The Rise of Eco-enterprise

Japan continues to overcome pollution and energy issues through a combination of institutional reforms and the development of environmental technologies often involving public- and private-sector collaboration. Desulfurization equipment, fuel-efficient cars and energy-saving home electronics are just some of the innovative environment-friendly products developed in this way in Japan in recent years. And as the potential of environmental business increases both at home and abroad, Japan is now redoubling its efforts, making use of its past experiences, to create new technologies and develop industries and businesses geared to tackling global environmental issues and stimulating economic growth. ***The Japan Journal*** reports.

In a policy speech delivered in January this year, Prime Minister Aso remarked, "We of the present day have the responsibility to resolve the issue of global warming. At the same time, efforts to address environmental issues are also the seeds that generate new economic demand and employment. We will bring about a low-carbon, sound material-cycle society that is compatible with growth."

Prime Minister Aso went on to bring up the development and dissemination of solar power generation and environmentally friendly cars and the creation of an effective Japanese-style model through a trial implementation of emissions trading (see **pages 16–17**).

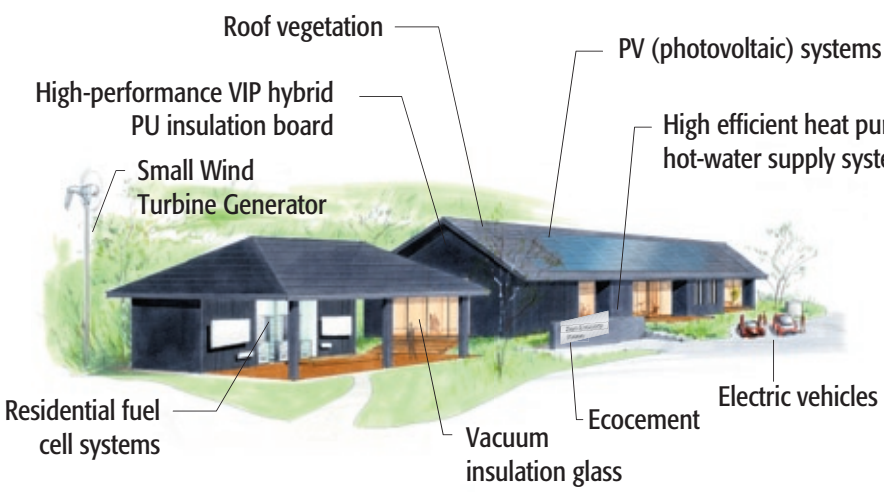
What kind of life awaits us in the Japanese-style model of which the Prime Minister spoke?

Electric vehicles with high performance rechargeable batteries will be in widespread use, and we will take them to the streets after recharging using electricity produced through our homes' solar power generation systems. Being an electric vehicle, no emissions are produced, and the motor drive issues almost no noise. The sound-insulating walls of expressways have vanished and the view of the city is also different. The air around the city has cleared up, and an increasing number of restaurants and shops face the streets in a cityscape that spreads out in an abounding sense of openness. Returning home, we will live in a so-called 200-year house. This is of course a zero emission house, and in addition to solar power generation, it features fuel cells for household use as well as wind generation. Hot water is supplied through a high-efficiency system that uses a heat pump. In addition, heat-insulated glass and vacuum-insulated materials are used and rainwater is also utilized. The electrical appliances and light fittings used in the home are Japanese-made models boasting the highest level of energy-saving efficiency in the world. These devices all incorporate a centrally managed intelligent system which controls activities ranging from energy usage to the selling of electrical power to power companies. Devices are controlled through voice-activated touch panels that are simple enough for children or the elderly to use....

These types of near-future cars, houses or related products will be built through the world's most advanced energy-saving and environmental technologies, robot technologies and sensor technologies based on Japan's specialized talent in manufacturing, and made possible through a world-class broadband environment.

Through the refinement and combination of Japan's experience, we can combine economic development with environmental protection and at the same time contribute to the reduction of greenhouse gases. That type of future is just around the corner.

Appearance of "Zero Emission House"



COURTESY OF MINISTRY OF ECONOMY, TRADE AND INDUSTRY

TADASHI AIZAWA

An energy-use monitor in the Zero Emission House, an exhibit at the G8 Hokkaio Toyako Summit

Photovoltaic Power Business

Behind the development of energy conservation and environmental technologies in Japan is the nation's experience of pollution problems during the high economic growth period of the 1950s to 1970s. In response to the situation, the government established and revised numerous laws to prevent and reduce water, air and noise pollution. Directed by the tough standards laid down by central and local governments, companies set about developing the technologies that would meet them. As a result, levels of environmental pollution have rapidly decreased since the 1970s. Moreover, Japanese economic growth did not slow, despite the huge investment made by Japanese companies to prevent pollution. Indeed, thanks to the development of environmental technologies, companies enhanced their international competitiveness. The oil shocks of the 1970s also served to accelerate Japanese companies' development of energy conservation technologies.

According to Ministry of Economy, Trade and Industry data for 2003, the market size of the "environment business," which includes pollution prevention equipment, recycling equipment and environment-conscious products, is 4.8 trillion yen (49 billion dollars) and employs some 1.36 million people.

One of the "seeds that generate new economic demand and employment" that the Japanese government has focused on is photovoltaic power. Although photovoltaic power-related industries face severe international competition, Japan is a world leader in the installation and production of such technologies.

According to the International Energy Association's *Trends in Photovoltaic Applications*, in 2007 Japan (1.92 GW) was second only to Germany (3.86 GW) in its accumulated capacity of installed photovoltaic power. Meanwhile, according to the American industry publication *PV News*, Sharp holds the world's second largest share of the photovoltaic cell market (9.7%), while fellow Japanese companies Kyocera (5.5%) and Sanyo (4.4%) are fourth and sixth, respectively.

To increase the installation of photovoltaic power, the Japanese government has introduced various measures. The Low-carbon Action Plan approved by the Cabinet in July 2008 set out the target that photovoltaic power installation increase by ten times in 2020 and by forty times in 2030, compared to current levels. It also targets a halving of prices for photovoltaic power systems from the current levels in three to five years from now. Based on the Plan, the government compiled an action plan last November to expand photovoltaic power installation. It includes development of materials and modules, collaboration between the photovoltaic power industry and housing industry, and promotion of photovoltaic power installation in public facilities such as schools, roads, railroads and airports. From January, the government started to offer subsidies to individuals who install photovoltaic power systems at home (70,000 yen for every kilowatt of power generation capacity). The Tokyo Metropolitan Government will also provide subsidies to people who install equipment using solar power, which includes photovoltaic power and solar thermal power, from April.

Japanese companies are actively investing in photovoltaic power. Sharp will build a factory producing thin-film silicon solar cells amounting to 1 million kW per year by 2010 in Sakai City, Osaka Prefecture. Using these thin-film silicon solar cells, Sharp, in cooperation with Kansai Electric Power, plans to build two mega-solar power generation plants (total 28 MW) in the city.

Sanyo also plans to double the production capability of photovoltaic cells to 600 MW by 2010, while Kyocera will increase its production capability from 200 MW to 650 MW by 2012.

According to a report by METI's Study Group on Solar System Industry Strategy released on March 18, the current market size of the solar power generation-related industry is 1 trillion yen (10.3 billion dollars) and employs some 12,000 people. However, the report forecasts that if Japan's share of worldwide solar cell production increases from the current level of around one-quarter to over one-third by 2020, solar power generation-related industries will create an economic effect worth up to about 10 trillion yen and will provide employment for up to about 110,000 people.

The weakness of solar and wind power is that the power output fluctuates according to the weather. However, storage batteries which overcome this weakness are now under development. If electricity generated by solar and wind power can be stored, it will be possible to provide electricity stably to end users.

In May 2008, the world's first wind power generation facility with storage batteries started operation in the village of Rokkasho, Aomori Prefecture. The storage battery is an NAS battery developed by NGK Insulators, the world's only company to have successfully commercialized the battery. The NAS battery consists of sulfur at the positive electrode and sodium at the negative electrode as the active materials. Although its energy density is three times higher than the conventional lead acid battery, its weight and volume are just a third. It also has long-term durability of some fifteen years.

The NAS battery has garnered a high reputation not only at home but also abroad. NGK Insulators provided a 1,000 kW NAS battery to a mega-solar power generation plant in Germany in December 2008. NGK Insulators has also received an order

KEIO UNIVERSITY ELECTRIC VEHICLE LABORATORY

Research results from the Eliica electric vehicle project are promoting further advances in related fields.

for a 50 MW NAS battery from the Abu Dhabi Water and Electricity Authority of the United Arab Emirates. As demand increases, NGK Insulators will increase production capacity of the NAS battery from 90 MW per year to 150 MW by 2010.

Other companies are also developing high-quality storage batteries. Kawasaki Heavy Industries is developing a storage battery for solar and wind power using a nickel metal-hydride battery.

Eliiy Power, a venture company established based on research results of the eight-wheel electric vehicle Eliica developed by Keio University, is working together with Sharp to develop a large-capacity lithium-ion battery for use with solar power generation systems.

NEDO (New Energy and Industrial Technology Development Organization) estimates that the market size of storage batteries for solar and wind power will be some 300 billion yen (3 billion dollars) at home in 2020 and that for hybrid cars, electric cars and fuel cell cars one trillion yen (10 billion dollars) by 2015.

Visualization of Environment Business

To promote the environment business and technology, it is important for ordinary people and companies to accurately know the current situation. To do so, the government is working to help people "visualize" the environment business and technology.

One way of doing so is through the Eco-Products Awards, which since 2004 have been given to products and services conscious of reducing their environmental impact, at the annual Eco-Products Exhibition.

Hideki Kimizuka, director of METI's Environmental Industries Office, comments, "Eco-Products Exhibitions are held with the aim of communicating developments to the public and to advance companies' initiatives to reduce their load on the environment. METI actively supports the spread of such 'visualization' to consumers and the promotion of related business-to-business and business-to-consumer relationships."

In 2008, SANYO Electric was awarded the Eco-Products Award (Minister of Economy, Trade and Industry Award) in the Eco-Services category for its Eco-Store System.

The Eco-Store System is an in-store integrated management system able to provide control for optimum energy savings through a master controller providing uniform energy management for the in-store showcases, including the refrigeration units for both the frozen and chilled food showcases, and the in-store air conditioning systems as well as others. Previously, these various systems and devices were operated through individual control systems, but by connecting each device to a communications network and performing uniform management and linked operations using the master controller capable of acquiring real-time operation conditions, the appropriate temperature adjustments for the showcase can be done to maintain the freshness of the food, while simultaneously realizing up to 23% of total electrical power consumption savings in the supermarket.

As of October 2008, approximately 300 stores nationwide have purchased and installed this system. On average, the expected reduction in annual CO_2 emissions for one store is approximately 60 tons, and based on that average, an annual reduction of CO_2 emissions for the currently installed systems is approximately 18,000 tons. Currently, there are about 20,000 supermarkets in Japan (number of stores according to an excerpt from the *METI Yearbook of the Current Survey of Commerce* [2007]), which if they all introduced this system into their stores, it would have an equivalent reduction of more than 1,000,000 tons of CO_2 emissions yearly (according to company calculations).

With respect to this visualization, METI is tackling yet another method for the "visualization of financial markets."

At present, the environmental capacity of companies that address environmental issues is not being properly assessed. For that reason, companies either cannot attract investment, or the incentives for them to address environment issues are not working.

"We are proceeding with initiatives in conjunction with the Tokyo Stock Exchange to assess the behavior of companies towards the environment, including efforts in energy conservation and recycling, and to translate that behavior into share price indexes. The goal is for investment to be diverted to companies that address environmental issues based on such an index to enhance their competitive footing," explains Kimizuka.

In addition to these efforts, METI has compiled the "Collection of Best Practices for Business to Turn the Environment into Power," which introduces cases of leading-edge environmental businesses aimed at solving worldwide environmental issues through conversion to a sustainable industry and society in which environmental conservation and economic growth coexist.

The assembled cases include advanced and unique business models, those that strike a balance between environmental load reduction and business profits, as well as those for which the expertise and factors for success are both clear and versatile, and cases in which success as a business has been achieved by overcoming adverse factors.

METI plans to collect even more case examples and to complete a vision to "make the environment a positive, not a negative."

Recycling Business

At the Davos Forum in January 2009, Prime Minister Aso remarked, "Climate change is a challenge, yet to tackle it is also an opportunity to create new industries. Japan, as the world's number one leader in energy efficiency, is a case in point. Over the last thirty years, we have doubled our real GDP without increasing the energy consumption of our industrial sector. Our primary energy consumption per unit of GDP stands at only one-half the average for OECD countries and less than one-third of the global average. Transforming the oil crisis into an opportunity has been part of Japan's history."

The area of recycling has been built up over a long time together with energy conservation. Technologies, programs and businesses have been established, with the spread of such activities evident from households to offices, factories and even across towns.

However, Japan faces other problems, including tightness of the availability of final industrial waste disposal sites and concerns over the future exhaustion of mineral resources. It is important to solve these environmental and resource constraints, but more important is to trigger new economic growth that strikes a balance between the environment and the economy. The keyword driving the concept is the "3Rs."

The term "3Rs" is an acronym for "Reduce, Reuse and Recycle."

Specifically, "Reduce" refers to increasing the efficiency of resource use associated with product manufacturing, logistics and consumption through efforts to conserve and extend the useful life of resources, and by working as much as possible to reduce the use of resources in ways that make waste unavoidable. "Reuse" refers to efforts to collect used products and reuse them after they have undergone the proper treatment, or the utilization of reusable components. Lastly, "Recycle" refers to the collection of used products or by-products produced in the product manufacturing process, and using those products as raw materials (materials recycling) or as a source of heat from incineration (thermal recycling).

While efforts in these three fields have already matured, there are new challenges to face, such as achieving a low-carbon society and securing scarce metal resources.

Norihiro Yokoyama, director of the Recycling Promotion Division at METI says, "We received a business proposal for plastic recycling and the collection of rare metals. Plastics contain many types of materials, and under existing conditions it is difficult to separate those materials, so they are often incinerated or used for heat recovery. Doing so requires sophisticated techniques to separate materials such as PP (polypropylene), PE (polyethylene) and PS (polystyrene), and techniques and criteria to assess whether collected plastics are suitable for recycling, or should be incinerated or used for heat recovery also need to be established. This would mean developing something very advanced and highly efficient. By the same token, further research and development is needed into techniques for extracting rare metals, particularly those found in mobile phones and the like."

Precious metals such as gold, silver and platinum, and rare metals such as indium and cobalt, found in mobile phones and home electronics, form what is called the "urban mine." According to the National Institute for Materials Sciences (NIMS), the accumulations of gold, silver and indium in the form of electronic components and waste in Japan's urban mines, are equivalent to 16%, 22% and 30% of world reserves, respectively. It is important to extract and collect these metals because Japan imports most of them from overseas. For this reason, in its budget for FY2009, METI has included implementation of model projects to collect discarded small electronic and electrical equipment from users in cooperation with local governments. The budget will be used to distribute collection boxes to public offices and retailers, select and dissolve components and substrates containing rare metals, and analyze their usability. To collect high-quality rare metals efficiently with low cost, it will also finance institutions to develop technologies to detach and separate components containing rare metals from small electronic and electrical equipment.

Numerous private companies have also launched businesses for the recycling of rare metals. Beginning last spring, an affiliate company of Dowa Holdings, a major mining operator, has been engaged in the recovery of some seventeen rare metals such as indium and bismuth from scrapped personal computer circuit boards, mobile telephones, consumer electronics and appliances, using its smelting technologies to process the waste. In cooperation with the Akita Prefecture government, where the subsidiary is based, and with a local university, Dowa has built one of Japan's largest networks for the collection and recycling of mobile phones and home electronics.

Similarly, Nippon Mining and Metals is pursuing the Hitachi Metal Recycling Complex project with a capital investment of approximately 11 billion yen (113 million dollars). The facilities, in Ibaraki Prefecture, will collect from waste materials metals such as gold, silver, copper, antimony, bismuth and nickel, confirming the company's determination to expand its Recycling and Environmental Services Business, in this case by "exploiting the abundant untapped recycling resources of cities."

TADASHI AIZAWA

Japan is the world's second-biggest user of electricity provided by photovoltaic modules.

Hitoshi Chiba and Osamu Sawaji, *The Japan Journal*