Design of a (National) Prototype of a Smart Electric Motorcycle with the IOT”	Asst. Prof. Dr. Kitchanon Ruangjirakit	GP Motor Company (Thailand) Co., Ltd.	1 July 2021 – 30 June 2022
8	Research and development of six-wheel multi-purpose electric trucks under a project to extend foreign technology to develop this strategic industry	Assoc. Prof. Dr. Yossapong Laoonual	1. Office of the National Higher Education Science Research and Innovation Policy Council 2. Sammitr Motors Manufacturing Public Co., Ltd.	1 July 2021 – 31 December 2022

ลำดับ	โครงการ	หัวหน้าโครงการ	แหล่งทุน	ระยะเวลาการดำเนินงาน
9	A search for an expert to be part of the Startup Business Investment Screening Committee (Startup Committee)	Assoc. Prof. Dr. Yossapong Laoonual	Thai Honda Manufacturing Co., Ltd.	1 May 2022 – 31 March 2023
10	Hiring Experts from Thai Honda Manufacturing Co., Ltd. Project	Assoc. Prof. Dr. Yossapong Laoonual	Thai Honda Manufacturing Co., Ltd	1 May 2022 – 31 March 2023
11	Study Report for Transitioning to Electric Public Transport (buses) in Thailand	Assoc. Prof. Dr. Yossapong Laoonual	United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)	26 November 2021 – 8 September 2022
12	Skill Mapping Project	Asst. Prof. Dr. Anusit Anmanatarkul	The Ministry of Higher Education, Science, Research and Innovation	1 August 2022 – 31 March 2023
13	Study of Motorcycles Safety Standards	Assistant Prof. Dr. Kitchaon Ruangjirakit	Thammasat University Research Center and Consulting Office	30 December 2021 – 26 August 2022
14	Developing of Cooling System for Electric Vehicle Batteries	Asst. Prof. Dr. Piyatida Trinuruk Kaewchinda	Thailand Science Research and Innovation (TSRI)	October 2021 –September 2022
15	Development of an Autonomous Electric Vehicle Platform	Asst. Prof. Dr. Kitchaon Ruangjirakit	Thailand Science Research and Innovation (TSRI)	October 2021 –September 2022
16	Study of the Effects of Biofuels on Particulate Matter from Diesel Engines with Partial Premix Compression Ignition and Diesel Particulate Filters (DPFs)	Asst. Prof. Dr. Nattapon Wongyao	Thailand Science Research and Innovation (TSRI)	October 2021 –September 2022

SUMMARY OF RESEARCH ARTICLES IN

2020-2022

0406

Research Article Topics	Authors	Year of publication	Journal	Link to QR-Code
A Review of the Parameters Affecting a Heat Pipe Thermal Management System for Lithium-Ion Batteries.	Boonma K, Patimaporn N, Mbulu H, Trinuruk P, Ruangjirakit K, Laoonual Y, Wongwiset S	2022	Energies	
Quantification of Heat Energy Leading to Failure of 18650 Lithium-ion Battery Abused by External Heating.	Chombo, P.V., Laoonual, Y	2022	Journal of Loss Prevention in the Process Industries	
An Electro-Thermal Model to Predict Thermal Characteristics of Lithium-Ion Battery Under Overcharge Condition	Hemisi, C.H., Chombo, P.V., Laoonual, Y., Wongwiset, S.	2022	Energies	
Prediction of the onset of thermal runaway and its thermal hazards in 18650 lithium-ion battery abused by external heating	P.V. Chombo, Laoonual, Y.	2022	Fire Safety Journal	

Research Article Topics	Authors	Year of publication	Journal	Link to QR-Code
Combustion and Emission Control Strategies for Partially -Premixed Charge Compression Ignition Engines: A Review	Bobi, S., Kashif, M., Laonual, Y.	2022	Fuel	
Evaluation of Heat Loss to Cylinder Wall of Compression Ignition Engine by Heat Transfer Models	Bobi,S., Laonual, Y.	2022	GMSARN International Journal	
Crashworthiness analysis and design of a sandwich composite electric bus structure under full frontal impact	Jongpradist, P., Saingam, N., Tangthamsathit, P., Chanpaibool, P. Sirichantra, J., Aimmanee, S.	2022	Heliyon	
Safety Assessment and Crash Compatibility of Heavy Quadricycle under Frontal Impact Collisions	Kongwat, S., Homsnit, T., Padungtree, C., Tonitwong, N., Jongpradist, P.	2022	Sustainability	

Research Article Topics	Authors	Year of publication	Journal	Link to QR-Code
Lessons from the Electric Vehicle Crashworthiness Leading to Battery Fire	Chombo, P.V., Laoonual, Y., Wongwises, S.	2021	Energies	
Experimental Study on the Thermal Performance of a Battery Thermal Management System using Heat Pipes	Mbulu, H., Laoonual, Y., Wongwises, S.	2021	Case Studies in Thermal Engineering	
A Review of Safety Strategies of a Li-ion Battery	Chombo, V. P., Laoonual, Y.	2020	Journal of Power Sources	
Design and Optimization of Electric Bus Monocoque Structure Consisting of Composite Materials	Kunakorn-ong, P., Ruangjirakit, K., Jongpradist, P., Aimmanee, S., Laoonual, Y.	2020	Proceedings of the Institution of Mechanical Engineers, Journal of Mechanical Engineering Science	

5

COOPERATION WITH EXTERNAL AGENCIES



01

COOPERATION IN ELECTRIC MOTORCYCLE RESEARCH AND DEVELOPMENT

between

King Mongkut's University of Technology Thonburi

and

i-Motor Manufacturing Co., Ltd.



[Signing ceremony of memorandum of understanding on cooperation in research and development of electric motorcycles](#)

On 1 June 2022, at the Auditorium, 7th Floor, KX Building, Krungthonburi Road, a memorandum of understanding signing ceremony for research and development of electric motorcycles between King Mongkut's University of Technology Thonburi (KMUTT) and I Motor Manufacturing Co., Ltd. was conducted by Assoc. Prof. Dr. Suvit Saetia, President of KMUTT and Mr. Preecha Prasertthavorn, Chief Executive Officer of I-Motor Manufacturing Co., Ltd. The ceremony was witnessed by Assoc. Prof. Anek Siriphanitchakorn, Director of the Institute for Scientific and Technical Research and Services, Assoc. Prof. Dr. Yossapong Laoonual, Head of Mobility and Vehicle Technology (MOVE) Research Center, and Mr. Alan Lim, President of the Singapore-Thai Chamber of Commerce and personnel of both parties.



02 DISCUSSION ON COOPERATION ON ELECTRIC VEHICLE TECHNOLOGY DEVELOPMENT

between

King Mongkut's University of Technology Thonburi

and

Nissan Motor Thailand Co., Ltd.



Discussion on Cooperation on Electric Vehicle Technology Development in Thailand

On 21 December 2021, Mr. Isao Sekiguchi, Vice President of Marketing and Sales, Nissan ASEAN Region and President of Nissan Thailand, along with the Nissan team visited King Mongkut's University of Technology Thonburi. Assoc. Prof. Dr. Suvit Saetia, President of KMUTT, welcomed the team and joined the discussion on cooperation on electric vehicle technology development along with Assoc. Prof. Dr. Yossapong Laoonual, Vice President of Sustainable Development and Head of Mobility and Vehicle Technology (MOVE) Research Center. On the same occasion, the Nissan team visited the university's charging station.



SENIOR MANAGEMENT OF MALAYSIA-THAILAND JOINT AUTHORITY (MTJA) VISITED KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI (KMUTT) TO OBSERVE ITS RESEARCH WORK

between
King Mongkut's University of Technology Thonburi
and
MALAYSIA-THAILAND JOINT AUTHORITY (MTJA)



Senior management of MALAYSIA-THAILAND JOINT AUTHORITY (MTJA) visited KMUTT to observe its research work at Prabha Meeting Room, Prajak Supanimit, 9th Floor, Office of the President Building

On 1 December 2022, King Mongkut's University of Technology Thonburi had the honor of welcoming the senior management of the Malaysia-Thailand Joint Authority (MTJA). In attendance were Mr. Datuk Joseph Podtung (Chief Executive Officer), Khun Supat Napanoparatkaew (Deputy Chief Executive Officer), Khun Wijaiyut Prapawit (Assistant Manager) and Mr. Nur Faradilla binti Mohamed Razman (Senior Reservoir Engineer). They visited the university's research facilities, including the Combustion and Energy Research Laboratory, Additive Manufacturing Laboratory (Department of Mechanical Engineering) and Institute of Field Robotics (FIBO).



During this visit, the senior management team discussed research with KMUTT administrators and researchers, including Dr. Kanyawim Kirtikara, Senior Vice President for Research and Innovation, Asst. Prof. Dr. Monthira Nopparat, Vice President for Industry and Cooperation, Assoc. Prof. Dr. Yossapong Laonual, Vice President of Sustainable Development and Prof. Dr. Navadol Laosiripojana, Director of the Joint Graduate School of Energy and Environment. MTJA is an agency established by the governments of Thailand and Malaysia to manage petroleum resources in the overlapping areas between the two countries. The CESS fund was established to support related research.

6

MOBILITY &
VEHICLE

DISSEMINATING ACADEMIC KNOWLEDGE



DISSEMINATING ACADEMIC KNOWLEDGE



Exhibition of an electric vehicle prototype at the Bangkok Motorbike Festival

The Mobility & Vehicle Technology (MOVE) Research Center under the Office of Science and Technology Research and Service, King Mongkut's University of Technology Thonburi, jointly organized an exhibition of an electric vehicle prototype at the Bangkok Motorbike Festival on 15-19 January 2020 at Zone E, 3rd Floor of Central World.

At the exhibition, researchers and students introduced swappable battery electric motorcycles (Honda PCX Electric), a Dynax electric tricycle, and the Shell Eco-marathon, an energy-efficient car.



↳ Bangkok Motor Bike Fair
Festival, 15-19 January 2020
At Zone E, 3rd Floor Central World



Honda PCX Electric - Swappable battery electric motorcycle

Dynax - electric tricycle

Shell Eco Marathon - energy efficient car



Annual Inventor Day 2020 (Thailand Inventors' Day 2020)

The Mobility and Vehicle Technology (MOVE) Research Center under the Office of Science and Technology Research and Service, King Mongkut's University of Technology Thonburi, participated and exhibited at Thailand Inventor's Day 2020 on 2-6 February 2020 in Event Hall 102 104 at the Bangkok International Trade & Exhibition Centre (BITEC), Bangna, Bangkok. The event was organized by the National Research Council of Thailand (NRCT).

In the exhibition, researchers and students introduced the MOVE Research Center and its research projects, such as electric buses, to participants.

ASEAN Sustainable Energy Week (ASEW) at the Queen Sirikit National Convention Center (QSNCC)

On 14-16 September 2022, KMUTT presented their study results on net-zero carbon-reduction at ASEAN SUSTAINABLE ENERGY WEEK 2022 (ASEW) in Hall 1-3 at the Queen Sirikit National Convention Center (QSNCC). This included work on electric vehicles projects of the MOVE Research Center. Additionally, the Learning Exchange or LX building inside KMUTT was presented at the event. This building demonstrates sustainable living in three areas that reduce carbon emissions, energy, environmental and safety. It received the Guaranteed Award by the Thai Green Building Institute (TREEs) at the 2020 Platinum level. It is also one of the three tall buildings in Thailand that was declared an outstanding building for safety in the ASEAN region. In 2021, it won the ASEAN Building Fire Safety award by the Engineering Institute of Thailand, under H.M. The King's Patronage, with the ASEAN Federation of Engineering Organization (AFEO) and the Graduate School of Energy and Environment (JGSEE).



↳ On 14-16 September 2022, KMUTT exhibited their work on net-zero carbon reduction at ASEAN SUSTAINABLE ENERGY WEEK 2022 (ASEW)



SMART MOVE Forum

“Joint Effort to Promote Thai Automobile Development” in GH 203 at BITEC Bangna

On 18 November 2022 in Grand Hall 203 at BITEC Bangna Center, the Mobility and Vehicle Technology (MOVE) Research Center of King Mongkut’s University of Technology Thonburi and RX Tradex jointly organized a forum on, SMART MOVE “Joint Effort to Promote Thai Automobile Development”. Participants from academia included Assoc. Prof. Dr. Yossapong Laonual, Head of the MOVE Research Center, King Mongkut’s University of Technology Thonburi and Asst. Prof. Dr. Nuksit Noomwongs of the Automotive and Intelligent Transportation Systems Research Center, Chulalongkorn University, who shared his research work on electric and autonomous vehicles.

Additionally, senior management from leading companies in the Thai automotive industry joined the discussion forum. They were Mr. Somphote Ahunai of Energy Absolute Public Co., Ltd., Mr. Panus Watanachai of Panus Assembly Co., Ltd. and Dr. Krisada Kritayakirana of Urban Mobiliti Tech Co., Ltd. The participants were committed to development and innovation within the Thai automotive industry and mobility so that they meet world standards and can compete globally.





7

EV CHARGING
ONLY

**ACTIVITIES WITHIN
THE MOVE RESEARCH
CENTER**



ACTIVITIES WITHIN THE MOVE RESEARCH CENTER

FIELD TRIP STUDY



Visit to the Eastern Polymer Group (EPG) and the EPG Innovation Center, Ltd.

On 20 December 2019, Assoc. Prof. Dr. Yossapong Laonual, Head of the Mobility and Vehicle Technology (MOVE) Research Center with other professors and researchers visited the Eastern Polymer Group (EPG) and the EPG Innovation Center, Ltd., which are supporting units for testing, research and development for EPG affiliates. There was a discussion on cooperation in research and technology development of next-generation vehicles between the company and King Mongkut's University of Technology Thonburi.

Visit to NPC Safety and Environmental Service Co., Ltd.

On 14 June 2022, Assoc. Prof. Dr. Yossapong Laonual, Head of the Mobility and Vehicle Research Center and his research team visited NPC Safety and Environmental Service Co., Ltd. at the Map Ta Phut Industrial Estate in Rayong Province, to discuss cooperation on battery safety research. They also visited a 30 MWh prototype factory for battery production of Nuovo Plus Co., Ltd. (formerly Global Power Machinery Co., Ltd.).





↳ Assoc. Prof. Dr. Yossapong Laonual, Head of the MOVE Research Center and his research team visited NPC Safety and Environmental Service Co., Ltd.

MOVE Research Center Seminar 2021

On 22-24 December 2021, Assoc. Prof. Dr. Yossapong Laonual, Head of the Mobility and Vehicle Technology Research Center, KMUTT led his researcher team and staff to attend the annual 2021 seminar at Wora Bura Hua Hin Resort and Spa, Prachuap Khiri Khan Province. MOVE developed a five-year strategic plan to become the country's leading research center for next-generation vehicles by 2027. To achieve this goal, the Center set clear objectives, indicators and a strategic plan





In this five-year strategic plan, the MOVE Research Center will support the 3rd milestone in the 13th National Economic and Social Development Plan, i.e., Thailand is to become one of the world's important electric vehicle manufacturing bases, supporting investment and the transition of the Thai automotive industry as well as creating readiness in terms of infrastructure and manpower.

Additionally, Asst. Prof Taweesak Kritjaroen, Vice President of Human Resources, led a team building activity. Dr. Winai Homsombat, the Principal Chairman of the Graduate School of Business Administration (Management) GMI was an invited as a guest speaker on development of internal personnel relationship, encouraging sharing opinion and thoughts, and inclusiveness in the workplace This is to achieve the Research Center's goals and increase work efficiency.

All participants traveled to this seminar by electric vehicles (BEVs) to reduce carbon emissions on this trip. Furthermore, a tree planting was done at the Sirindhorn International Environmental Park, Phetchaburi Province, to offset the carbon emissions from travelling to this seminar. The Seminar studied the efficiency of using electric vehicles to support KMUTT and the MOVE Research Center in making all their activities carbon-neutral by 2040.

Annual Seminar 2022 at the MOVE Research Center, 2nd Floor, Seminar Building, KMUTT

On 21-22 December 2022, Assoc. Prof. Dr. Yossapong Laonual, Head of the Mobility and Vehicle Technology (MOVE) Research Center, KMUTT, led the Center's research team and staff to participate in the 2022 Annual Seminar, at the MOVE Research Center on the 2nd Floor of the KMUTT Seminar Building.

A summary of 2021-2022 operational results of the MOVE Research Center was presented. An operational plan for 2023 was presented. This plan includes Up-Skill and Re-Skill training for people working with electric vehicles and in projects for the Battery Testing Center. The 2020-2022 annual report of the MOVE Research Center, with its objective of becoming Thailand's leading research center for next-generation vehicles by 2027, was summarized and presented.

Additionally, the MOVE Research Center hosted a New Year's activity. Assoc. Prof. Anek Siriphanitchakorn, Director of Science and Technology Research and Service and his management team participated in the event.



ACTIVITIES SUPPORTING THE MISSION OF KMUTT

KMUTT promote the uses of electric motorcycles to deliver organic vegetables in an effort by the (SAFETist)'s farm to reduce pollution

King Mongkut's University of Technology Thonburi recognizes the importance of the balance among the people in society (People), where they live (the Planet) and value of organization (Prosperity), which brings sustainability. Therefore, the university aims for sustainability with six strategic goals. They are to reduce carbon emissions of KMUTT and achieve carbon neutrality by 2040, create an environment with student participation, create research and innovation projects that yield positive impacts and build community engagement, create ecological/green infrastructure and environment, and finally, create a sustainable management system.



KMUTT promotes community learning of sustainability through its SAFETist farm. The farm is located at Soi Pracha Uthit 76, Intersection 9 along the Bangmod Canal. The farm does organic farming for biodiversity and a sustainable ecosystem. It is a learning place for organic farming with many activities involving nature. It created a vocation, "Veggie Delivery", which involves vegetable delivery within a radius of 5–10 kilometers of the farm.

KMUTT provided electric motorcycles, model PCX Electric, to the SAFETist farm for its use, as an experiment to deliver organic vegetables without creating pollution. On 19 November 2021, Assoc. Prof. Dr. Suvit Saetia, President of KMUTT, delivered Honda PCX electric motorcycles to the farm.

Note: The artwork was designed by a group of people with disabilities, for public relations in the 1st group of printed media design training program of KMUTT.

Tree planting activity on the National Forest Conservation Day at Bang Khun Thian

On 14 January 2022, the National Forest Conservation Day, King Mongkut's University of Technology Thonburi (KMUTT) organized a tree planting activity on the National Forest Conservation Day at Bang Khanu Thian. The activity was led by Assoc. Prof. Dr. Suvit Saetia, President of KMUTT together with Ajarn Thanisorn Jirapornchai, Vice President for Planning and Information, and Assoc. Prof. Dr. Yossapong Laonual, Vice President of Sustainable Development and Head of Mobility Vehicle Technology Research Center (MOVE), and the university staff.

A forest is likened to human breath and livelihood. It is the lungs of the world since it absorbs carbon dioxide and generates oxygen. It is a source of biological diversity that helps create balance in nature.

However, the forests are being encroached upon and destroyed. There is a need to protect our forests so that they are green and healthy thereby providing us with pure air to breathe forever.

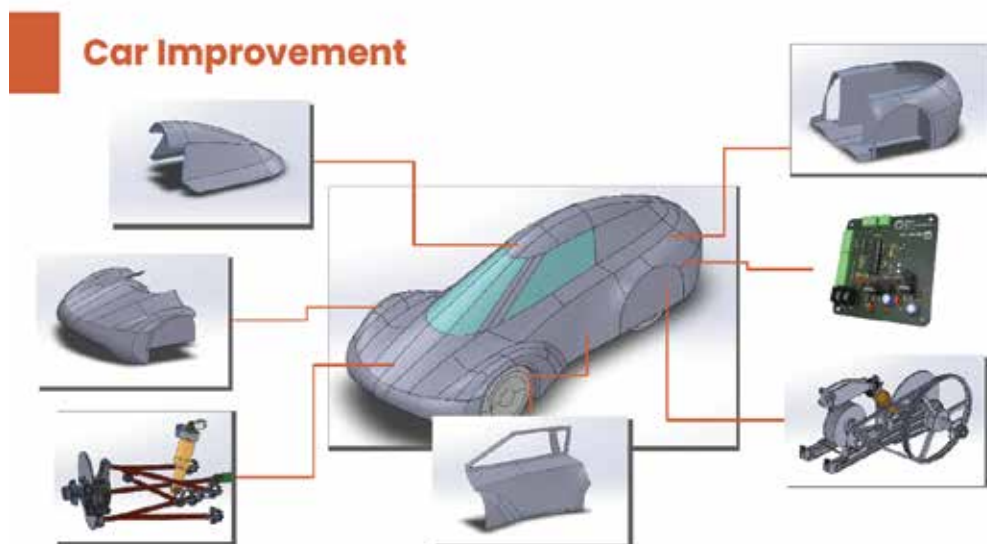


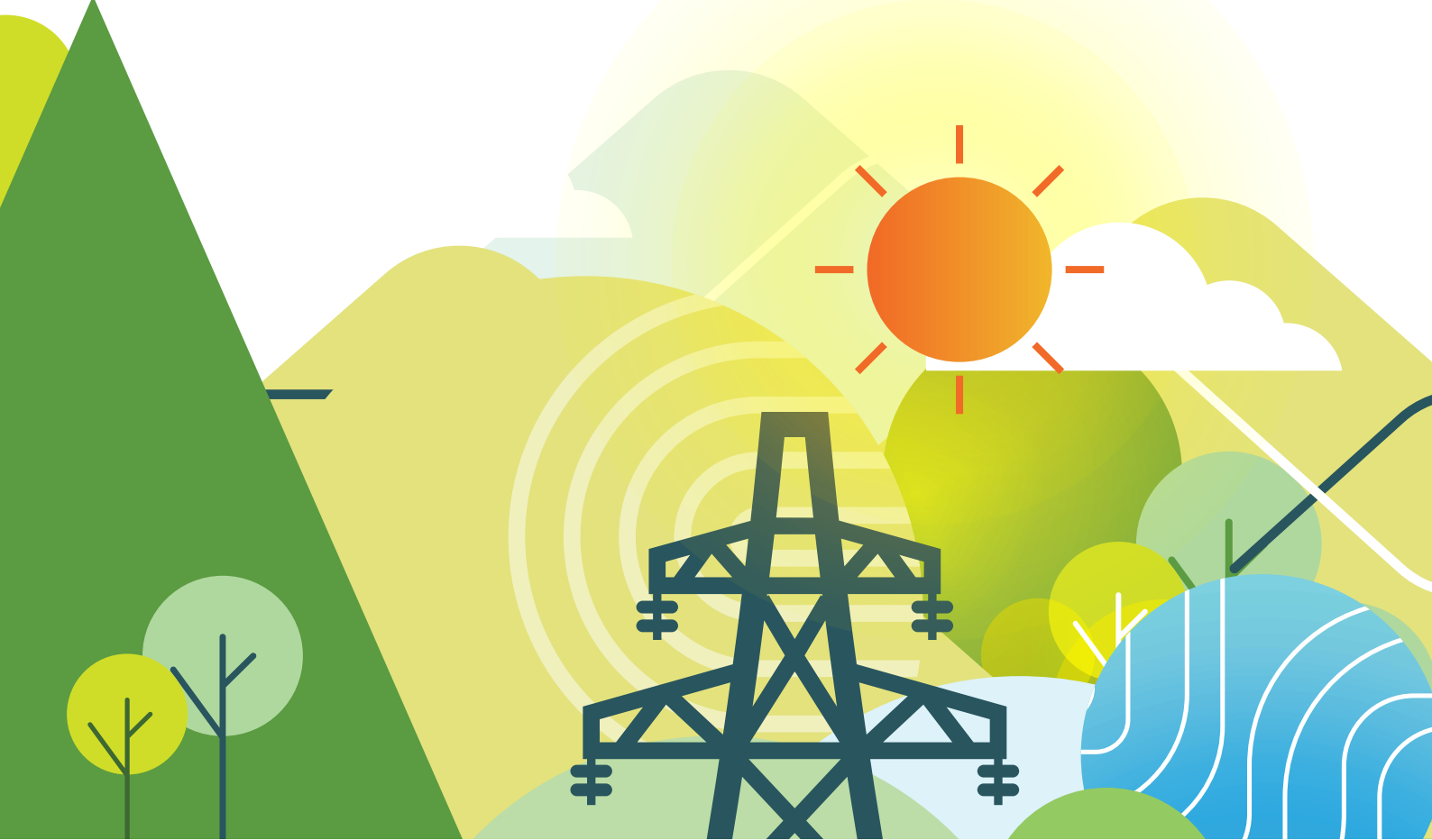
SUPPORT FOR STUDENT ACTIVITIES



KMUTT E-DRIVE REVOLUTION CLUB

Currently, the KMUTT Epsilon team of the KMUTT E-Drive Revolution Club, with Assoc. Prof. Dr. Yossapong Laonual and Asst. Prof. Dr. Kitchanon Ruangjirakit as its advisors, participated in competition for two years. In 2019, the team designed and built a car that met the Asian standards of cars for competition. They won the first prize in the Communication Award Category of Asia among 122 teams. However, in 2020 and 2021 the competition was cancelled due to the COVID-19 virus outbreak. Nevertheless, the KMUTT Epsilon team continued to collect information to develop their car and is preparing for readiness to compete and win in 2022.





King Mongkut's
University of
Technology
Thonburi

