



Toyota Environmental Challenge 2050 **Ever-better manufacturing**

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- Outline of Toyota
- TOYOTA Environmental Challenge 2050
- Renewable Energy
- Summary

Toyota conducts its business worldwide with 54 manufacturing companies in 28 countries, 364,445 employees

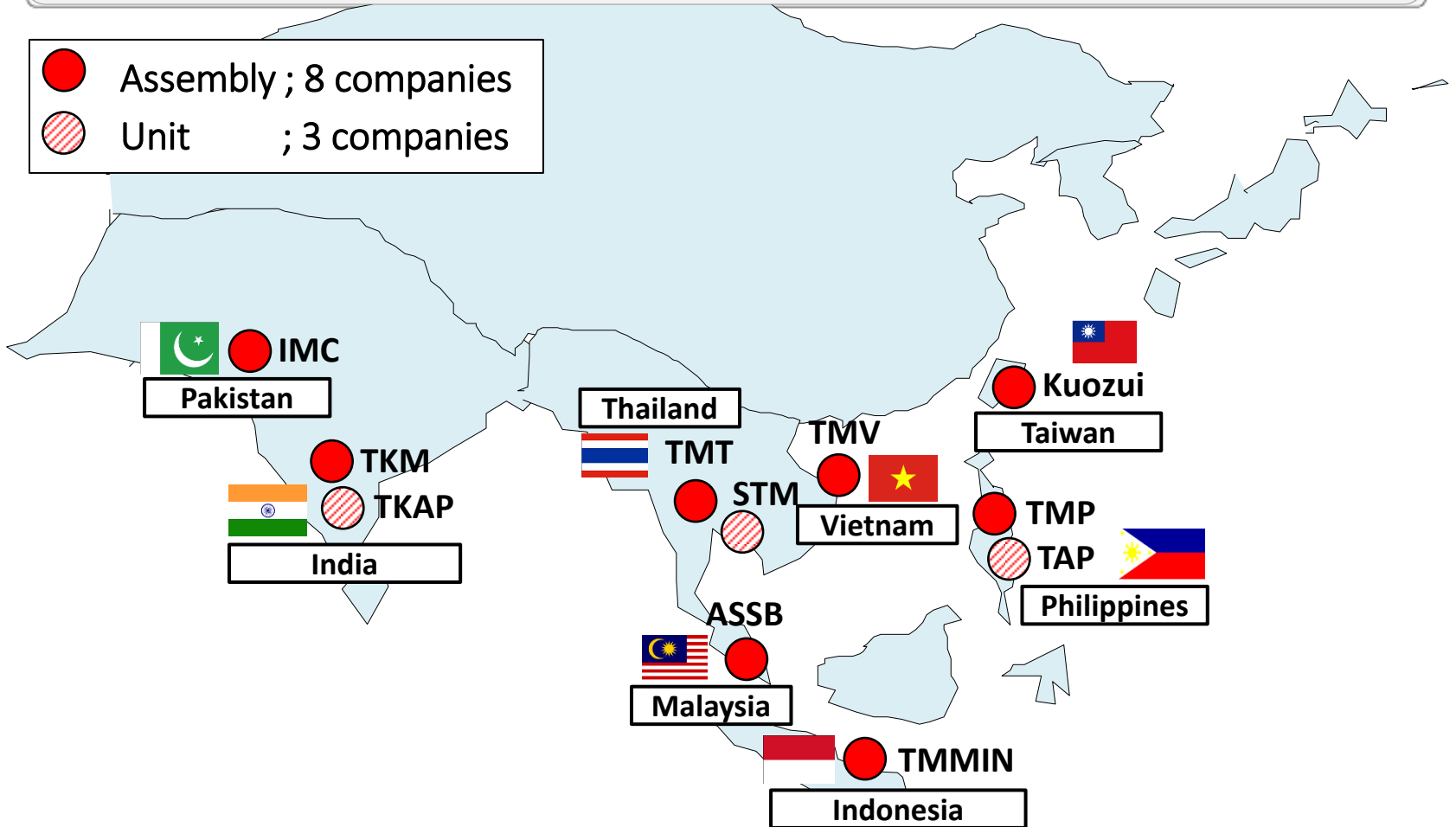


Toyota vehicles are and sold to more than 170 countries.
The business has been managed via 9 regions.
TDEM is responsible for Asia region¹

¹Asia includes South East Asia and South Asia (except China, Taiwan, Japan, Korea)



Toyota manufacturing business in Asia covers 11 companies in 8 countries



ZERO

Challenge of Achieving Zero CO₂

1



New Vehicle Zero CO₂ Emissions Challenge

Life Cycle Zero CO₂ Emissions Challenge

2



3



Plant Zero CO₂ Emissions Challenge

Today's Theme

TOYOTA ENVIRONMENTAL CHALLENGE 2050

Challenge of Minimizing and Optimizing Water Usage

4



5



Challenge of Establishing a Recycling-based Society and Systems

Challenge of Establishing a Future Society In Harmony with Nature

6



PLUS

Net Positive Impact Challenge

2030 milestone toward Toyota Environmental challenge 2050

The milestones toward the Toyota Environmental Challenge 2050 as of 2030 are shown below

Toyota Environmental Challenge 2050

Challenge 1 New Vehicle Zero CO₂ Emissions Challenge



Reduce global average CO₂ emissions during operation from new vehicles by 90% from Toyota's 2010 global level

2030 Milestone

- Make annual global sales of more than **5.5 million** electrified vehicles, including more than **1 million** zero-emission vehicles (BEVs and FCEVs)
- The estimate of global average CO₂ emissions reduction in g-CO₂/km from new vehicles will be **35% or more**, which may vary depending on market conditions, compared to 2010 levels

Toyota Environmental Challenge 2050

Challenge 4 Challenge of Minimizing and Optimizing Water Usage



Minimize water usage and implement water discharge management based on individual local conditions

2030 Milestone

- Implement measures, on a priority basis, in the regions where the water environment is considered to have a large impact <Water quantity> Complete measures at the **4** Challenge-focused plants in North America, Asia and Southern Africa <Water quality> Complete impact assessments and measures at all of the **22** plants where used water is discharged directly to river in North America, Asia and Europe
- Disclose information appropriately and communicating actively with local communities and suppliers

Toyota Environmental Challenge 2050

Challenge 2 Life Cycle Zero CO₂ Emissions Challenge



Completely eliminate all CO₂ emissions from the entire vehicle life cycle

2030 Milestone

- Reduce CO₂ emissions by **25% or more** over the entire vehicle life cycle compared to 2013 levels by promoting activities for the milestones of Challenges 1 and 3, and with support from stakeholders such as suppliers, energy providers, infrastructure developers, governments and customers



Toyota Environmental Challenge 2050

Challenge 5 Challenge of Establishing a Recycling-based Society and Systems



Promote global deployment of End-of-life vehicle treatment and recycling technologies and systems developed in Japan

2030 Milestone

- Complete establishment of battery collection and recycling systems globally
- Complete set up of **30** model facilities for appropriate treatment and recycling of End-of-life vehicles

Toyota Environmental Challenge 2050

Challenge 3 Plant Zero CO₂ Emissions Challenge



Achieve zero CO₂ emissions at all plants worldwide by 2050

2030 Milestone

- Reduce CO₂ emissions from global plants by **35%** compared to 2013 levels

Toyota Environmental Challenge 2050

Challenge 6 Challenge of Establishing a Future Society in Harmony with Nature



Connect nature conservation activities beyond the Toyota Group and its business partners among communities, with the world, to the future

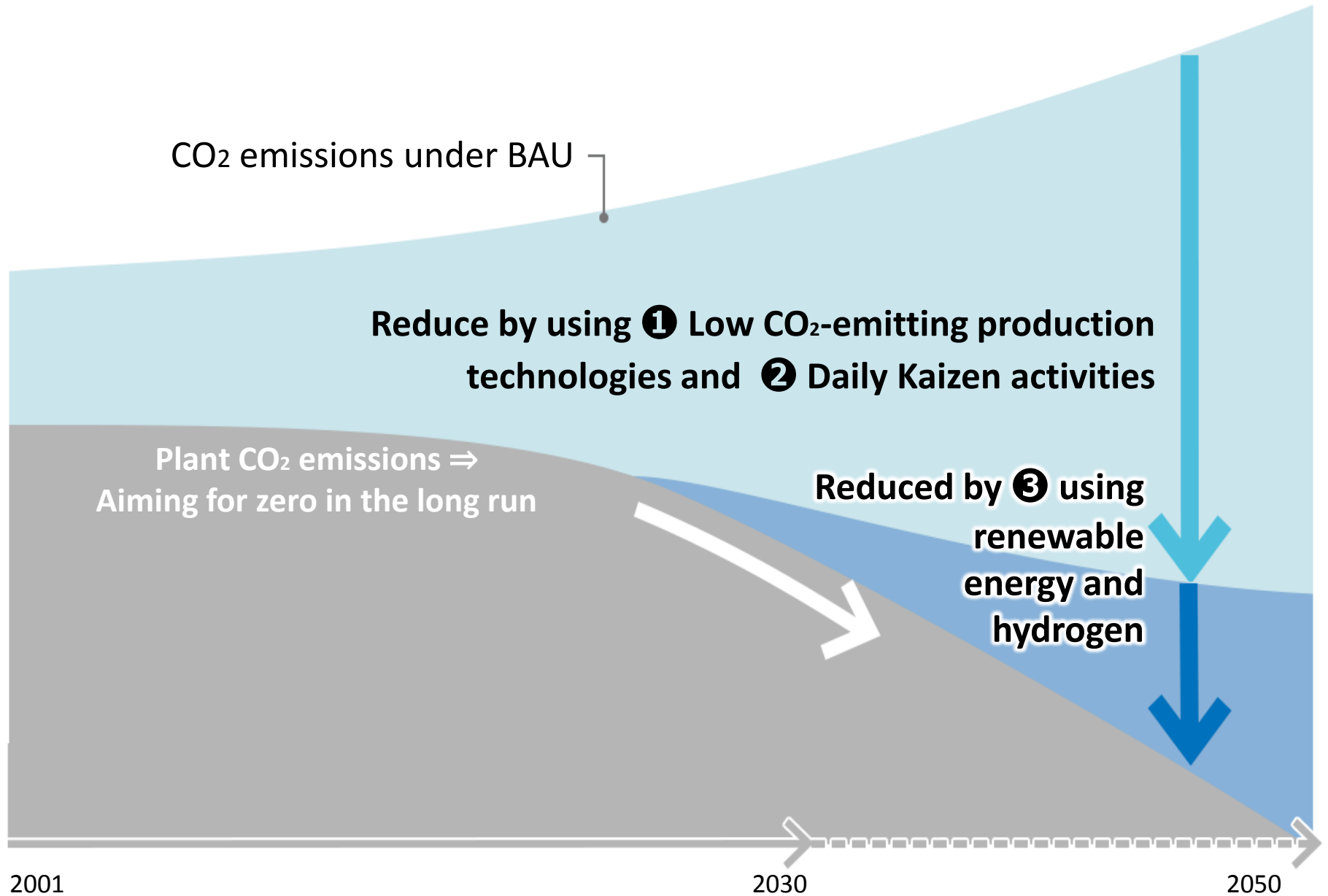
2030 Milestone

- Realize "Plant in Harmony with Nature" – **12** in Japan and **7** overseas – as well as implement harmony-with-nature activities in all regions where Toyota is based in collaboration with local communities and companies
- Contribute to biodiversity conservation activities in collaboration with NGOs and others
- Expand initiatives both in-house and outside to foster environmentally conscious persons responsible for the future

Press release ; Sept./2018



Challenge 3 - Plant Zero CO₂ Emissions



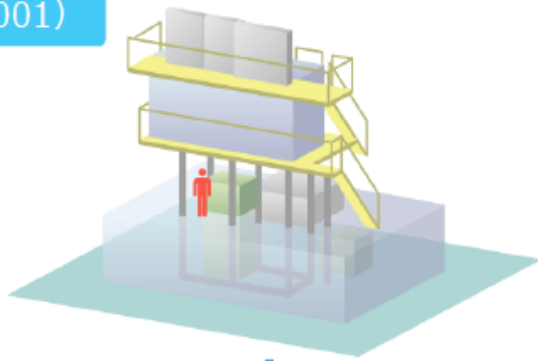
1 Low CO2 Production Technologies

- Thoroughly shortening production process
- Minimization and energy saving of moving parts
- Recovery of wastes energy
- Increasing energy storage

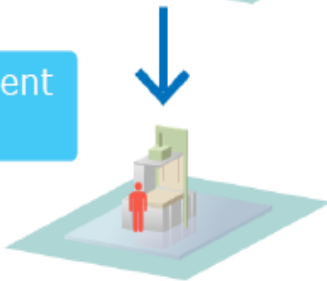
Casting Process

Downsize equipment

Existing (2001)



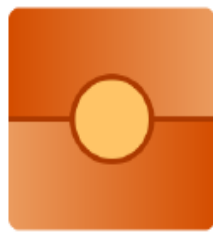
Development (2020)



Volume ▲50%
CO2 reduction ▲30%

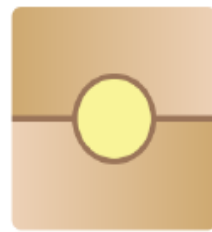
Harden sand mold at low temperature

Existing



organic sand mold
harden at high temperature

Development



inorganic sand mold
harden at low temperature



CO2 reduction ▲10%

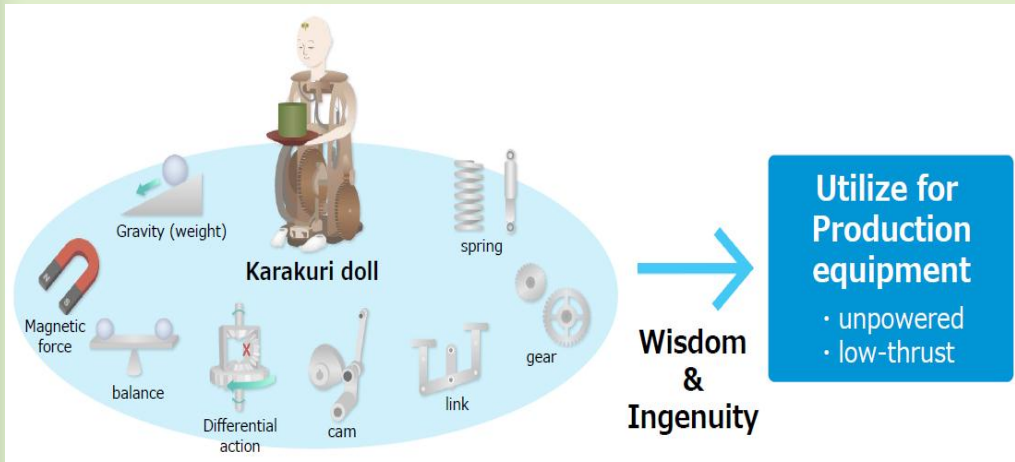
Energy saving ⇒ CO2 reduction by 40%

② Daily Kaizens

- Elimination of unnecessary/inconsistent/unreasonable efforts
- Unpowered/low-thrust operation energy

Karakuri Mechanism

Using gravity or magnetic force to move tools without any external energy



Daily Kaizen Management

One of the core principles of Toyota Production System

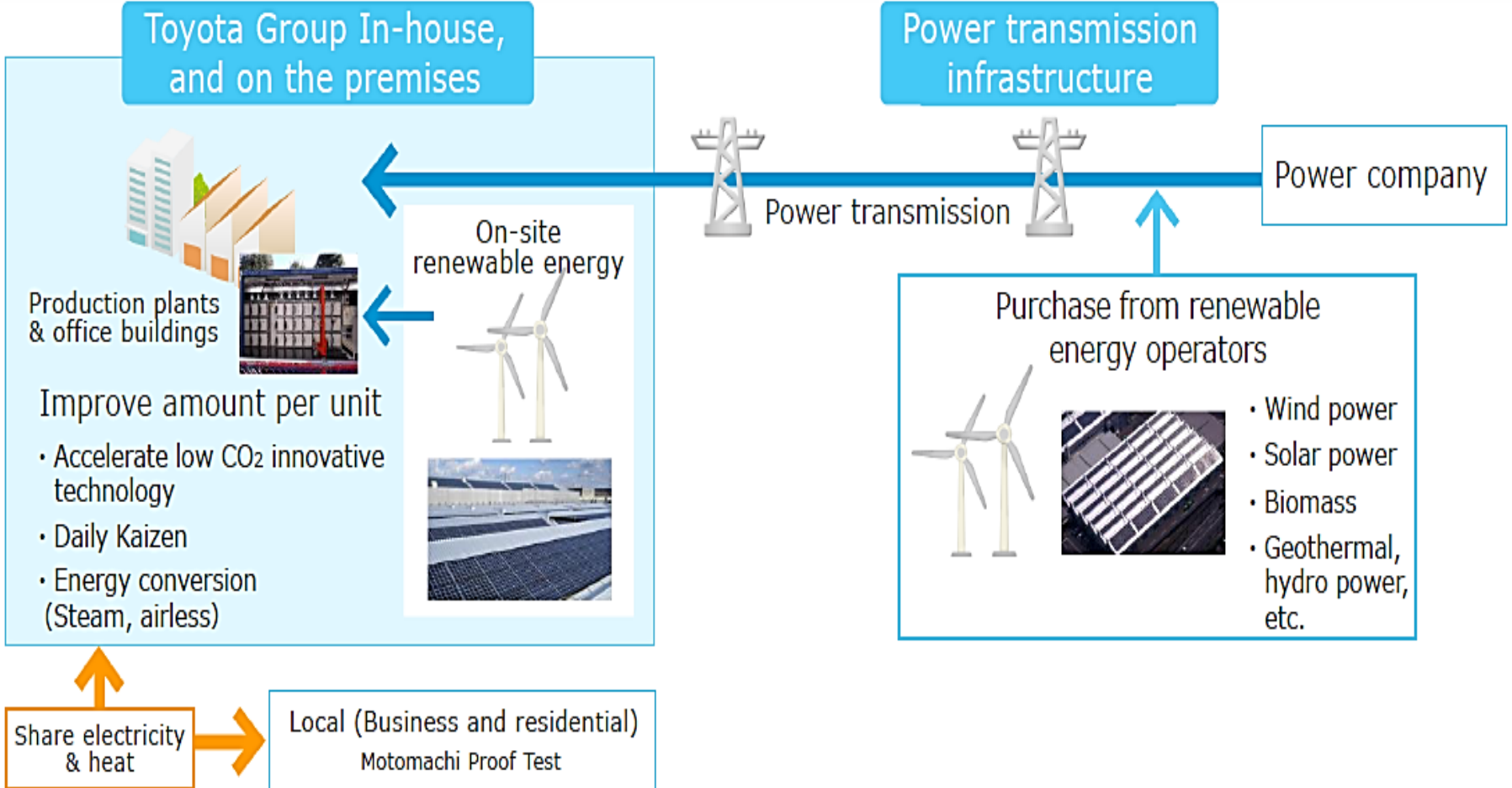
“Continuous improvement “

‘Always a Better Way’



③ Renewable Energy

- Elimination of unnecessary/inconsistent/unreasonable efforts
- Unpowered/low-thrust operation energy



As the first process, wind power generation will be introduced in domestic plants by around 2020, for zero CO₂ in the FCV production line

Toyota de Brazil in Brazil will be the first plant to start the use of 100% renewable energy from 2015

Renewable Energy introduction on SITE

Project (2017)

Country: Philippines

Project : Introduction of 1MW Rooftop Solar Power System in Vehicle Assembly Factory

PP (Japan): Toyota Motor Corporation , PP (Philippines): Toyota Motor Philippines Corp.

Outline of GHG Mitigation Activity

This project aims the reduction of CO₂ emission by installing 1.1MW solar panel on the rooftop of the vehicle assembly factory of Toyota Motor Philippines Corp. in the south of Manila. Electricity generated by solar power system is consumed in house and replaces part of grid electricity consumption.

290w x 3,960 panel = 1.148MW



(Source:<http://www.toyota.com.ph>)

Expected GHG Emission Reductions

859 tonCO₂/year

= (Reference CO₂ Emission) — (Project CO₂ Emission)

= ((Reference Power consumption) — 0)

× CO₂ Emission Factor

Unit: CO₂ Emission [tCO₂/year]

Power Consumption [MWh/year]

CO₂ Emission Factor [tCO₂/MWh]

Sites of Project

Site of TMP, Quezon city (approx. 40km from Manila)



Map data©2017Google



Renewable Energy introduction on SITE

Project (FY2018)

Country: Thailand

Project Title : Introduction of 3.4 MW Rooftop Solar Power System in Technical Center and Office Buildings

PP (Japan) : Toyota Motor Corporation , PP (Thailand): Toyota Daihatsu Engineering & Manufacturing Co., Ltd.

Outline of GHG Mitigation Activity

This project aims the reduction of CO₂ emission by installing 3.4 MW solar power system on the rooftop of the technical center and office building of Toyota Daihatsu Engineering & Manufacturing Co., Ltd. located in Samutprakarn in eastern Bangkok.

Electricity generated by solar power system is consumed in-house and replaces part of grid electricity consumption.



Expected GHG Emission Reductions

1,617 tCO₂/year

- Project emission is assumed to be zero.

- Reference emission:

Annual electricity generation x CO₂ emission factor

$$= 5,069 \text{ MWh/year} \times 0.319 \text{ tCO}_2/\text{MWh}$$

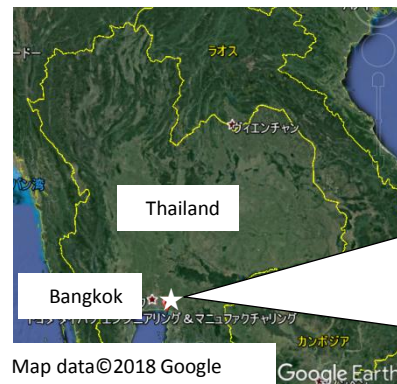
$$= 1,617 \text{ tCO}_2/\text{year}$$

- GHG emission reductions:

Reference emission - Project emission

$$= 1,617 - 0 = 1,617 \text{ tCO}_2/\text{year}$$

Sites of Project



Approx. 45 km east from Bangkok central



RE Implementation Target in ASEAN

Country	Target of RE implementation	Target of Solar PV installation
ASEAN	23% of RE in energy mix within 2025 *From 2016-2025 Action Plan of ASEAN Energy Cooperation (APAEC)	-
Thailand	30% of alternative energy in energy consumption within 2036 *From Alternative energy development plan (Sep 2015)	6,000 MW within 2036 *From Alternative energy development plan (Sep 2015)
Vietnam	27 GW within 2030 (129.5 GW) *From Power Development Plan 7 th revision (Mar 2016)	<ul style="list-style-type: none"> • 4 GW within 2025 • 12 GW within 2030 *From Power Development Plan 7 th revision (Mar 2016)
Malaysia	<ul style="list-style-type: none"> • 2,080 MW within 2020 • 4,000 MW within 2030 *From 2010 National RE Action Plan	<ul style="list-style-type: none"> • 175 MW within 2020 • 4,000 MW within 2030 *From 2010 National RE Action Plan
Indonesia	23% of total energy consumption within 2025	NONE
Philippines	15 GW of power capacity within 2030	<ul style="list-style-type: none"> • 500 MW within 2016 • 1,528 MW within 2030