Challenge 3

Plant Zero CO₂

Emissions Challenge
Reducing CO₂ emission from the plants by 35% or more (compared to 2013)

Promoting CO₂ reduction by ‘low CO₂ production technologies’ + ‘daily kaizen’ and ‘renewable energy + hydrogen’
Steadily promoting the zero emission goal toward 2030 while enhancing competitiveness.
TOYOTA CO₂ Emissions

Promoting CO₂ reduction collaboratively by TOYOTA group companies
Features of Approach1

Low CO₂ production technologies

- Simple and slim
  - Review the production processes
  - Reduce and integrate the processes

Energy transformation/recycling

- Replace currently-used energy with more-efficient energy
- Recover waste energy

Daily kaizen

- Completely eliminate Muda (non-value added)
- Mura (unevenness)
- Muri (overburden)

- Change energy to no power/low thrust

Flexibility rise
  resilience
  improvement

cost reduction
  energy/material
  /man power...

CO₂ reduction

「Thoroughly energy reduction」
→ 「enhancement of competitiveness」
Features of Approach 2

Significantly reduce CO₂ emission, still energy remaining

Green and Lean

Renewable energy

On-site PJT (installed in the company)
- Actively introduce those below purchased power cost → For higher competitiveness

Off-site PJT
- Support renewable energy spread
- Purchase from outside company
- Utilize depending on local status

Hydrogen

Introduce it to production process

Eventually achieve ZERO CO₂ by using renewable energy and hydrogen
Global CO₂ Emissions

Past and Future

Suppressing emission increase due to increase of production volume and prevalence of next-generation vehicles and achieving the goal

CO₂ emissions under BAU

Zero Challenge

Toward zero emission
Drastically improving energy efficiency by changing energy to gas => CO₂ reduction
Eliminate waste energy by changing start up timing with the seasons.

**Winter**
- Operation Start: 7:00
- Start up temperature
- Equip. temp
- Winter Heat up time

**Summer**
- Operation Start: 7:00
- Equip. temp
- Summer Heat up time
- Possible to reduce

Heat up time: from equipment temperature to operation temperature.

Eliminate waste energy >> CO₂ reduction
<Daily Kaizen> Ground-heat Energy

Introduction on our plant’s site

- Utilization of ground-heat energy system in the Honsha area

Using both the air-conditioning heat-pump system and ground-heat energy system in the new building

35°C Summer

Heat-pump

Constant temperature line 18°C

Cooler than air-temperature

Temperature is stable all year round

Promote introduction of the facilities that can be feasible on our sites
Incorporating our low CO\textsubscript{2} production technologies and daily kaizen items accumulated so far.

Reducing estimated CO\textsubscript{2} emission from new plants to a half of 2001 by 2020.
<Specific Action> Renewable Energy

Generation on our plant’s site + Procurement

- Solar power generation in North America

Solar panels on the rooftop of the parking

Procurement of wind power generated in TX

Achieved 100% of renewable energy at the office building

Not only generate on our plants’, we promote procurement
**<Renewable Energy> On-Site PJT in China**

Staring on introduction solar power from Tianjin and Guangzhou

<table>
<thead>
<tr>
<th>Tianjin</th>
<th>Guangzhou</th>
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</thead>
<tbody>
<tr>
<td>Vehicle assembly plant (10MW)</td>
<td>Vehicle assembly plant (10MW)</td>
</tr>
<tr>
<td>Unit plant (1.6MW)</td>
<td>Unit plant (5MW)</td>
</tr>
<tr>
<td>Unit plant (1.5MW)</td>
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</tbody>
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Expand similar scheme to other area in China
CO₂ emission in production line before

CO₂ emission is zero in first operated line of FCEV’s new model

Achieve CO₂ ZERO, in first operated line of FCEV
建立我们对氢使用领导地位，通过引入各种技术

1. 生产低碳氢
   - biogas reforming
   - water electrolysis

2. 实用氢电车
   - FC forklift
   - FC bus for visitors

3. 氢气生成
   - SOFC-MGT

4. 二氧化碳零排放下一代氢电车

建立我们对氢使用领导地位，通过引入各种技术
<Specific Action> Society that Toyota aims

We promote activities to practical use of hydrogen in each process of, Produce, Store, Transport, Use.

Use of electricity and hydrogen from renewables
Our Approach for Development and Introduction of Technologies

Undertake with the painting and power train process of higher emissions.
Mainly of the innovation of the spray system, large evolution in every element