

## Efforts Aimed at Realizing an Infrastructure Services Company Contributing to the Solution of Social Issues



Executive Officer  
Corporate Senior Vice President and  
CTO

ISHII Hideaki

We are facing many social issues such as global warming, increasingly intense natural disasters, and the spread of coronavirus (COVID-19) infections, and these issues are becoming more and more complicated. Leveraging its extensive knowledge and expertise cultivated through decades of experience in the infrastructure and energy businesses, the Toshiba Group is endeavoring to solve these social issues and the challenges faced by customers by combining its unique cyber-physical system (CPS) and other cutting-edge technologies while envisioning the ideal future. Steadily pursuing the Toshiba Next Plan announced in 2018, we have shifted our focus to spurring growth based on the strengthening of core earning power. We aim to achieve stable growth as an infrastructure services company and develop further into a world-leading CPS technology company.

At the FY2020 Technology Strategy Briefing held in December 2020, we articulated carbon neutrality, reinforcing infrastructure, and responding to the “new normal” as urgent social issues and set forth our initiatives for solving these issues through CPS-based infrastructure services. The briefing also covered our initiatives concerning common fundamental technologies that support the open provision of infrastructure services based on artificial intelligence (AI), security technology, and the Toshiba Internet of Things (IoT) Reference Architecture. In addition, we discussed our initiatives for cutting-edge technologies, including quantum technologies (e.g., quantum cryptographic communication, the Simulated Bifurcation Machine™), precision medicine (e.g., early cancer detection technology using micro-ribonucleic acids (miRNAs) and biodegradable liposomes), and differentiating device and component technologies (e.g., the next-generation SCiB™ rechargeable battery, power devices). *TOSHIBA REVIEW Science and Technology Highlights 2021* provides a snapshot of the latest results that we have achieved through technological initiatives aimed at solving social issues, developing fundamental technologies for infrastructure services, and inventing new technologies.

Our achievements related to carbon neutrality and energy-saving technologies are wide-ranging and include a low-cost, high-efficiency tandem solar cell; the commencement of demon-

stration operation of a large-scale hydrogen energy system using renewable energy; a large-capacity DC circuit breaker for multi-terminal high-voltage DC (HVDC) transmission systems; a hybrid propulsion system for the test vehicles of the HC85 series operated by Central Japan Railway Company; and a silicon carbide (SiC) module in an industry-standard package consisting of third-generation SiC metal-oxide-semiconductor field-effect transistors (MOSFETs) and Schottky barrier diodes (SBDs).

Our technological achievements for the reinforcement of infrastructure include commercialization of a service for the sensing of river water levels and rainfall amounts using LPIS™, a power-efficient wireless IoT solution to realize a wireless multihop network; and the launching of a data collection service using LPIS™.

We have also introduced many technological innovations in response to the “new normal” such as the development of a packaged digitization service for visualization of the movement of workers at manufacturing sites; intelligent robots that help to save labor required for logistics and manufacturing work and those for the automation of distribution centers; the ToScLive automatic captioning system designed to help improve attendees’ comprehension of online lectures and meetings; a technology that makes it possible to count the number of people in a crowd with high speed and high accuracy using an ordinary PC; and a remote monitoring system for escalators that reduces the workload of maintenance personnel.

In the field of cutting-edge and fundamental technologies, our achievements include the progress of quantum key distribution (QKD) toward practical applications; an automated manufacturing technology using AI and IoT; tumor-tropic liposome technology for precision medicine designed for the selective delivery of therapeutic genes to tumor cells; and an aqueous lithium-ion battery with enhanced safety.

*TOSHIBA REVIEW Science and Technology Highlights 2021* also provides an overview of our technological achievements in each business domain. In the energy business domain, Toshiba Energy Systems & Solutions Corporation has completed its work on the JT-60SA thermonuclear fusion device and launched a security enhancement solution service for power generation control systems. In the social infrastructure business domain, Toshiba Infrastructure Systems & Solutions Corporation has developed the high-energy, high-power 20 Ah SCiB™ cell and the high-energy 26 Ah SCiB™ cell using a new material. In the electronic devices and storage business domain, Toshiba Electronic Devices & Storage Corporation has developed 18 terabyte (tera:  $10^{12}$ ) 3.5-inch nearline hard disk drives (HDDs) applying flux control microwave-assisted magnetic recording (FC-MAMR) technology and a visual simultaneous localization and mapping (visual SLAM) technology that combines data from sensors with camera images to improve motion estimation for vehicles traveling at ultralow speed. In the digital solutions business domain, Toshiba Corporation has expanded the lineup of common HABANEROTS components for the IoT platform for energy systems, and Toshiba Digital

Solutions Corporation has commercialized an AI service for predicting the risk of lifestyle-related diseases based on health examination results. In the building solutions business domain, Toshiba Carrier Corporation has released a new series of high-efficiency variable-refrigerant-flow (VRF) air-conditioning systems equipped with features to promote the transition to the new series, and Toshiba Lighting & Technology Corporation has expanded its lineup of camera-equipped light-emitting diode (LED) lights. In the retail and printing business domain, Toshiba Tec Corporation has commercialized the e-STUDIO330AC/400AC series of high-performance full-color A4 multifunctional peripherals (MFPs) incorporating design concepts for high-performance A3 models.

We will further facilitate the R&D of leading-edge technologies to create unique infrastructure and data services, aiming to solve social issues together with our customers and partners. We hope that you will enjoy reading *TOSHIBA REVIEW Science and Technology Highlights 2021* and, as always, we would appreciate your feedback, suggestions, and comments.