

THE JAPAN OF THE FUTURE

**CAN JAPAN RETAIN ITS ECONOMIC VIGOR
DESPITE AN AGING, SHRINKING POPULATION?
THE JAPANESE GOVERNMENT BELIEVES IT CAN.
SO DO MANY OF ITS LEADING COMPANIES.**

The rapid industrialization of China and India is redrawing the world economic map, with a focus firmly on Asia.

In response to this trend, Japan—the world’s second-largest superpower—is strategizing on how to remain competitive in the 21st century at a time when it must grapple with an aging population, dwindling natural resources, pollution, and climate change. The Japan Center for Economic Research, an independent think tank, predicts that by 2030 Japan’s real GDP will be less than half of India’s and one-fifth the size of China’s, while Japan’s population will plummet by more than 25%—from over 127 million now to around 94 million by midcentury.

To turn the tide, Japanese government officials are betting their hopes on innovation as a key to the nation’s continued prosperity. No sooner had Shinzo Abe, Japan’s former prime minister, assumed office in September 2006 than he established the Innovation 25 Strategy Group, a committee of thought leaders from industry and academia tasked with devising an “innovation roadmap” to take Japan up to the year 2025. Abe also created a new “Minister for Innovation” post, as well as establishing a cross-ministry Innovation Promotion Office to cut red tape and implement initiatives promptly.

But all this begs the question: Do Japanese companies actually need government help to be innovative? Bestselling, inventive products like Toyota’s Prius

hybrid car and Nintendo’s Wii handheld game console seem to suggest they’re doing perfectly well on their own. *Innovation: Transforming the way business creates*, a May 2007 report published by the Economist Intelligence Unit (EIU), actually ranked Japan as the top innovator out of the 82 countries surveyed, noting that it invests proportionately more in R&D, has more scientific researchers per capita, and generates 51% more patents than the fifth-placed United States.

The EIU survey may have ranked Japan No. 1 for innovation performance, but as an environment conducive to innovation—which includes such factors as flexibility of the labor market, regulation, and openness to foreign investment and cultural influence—it came in at a less reassuring 25th place. That,

says Akihiko Iwahashi, Deputy Director General for Innovation, Science, and Technology Policy, is where the government’s role begins.

“Innovation is not just about technological breakthroughs,” he explains. “It also involves new ways of thinking and new values. The seeds of innovation need to feed through to society fast, and government can create the social and legal environment to facilitate this. Too much regulation or an excessive attachment to the old way of doing things can nip innovation in the bud.”

The Innovation 25 roadmap reflects this holistic view, setting out not just specific technological goals but also strategies for social reform. Proposed changes include making it easier for highly qualified non-Japanese to get visas to work in Japan (part of “becoming a country more open to the world”) and helping make society more diverse by introducing flexibility into the country’s famously conformist education system. “The nail that sticks out will be hammered in” is



TECHNOLOGY ON THE FAST TRACK: JR Central’s Maglev train moves at 500 kph, offering travel time equal to an airplane but with lower CO₂ emissions.

an old Japanese saying to express the idea that unusual people will be forced to conform. But in the future the Japanese government is hoping to see a society where, as Iwahashi puts it, “the nails that stick out are actively encouraged to stick out even more.”

IGNITING THE CREATIVE SPIRIT

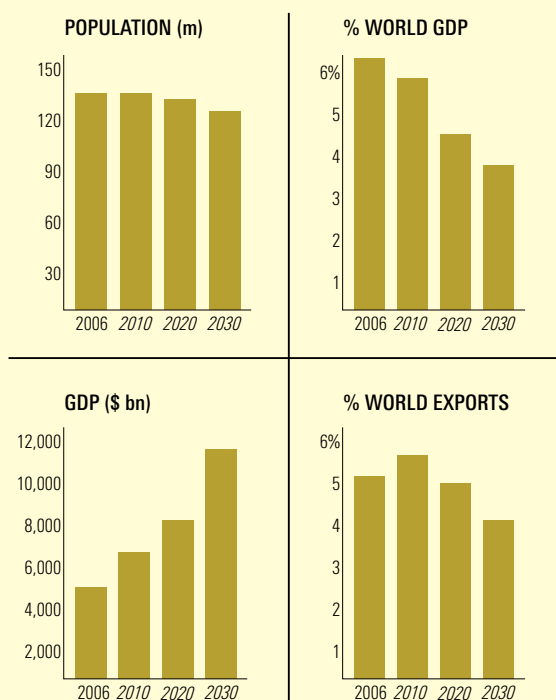
The change of consciousness proposed by Innovation 25 is nothing short of a seismic shift. Iwahashi sums it up like this: switching the focus from the organization to the fostering of individual talent, from internal to global competition and cooperation, and from condemning entrepreneurial failure to celebrating it as the first step on the road to success. But can Japan—traditionally seen as group-oriented, introverted, and risk-averse—really reinvent itself quite so radically?

Signs are that change is already underway. Take Tokyo-based Takram, an 18-month-old fledgling design-engineering firm. The company’s two founders are classic entrepreneurs; both studied abroad (one at the Royal College of Art in the U.K., the other at Stanford in the U.S.) and upon graduation nixed the notion of working at large Japanese companies. They feared that they’d be pigeonholed as engineers, which would stifle their creativity. The two have just returned from promoting their services to potential clients in the San Francisco Bay Area on a tour sponsored by Japan’s Ministry of Economy, Trade, and Industry (METI)—a case of the mandarins working side by side with the mavericks.

International, nonconformist, and passionate about what they do, Takram’s Kinya Tagawa and Motohide Hatanaka believe that innovation is an amorphous process that cannot be neatly segmented into distinct engineering and design stages. For them, innovation is about a richer user experience, something more likely to be achieved by good design and sensitivity to feedback than by technology alone. This was the kind of

WHAT LIES AHEAD

A snapshot of how Japan’s economic standing is predicted to change.



Source: Economist Intelligence Unit, May 23, 2007

down-to-earth thinking that inspired Afterglow, their recently launched software package designed to enliven PowerPoint presentations by letting audience members interact with the speaker by writing comments onto projected slides with an ordinary laser pointer. Having created the product through the three stages of concept-making, prototyping, and gathering user feedback, Takram handed over production and distribution to a third party, leaving itself free to focus on what it does best: incubate ideas.

Another young entrepreneur to have gotten a helping hand from government is Hidekazu Kondo, the 29-year-old president of the software company Lunascape. After a year of working at the consumer electronics giant Sony, Kondo dropped out to take one of the U.S. \$87,000 (¥10 million) research

scholarships that METI provides to 30 promising young scientists every year. Lunascape, which bills itself as “the world’s most advanced browser,” was the upshot of Kondo’s research project at Tokyo’s prestigious Waseda University. Launched in 2001, Lunascape incorporated a host of then-revolutionary features, including multi-tab browsing and the ability to build your favorite search engine into the browser bar. In a market dominated by Microsoft’s Internet Explorer, creative marketing has been essential. Kondo has promoted Lunascape by doing everything from teaming up with Toyota to create a branded browser for a new sedan to devising colored “skins” that let users customize the browser’s look, a feature that appeals to the design-conscious Japanese consumer. Kondo earns money by discreet ads that are fed to the browser by RSS, but his firm also develops and markets other software packages, including Takram’s Afterglow. “Japan is strong in hardware and middleware, but weak in software, especially PC applications,” says Kondo. “I want Lunascape to become the software equivalent to Sony in terms of style and innovation.”

THE CORPORATE AGENDA

“There are many paths to innovation,” says Takram’s Tagawa, who sees the process as inherently vague and defying regimentation. It’s a point of view that big business

shares. Just look at the range of approaches used by major Japanese firms, which are starting to forge research alliances with universities, establish R&D centers in hot spots like China and Singapore, buy up the peripheral (but highly sophisticated) operations of other large Japanese companies as they restructure to focus more firmly on their core competences, and put a greater emphasis on lifelong education with tutoring and in-house training centers for everything from technology to management.

One specific area where Japanese companies are being particularly innovative is green technology, a result of the hard lessons learned from dealing with the pollution that accompanied the country's breakneck postwar economic growth. Japan is already the world's most energy-efficient producer of steel and cement and it is a big producer of solar cells. It's also a leader when it comes to its citizens' green behavior. Japan has a level of public transport usage two or three times higher than the developed economies of the West—and public transport is inherently less polluting than private cars. Its citizens are scrupulous about separating and recycling trash, and the country even has a so-called Cool Biz movement encouraging people to dress in cool, casual clothes in the summer months to cut back on the CO₂ emissions from heavy air-conditioning use.

JR Central, Japan's biggest operator of intercity railway train services, is already turning green into a pillar of its marketing strategy. Its Shinkansen bullet trains currently transport around 400,000 people per day (versus

just 40,000 for airlines) on the main Tokyo-Osaka route. The company is wooing business travelers by noting that per kilometer, train travel causes a mere one-tenth of CO₂ emissions per person compared to those of air travel.

The train may be clean, but isn't the speed offered by planes an invincible argument in their favor? Not if JR Central's innovative superconducting magnetic levitation

environmentally friendly paper instead of metal. Another Toppan product, a carton for drinks and detergents called the Yasashii Ecotainer, is not just eco-friendly but people-friendly too. (Yasashii means "kind" or "gentle.") It incorporates special universal design features to make it easy to pick up, easy to pour, and slip-resistant—something very welcome to the aging, slightly less dexterous, Japanese consumer.



THE NEXT BIG THING: Takram's Afterglow software lets audience members interact with a speaker (upper left); Omron's efficient solar panels adjust to the sun's rays (upper right); and the Lunascape browser (left).

(Maglev) train becomes a reality. Traveling at 500 kilometers per hour 10 centimeters above the track, the new train would slice the journey time from Tokyo to Osaka to one hour from the present two and a half, delivering the same travel time as a plane but with a mere one-third the level of CO₂ emissions—dramatically superior environmental performance.

Not all the efforts of Japanese companies to make the world a greener place are quite so close to science fiction. The world's largest printing company, Toppan, recently introduced the Cartocan. It looks and functions like a tin can—except that it's made from



INNOVATIONS: Toppan's eco-friendly Cartocan is made from paper-based materials.

Iwahashi believes the Japanese have a successful track record when it comes to turning challenges into opportunities due to their ability to learn the lessons of adversity. The pollution caused by the country's headlong economic growth of the 1960s and the high energy prices after the 1973 oil shock could have been fatal blows for the island nation, but instead these troubles gave birth to the clean-manufacturing and energy-saving technologies in which Japan is now a world leader. If Japan can apply that same can-do mentality to the challenges it's now facing and successfully "flip the equation" to turn an aging society, a shrinking population, and planet-wide environmental degradation into positives, it will be an example of how to deal with problems that will one day confront the rest of the world.

—Giles Murray

Sustainability is our standard for measuring CO₂ reduction.

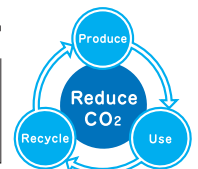
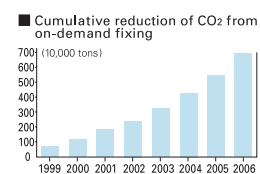


© Canon Inc. 2007

The Blue Hole in the Belize Barrier Reef, a World Heritage in the western Caribbean Sea.

One Canon energy-saving technology has reduced CO₂ emissions by nearly 7 million tons, the amount assimilated by the seas surrounding the earth's coral reefs each year.*

Extending for nearly 185 miles, the Belize Barrier Reef is home to one of the most diverse ecosystems on earth. At Canon, we believe corporations have a responsibility to undertake sustainable practices that help preserve such World Natural Heritages. In 1998, we embarked on a program to reduce CO₂ emissions throughout the lifecycle of our products. For example, we developed energy-saving on-demand fixing technology for our office equipment and home printers. Over 8 years, the reduction in CO₂ emissions attributable to our office equipment totaled some 6.99 million tons. That's approximately the amount of CO₂ assimilated in a year by 350,000 km² of seawater—more than the surface size of the coral reefs in all the oceans. Canon's many programs to reduce CO₂ emissions are all part of one corporate goal: sustaining the natural environment for future generations.



* There are approx. 290,000 km² of coral reef, 1 km² of seawater assimilates approx. 20 tons of CO₂ per year. Between 1999 and 2006, the CO₂ reduction attributable to Canon office equipment was 7 million tons, which is approx. 20% more than the seawater around the earth's coral reefs assimilates in a year.

Produce. Use. Recycle. CO₂-emission reduction throughout the product lifecycle.

CLOSE-UP ON CANCER

The cure for cancer may still be elusive, but innovations at Olympus Corp. are giving us a much clearer vision of what we're looking for.

You know the scenario: The nurse returns to the examination room with the results of your routine checkup. You're at an age when it's prudent to screen for this or that kind of cancer, so there's the inevitable anxiety playing on your mind ... even though you're sure there's nothing wrong. Happily, the doctor gives you a clean bill of health, but your relief is soon eclipsed by an even greater feeling of relief when you learn you won't have to think about the matter again for a decade or so.

This is the outcome envisioned by Olympus Corp., which is developing technologies to help detect cancer at such an early stage that the average person will only have to be screened once every ten years.

"As we enter an era of unprecedented advances for next-generation health care, one of the priority goals for Olympus is the development of minimally invasive products that apply its endoscope and other screening technologies to assist in the early detection of cancer," says Tsuyoshi Kikukawa, president of Olympus Corp.

For those only familiar with Olympus as a leading camera maker, this statement may come as something of a surprise. The company, however, was established in 1919 to make microscopes—the first in a long line of precision scientific and medical equipment. Today, Olympus enjoys a 70% share of the global market for gastroenterological endoscopes. More than 40% of its sales revenue is generated by its medical and life science businesses.

At the heart of the company's anti-cancer mission is its Corporate Research and Development Center (CRDC). In contrast to the company's regular R&D activities, the near-basic research conducted at the CRDC transcends its various business divisions to focus on potential diagnostic and therapeutic applications in clinical labs and hospitals. The results of the center's

cutting-edge research in the areas of molecular imaging and regenerative medicine are putting tomorrow's medical technology into the hands of doctors today.

BACK TO THE FUTURE

Olympus' journey from basic microscopy to these esoteric fields of next-generation medicine is characterized by innovation, inspiration, and some savvy decisions.

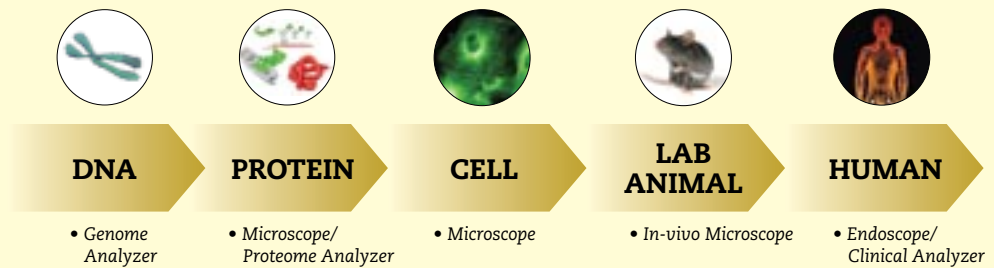
At the turn of the millennium, Japan's Ministry of Economy, Trade, and Industry established a consortium of academics and industry leaders to identify and prioritize the most pressing problems facing medical research in the country. The Medical Engineering Technology Industrial Strategy Consortium (METIS) identified seven areas for research and innovation, among them bionics, regenerative medicine, and intelligent surgical robots.

"Five of the seven areas were directly related to Olympus' core competencies," recalls Shuichi Takayama, CRDC director and a member of the board. "So we had to ask ourselves which of these had the greatest potential to become real products."

Around the same time that METIS was drawing up its roadmap, Olympus was surveying the dominant trends in life science and medicine and plotting a course of its own. Looking specifically at research being done on genes, cells, laboratory animals, and the human body, Olympus identified areas at the subcellular level that were not covered by its existing products. The field of molecular imaging—another direction designated by METIS—became a new focus for the CRDC.

FROM THE LAB TO THE MARKETPLACE

Applying "translational research," Olympus is turning knowledge obtained from its work in DNA, proteins, cells, and small animals into diagnostic and therapeutic tools doctors and clinicians are using on patients.



Olympus embarked on a project with three of Japan's top universities to develop a video endoscope system that utilizes a multispectral micro imaging device to look simultaneously for multiple tumor markers—something that's very difficult to do with conventional MRI and PET scans. Even more revolutionary is that the observations don't have to be made *in vitro* through a conventional microscope; they're done via an endoscope that can get close to the area of interest inside the living body.

Through the application of this molecular imaging



*Tsuyoshi Kikukawa, President
of Olympus Corp.*

technology, one day it may be possible to assist in the detection and removal of extremely early-stage cancers in procedures as basic as a routine biopsy.

REVOLUTIONARY PRODUCTS

Although cancer demands a great deal of attention at Olympus, by no means is it the only health issue the CRDC is addressing. The company is also working to develop products that help restore lost, damaged, or aging bones, tissue, and cells in the human body.

The precursor to this move into regenerative medicine is a product called OSferion, a beta-tricalcium phosphate (β -TCP)-based artificial bone-replacement material that Olympus introduced in 1999. Used primarily in orthopedic surgery, the material is placed in the void left by a damaged or diseased bone and acts as a scaffold while the body's natural recuperative power replaces the bone tissue. "The material was part of the glass making technology used in manufacturing lenses for Olympus products," explains Tomoaki Tamura, a senior product engineer in the R&D center. "Someone suggested that it could also have applications in the development of artificial bone material."

Spurred by this success, Olympus moved into the field of tissue engineering. In 2004 it established a subsidiary, Olympus Biomaterial, to create a bone-tissue

engineering business based on the same β -TCP material. In April 2007, this subsidiary merged its technology with the collagen business division of the Japanese medical equipment maker Terumo Corp. in a joint venture to develop new products in the fields of orthopedics, dentistry, oral surgery, plastic surgery, and dermatology. "The idea is to combine the artificial bone material with stem cells harvested from marrow in the spine, and to grow tissue-engineered bone in an *in vitro* environment," says Yuji Takamiya, a researcher at the Olympus Terumo Biomaterials Corp. Its developers hope the process will also work for teeth, skin, and—one day—even whole organs.

If that sounds futuristic enough, Olympus has also partnered with San Diego-based Cytori Therapeutics to develop a bedside medical device that extracts, via liposuction, body fat that is rich in stem cells, which in turn are returned to the patient as regenerative cells—all in a single, seamless process. The technology has potential application in reconstructive plastic surgery for breast cancer patients who have undergone mastectomies, where the transplanted stem cells will trigger the regeneration of breast tissue. The treatment of heart disease is another area where expectations are high.

REAPING THE REWARDS

This awe-inspiring array of innovations has not come cheap for Olympus. In the fiscal year ended March 2007, its overall R&D expenditure totaled \$462.5 million (¥55.5 billion), equivalent to 5.2% of net sales. Five years ago, expenditures were \$289.2 million (¥34.7 billion); this translates into a jump of almost 60%.

A cursory glance at Olympus' bottom line indicates that the investment is paying off. Last year, combined sales of Olympus' Medical and Life Science businesses amounted to some ¥435.4 billion, or 41.1% of the company's total global sales. The businesses' combined operating income was ¥95.9 billion.

Olympus' share price has more than doubled since it reorganized its imaging and medical operations in 2004 and established Olympus Medical Systems Corp. as an independent entity alongside Olympus Imaging Corp. The Life Science Group remains within Olympus Corp.

The bottom line: With its wide array of technology, Olympus' medical and life science business now extends from the human body all the way down through to the DNA level. Considered in the context of Olympus' corporate philosophy of fostering human health and happiness, the products—when lined up with those from Olympus' other businesses—extend across the entire spectrum of life.

"Olympus was founded to contribute to the advancement of medical science," says Kikukawa. "This legacy of corporate responsibility lives on in our continuing efforts to develop products that support the early detection of cancer, and in our endeavors toward personalized medicine and next-generation innovations in health care." — **Campbell Hanley**



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INNOVATIONS THAT COUNT

Ricoh stays on the leading edge by turning out new products that solve workflow problems for customers.

“It was a bit like that arcade game, ‘Bash-a-Mole.’ We’d work like crazy solving individual problems as they came up,” says Shiro Kondo, president and CEO of Ricoh, the office equipment maker with \$17 billion in annual sales, as he describes the company’s approach to innovation before he took over the product development reins. Now, instead of an almost infinite loop of testing and ad-hoc improvements, Kondo has introduced quality-engineering principles. Basically, this involves getting the technology 100% right at the first stage of development, using tools such as simulators, databases, and project management.

“It’s thanks to quality engineering that the Americans were able to send a man to the moon,” says Kondo. “What I’ve done is try and import the methods of NASA. The reliability of Ricoh products has improved immeasurably.”

Along with reliability, Ricoh’s copiers and multifunction printers are known for their green innovations. The hybrid quick start-up (QSU) technology that lets black-and-white Ricoh copiers go from zero-power to fully operational in less than ten seconds—a market-leading feature—was recognized with an award from the International Energy Agency (IEA), while even further energy savings are achieved by using a polyester resin-based toner that melts at temperatures ten degrees lower than standard toners. Innovations like these help customers save money as well as saving the planet.

But where do such innovations come from? According to Kondo, it’s a combination of elements. There’s education—whether that means sending young software engineers to study programming at U.S. universities, getting older staff to tutor their juniors, or offering free in-house practical training to everyone. Other incentives include in-house contests that offer funding for the winning invention. (Among others, these contests produced a copier that could copy a whole book, automatically turning the pages as it went.) But on one point Kondo is adamant. You cannot rely on researchers alone for innovative ideas. Ricoh actually gets many of its best ideas from customers. The company observes how they work, uncovers distinct patterns, and then proposes equipment and networks customized to optimize the workflow of specific organizations. “Our goal,” says Kondo, “is to deliver solutions to problems that our customers haven’t even recognized as problems.”



Shiro Kondo, President and CEO of Ricoh

Innovation also has a “big picture” side. Kondo receives regular reports from trend forecasters to keep abreast of changes that might influence or even undermine Ricoh’s business model—like the way the iPod pulled the rug from under the record labels. He sees the iPod as the epitome of dramatic innovation, pointing out that it brought existing technology together to offer an irresistible proposition: all one’s music, pictures, and documents stored on a single device. “The iPod shows that innovation is not just about new technology,” he emphasizes, “but about creating new customer value.”

Kondo sees fostering leaders who can cut through the clutter and make such intuitive leaps as a key part of his job. A copier may never be as much fun as an iPod, but Kondo wants to “humanize” Ricoh’s office products and make them as easy to use as coffeemakers, toasters, and other kitchen appliances—and, along the way, help simplify the process of knowledge creation.

Kondo’s commitment to innovation is deep. “It’s our life,” he declares. “Either we keep innovating and offering new forms of customer value, or we die.” The adoption of digital technology in the workplace began only ten years ago, Kondo points out. Clearly, then, there are still plenty of innovations we can look forward to in the future.

—Giles Murray

A CATALYST FOR CHANGE

Developing a breakthrough is hard enough, but transforming it into a commercial product is even harder. Japan's NEDO gives companies a helping hand.

Glowing with lurid pinks and purples, decorated with exotic plants and fish, and marked with sinister place names like "Devil River," "Valley of Death," and "Darwinian Sea," the illustration on the table between me and Masahiro Hashimoto, director general of the New Energy and Industrial Technology Development Organization (NEDO), looks like some kind of map. I wonder if it is a guide to hidden treasure, but then I learn it's a vivid visual metaphor created by the U.S. National Institute of Standards and Technology to express the pitfalls that lie waiting for inventors trying to turn their research into commercial products. Sure enough, a closer look of the map reveals a number of everyday terms such as basic research, business innovation, and viable business.

In Japan, Hashimoto is the man charged with helping the scientific community catapult technology and know-how past these obstacles and into the marketplace. To boost the odds of success, NEDO determines which advanced industrial, energy, and environmental technologies are of national strategic priority. It also allocates funds—subsidies to private companies, grants to universities—and helps project-manage the efforts of public research laboratories, private companies, and academia. "The 1990s are often referred to as 'Japan's lost decade,'" says Hashimoto, "but, in fact, it was in the middle of that decade that the country realized the importance of innovation and redesigned its whole strategy."

The size of NEDO's budget illustrates that point. Japan's corporations spend a combined U.S. \$111 billion (¥12.7 trillion) on research and development every year, but more than 90% of that actually goes into making incremental improvements to existing products, with only \$7 billion (¥800 billion) going to basic research. That makes the more than U.S. \$1 billion (¥125 billion) that NEDO pours into its 140 research projects equal to almost 16% of the total corporate investment in basic research. On top of this, since being reorganized as an incorporated administrative agency in late 2003, NEDO now has a free hand in allocating financial resources.

"Now we can propose, plan, fund, manage, and evaluate projects independently with the support of the Ministry of Economy, Trade and Industry (METI)," explains Hashimoto. "We have complete control of the



This NEDO-commissioned solar cell array provides a reliable electricity supply to the village of Noyon Soum in Southern Mongolia's Gobi desert.

national projects we run; we can cancel funding for projects that aren't going well and direct more money into promising-looking research."

BENEFITS OF BASIC RESEARCH

The awareness that NEDO's budget comes from the Japanese taxpayer is what makes Hashimoto so rigorous in project evaluation. He also recently commissioned a survey to see how key Japanese industries were exploiting technologies derived from NEDO research. Significant outcomes were found in fields ranging from automobiles to mobile telephone displays, but—since basic research in one area often leads to spinoff benefits in another—some of the results are not always obvious at first glance. Take NEDO's long-term commitment to solar-cell research. On the one hand, Japanese manufacturers like Sharp and Kyocera have won a significant share of the global market using technologies developed through NEDO projects; on the other, the same know-how has also contributed indirectly to advances in semiconductor manufacturing and LCD (liquid crystal display) panel technologies.

The twists and turns of innovation are something Hashimoto is accustomed to. NEDO may be positioned near what Hashimoto calls "the exit"—the point where industry finally turns research into marketable products—but it's always shuttling between the two worlds of commerce and science. "If you want to move beyond present-day technology, you often have to go back to science to find a solution," he explains. "We enable this back-and-forth process to take place." An example: When developing new materials like carbon nanofiber, NEDO will arrange for a number of upstream materials manufacturers to work together at a common research



laboratory on basic technology development, but come time to develop practical applications for those R&D outcomes, the original team will be joined by a variety of downstream companies tightly focused on the end user.

ON THE CUTTING EDGE

One NEDO-fostered technology on the cusp of commercialization is organic electro-luminescence (EL) lighting. In addition to obvious merits like brightness, thinness, and flexibility, organic EL is also environmentally benign, potentially consuming only 10% as much energy as a conventional light bulb and without harmful substances like the mercury found in fluorescent lights. At a Lighting Fair held in Tokyo's International Exhibition Center early this year, prototypes excited enormous public interest. "It could be the next generation of household lighting," says Hashimoto. The technology is now established, and cooperative research is giving way to the all-out inter-company competition of the "Darwinian Sea" phase.

NEDO backs research at different stages on the journey to commercialization, and not always from the start. In 2006, a researcher from the biggest Tokyo railway company contacted the organization about a prototype floor he was testing that could convert the pressure of people's footfalls as they



NEDO is funding research into a technology to convert commuter footfalls into a clean source of electrical power (left). Organic electro-luminescence may be the next generation of household lighting. This particular design was displayed at a lighting fair in Tokyo in March this year (right).

passed through a station's automatic ticket gates into electric power. "In this case, we joined at a late stage when the prototypes were already being tested in Tokyo Station," explains Hashimoto. "The aim of the project we're majority-funding is to increase the efficiency of the system more than ten times." The idea may look eccentric—but then again, it may just change the world. Imagine all the clean energy that would be generated if such a system were installed beneath busy sidewalks or under highways.

INNOVATIONS OF THE FUTURE

Of course, not all the technologies NEDO backs are quite so revolutionary. The organization's headquarters stands near Kawasaki station, a complex that includes the Azalea underground shopping mall. This is cooled by yet another new NEDO-supported technology. Instead of using a conventional water-based system, the mall uses one based on something called hydrate slurry—a combination of water and tetra butyl ammonium bromide, which has similar properties to the kind of material used in instant-icing pillows. Feeding this solution through the existing pipes and pumps of a building's cooling system cuts energy consumption by 30%. The technology has won a host of awards, and Hashimoto is confident it will expand beyond the five or so commercial buildings where it's currently in use.

Of course, this being Japan, some NEDO-based innovations are not merely eco-friendly but cute-looking too. Hashimoto whips out what looks like an ordinary leather wallet and flips it open to reveal four flat black strips attached to the inside. He places the open wallet under a lamp and attaches it by a flex to his cell phone, whereupon—presto—the "charging in progress" light comes on. The stylish wallet is in fact a portable phone charger based on thin film solar cells. This is a small display of a technology with enormous potential. Thin film solar cells like these are more durable, lighter, and more flexible than the traditional glass-based cell, meaning solar panels can now be attached to surfaces such as telephone poles, curved bus shelter roofs, or domed buildings.

"Just think of the scale of the energy savings in a place like the Tokyo Dome," says Hashimoto excitedly, referring to Tokyo's leading venue for anything from Rolling Stones concerts to baseball games. Once again, it looks like another NEDO innovation home run. ■



To learn more about NEDO's activities and its overseas representative offices in Washington, D.C.; Paris; Beijing; Bangkok; and Jakarta: www.nedo.go.jp/english