Recent Progress of Energy Efficiency in Transportation Sector of Japan

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1. Energy Efficiency in General
Trend of Final Energy Consumption

Real GDP 1973→2015 2.6 times

Final Energy Consumption 1973→2015
- Total: 1.2 times
- Transport: 1.7 times
- Residential: 1.9 times
- Commercial: 2.3 times
- Industry: 0.8 times

Final Energy Consumption per Real DGP

(Oil equivalent Million ton /1 trillion yen)

Approx. 40% improvement

Source: ANRE/METI
**Basic Framework of Energy Efficiency Policy**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Commercial</th>
<th>Residential</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular Reports, Medium to Long-term Plans, 1% Annual Energy Efficiency Improvement</td>
<td>Compliance with EE Standards</td>
<td>Regular Reports, 1% Annual Energy Efficiency Improvement</td>
<td></td>
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<tr>
<td>Benchmark System</td>
<td>Voluntary Action Plan</td>
<td></td>
<td></td>
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<tr>
<td><strong>Economic Incentives</strong></td>
<td></td>
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</tr>
<tr>
<td>Subsidy Systems (Equipment Investment, Interest Subsidy, Housing Insulation Retrofit, Clean Energy Vehicles, etc.)</td>
<td>Green Investment Tax Cut, Special Depreciation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free Energy Conservation Audit for SMEs</td>
<td>Information Provision, National Campaign, Award System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R&amp;D Subsidies (High-Performance Heat Pumps, Highly Efficient Gas Engines, Innovative Batteries, IoT Technologies, Autonomous Driving Systems, etc.)</td>
<td></td>
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</tr>
</tbody>
</table>
Energy Efficiency improvement towards 2030

Final energy consumption (Long-term energy demand & supply outlook)

- Final energy consumption 2013 (Actual): 361 million KLOE
- Final energy consumption 2030 (With development of Energy Efficiency measures): 376 million KLOE

Econ growth (estimate) 1.7% / year

50.3 million KLOE Energy Saving

Energy Efficiency Improvement

<table>
<thead>
<tr>
<th>Industry 45%</th>
<th>Residential 14%</th>
<th>Transport 23%</th>
<th>Commercial 18%</th>
</tr>
</thead>
</table>

- Industry: 52%
- Commercial: 17%
- Transport: 19%
- Residential: 12%

Energy Efficiency rate = Final energy consumption / real GDP

Improvement 35%
2. Energy Efficiency in Transportation Sector
Sales and Stocks of Heavy Duty Vehicles

Total Automobile Sales in 2015: 4.96 million

- Passenger Vehicles: 4.13 mil.
- Trucks (under 3.5t): 0.66 mil.
- Trucks (over 3.5t): 0.15 mil.
- Buses (under 3.5t): Approx. 3,000
- Buses (over 3.5t): 0.01 mil.

Total Stocks of Automobile as of the end of 2015: 75.6 million

- Passenger Vehicles: 60.8 mil.
- Trucks (under 3.5t): 11.65 mil.
- Trucks (over 3.5t): 2.28 mil.
- Buses (under 3.5t): 0.02 mil
- Buses (over 3.5t): 0.21 mil.

*Trucks incl. Tractors
Trend of Fuel Consumption

Oil equivalent KL

Set 2015 target

- Total -10%
- Other than HDV -16%
- HDV -16%

approx. 30%

Heavy Duty Vehicles

Other Vehicles
# Fuel Efficiency Categories for Heavy Duty Vehicles

## [Freight vehicles]

<table>
<thead>
<tr>
<th>Category</th>
<th>Gross vehicle weight (GVW) in ton</th>
<th>Payload (PL) in ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucks</td>
<td>1</td>
<td>PL ≤ 1.5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.5 &lt; PL ≤ 2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2 &lt; PL ≤ 3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>3 &lt; PL</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>7.5 &lt; GVW ≤ 8</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>8 &lt; GVW ≤ 10</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>10 &lt; GVW ≤ 12</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>12 &lt; GVW ≤ 14</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>14 &lt; GVW ≤ 16</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16 &lt; GVW ≤ 20</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>20 &lt; GVW ≤ 25</td>
</tr>
<tr>
<td>Tractors</td>
<td>1</td>
<td>GVW ≤ 20</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>20 &lt; GVW</td>
</tr>
</tbody>
</table>

## [Passenger heavy duty vehicles]

<table>
<thead>
<tr>
<th>Category</th>
<th>Gross vehicle weight (GVW) in ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route buses</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Other buses</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>
Achievement of 2015 Target (Trucks and Tractors)

Trucks (Weighted average)

- 2015 Target
- Achievement in 2015

Tractors (Weighted average)

- 2015 Target
- Achievement in 2015
Achievement of 2015 Target (Buses)

Route Buses (Weighted average)

- 2015 Target
- Achievement in 2015

Other Buses (Weighted average)

- 2015 Target
- Achievement in 2015
Trend of Weighted Average of Fuel Consumption

**Trucks (Weighted average)**

- Weighted average: 7.31 km/L

**Tractors (Weighted average)**

- Weighted average: 2.96 km/L

**Route Buses (Weighted average)**

- Weighted average: 4.93 km/L

**Other Buses (Weighted average)**

- Weighted average: 6.52 km/L
How to set the Target Standards

(1) Selection of the Top Runner
✓ The Top Runner shall be the most fuel-efficient heavy vehicle in each category currently available on the market in FY2014, having the best fuel-efficiency in the heavy vehicle mode in each category.

(2) Evaluation of the improvement in fuel efficiency achievable by technical development
✓ In establishing the target standards, the expected technical improvement rate in fuel efficiency based on the following concept shall be also reflected.

\[
\text{Expected technical improvement rate} = \sum \left( \text{Popularity in FY2025} \times \text{Technical improvement rate in fuel efficiency} \right)
\]

✓ However, the technology already adopted in the Top Runner is exempted from this evaluation as its efficiency is already proven.

(3) Evaluation of negative impacts in fuel efficiency
✓ In heavy vehicles, negative impacts in fuel efficiency shall also be estimated and reflected in establishing the target standards, such as the introduction of new technologies to reduce NOx and PM in association with the stricter emission control regulations to be enforced on all vehicles by FY2019 and the adoption of torque-converter AT, which in general has lesser fuel efficiency compared with MT.

Target standards = Top Runner’s fuel efficiency (1) + Technical improvement rate (2) - Negative impacts in fuel efficiency (3)
Top Runner Programme in Transportation Sector

Example of Top Runner Program

32 equipment and materials

1. Passenger vehicles
2. Air conditioners
3. Lighting equipment
4. TV sets
5. Copying machines
6. Computers
7. Magnetic disk units ....etc.

1995 1997 1999 2001 2003 2005 2007 2009 FY

Fuel economy (km/L)

19km/L
18km/L
17km/L
15km/L
14km/L
13km/L
12km/L

Transition in fuel economy of average new cars

(Note) Fuel economy values for the 10-15 mode.
Proposed 2025 Target Standards (Trucks and Tractors)

Fuel efficiency (km/L)

Proposed FY2025 standards

Average FY2014 fuel efficiency

Top Runner fuel efficiency (offsetting the negative impacts from the emission control regulations)

FY2015 standards

Category

Trucks

Tractors
Proposed 2025 Target Standards (Route Buses and Other Buses)

Fuel efficiency (km/L)

Route buses

Other buses

- Proposed FY2025 standards
- Average FY2014 fuel efficiency
- Top Runner fuel efficiency (offsetting the negative impacts from the emission control regulations)
- FY2015 standards
3. Next Steps
Trend of Energy Consumption in Transportation Sector

Compared to previous year

10,000 KL, Crude Oil Equivalent
Energy Consumption in 2030

Outlook of Final Energy Consumption in 2030

Outlook of Ratio of Automobile Type in 2030

Energy Efficiency Improvement

- Industry
- Commercial
- Residential
- Transportation

Millions KL, Crude Oil Equivalent

HV: 29%
EV-PHV: 16%
CDV: 4%
FCV: 1%
THANK YOU!

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