

TECHNOLOGY

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## Inspired Technology for the Environment, Safety and Driving Pleasure

Nissan's R&D operations focus on providing our customers with consummate assurance of driving pleasure. That concept covers four technological facets: environment, safety, dynamic performance, and what we refer to as "life on board." We have set clear targets for each of these elements, and they are expressed in our short-term, mid-term, and long-term R&D plans.

### For the environment

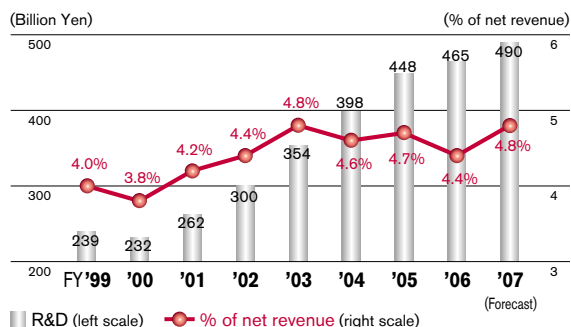
Last December we announced our mid-term environmental action plan, known as Nissan Green Program 2010. As outlined in this plan, we view the following three issues as paramount: reducing carbon dioxide (CO<sub>2</sub>) emissions; minimizing emissions to preserve the atmosphere, water and soil; and the recycling of resources (reduce/reuse/recycle).

Among the many environmental challenges we face, the issue of reducing CO<sub>2</sub> emissions is one of our highest priorities. Nissan considers the gasoline engine the primary power plant for cars in the short- to mid-term, and we are developing technologies to enable gasoline-powered cars to significantly improve their fuel consumption. In practical terms, this will have a major impact because of the sheer number of gas-driven vehicles on the road. We are

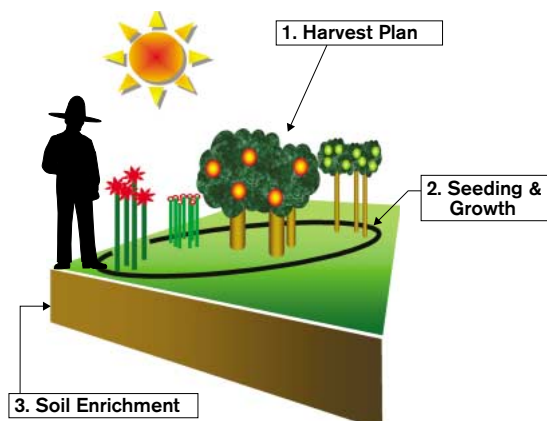
also working on "clean diesels," as well as cars that run on bio-ethanol fuels made from plants and other renewable resources. Concurrently, we are boosting our efforts to develop cars that will operate on electric power, such as hybrid and plug-in hybrid cars, fuel-cell vehicles and electric vehicles.

During fiscal 2007, we will introduce an engine to world markets that incorporates our VVEL or Variable Valve Event & Lift system. VVEL optimizes valve timing and lift, which results in more efficient airflow through the cylinder. Besides significantly improving responsiveness, this fine-tunes the balance between power and environmental performance, reducing CO<sub>2</sub> emissions by approximately 10 percent. We are developing a gasoline engine that emits the same level of CO<sub>2</sub> that diesel engines do, representing an overall reduction in CO<sub>2</sub> of approximately 20 percent. That engine will debut worldwide in fiscal 2010. The same year we will also introduce a "three-liter car" in Japan that can run approximately 100 kilometers on three liters of gasoline, exceeding 30 kilometers per liter, or more than 75 miles per gallon. This also slashes CO<sub>2</sub> emissions by about 30 percent, roughly equivalent to what a hybrid car achieves.

### R&D Expenditure



### The Orchard Concept





The diesel engines Nissan will offer will meet the strict emissions standards being established internationally at an early stage. In the first half of fiscal 2007, for example, we launched the Qashqai with the new Euro 4-compliant two-liter diesel engine for Europe. Starting in fiscal 2010, we will introduce clean diesel cars that satisfy the Post New Long-Term Emissions Regulations in Japan, Tier2 BIN5 in North America, Euro5 in Europe, and their equivalents. In North America, we will be launching a Nissan Maxima in 2010 powered by a clean-diesel engine co-developed by Nissan and Renault.

In the area of bio-ethanol, all our gasoline-driven vehicles sold globally are E10 compatible, meaning they can run on gasoline that includes 10 percent bio-ethanol fuel. In North America, we've had the Titan pickup, which is E85 compatible, in our lineup since 2005. We added the E85-compatible Armada flex-fuel vehicle in 2007. In three years we will also have an E100 flex-fuel vehicle ready for Brazil.

A car's transmission provides another way to cut emissions. Our CVTs, or continuously variable transmissions, can also improve fuel efficiency. Nissan has been the leader in this technology for some time, in fact, with CVT offerings for small- to large-displacement engines. We have already

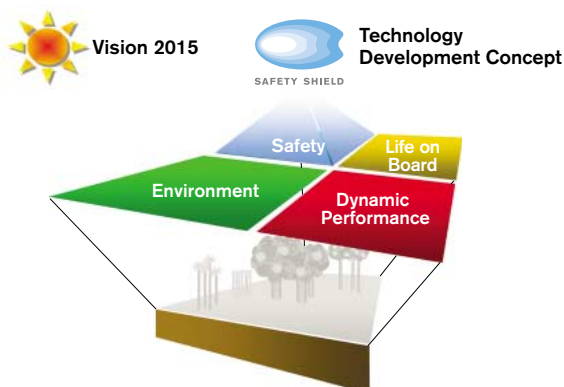
launched six gasoline engine models in Japan equipped with CVTs. All six have achieved the top rank for fuel economy performance. In fact, they already surpass the 2010 standards by 20 percent, and meet the highest standard for emissions, which is known as SU-LEV. Within the next fiscal year, we expect to sell more than a million vehicles equipped with CVTs globally.

For the coming era of electrically powered vehicles and electric motivation, we will introduce hybrid vehicles first, later accelerating our launches of fuel-cell vehicles and electric vehicles—FCVs and EVs, respectively. Furthermore, we have widely acknowledged strength in lithium-ion battery technology, one of the core technologies for electric-powered vehicles. We have been working in this area since 1992 and will further accelerate development.

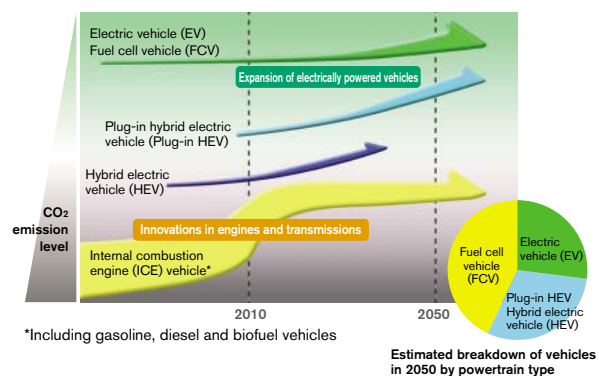
We are developing a hybrid car using our own proprietary hybrid system that will debut during fiscal 2010 in North America and Japan. We are promoting the development of a plug-in hybrid system as an effective technology for reducing CO<sub>2</sub> emissions.

As for FCVs, we have made several strides forward so far, such as development of our own stack and 70Mpa hydrogen tank. We've used these

### Vision 2015



### Nissan's roadmap for reducing the CO<sub>2</sub> from our vehicles



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to power the 2005 model X-TRAIL FCV, which has a range and acceleration comparable to those of its gasoline sibling. We will have a high-performance in-house stack for wider production application by the early part of the 2010s, starting with the U.S.—where a fueling infrastructure for hydrogen is currently being built—and then in Japan.

We think that EV use can be expanded from the first half of 2010, but we need to extend the range and establish a network of charging stations in collaboration with other industries. We will continue real-world testing in Japan until 2010. Our plan is to introduce a production version to the market in the early part of the decade, beginning in Japan.

The three core technologies for any electrically powered vehicle are the motor, battery and inverter. To achieve the objective of the Nissan Green Program 2010 plan, we will continue to improve their performance and reduce costs to a practical level.

Nissan has long been the leader in lithium-ion batteries for automobiles, and we've now established a joint-venture company with NEC to develop, manufacture and market these batteries. This joint venture will be producing an all-new lithium-ion battery that will set industry standards for superior performance and low cost. The batteries the new

company produces will be used on the hybrids, EVs and FCVs. Some competitors have stopped lithium-ion battery development, primarily because of safety issues. Our lithium-ion battery is different from those our competitors have devised and has much better safety characteristics.

**For safety**

Safety, of course, is another critical area, and our safe driving environment goal is to reduce the number of accidents to achieve the ultimate objective expressed in our Vision Zero plan. That goal is to cut the number of Nissan-related automobile accidents that resulted in fatalities and serious injuries in 1995 in half by 2015. And it's working. Fatalities and serious injuries among the 10,000 Nissan-related automobile accidents in 2004 declined by 27 percent, and in 2005 by 34 percent.

We have been promoting R&D based on our original concept, called the "Safety Shield," since 2004. The Safety Shield refers to active safety measures that use the vehicle itself to help avoid accidents. To clarify things, we've divided the accident "environment" into six categories: unforeseen risk, apparent risk, possible crash, unavoidable crash, actual crash, and post-crash.

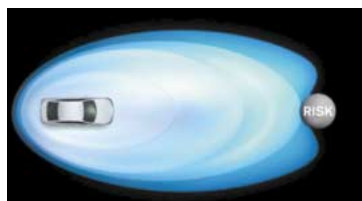
**Safety Shield**



SAFETY SHIELD

The vehicle activates various technologies to help the driver, passengers and other road users avoid danger from normal driving conditions through post-accident conditions.

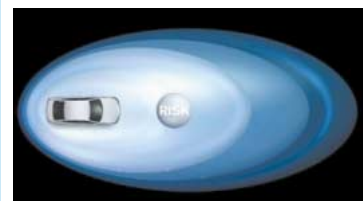
**Helps the driver maintain comfortable driving**



**Helps the driver return to a safe driving mode in dangerous conditions**



**Helps reduce injuries and damage when a collision is unavoidable**



Based on the risk factors for each category, our cars activate the optimal barrier and support functions to avoid the risk at hand. The fruits of our development in this area include “world’s first” technologies such as the Distance Control Assist System, Lane-Departure Prevention, and Around View Monitor, all of which we’ll be introducing during fiscal 2007.

Nissan is actively engaged in a wide range of initiatives to realize a safe driving environment, and we intend to widen our use of technology to address the hazards of driving while drunk. The severity of accidents caused by drunk driving has been increasing year after year, and naturally that attracts a great deal of public attention. Nissan is committed to preventing drunk driving both through technology and by educating drivers to the dangers of drinking and driving.

For example, we are carrying out trials of alcohol interlock equipment in collaboration with the local government. This system prevents the engine from starting when a sensor that analyzes the breath indicates that the driver is drunk. The updated CARWINGS navigation systems will also display a drunk-driving alert when the ignition is turned on to remind the driver of the hazards of driving while intoxicated by saying “Do not drive after drinking!”

### **Dynamic performance and life on board**

The third of our four key areas is dynamic performance. We want every Nissan customer to

sense this phenomenon within thirty meters of putting the car in gear. We expect our customers to sense that dynamic performance, particularly in the following four scenarios: high quality when pulling away, a feeling of security while driving at higher speeds, an overall sensation of car and driver as one, and a feeling of exhilaration during acceleration. To achieve this state, we are continuously refining our powertrain and suspension technologies.

The last facet, “life on board,” is a concept that relates to the total car experience. We are working constantly to perfect a luxurious interior with a cockpit that makes both inhabiting and driving a car comfortable, effortless and intuitive.

### **The Alliance advantage**

Our Alliance with Renault continues to work for us in many ways at the R&D stage. More and more of Nissan and Renault’s total production is now covered by common platforms, a trend that will continue. By using the same powertrains, engines and transmissions, we also avoid duplicating product development and parts manufacture.

Seamless driving pleasure is what R&D can provide to Nissan customers. We remain committed to creating more value for our customers through developments in the four technological areas mentioned, and we believe this will in turn create greater value for our shareholders.



SU-LEV clean diesel



Passenger seat alcohol odor sensor in the anti drink—driving concept car