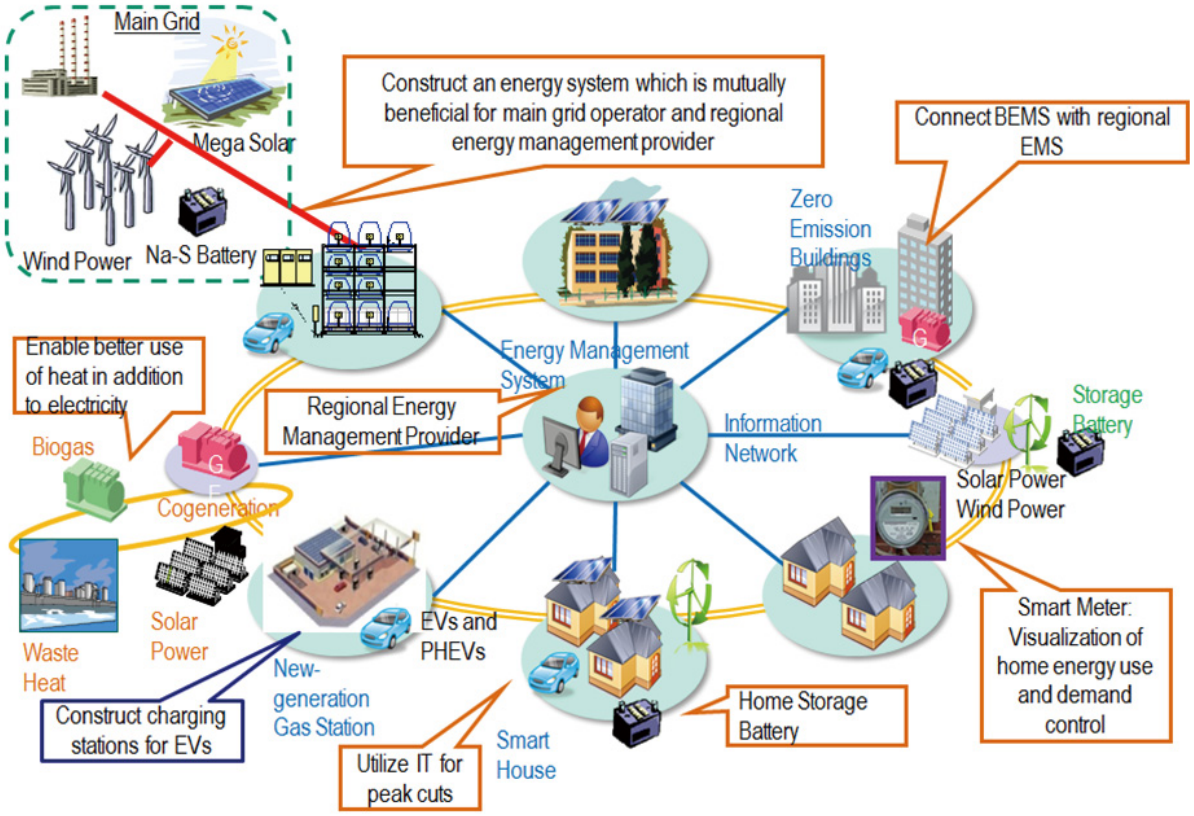
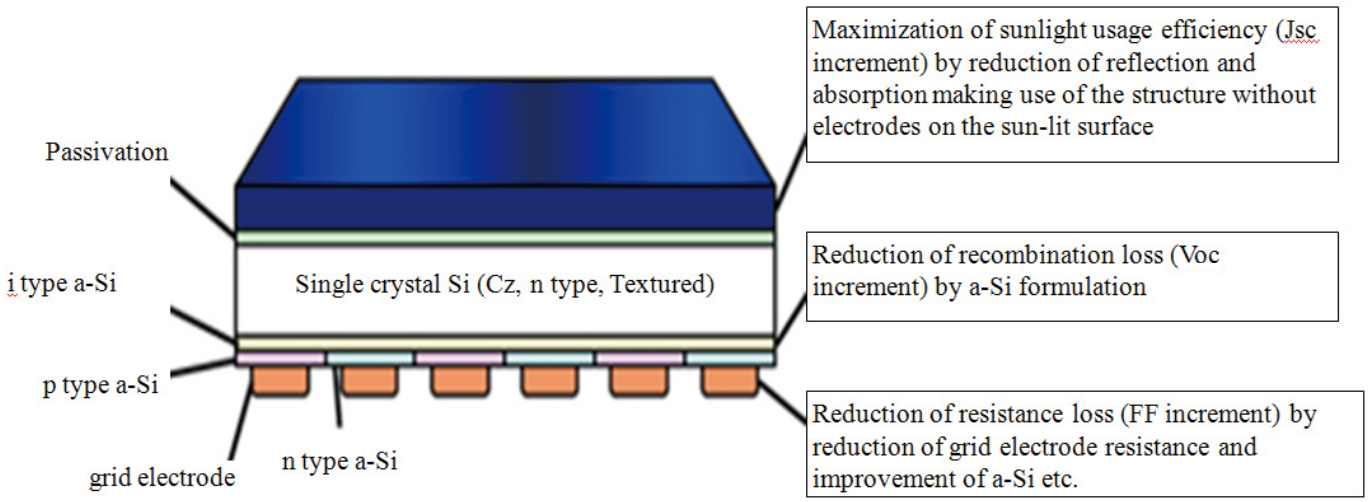
Increasing community demonstration smart-grid projects involving consumers



(Source: NEDO)

Smart-city initiatives are being developed worldwide, especially in the United States, Europe, and Asia. These smart-city projects are characterized as a social experiment by local communities while involving consumers. Under these circumstances, the International Smart Grid Action network (ISGAN) announced the 1st ISGAN Award in May 2014 as part of its ISGAN Award program to commemorate the world's top smart-grid projects. Under the theme "Consumer Engagement and Empowerment," this award advocated consumers as the main player in smart cities. Expectations are high for smart-city projects to renovate society.

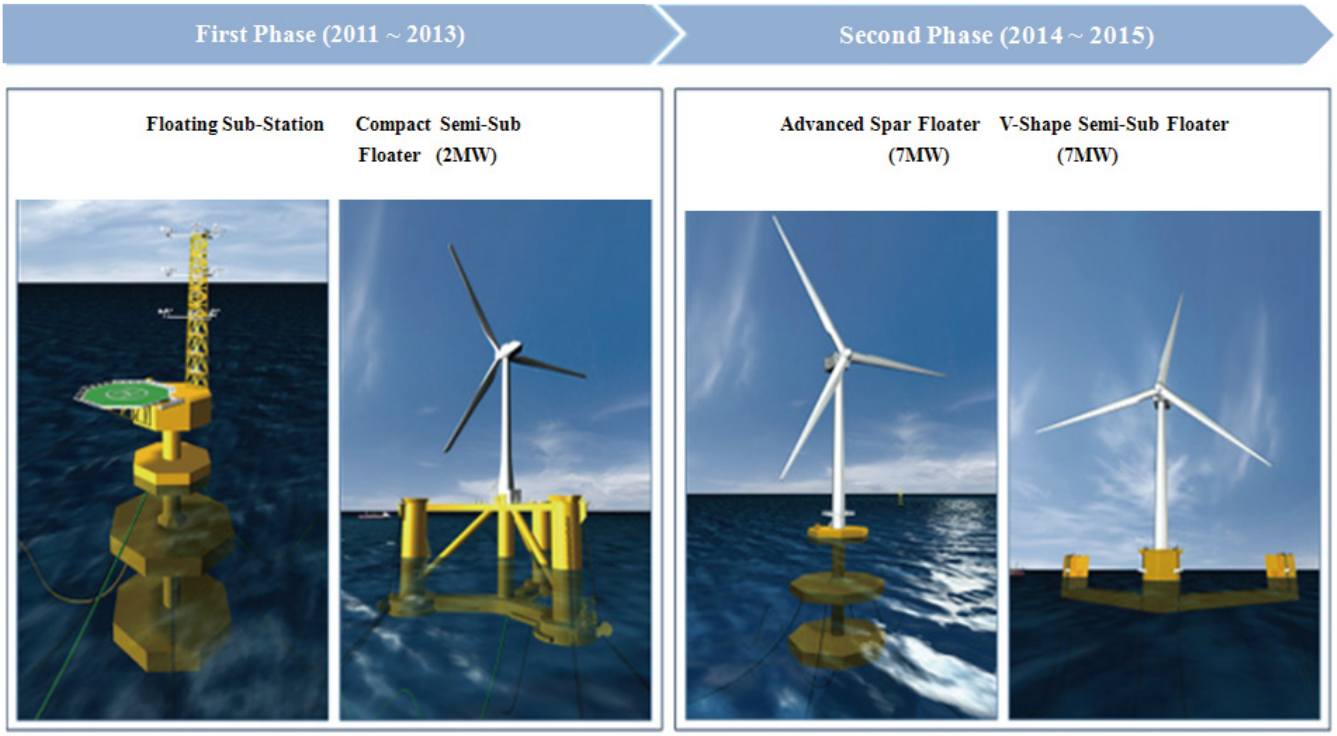
Achievement for the first time in 15 years of the world's highest photoelectric conversion efficiency of crystal silicon-based solar cells



HIT solar cells (Source) Panasonic

Panasonic achieved the world's highest photovoltaic conversion efficiency of 25.6 % with a crystal silicon-based solar cells in April 2014 mainly by arranging electrodes only on the back side of cell for maximizing the surface area to be exposed to the sun light. This has broken the then world record of photovoltaic conversion efficiency of 25.0 % achieved by University of New South Wales in 1999. This is the first world record after 15 years for crystal silicon-based solar cells. Since this was achieved on cells of a commercial size, it is expected to directly contribute to improve efficiency of solar cells on the market.

Startup of demonstration operation of a floating offshore wind power system equipped with a transmission and distribution unit



(Source) Fukushima Offshore Wind Consortium

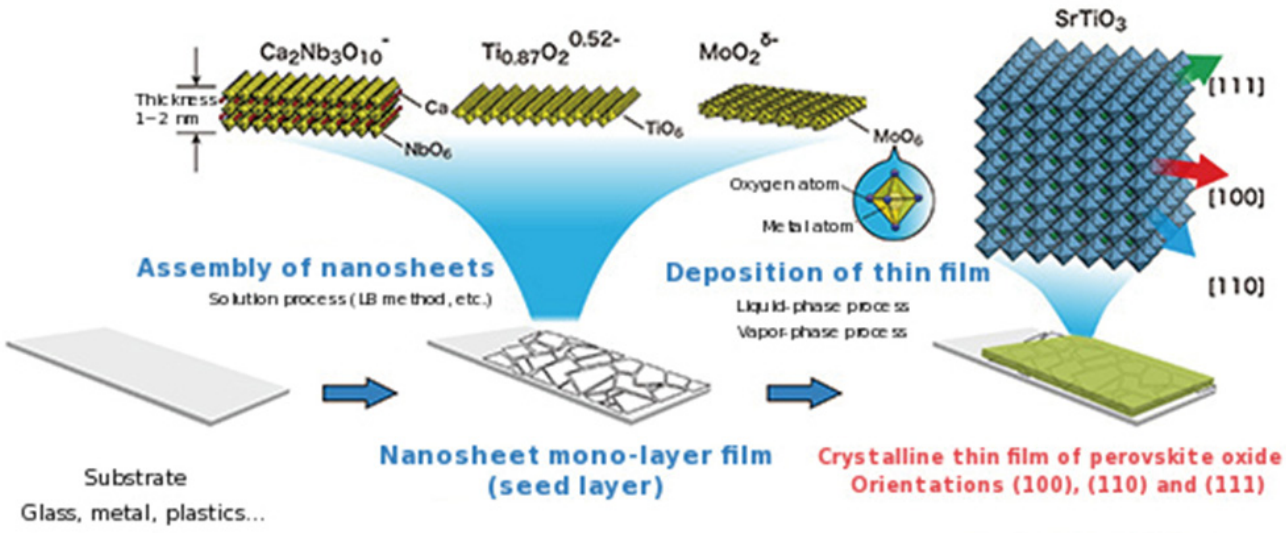
In November 2013, Fukushima Offshore Wind Consortium started operating the Fukushima Recovery, Floating Offshore Wind Farm Demonstration Project - the world's first case of its kind. Bottom-founded offshore wind power generators have been developed and used commercially on a large scale in Europe for over 20 years. Meanwhile, floating offshore wind power generators have been built only in recent years on a demonstration basis in Norway and Portugal, leaving technical problems unsolved for floating power generation, transmission and transformation. The Fukushima Recovery, Floating Offshore Wind Farm Demonstration Project is the world's first case of demonstration conducted using commercial-scale facilities to verify technologies to solve such issues.

Development of a prototype vehicle running on a liquid fuel cell free of noble metals

“FC DECK” (Source) Daihatsu Motor Co.,Ltd.

In the Tokyo Motor Show of November 2013, Daihatsu Motor revealed a prototype vehicle "FC Deco DECK," which uses a fuel cell equipped with electrodes free of platinum or any other noble metal. Daihatsu Motor had succeeded in developing a non-platinum electrode for anion-exchange fuel cells, jointly with the University of New Mexico. The success led to the development of the new prototype vehicle. By reducing the high cost of platinum or other noble metals, which had long been used in fuel cells for vehicles, the new type fuel cell also has the high potential for proliferation in fuel cell vehicles.

Dramatic efficiency improvement in perovskite-type solar cells

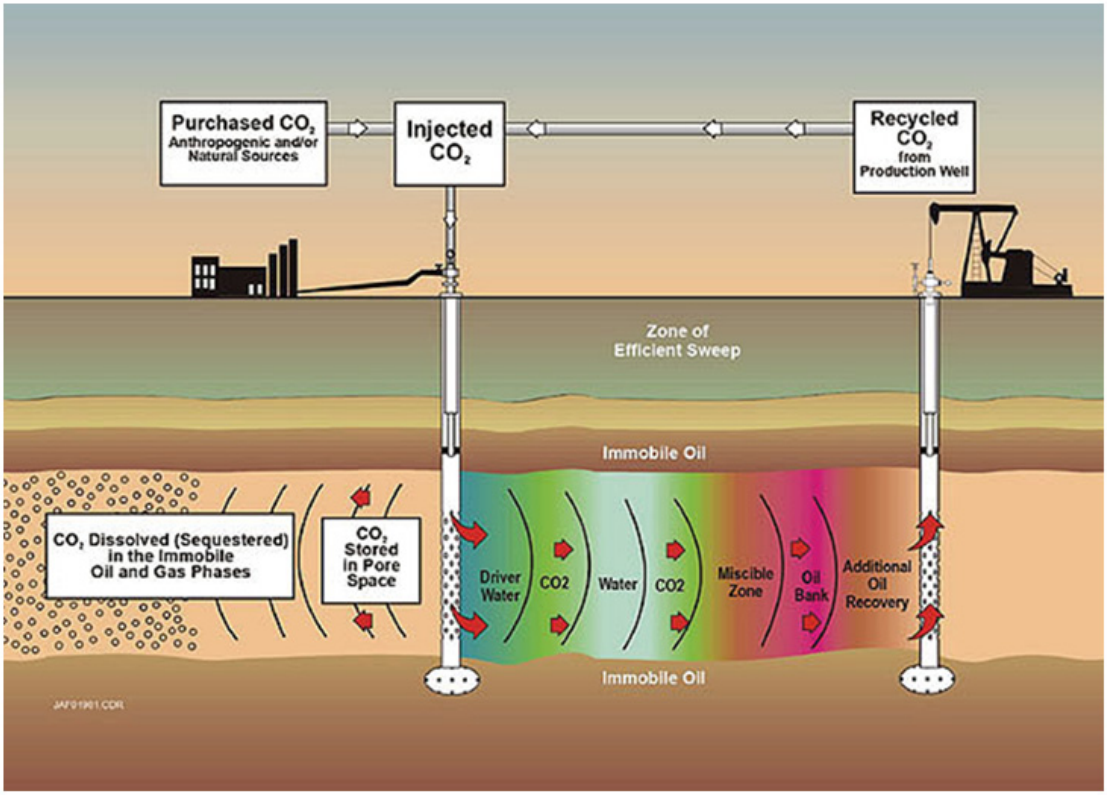


Study for Crystalline thin film of perovskite oxide
(Source: NIMS, JST)

(Image picture)

Developed for the first time in 2009, perovskite-type solar cells initially had efficiency of only 3.8%. Subsequent development efforts have led to remarkable efficiency of 17.9%, showing unprecedented fast advancement. Although we still need to lower production cost and enhance stability of the perovskite-type cells, its efficiency is now comparable to silicon type cells. Efficiency of perovskite-type cells is expected to further improve in years to come and promote wider use.

Successive announcement of commercial operation of CCS systems for coal-fired power plants



Conceptual Image of CO_2-EOR (Source) Global CCS Institute

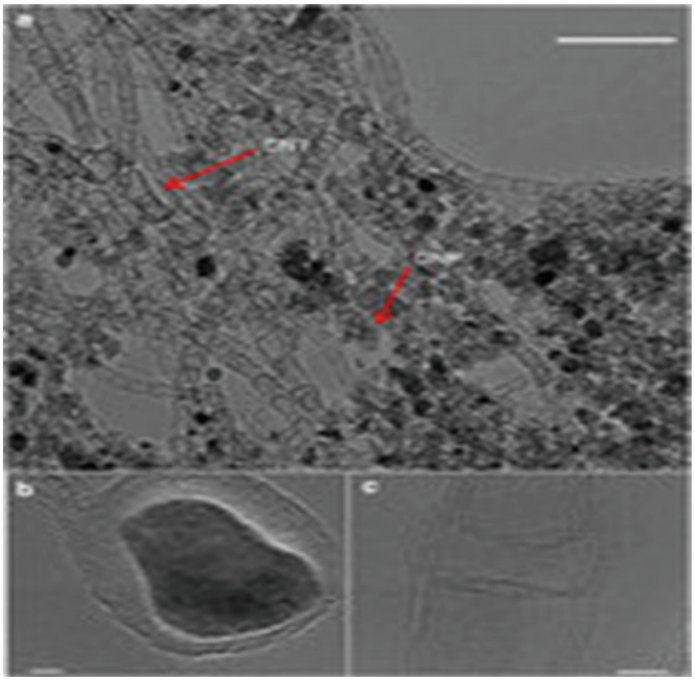
The CO_2 recovery and storage technology is expected to contribute to curb global warming. However, since it is costly to introduce the technology, it has not been utilized by thermal power plants so far. Nevertheless, commercial CCS projects for power plants have been increasingly active thanks to governments' support in some countries. For example, the Boundary Dam CCS Project in Canada is the world's first-ever project in commercial scale which comprehensively deals with recovery after burning, transport and storage of CO_2 in a commercial coal-fired power plant. Their construction completion and inauguration of commercial operation of CCS system is expected in 2015. The recovered CO_2 will be used not only for CO_2-EOR but also for safety evaluation and study of aquifer storage. Meanwhile, Parish Coal-Fired Power Plant in Texas, US, is considering introducing a larger CCS system, which is scheduled to start commercial operation in 2016.

Disaster-resistant microgrid technology

(Source: NEDO)

In the wake of large-scale natural disasters such as the Great East Japan Earthquake and extraordinary hurricanes in the United States, microgrids have been attracting a keen interest as a disaster-resistant system capable of supplying electricity independently in a power outage. There is a growing tendency to introduce microgrids into key facilities and urban communities. Under these circumstances, a number of demonstration projects have been carried out in the United States and other countries, including a high-reliability power supply system in New Mexico, U.S, that works independently in buildings in a power outage, an uninterruptible power supply project in California, and a microgrid system in Santa Rita Jail. These microgrid technologies, mainly aimed to counter disasters, are expected also to make substantial contribution to GHG reductions.

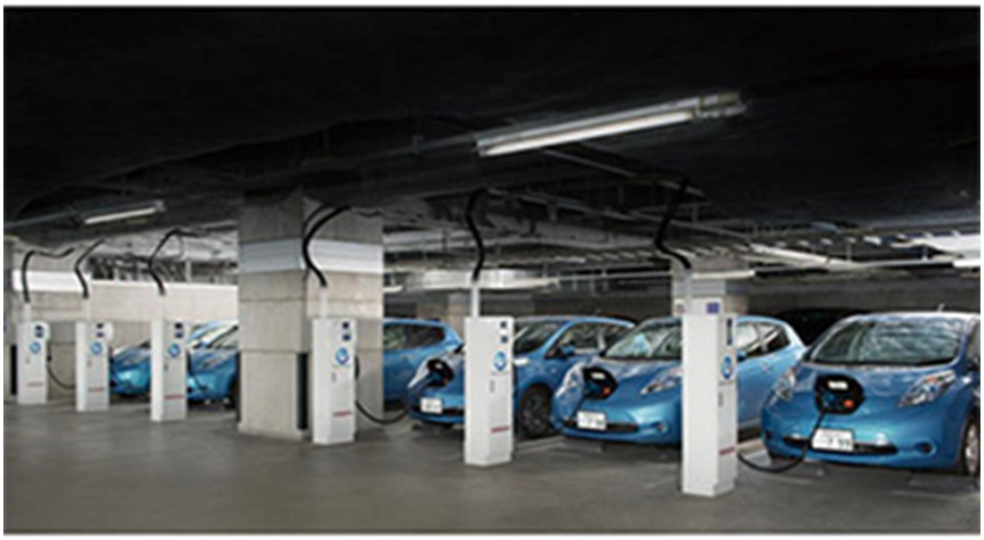
Development of a new type of a nanostructured carbon-based catalyst electrode for next-generation fuel cells



Micrographs of carbon nanotube/nanoparticle composite (Source) Nature

Los Alamos National Laboratory (LANL) developed, in June 2013, a carbon-based catalyst electrode with nano-structure for next generation fuel cells. Most of the existing electrodes use platinum as a catalyst. The high cost of rare platinum is the major challenge. Even though it is also indispensable to use high-performance, high-reliability alkali electrolyte, the new type of catalyst indicated the possibility of replacing expensive platinum.

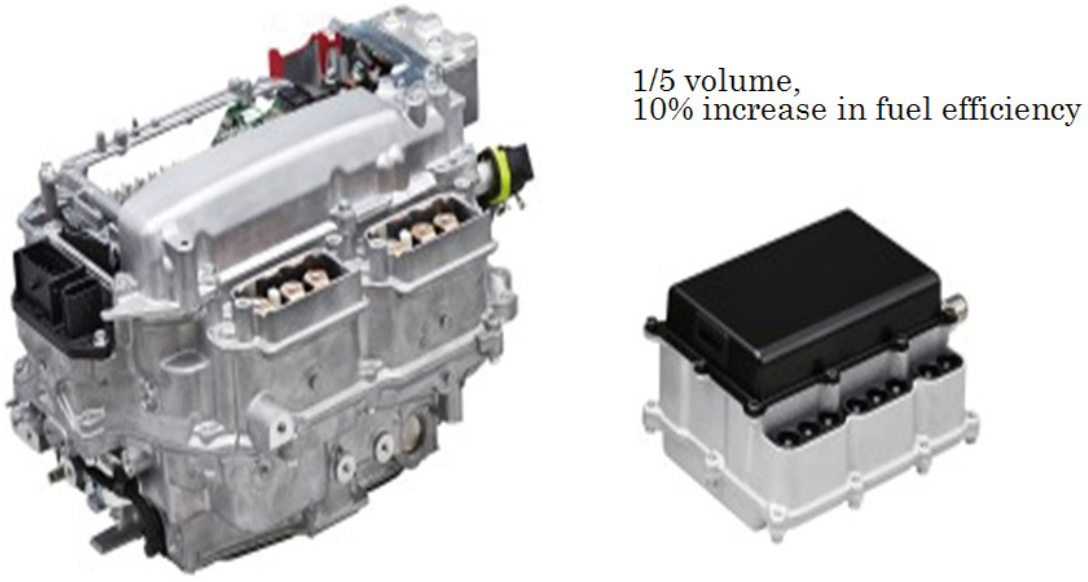
Initiative for a vehicle-to-building system in progress



Vehicle-to-building demonstration at the Nissan Advanced Technology Center in Atsugi City
(Source) Nissan Motor Corporation

Vehicle-to-building systems deployment, in which batteries for electric vehicles are used as a power source, are now fully in progress in various parts of the world, including Japan, the United States, and France. In July 2013, Nissan Motor developed and started a demonstration project of a vehicle-to-building system, by applying its "LEAF to Home" power supply system for households. The experiment succeeded in cutting power consumption during peak hours by providing electricity from the EVs via this system prior to peak hours.

Development of a SiC power semiconductor for automobiles



Left: PCU with silicon power semiconductors (Production model)
Right: PCU with SiC power semiconductors (Future target)
Source) Toyota Motor Corporation

In May 2014, Toyota Motor Corporation was the world's first to a power control unit using a SiC power semiconductor, which was developed in collaboration with DENSO Corporation and Toyota Central R&D Labs, Inc. They confirmed that Prius' fuel efficiency had been improved by 5% when the unit was applied to the car model. The development indicates solutions to enlargement and quality enhancement of SiC wafers and to establishment of SiC semiconductor process. It does not only indicates the possibility of future fuel efficiency improvement of Electric Vehicles, Hybrid Vehicles and Fuel Cell Vehicles, but also the possibility of extended application of SiC wafers to other industrial devices, contributing to significant CO_2 emissions reduction.