Community Solutions

Yokohama Smart City Project

The Yokohama Smart City Project (YSCP) was inaugurated in April 2010 as one of the Next-Generation Energy and Social System Demonstration Areas selected by the Ministry of Economy, Trade and Industry (METI). The main objective of the YSCP is to realize innovative changes in handling energy so as to achieve comfortable lifestyles and low carbon emissions in cities that already have a mature infrastructure. The YSCP consists of 15 subprojects implemented by 28 companies. Each company has been demonstrating its technologies, including energy management systems (EMSs), over a five-year period.

Toshiba has demonstrated grid stabilization and optimal energy management by applying community EMS (CEMS), building EMS (BEMS), home EMS (HEMS), and storage supervisory control and data acquisition (SCADA) technologies. We have focused on demonstrating demand response (DR)[*1], and have achieved the following results:

- The DR for 3 600 residential participants achieved a 14.9% reduction of peak electricity demand on average.
- The DR for 29 commercial participants reduced peak electricity demand by up to 23%.
- In a negawatt trading[*2] demonstration, we achieved more than 90% of the target for reduced electricity demand on average.

We will extend our technologies, systems, and services to other cities.

(*1) Changes in electricity demand in response to requests by a utility or aggregator

(*2) A service whereby an aggregator offers reduced electricity consumption by electricity users to a utility or an independent system operator

- One of the largest smart community projects
- Demonstration of new technologies and concepts (CEMS, battery SCADA, DR) for practical implementation

Target —> Achievement	HEMS (4 000 units —> 4 200 units)	PV (27 MW —> 36 MW)
EVs (2 000 units —> 2 300 units)	Enhanced reduction of CO_2 emissions (30 000 tons —> 39 000 tons)	Enhanced rate of reduction of CO_2 emissions (25% —> 29%)

EV: electric vehicle   FEMS: factory EMS CO_2: carbon dioxide   PV: photovoltaics
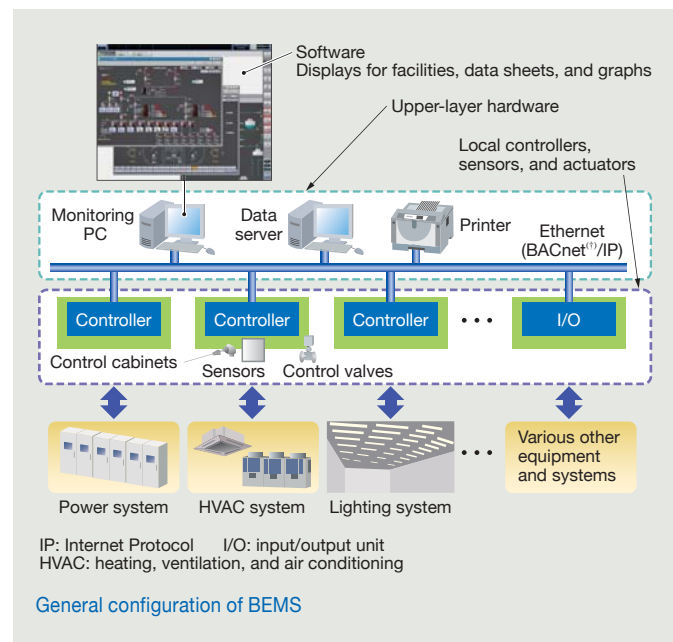
Overview and accomplishments of YSCP

Development of BEMS for Chinese Market

In 2012, Toshiba developed and shipped a building energy management system (BEMS) for overseas English-speaking markets. After obtaining an order for a BEMS project in China this year, Toshiba has developed a Chinese version of BEMS software with Chinese engineering manuals for system integrators as well as manuals for users. One feature of Toshiba's Chinese BEMS is that it provides the world's only Chinese predicted mean vote (PMV)[*] control function, which was codeveloped by Toshiba and Tsinghua University.

To deal with increasing energy demand and reduce environmental pollution, the Chinese government has issued new regulations related to green buildings. In response to these regulations, the building automation market in China is expected to show annual growth of 10% from 2014 to 2020. Toshiba considers this Chinese BEMS software to be a core technology and will continue to develop BEMS for the Chinese market.

(*)   An index of human sensitivity to the thermal environment, specified in the International Organization for Standardization (ISO) 7730:2005 standard

IP: Internet Protocol   I/O: input/output unit
HVAC: heating, ventilation, and air conditioning

General configuration of BEMS

BACnet is a registered trademark of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

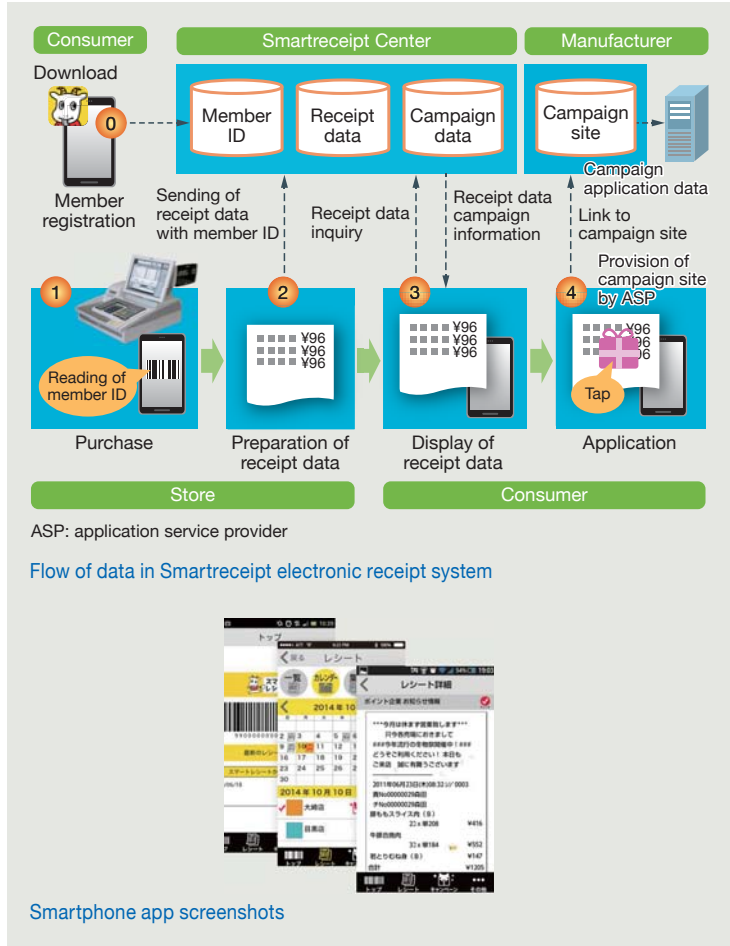## "Smartreceipt" Electronic Receipt System

Toshiba TEC Corporation has developed "Smartreceipt," an electronic receipt system in which point of sale (POS) terminals send receipt data to a cloud-based "Smartreceipt Center" instead of printing receipts on paper. Receipt data can be viewed via a smartphone application at any time.

This mobile application has many features, including:
*   the ability to search for past receipts
*   totaling of receipts by the day, week, or month
*   linkages to other bookkeeping applications
*   banner advertising displays.

Smartreceipt collects not only receipt data, but purchasing data as well. This allows the app to use purchase authorization information in order to lead consumers who have purchased specific items to campaign websites run by consumer-goods companies via an icon shown on receipt images within the app.

In the future, Smartreceipt will become a data management platform for many other services that utilize purchasing data.

Flow of data in Smartreceipt electronic receipt system

ASP: application service provider

Smartphone app screenshots

"TCxAmplify" Consumer Mobile Shopping Solution

Toshiba Global Commerce Solutions, Inc. has developed a consumer mobile shopping application called "TCxAmplify," which supports both consumer mobile shopping and associate line/queue busting by extending the capabilities of existing POS solutions.

The key features of TCxAmplify are as follows:
*   Consumer mobile shopping
    TCxAmplify provides faster checkouts and reduces the workload of store staff by allowing consumers to scan items using their own smartphones while shopping. It also allows retailers to differentiate themselves by providing a more interactive shopping experience, building brand loyalty, and increasing the effectiveness of promotions, while offering a faster and more convenient checkout option for mobile shoppers. Moreover, the delivery of information to customers directly via their smartphones provides a wide range of opportunities for retailers.
*   Associate mobile line/queue busting
    TCxAmplify also gives retailers a powerful associate line/queue busting capability, allowing greater versatility during peak shopping periods. Associate mobile line/queue busting increases shopper satisfaction while boosting total store throughput.

TCxAmplify consumer mobile shopping solution used in conjunction with POS applications

## "e-BRIDGE CloudConnect" Cloud-Based MFP Management System

Toshiba TEC Corporation has developed "e-BRIDGE CloudConnect," a cloud-based management system for multifunctional peripherals (MFPs) that is highly scalable and globally available.

The key features of this system include the following:

- remote monitoring and configuration of MFPs, which drastically reduces the number of service visits to customer sites
- failure prediction by monitoring MFP usage and error history, to prevent interruption of print services
- provision of statistical data on the use of MFPs, to assist in planning future MFP product updates.

Since the launch of this service in the United States in July 2014, the number of connected MFP devices has grown rapidly to 10 000 MFPs throughout the U.S.

Service launches in Europe and the Asia-Pacific region are planned in 2015.

Configuration of e-BRIDGE CloudConnect system for MFPs
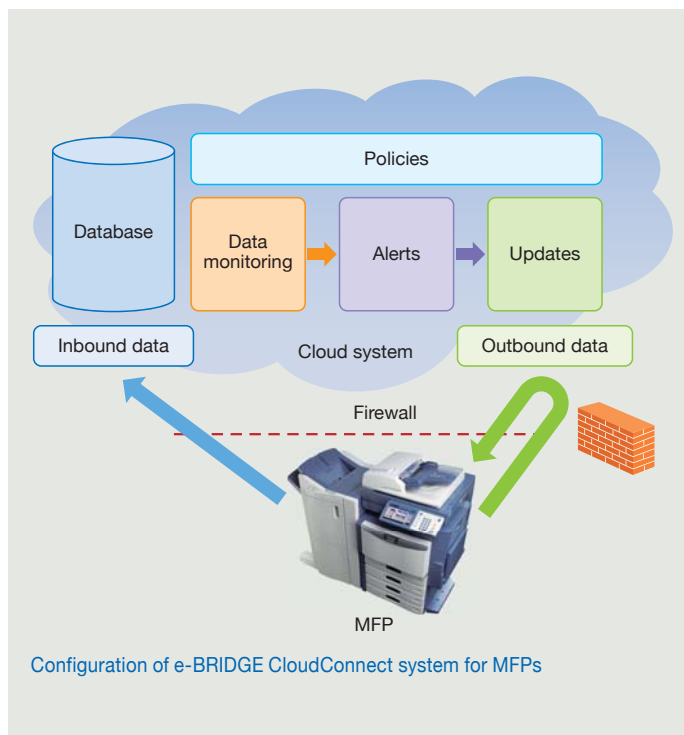
"TCxFlight" Mobile Hybrid POS Terminal

Toshiba Global Commerce Solutions, Inc. has developed a mobile hybrid POS terminal called "TCxFlight" for tablets that combines an exclusive retail-hardened exterior and a docking station.

The main features of TCxFlight are as follows:

- A wide variety of configurations are available for fixed and mobile environments.
- The 11.6-inch wide display is suitable for both fixed and mobile use.
- The terminal offers high mobility with a durable dedicated case for tablets, allowing the POS application to be used anywhere in the store.
- TCxFlight can be utilized not only as a POS terminal but for many other applications as well, including as a kiosk terminal or desktop workstation.


TCxFlight mobile hybrid POS terminal

Shock-Absorbing Material for Front Edge of Escalator Steps to Improve Safety

Toshiba Elevator and Building Systems Corporation has developed a shock-absorbing material for the Kindmover series of escalators as a standard feature to reduce injuries if a rider falls on the steps.

The shock of an impact against the steps can be significantly reduced in the event of an accident when voice announcements and other conventional proactive measures fail. Mitigation of injuries was quantitatively evaluated using the Head Injury Criterion (HIC)(*), a standard used to assess safety in the automotive industry and in areas such as playgrounds for children.

It was verified that the shock-absorbing material reduces the probability of sustaining a slight injury at the top or bottom of an escalator or a fatal injury on the inclined part by about 50%.

(*) Under this standard, the degree of head injury is calculated based on collision acceleration.

Kindmover

Escalator with shock-absorbing material affixed to front edge of escalator steps
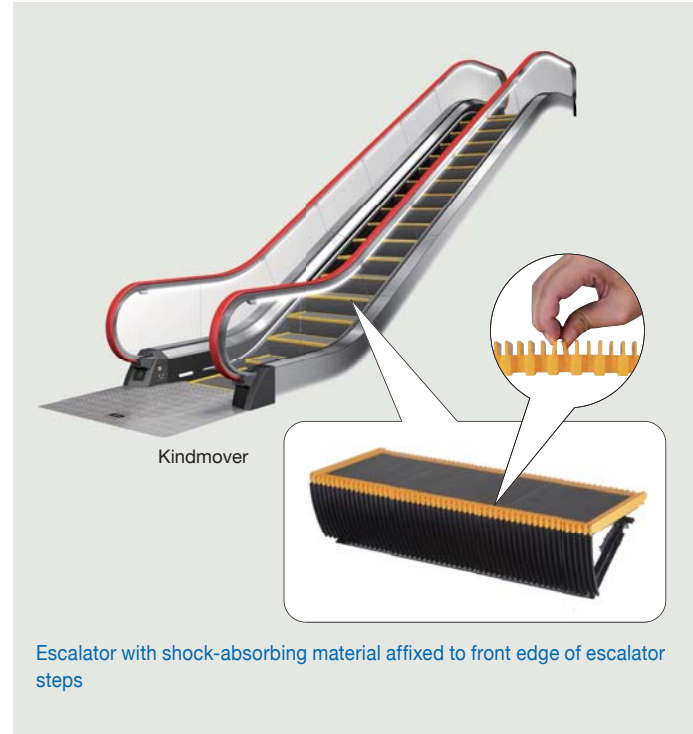
"TOSMOVE-NEO" Function for Continuous Elevator Operation during Power Failure

Toshiba Elevator and Building Systems Corporation has developed and commercialized a continuous operation function for elevators, called "TOSMOVE-NEO," to ensure greater peace of mind for elevator passengers.

This function utilizes power-saving and safety technologies to achieve continuous elevator operation during an unexpected power failure for up to two hours. Instead of stopping suddenly, the elevator slows down and travels to the nearest floor. Passenger unease is reduced by the smooth switching of operations after a power failure. Moreover, when hybrid operations are adopted, a special rechargeable battery is charged during normal operation and used in an emergency, such as a power failure. This contributes to energy saving.

TOSMOVE-NEO also meets market requirements by providing various features such as a liquid crystal display (LCD) indicator and the ability to switch between energy-saving operation and operation during a power failure.

Controller and LCD indicator of TOSMOVE-NEO

Multicolor LED Ceiling Light Fixture

Toshiba Lighting & Technology Corporation has launched two types of multicolor ceiling light fixtures with new functions. They are respectively available with brightnesses of 5 000 lm and 3 800 lm.

These multicolor ceiling light fixtures can disseminate light in various colors to meet the needs of users. The light-emitting diode (LED) light is capable of producing the colors of daylight white, warm white, red, blue, and green.

The multicolor ceiling light fixture has a function called the "good sleep assist function." This function supports sleep with soft light of 2 200 K color temperature. We have experimentally confirmed that a shorter time is required for a subject to fall asleep with the good sleep assist function than with a conventional ceiling light fixture. Furthermore, users can set 310 000 types of light colors by controlling the five LED colors individually.

Multicolor LED ceiling light fixture

Dimmable LED Lamp Using GaN Power Device for Replacement of 100 W Halogen Lamps
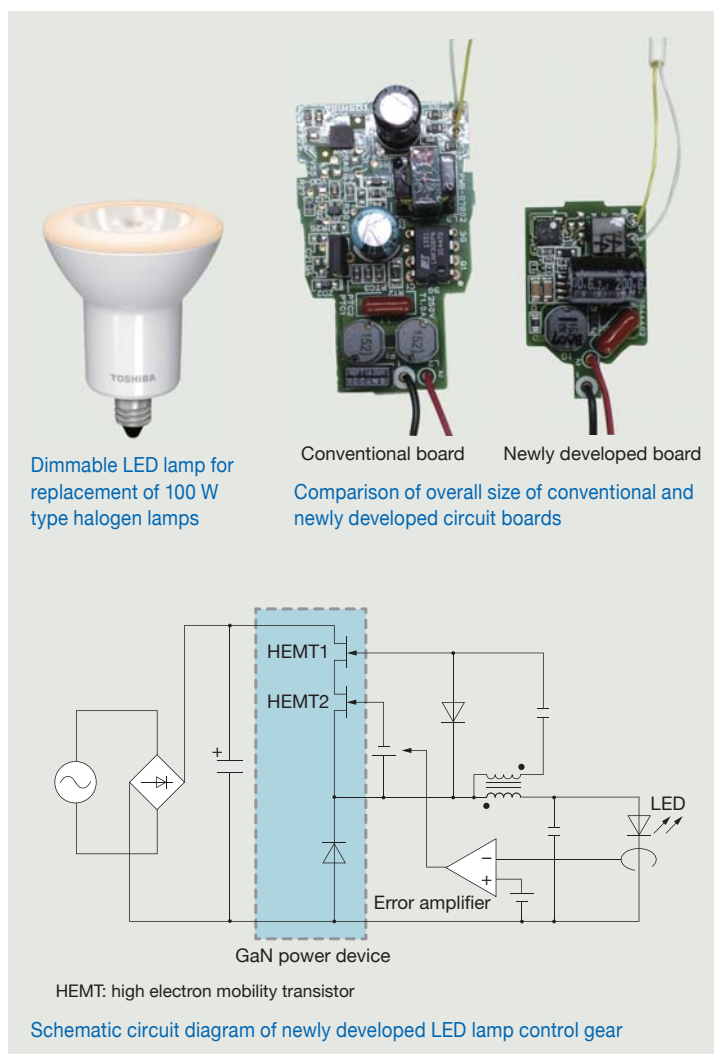
Toshiba Lighting & Technology Corporation has developed a control gear equipped with a gallium nitride (GaN) power device, the first in the lighting industry[*], and commercialized a dimmable LED lamp for replacement of 100 W type halogen lamps. We took advantage of the fast and efficient switching characteristics of a GaN device to downsize the passive components. As a result, we realized a compact control gear with a phase-controlled dimming function. The area occupied by the circuit board has been reduced to 40% compared with conventional products, making it possible to mount the newly developed lamp on existing halogen lamp fixtures.

The GaN power device is a dedicated power module composed of a normally-on type field-effect transistor (FET) and a fast diode. It operates at a switching frequency of 700 kHz, 10 times that of a conventional control gear.

The new lamp is equipped with the unique "premium dimming technology," which offers a brightness range from zero to 100% without flickering.

A dedicated lens is used to realize uniformity of the light, thus producing lighting with vivid contrast.

(∗)　As of February 2015 (as researched by Toshiba Lighting & Technology Corporation)

Dimmable LED lamp for replacement of 100 W type halogen lamps

Conventional board　Newly developed board

Comparison of overall size of conventional and newly developed circuit boards

HEMT: high electron mobility transistor

Schematic circuit diagram of newly developed LED lamp control gear

"Ultra Power Eco" Series Air-Conditioning System for Stores and Offices

To conform with Japanese laws related to saving energy and controlling hydrofluorocarbon (HFC) emissions, Toshiba Carrier Corporation has commercialized the "Ultra Power Eco" series air-conditioning system for use in Japanese stores and offices. This system has achieved the top position in the industry for energy-saving performance, as well as a low global warming potential (GWP) by using the new refrigerant R32.[*1]

By newly developing a cabinet and various parts (compressor, propeller fan, heat exchanger, and inverter), optimizing the control of operating modes, and ensuring reliability, we attained the No. 1 rank in the industry in the following four areas[*2]:

- No. 1 energy saving in the industry in APF2015[*3]
- cooling capacity for outdoor temperatures of up to 52°C
- heating capacity for outdoor temperatures as low as -27°C
- three-year guarantee ahead of our competitors in the industry.

Moreover, the installation space required for the outdoor units has been reduced by 50% in comparison with conventional models.

(*1) The GWP of R32 is about one-third that of refrigerant R410A.

(*2) As of January 2015 (as researched by Toshiba Carrier Corporation)

(*3) APF: annual performance factor. The Ultra Power Eco has achieved an APF of 6.7, the best in the industry for a 3 horsepower (hp) model.
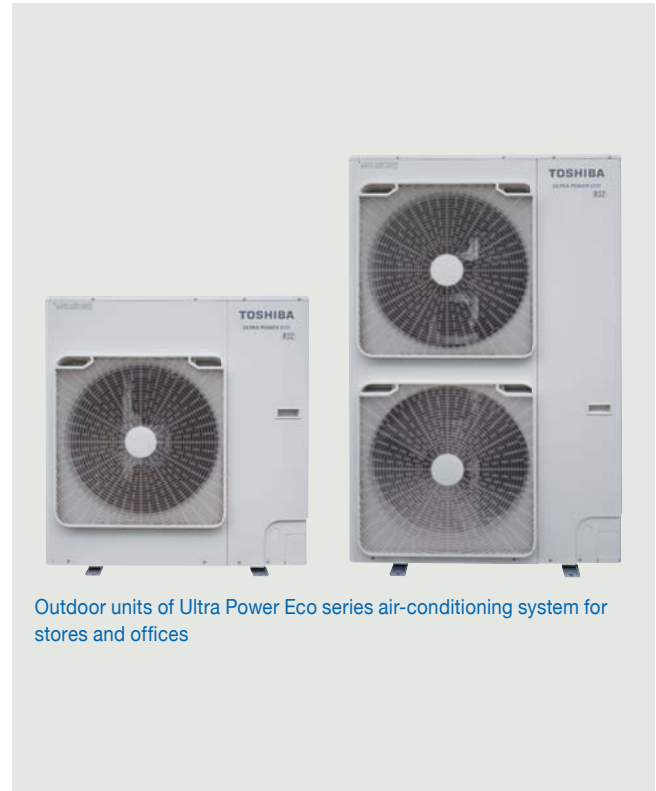
Outdoor units of Ultra Power Eco series air-conditioning system for stores and offices

SMMS-C Air-Conditioning System with Variable Refrigerant Flow for Chinese Market

Toshiba Carrier Corporation has commercialized the SMMS (Super Modular Multi System)-C air-conditioning system, a cost-oriented, variable refrigerant flow system specialized for use in medium-sized office buildings, in response to the increased development of small-scale third- and fourth-tier cities in China.

Compressor performance has been improved by increasing the compressor capacity and using higher speed rotation. This allows a reduced number of compressors to be used in the outdoor unit. With production and parts procurement carried out within China, a cost reduction of about 30% is achieved compared with the domestic Japanese SMMS-i model.

Moreover, the capacity of the outdoor unit has been increased from 16 hp to 18 hp, making it possible to decrease the system cost and the installation cost for connecting outdoor units. The product has also received a first-grade rating in China's energy-saving standards among all models.

Outdoor units of SMMS-C air-conditioning system for office buildings