

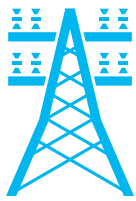


## Environment

Under the slogan of “Technology for Eco Life,” we help solving environmental issues through our leading-edge technologies and services.

In the world today, there are various environmental concerns, including climate change, depletion of energy and natural resources, pollution by chemicals and waste, and decline in biodiversity. TEL helps solving these issues through our leading-edge technologies and services.

## Highlights



Energy consumption level of a new equipment model compared to a previous generations

**40%**

The latest TiN metallization system reduced energy consumption by 40% compared to previous model.



Reduction of water consumption

**65%**

The Koshi factory in Kumamoto reduced water consumption by 65% during equipment evaluation process.



Environmental education

**5,000** people

About 5,000 employees took a web-based education course on environmentally friendly design.

## Goals and results for fiscal year 2016

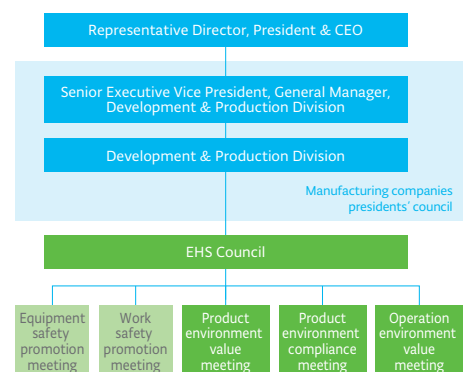
Theme	Goals	Results
Products	Reduce environmental impact of products. <ul style="list-style-type: none"> <li>Develop a roadmap for understanding the current situation and achieving the goals for fiscal year 2019*.</li> <li>* Reduce energy and pure water consumption per wafer by 10% (using fiscal year 2014 as the baseline).</li> </ul>	<ul style="list-style-type: none"> <li>Completed assessment of current situation of products manufactured in Japan and completed future roadmap.</li> </ul>
	Comply with Chinese RoHS. <ul style="list-style-type: none"> <li>Implement initiatives globally.</li> </ul>	<ul style="list-style-type: none"> <li>Integrated compliance initiatives for Chinese RoHS with environmental product compliance initiatives in other countries.</li> </ul>
	Promote voluntary product compliance with European RoHS. <ul style="list-style-type: none"> <li>Maintain the percentage of compliant parts in major models of each business unit at 98.5% or greater.</li> </ul>	<ul style="list-style-type: none"> <li>Goal was achieved and the results were tallied.</li> </ul>
	Comply with the environmental regulations of each country. <ul style="list-style-type: none"> <li>Continue to ensure products comply with environmental regulations (including China RoHS, GHS, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Conducted initiatives on an ongoing basis and expanded the scope of these activities to production sites outside Japan.</li> </ul>
Factories and offices	Promote energy efficiency. <ul style="list-style-type: none"> <li>Reduce energy consumption by 1% year-over-year.</li> <li>Continue activities.</li> </ul>	<ul style="list-style-type: none"> <li>Of the 12 sites in Japan and abroad with an established goal, 7 sites successfully reduced energy consumption by 1% year-over-year.</li> </ul>
	Reducing water consumption <ul style="list-style-type: none"> <li>Maintain recycling rate at the fiscal year 2012 level for Japanese sites, and at the base year level for overseas sites.</li> <li>Continue activities.</li> </ul>	<ul style="list-style-type: none"> <li>Attained 11 out of 15 goals set for Japanese and overseas sites.</li> </ul>
	Waste recycling <ul style="list-style-type: none"> <li>In Japan: Attain a recycling rate of 97% or higher.</li> <li>Outside Japan: Attain a higher recycling rate year-over-year.</li> </ul>	<ul style="list-style-type: none"> <li>In Japan: Attained a recycling rate of 98.4%.</li> <li>Outside Japan: Attained an increase of 0.3 percentage point year-over-year at manufacturing sites.</li> </ul>
Procurement and logistics	Green procurement <ul style="list-style-type: none"> <li>Continue activities.</li> <li>Plan activities based on analysis of survey results, conduct the third green procurement survey, and improve evaluation of low-scoring suppliers.</li> </ul>	<ul style="list-style-type: none"> <li>This year's green procurement survey was integrated with the Supply Chain CSR Assessment.</li> </ul>
	Reducing the environmental impact of logistics <ul style="list-style-type: none"> <li>Continue activities.</li> </ul>	<ul style="list-style-type: none"> <li>Continued activities and monitoring.</li> </ul>
Environmental management	Environmental management system <ul style="list-style-type: none"> <li>Adhere to the revised ISO 2015 standards.</li> </ul>	<ul style="list-style-type: none"> <li>Established an in-house project to adhere to the revised ISO 2015 standards and consolidate the environmental management systems for sites in Japan.</li> </ul>
	Environmental education <ul style="list-style-type: none"> <li>Provide web-based education on environmentally friendly design.</li> </ul>	<ul style="list-style-type: none"> <li>Provided web-based education to approximately 5,000 employees.</li> </ul>
	Environmentally friendly design <ul style="list-style-type: none"> <li>Implement education programs at design and procurement departments.</li> </ul>	<ul style="list-style-type: none"> <li>Programs implemented as part of the environmental education mentioned above.</li> </ul>
	Environmental communication <ul style="list-style-type: none"> <li>Continue to publish Environmental and Social Report.</li> </ul>	<ul style="list-style-type: none"> <li>Continued to publish the report.</li> </ul>
	Biodiversity <ul style="list-style-type: none"> <li>Based on the guidelines, conduct ecosystem tours multiple times at each factory in Japan.</li> <li>Hold symposiums.</li> <li>Create a list of conservation activity targets in key areas.</li> </ul>	<ul style="list-style-type: none"> <li>Conducted ecosystem tours in each area.</li> <li>Held symposiums.</li> <li>Created a list of conservation activity targets in key areas.</li> </ul>

## Framework

TEL promotes environmental activities across TEL through its corporate EHS Promotion Department. TEL executives appoint members to the product environment value meeting, the product environment compliance meeting, and the operation environment value meeting, all of which carry out activities to achieve our environmental goals. The EHS council convenes twice a year to assess progress toward our environmental goals and encourage continued improvement.

Since 1997, we have been working to obtain certification for the ISO 14001 environmental management standards. Seven sites, including many of our manufacturing subsidiaries, are currently certified. In fiscal year 2017, we plan to adhere to the revised ISO 2015 standards by consolidating the environmental management systems of our subsidiaries. Our Japanese systems will be consolidated first, followed by the overseas systems.

Through these efforts we continue to assess our compliance with environmental laws, emission standards, and other voluntary standards. TEL has not been involved in any environmental incidents or accidents. We have not been in violation of any environmental laws or subject to any associated legal proceedings in fiscal year 2016.



## Product initiatives

### Environmentally friendly products

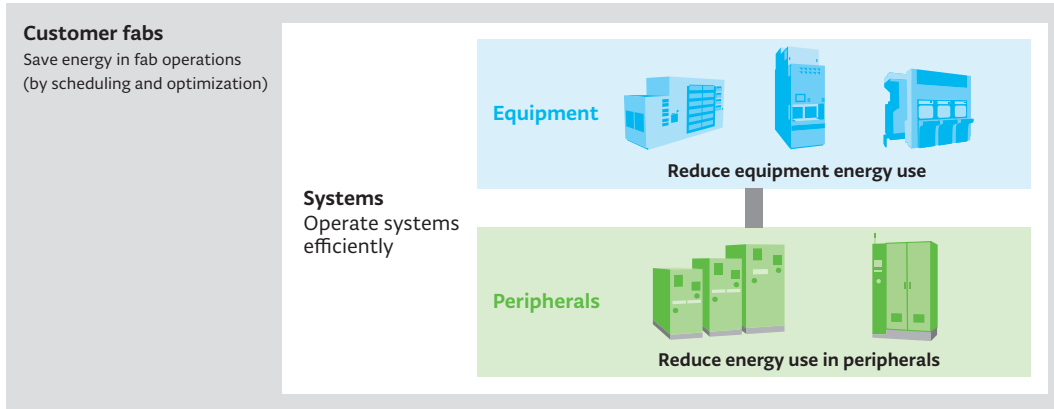
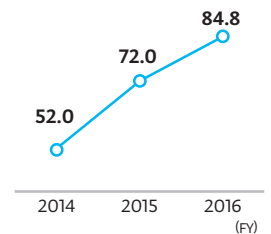
The total CO<sub>2</sub> emissions from the TEL value chain (including raw material procurement and product manufacture, transport, use, and disposal) was calculated according to the greenhouse gas (GHG) protocol. Emissions arising from product use currently account for 90% of our total emissions. For this reason, TEL has made it a key corporate objective to promote environmentally friendly product design and has been striving to lower the energy consumption of its products. In fiscal year 2015, TEL established a goal to reduce energy and pure water consumption by 10% by fiscal year 2019 (using fiscal year 2014 consumption as the baseline). In fiscal year 2016, TEL expanded the scope of this program to include products produced by its overseas subsidiaries. TEL also monitored TEL's global energy use while seeking to improve overall throughput. In addition, the percentage of sales of energy-saving models\* increased to 84.8% of the total product sales.

To reduce the overall environmental impact of our products at our customers' sites, we must examine our primary equipment, peripherals, associated facilities, and management of our own factories. Increasing the operational efficiency of the entire production system is increasingly important, along with encouraging energy-efficient operations of our customers' sites. We will continue to focus on monitoring and controlling our energy use. We also plan to demonstrate the importance of energy saving measures through compliance with SEMI S23, a semiconductor industry standard for assessing energy conservation.

To meet our goals, we are promoting environmentally friendly manufacturing through development of new technologies, further reduction in the use of energy, water, and chemicals, and proactive measures to contain greenhouse gases.

\* Based on in-house standards

Percentage of energy-saving model sales in total sales



### Energy conservation features of TiN metallization system

Thin film deposition is a key process in semiconductor manufacturing. Conventionally, chemical vapor deposition (CVD)<sup>1</sup> was the technology of choice for this process; however, the need for continued semiconductor miniaturization from our customers called for development of new equipment based on the Advanced Sequential Flow Deposition (ASFD)<sup>2</sup> process technology. This new technology not only enables deposition of nanoscale film with highly engineered properties, but can also be implemented at temperatures lower than those for CVD, making it a superior deposition technology in terms of energy conservation.

TEL's TiN metallization system was developed in response to this shift in process technologies. Due largely to its low temperature processing and idle-time energy conservation feature, the system achieved a 50% reduction in per wafer energy consumption in fiscal year 2014 as compared with its performance in fiscal year 2008.

The latest Triase<sup>+</sup>™ EX- II™ TiN Plus model features a newly developed reactor chamber and unique gas injection mechanism to attain significant improvement in throughput while reducing the energy consumption level to 40% of the previous model. As a result, the new model achieved the corporate target of reducing energy consumption per wafer by 10% from the fiscal year 2014 level. This is three years ahead of the fiscal year 2019 deadline.

1 CVD: A method for depositing thin films on substrates by decomposing source materials using thermal and/or chemical processes.

2 ASFD: Advanced Sequential Flow Deposition, a low-temperature processing method for forming nanoscale metal films with highly-engineered properties.

## Management of chemical substances contained in products

To achieve our goal of manufacturing environmentally friendly products, TEL has set up a system for managing hazardous chemicals in our products. In addition, we proactively collect information on relevant laws and regulations in Japan and abroad to properly ensure compliance. For example, when any substance of very high concern (SVHC) is present in our products at a level of 0.1% or higher, we disclose the information appropriately, based on EU REACH<sup>1</sup> regulations. We also provide safety data sheets (SDS) on the chemicals we use, in accordance with GHS<sup>2</sup> requirements.

To comply more effectively with regulations such as REACH and China RoHS<sup>3</sup>, in April 2015 we conducted a survey of our Japanese suppliers regarding the chemicals contained in their products based on the JAMP AIS<sup>4</sup>.

In fiscal year 2016, we expanded the previous year's Seminar on Design for Environmental Compliance and offered the course not only to managers but also to staff members from relevant departments. The seminar consisted of an overview of frequently revised environmental laws and regulations, lectures on target chemicals, and comprehension tests. About 5,000 employees took the course during the fiscal year.

We will continue to closely monitor and appropriately respond to relevant laws and regulations worldwide, further increasing our global efforts to reduce hazardous chemical substances.

## Logistics initiatives

Transport regulations are becoming more stringent due to worldwide environmental concerns such as global climate change and the rising demand to reduce the environmental burden of logistics activities. TEL has been implementing modal shifts<sup>5</sup> to use less environmentally harmful means of transport where applicable. For example, we have adopted ocean shipment for some semiconductor and FPD production equipment, and we are making efforts to reduce production lead time to compensate for the extra time it takes to ship by ocean rather than by air. We have extended the use of shelved trolleys from the shipment of FPD production equipment to semiconductor production equipment as well, thereby improving the load factor of trucks and reducing both CO<sub>2</sub> emissions and costs.

Our CO<sub>2</sub> emissions in fiscal year 2016 were 65 kilotons, down about 11% year-over-year. This is primarily due to the increase in the ratio of outbound international ocean shipments.

To conserve resources, we are using recyclable cardboard boxes for packaging. After equipment has been shipped and installed, casters and other specialized transport fixtures are collected and brought back to TEL factories for reuse. These are only a few examples of TEL's resource-saving efforts.

## Product reuse and recycling

As the need for more varied semiconductor production equipment increases, TEL is encouraging reuse and recycling of equipment and components by marketing refurbished TEL equipment and offering modification services to customers who have TEL equipment already installed.

Our refurbished equipment operations start with procuring used equipment from the market. This equipment is then properly tested and refurbished, before being offered to customers as TEL Certified Used Equipment. Our equipment modification services boost the productivity of installed equipment by maintaining and improving its quality and availability. Through these approaches, we address our customers' cost, speed, and performance needs, while also contributing to waste reduction and resource conservation and utilization. These efforts help reduce the use of resources and CO<sub>2</sub> emissions associated with procuring and manufacturing equipment and components. They are also effective in reducing the costs of production, logistics, and waste disposal.

1 EU REACH: EU Registration, Evaluation, Authorization and Restriction of Chemicals. An EU regulation pertaining to the registration, evaluation, authorization, and restriction of chemicals.

2 GHS: Globally Harmonized System of Classification and Labeling of Chemicals

3 China RoHS: Chinese regulation on materials including lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs). Businesses are required to provide customers with relevant information on the use of these materials.

4 JAMP AIS: Article Information Sheet (AIS) promoted by the Joint Article Management Promotion-consortium (JAMP). This sheet is used to communicate basic information on regulated chemical substances contained in products.

5 Modal shift: A change in the mode of transport; specifically, switching from conventional freight transport by truck or aircraft to a means that has a lower impact on the environment, such as rail or ocean.

## Factory and office initiatives

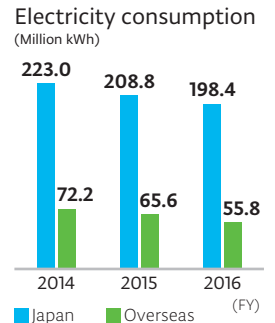
### Initiatives to prevent global warming and save energy

Each TEL factory and office has an established company goal of reducing energy consumption by at least 1% year-over-year. Initiatives to achieve these goals include energy-saving clean room operation, optimum temperature settings for office cooling and heating, and the introduction of highly energy-efficient equipment.

Photovoltaic power generation systems have been installed at some of our factories and offices in Japan, and the renewable energy they generated in fiscal year 2016 totaled 4,486 MWh. Tokyo Electron U.S. Holdings, Inc. has also been purchasing green electricity since 2001. Green electricity usage totaled 3,833 MWh in fiscal year 2016.

Out of the 12 TEL factories and offices worldwide with reduction goals, 7 achieved them in fiscal year 2016. Organization-wide power consumption in fiscal year 2016 was 254 GWh, down 7% year-over-year, and CO<sub>2</sub> emissions from energy consumption\* were 147 kilotons, down 8% year-over-year.

\* In calculating CO<sub>2</sub> emissions, the emission factor for TEL's electricity consumption in Japan in fiscal year 2016 was substituted by adjusted emission factors for the electrical power providers concerned. The emission factor for TEL's overseas electricity consumption was substituted by estimated factors calculated by the Federation of Electric Power Companies of Japan based on values published by the International Energy Agency (IEA).



### Example of initiatives

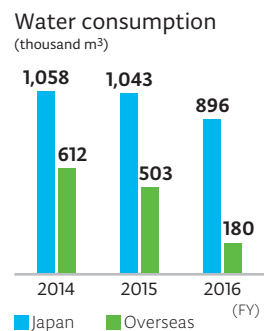
The Hosaka factory in Yamanashi installed a new air conditioning control system for its clean room. The atmosphere in a clean room must be precisely controlled, not only for cleanliness, but also for temperature and humidity. When controlling temperature and humidity, overcooling should be avoided, because overcooling must be compensated for by heating, which increases wasted energy. The newly installed system accurately monitors the atmospheric temperature and humidity inside and outside of the clean room and enables the air conditioning equipment to operate in an energy-efficient manner. As a result, the Yamanashi Factory saved about 670 MWh of electricity (335 tons of CO<sub>2</sub>) and 140 kl of heating oil (350 tons of CO<sub>2</sub>) in a year, reducing CO<sub>2</sub> emissions by 685 tons. The factory estimates that the system upgrade costs can be recovered within three years.

### Initiatives to reduce water consumption

TEL has established a goal of keeping water consumption at the same level or below that of a baseline year (fiscal year 2012 for factories and offices in Japan, and a fiscal year of their choosing for overseas operations). In fiscal year 2016, we achieved 11 out of the 15 goals at our sites worldwide. Continued efforts to achieve these goals include installing water-saving devices, watering lawns with rainwater, and implementing intermittent operation of cafeteria faucets. Overall, we reduced water consumption by 30% year-over-year to 1,076,000m<sup>3</sup> in fiscal year 2016, due in part to the closure of some overseas facilities. In fiscal year 2016, we discharged an estimated 905,000m<sup>3</sup> of wastewater.

### Example of initiatives

In fiscal year 2016, the Koshi factory in Kumamoto opened a facility for reusing water discharged from the semiconductor production equipment evaluation process, reducing water consumption by about 65%. The plant expects to recover its investment for this facility renovation in 1.8 years or less. In another example, the Fuchu Technology Center in Tokyo installed water-saving devices in the restrooms and the kitchen, reducing the overall water consumption by 12% year-over-year.



## Initiatives to reduce waste

TEL is contributing to waste reduction and recycling whenever possible by sorting waste, switching to waste-free production processes, and disposing of non-recyclable waste in an appropriate manner. TEL actively advocates waste sorting, and some of its facilities have participated in the electronic manifest system<sup>1</sup> to ensure proper waste management. In fiscal year 2016, the amount of incinerated and landfill waste generated by TEL in Japan was 122 tons. As a result of our waste-reduction initiatives, the recycling rate<sup>2</sup> at sites in Japan in fiscal year 2016 was 98.4%, achieving our goal of maintaining a recycling rate of 97% or higher for the 10th consecutive year. The recycling rate for TEL's overseas factories and offices was 87.9% in fiscal year 2016.

### Example of initiatives

TEL FSI, Inc., in Chaska, Minnesota, takes waste recycling measures, such as eliminating the use of disposable plastic cups and composting paper towels. As a result, TEL's recycling rate for 2015 increased to 70%, an increase of 6% from 2014.

## Management of chemical substances

TEL uses chemical substances in our product development and manufacturing phases. The use and release of chemical substances that are under the purview of the Japanese PRTR<sup>3</sup> law are consistently monitored and managed. Whenever we introduce a new chemical substance or change the way an existing substance is used, we check for environmental, health, and safety risks beforehand. We dispose of hazardous substances properly after use, either through expert waste disposal contractors or by using in-house processing equipment. In response to the April 2015 revision to the Fluorocarbons Recovery and Destruction Law, we have been conducting simple, regular inspections to monitor the amount of fluorocarbons that have been released and have been used in equipment as a refrigerant and the amount that has been recovered. In fiscal year 2016, our factories and offices did not exceed the level of fluorocarbon leakage that requires reporting.

## Biodiversity

TEL's activities impact biodiversity while also benefiting from it. In recognition of this, we are making efforts to conserve biodiversity and improve the conservation system.

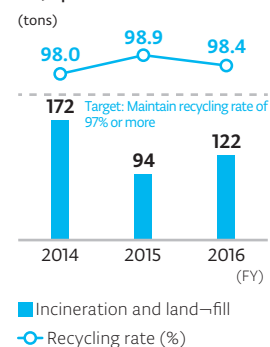
In fiscal year 2016, as in 2015, TEL met our goal of conducting at least two ecosystem tours at our Japanese sites, as part of our biodiversity conservation activities. The Koshi factory in Kumamoto held a lecture on biodiversity and biomimicry<sup>4</sup>, as well as an ecosystem tour of the property surrounding the plant, guided by members of the Forest Instructors Association of Kumamoto Prefecture. The tour's participants observed nearly 50 different plant species, and learned about the plants' characteristics. In addition, TEL drew up a list of targets for its conservation activities for fiscal year 2017, assessing the impact of previous ecosystem tours and consulting the Red List<sup>5</sup> of threatened species in the prefectures where TEL's offices and plants are located.

## Environmental communication

TEL's environmental policy requires that we foster a cooperative partnership with our wide-ranging stakeholders to reduce our environmental burden and properly respond to their expectations.

In both 2014 and 2015, the Esashi factory in Iwate invited its neighbors and local government representatives to the 6th Environmental Debriefing for the Local Community. TEL also held lectures at an environmental skill-building seminar for local businesses in Oshu City, Iwate Prefecture, and at the 2nd Environmental Business Seminar in Sendai City, Miyagi Prefecture, to enhance communication with our stakeholders and provide transparency around TEL's environmental activities.

### Recycling rate and generation of incinerated and landfill waste in Japan



1 Electronic manifest system: A system for electronically tracking the flow of industrial waste instead of using paper-based manifests (i.e. paper forms for tracking industrial waste). With this system, data processing centers, businesses that generate waste, and waste collection/disposal companies can share information over communications networks to streamline waste tracking.

2 Recycling rate: (Recycled amount / Amount of waste generated) × 100

3 PRTR: Pollutant Release and Transfer Register. A framework for tracking, tabulating, and disclosing quantitative data on chemical substances that may be hazardous to human health and the ecosystem, including the amounts used and discharged into the environment and the amounts transferred (as part of waste) off the original business' premises.

4 Biomimicry: An approach to creating innovative technologies by emulating the characteristics of living things.

5 Red List: A list of wild plants and animals facing extinction.