New and Renewable Energies in Transportation
Japan

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**Basic Act on Energy Policy (2010)**

**Biofuels:**
- Aim over 3% introduction in gasoline in 2020
- Establish next generation technologies (Cellulosic and Micro Algae etc.) and maximum usage

**EV, HEV, PHEV, FCV (Clean Diesel, CNG):**
- Introducing maximum 50% among new passenger car in 2020.
- Maximum 70% in 2030.

**FCV**
- Increase Hydrogen Station to support commercial usage start from 2015.

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**Cool Earth**

**- Innovative Energy Technology (2007)**

Innovative Energy Technology which is important for reducing CO2 emission level drastically until 2050.
External factors affecting the auto industry

1. Great Change in the Competition environment
   - Alliance based on environment technology
2. Energy Constraints
   - High oil prices in the medium-to-long term
3. Global warming prevention
   - Target of reducing GHG by 25% from the 1990 level by 2020
4. New industry
   - Marking EVs and batteries the growth driver
# Next-Generation Vehicle Plan 2010

## Six Plans

<table>
<thead>
<tr>
<th>Overall plan</th>
<th>Batteries</th>
<th>Rare metals</th>
<th>Infrastructure</th>
<th>Systems</th>
<th>International standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>next-gen. vehicle development and production</td>
<td>Secure battery R&amp;D and technology</td>
<td>Secure rare metals and build resource recycling systems</td>
<td>Install 2 mil. normal chargers &amp; 5,000 quick chargers</td>
<td>vehicles with systems (smart grid, etc.)</td>
<td>strategic international standardization</td>
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### Targets
- **Battery R&D Target** (set in 2006)

### Action plan
- **Battery R&D Target**
  - Set diffusion targets (for 2020/2030)
  - Next-generation vehicles account for up to 50% in 2020
  - Advanced eco-friendly vehicles (next-generation vehicles + eco-friendly conventional vehicles) account for up to 80% in 2020
  - Diversify fuels
  - Higher-value-added parts
  - Diversify the siting of low-carbon industries

- **Batteries**
  - Improve performance of lithium-ion batteries
  - Develop post-lithium-ion batteries
  - Achieve economies of mass production by promoting EVs
  - Create an environment for secondary use of batteries

- **Rare Metals**
  - (Upstream)
    - Strategically secure rare metals
  - (Middle course)
    - Develop batteries and motors free of rare metals
  - (Downstream)
    - Establish battery recycling systems

- **Infrastructure**
  - Build infrastructure intensively and systematically during the market preparation phase
    - Mainly in EV/PHV towns
  - Pave the way for full-scale diffusion
    - Compile EV/PHV town best practice handbook
    - Collaborate with the private sector (CHAdeMO Association)

- **Systems**
  - Create new business models in EV/PHV towns.
  - Verify systems through the Next-Generation Energy and Social System Demonstration program.
  - Promote international standardization and business development based on the verification results

- **International standards**
  - Establish international standards for battery performance and safety evaluation methods.
  - Establish international standards for charging connectors/systems.
  - Enhance public-private organization for standardization.
  - Develop human resources for standardization
### Next-Generation Vehicle Plan 2010
(Diffusion Projections for 2020 and 2030; Government Targets)

#### Diffusion projections by type of vehicle (with private-sector efforts)

- Diffusion projections assuming private-sector efforts (scenario where auto makers make the utmost efforts to improve fuel efficiency and develop next-generation vehicles) were made.
- Next-generation vehicles will account for less than 20% of new vehicle sales in 2020 and 30-40% in 2030.

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<thead>
<tr>
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<th>2020</th>
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<tr>
<td>Conventional vehicles</td>
<td>80% or more</td>
<td>60 - 70%</td>
</tr>
<tr>
<td>Next-generation vehicles</td>
<td>Less than 20%</td>
<td>30 - 40%</td>
</tr>
<tr>
<td>Hybrid vehicles</td>
<td>10 - 15%</td>
<td>20 - 30%</td>
</tr>
<tr>
<td>Electric vehicles</td>
<td>5 - 10%</td>
<td>10 - 20%</td>
</tr>
<tr>
<td>Plug-in hybrid vehicles</td>
<td>Miniscule</td>
<td>1%</td>
</tr>
<tr>
<td>Fuel-cell vehicles</td>
<td>Miniscule</td>
<td>- 5%</td>
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<tr>
<td>Clean diesel vehicles</td>
<td>Miniscule</td>
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Next-Generation Vehicle Plan 2010
(Diffusion Projections for 2020 and 2030; Government Targets)

The government has set diffusion targets to pursue for each type of vehicle for accelerating the spread of next-generation vehicles.

Next-generation vehicles should account for up to 50% of new vehicle sales in 2020.

To achieve this target, the government should provide effective incentives.

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EV & HEV
Eco-Car Subsidy (2009 Apr.-2010 Sep)
Already Finished.
250 thousand yen subsidy for purchasing new car for the owner who replace the car more than 13 years old (one example)

EV Subsidy
(Nominal Price – Base price) x 1/2 = Subsidy Nominal Price means price before discount.
EV/PHEV Introduction and Promotion

EV・PHEV Town

Kyoto (EV tour at historic area)

Niigata (EV Taxi)

Picture: METI Journal
Smart Community and EV

Establish technology for integrated management of electricity and heat

Reduce peak demand (oil thermal power) by using IT

Build charging infrastructure

Establish a regional energy management system

Upper systems
- Solar power generation
- Wind turbine generation
- Na-S battery

Create a power supply system that creates a complementary relationship between a utility grid and a regional energy system

Presence of a project leaders to organize players

Verify the locations to install storage batteries (distribution station or each home)

Set installation standards for lithium storage batteries based on demonstration data

Use smart meters to visualize power consumption and control demand

Establish a Next-generation Service Station

Next-generation car

Energy management system

ZEB

Cogeneration

Solar/wind power generation

Storage battery

Solar power generation

Biogas

Waste heat

Smart house

Next-generation car
Examples of Smart Community projects in Japan

Kansai Science City, Kyoto pref.
- ‘Smart tap’ which visualizes energy consumption control home electronics energy usage.
- ‘Electric power virtual coloring’ technology actualizes total home energy management system.

Yokohama City, Kanagawa pref.
- Energy management system which integrates HEMS, BEMS, EV
- Large-scale PV system (27000 kW), 4000 Smart houses, 2000 EVs
- Use of heat and unused energy

Kitakyushu City, Fukuoka pref.
- Real-time management in 70 companies and 200 houses
- Energy management by HEMS, BEMS
- Energy system which integrates demand-side management and high energy system.

Toyota City, Aichi pref.
- Use of heat and unused energy as well as electricity
- Demand response with more than 70 home, 3100 EVs, Vehicle to Home (V to H), Vehicle to Grid (V to G)
FCV
The Japan Hydrogen & Fuel Cell Demonstration Project

JHFC: The Japan Hydrogen & Fuel Cell Demonstration Project consists of the "Fuel Cell Vehicle (FCV) etc. Demonstration Study" and the "Hydrogen Infrastructures Demonstration Study". Both studies are part of the "Fuel Cell System Demonstration Study" subsidized by the Ministry of Economy, Trade and Industry.(NEDO from FY 2009).

JHFC1 : FY 2002 - 2005
1. Clarified the high energy efficiency of FCV as a vehicle.
2. Clarified "Well to Wheel" efficiency (overall energy efficiency that takes consumption of all energies concerned: from the mining of the primary energy, production, transportation and filling to vehicle and to driving of vehicles) with demonstration data of FCVs and hydrogen stations.

JHFC2 : FY 2006 – 2010
1. To clarify the remaining issues under the actual use conditions
2. To collect data to develop regulations, codes, and standards
3. To formulate and implement public relations and education strategies for dissemination and promotion
4. To verify the energy saving (fuel economy) and environmental impact mitigation
5. To identify technology and policy trends of FCVs, small fuel-cell powered vehicles and hydrogen engine vehicles as well as hydrogen infrastructures

http://www.jhfc.jp/e/index.html
As a major activity of JHFC project, 14 hydrogen stations were constructed and have been operated in the Tokyo metropolitan area, Chubu, Kansai and Kyushu region. Hydrogen is produced by reforming a wide variety of fossil fuels such as desulfurized gasoline, naphtha, methanol and natural gas, or by water electrolysis or purification of COG. These hydrogen infrastructures have been evaluated in the real world through refueling of hydrogen to FCVs and ICVs.
13 companies announced their plan to start developing FCV market in 2015 on 1/13/2011.

Automobile manufacturers: Toyota Motor, Nissan Motor, Honda Motor,
Refiners: JX Nippon Oil and Energy, Idemitsu Kosan, Showa Shell Sekiyu, Cosmo Oil
Gas Companies: Tokyo Gas, Osaka Gas, Toho Gas, Saibu Gas, Iwatani, Taiyo Nippon Sanso

1. Automobile manufacturers are developing commercial FCV
   with aiming to start selling in domestic market with a focus on four major metropolitan areas in 2015.

2. Hydrogen supply companies aim to place about 100 hydrogen stations before 2015
   in order to develop early stage of FCV hydrogen infrastructure for commercial FCV.

3. Asking for government to establish deployment strategy including measures to
   improve social acceptance etc.
Biofuels
Law regarding Advanced Energy Supply Structures

- Law regarding promote the effective utilization of raw materials of fossil energy and use of non-fossil energy sources (Law regarding Advanced Energy Supply Structures) was passed in July 2009.
- Related ministerial order including ethanol introduction target was in effect in November 2010.
- Distributor : 0.6ml/year of gasoline sales  
  Refiner : 3 million kl/year of crude oil processing  
  Minimum criteria to mandate ethanol (about 98% of the market)
- LCA of GHG emission of ethanol should be less than 50% of baseline gasoline
- Both of ETBE and direct blend are accepted.

- Domestic use of gasoline was about 58million KL in 2010.
- No nationwide supply for biodiesel.  
  Only “local production, local use”
Thank you for your attention!