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Media Release

Celebration of Engineering Brilliance and Launch of New Partnerships in Artificial Intelligence at National Engineers Day 2020

Minister for Sustainability and the Environment, Ms. Grace Fu witnessed signing of MoUs involving IES, AI Singapore, AI Professionals Association and SMRT Corporation to anchor deep AI capabilities and develop local AI talent for Singapore's engineering cluster

Fifteen local projects awarded for innovative solutions to improve the way Singaporeans live, work and play amidst the 'new normal'

The first hybrid National Engineers Day (NED) 2020 event concluded today at The Institution of Engineers, Singapore (IES) Building with the Engineering Innovation Challenge (EIC) 2020 Prize Announcement Ceremony. The digital-physical hybrid event held from 12 to 21 November offered students across Singapore insights into the latest advancements and career opportunities in engineering through a series of online talks, workshops, site visits, along with a virtual booth exhibition and interactive contests.

Ms Grace Fu, Minister for Sustainability and the Environment graced the event as the guest-of-honour and addressed close to 1,000 students and other guests on livestream. She also witnessed the signing of three memorandums of understanding (MoU) to deepen artificial intelligence (AI) capabilities in Singapore's engineering cluster; unveiling of the winners of the IES Prestigious Engineering Achievement Awards and the student teams of EIC 2020; and launched the third edition of Who's Who in Engineering, Singapore.

NED 2020 Virtual Exhibitions

This year's NED presented its first-ever virtual exhibition, an interactive platform showcasing technological innovations from leading engineering organisations in Singapore. Freed from the space limitations of a physical event, the online format allowed for participation from 18 exhibitors, a significant increase from previous years.

Besides learning about exciting engineering advancements, students can also have fun taking part in a quiz and winning attractive prizes from the comfort of their homes. The virtual booth was launched on 12 November and will be kept open until 30 November to nurture interest in engineering amongst more students.

MoUs to boost national AI capabilities

Three MoUs were signed today at the ceremony, marking a notable milestone in engineering advancements in the field of AI in Singapore.

- **MoU between AI Singapore (AISG) and IES** – to drive cluster-wide adoption of AI solutions by its member companies in the engineering sector in Singapore. The collaboration will also seek to grow certified local AI engineering talent through AISG's talent programmes such as AI for Industry, AI Apprenticeship Programme and the AI Certified Engineer certification programme.

The MoU will facilitate project proposals to AISG for development of deployable AI solutions under AISG's 100 Experiments (100E) programme. The ceremony saw ST Engineering Electronics becoming the first recipient to receive a Letter of Award from AISG for their 100E project on AI-based object for unmanned surface vehicles.

- **MoU between AISG and SMRT Corporation** – as part of the above-mentioned MoU, SMRT will be the first organisation in Singapore to collaborate with AISG on multiple AI projects under the AI Engineering Hub (AIEH) programme.
- **MoU between AI Professionals Association (AIP) and IES** – to develop and promote joint learning and development programmes for engineering communities in Singapore.

“AI is a frontier technology of the digital age, holding immense potential for improving lives, increasing productivity and opening up new growth opportunities. Through these MoUs, IES hopes to put in place a ‘green lane’ for local companies to tap on AISG's AI Innovation programs and

engineering expertise; and fast track the co-creation of innovative AI solutions in Singapore,” said Dr Richard Kwok, President of IES.

“AISG is honoured to partner with IES and AIP to identify up to 20 AI projects, which will be supported under AISG's 100E programme, in the engineering sector in Singapore, as well as train up to 50 Singaporeans as Certified AI Engineers through AISG's AI Apprenticeship Programme (AIAP) over the next two years. In addition, AISG will partner with Google Cloud on this initiative, providing participants in the programme advanced Cloud AI technology and expertise to help them on their journey,” said Laurence Liew, Director of AI Innovation, AI Singapore. “We are also excited to have SMRT on board as the first organisation in Singapore to collaborate with us on multiple AI projects under the AIEH programme.”

IES Prestigious Engineering Achievement Awards 2020

IES today announced the 15 winning projects of the IES Prestigious Engineering Achievement Awards 2020, recognising the outstanding contributions of local engineers to advancing engineering and enhancing quality of life of Singaporeans. This year, IES received a record number of 50 submissions, an indication of the expanse of engineering innovations being developed in Singapore.

The winning projects are in four categories: Applied Research & Development, Engineering Project, Technology Innovation and Young Creators. The judges accorded the highest ratings to these teams for resourcefulness in the planning and solving of design problems; pioneering use of materials and methods; innovations in planning, design and construction; and unique aspects and aesthetic values.

This year's winning projects have demonstrated excellence in impacting lives, society and economy from setting up of a healthcare facility to handle infectious outbreak and shepherding wildlife for animal well-being to enhancing productivity and sustainability in construction and new waste recycling and food waste co-digestion approaches.

Please refer to Annex 1 for list of winners and project descriptions.

Launch of Third Edition of Who's Who in Engineering, Singapore

IES also launched “Who's Who in Engineering, Singapore” a publication that recognises outstanding engineers for their contributions to Singapore's economic progress, nation development and enhancement of quality of life. The third edition featured engineering profiles selected from more

than 60,000 engineers from more than 1,000 organisations. The book is available for purchase online at <https://bit.ly/WWIES2020> at a retail price of \$120 (excluding GST).

Engineering Innovation Challenge (EIC) 2020 Winners

A total of 101 student teams battled it out at the annual EIC 2020, jointly organised by IES and Science Centre Singapore, and supported by Singapore Nuclear Research and Safety Initiative (SNRSI) and the Ministry of Education. This unique competition provided students with the opportunity to work under the close mentorship of industry leaders to gain hands-on experience in developing solutions for real world problems to demonstrate their engineering capabilities.

With the help of 2019's EIC champion team's winning prototype, Rad-X, EIC 2020 challenged students to design projects and prototypes in response to the topic "Radiation 360". Winning projects were aimed at improving the food security of Singapore and the region – from enhancing crop quality, crop yield and crop growth to extending the shelf life of food to reduce food wastage; and improving food packaging materials for radiation processing to creating a portable beverage disinfectant to reduce the spread of food-borne viral infections.

The four champion teams are:

- **Category 1 (Secondary Schools):** Team S-26 from River Valley High School with their project titled 'GROWnite'
- **Category 2 (Junior Colleges):** Team J-13 from National Junior College with their project titled 'Improving Materials for Packaging Food for Radiation Processing'
- **Category 3 (Polytechnics and Institution of Technical Education):** Team P-04 from Temasek Polytechnic with their project titled 'Food Rejuvenator'
- **Category 4 (Local and Overseas Universities):** Team U-22 from National University of Singapore with their project titled 'BevSafe: A Hand Crank Powered Portable UV-C Based Beverage Disinfectant'

Please refer to Annex 2 for list of winners, project descriptions and breakdown of prizes for each category.

"Holding a student-centric event in the midst of a pandemic presented IES with many challenges. However, it has also highlighted the urgency in nurturing the next generation of engineers to develop solutions that can keep us safe, provide quality of life and stimulate economic competitiveness. This is encapsulated aptly in the NED 2020 theme: 'Transforming the Future

through Engineering’. We are encouraged to see our students responding enthusiastically to the EIC 2020 challenge with brilliant inventions. Such resilience amongst our younger generation will pave the way for a brighter future for all of us,” said Ms Jasmine Foo, NED 2020 Chairperson.

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i. Annexes

1. Annex 1 – IES Prestigious Engineering Achievement Awards 2020 Winners & Project Descriptions
2. Annex 2 – Engineering Innovation Challenge 2020 Winners, Project Descriptions & Prizes

ii. Chinese Glossary

Terms in English	Terms in Chinese
The Institution of Engineers, Singapore (IES)	新加坡工程师学会
National Engineers Day	全国工程师日
Dr Richard Kwok, IES President	郭威安博士, 新加坡工程师学会会长
Engineering Innovation Challenge	工程创新挑战
IES Prestigious Engineering Achievement Awards	新加坡工程师学会卓越工程成就奖
AI Singapore	新加坡全国人工智能核心
AI Professionals Association	人工智能专业协会
SMRT Corporation Ltd	SMRT 企业有限公司

About The Institution of Engineers, Singapore (IES)

The Institution of Engineers, Singapore (IES) was formally established in July 1966 as the national society of engineers in Singapore. IES is the premier engineering institution in Singapore and is called upon by the Government to provide feedback on professional engineering matters.

IES is well represented among the faculty members of the major engineering institutions of higher learning in Singapore. Through close collaboration with the local universities and polytechnics, IES

organises courses, seminars and talks for engineers and IES members to advance the continuous development of engineers.

The Institution maintains close links with professional organisations of engineers regionally and throughout the world. These include organisations in Australia, China, Japan, United Kingdom and the United States. The Institution also represents Singapore in the ASEAN Federation of Engineering Organisations (AFEO) and the Federation of Engineering Institutions of Asia and the Pacific (FEIAP) in promoting goodwill and fellowship among all engineers in ASEAN and the Asia-Pacific region.

Through its Engineering Accreditation Board (EAB), IES obtained full signatory status in the Washington Accord (WA) in June 2006. The entry grants IES the authority to represent Singapore, the first country within the ASEAN region which has obtained full signatory status in the WA, to vet education systems under the WA mutual recognition framework.

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Annex 1

IES Prestigious Engineering Achievement Awards 2020 Winners & Project Descriptions

CATEGORY: APPLIED RESEARCH & DEVELOPMENT

1. Solid State Transformer for Energy Grid 2.0

Winner: Energy Research Institute @ Nanyang Technological University (NTU)

From AC-generation and AC-loads, the distribution power grid is rapidly transitioning to AC/DC distributed generation and DC-loads. This shift will create massive power imbalances at distribution networks leading to frequent disruptions.

Solid State Transformers, or SSTs, developed at NTU will seamlessly integrate loads and energy resources irrespective of these being AC or DC.

These multi-functional SSTs will decouple DC-generation or loads from the main grid and prevent them to cause any power transfer or power quality issues.

2. Neuro-inspired Electronic Skin Nervous System for Intelligent Autonomous Robotics

Winner: National University of Singapore (NUS)

Benjamin Tee and his team at NUS have developed an artificial nervous system called ACES that enables ultrafast electronic skins.

The system can touch and discriminate object properties 10 times faster than the blink of a human eye and can scale to hundreds of thousands of sensors without sacrificing speed.

This technology will impact lives by advancing prosthetics and robotics technology.

3. Small-Scale Wireless Bioelectronics for Remote-controlled Phototherapy

Winner: National University of Singapore (NUS)

Current phototherapy is limited to treating diseases near the body surface due to the low penetration of light through biological tissues.

Professor Zhang Yong and Dr John Ho from NUS have developed a way to wirelessly deliver light into deep regions of the body to activate light-sensitive drugs for photodynamic therapy.

This approach provides significant advantages for treating diseases using light in previously inaccessible regions of the body, which may lead to more effective ways to treat cancer and other diseases.

4. Microbial Electrochemical Sensor (MES) for Detecting Heavy Metals and Cyanide Discharge in Used Water

Winner: PUB, Singapore's National Water Agency

Pollutants such as heavy metals and cyanide are tightly regulated in Singapore, as these can affect the downstream biological treatment processes in our water reclamation plants. The monitoring approach comprises routine sampling as well as ad-hoc inspections carried out by PUB to ensure that discharge is complying with regulations.

In this R&D project, the team brought the idea of a real-time toxicity sensor for heavy metals and cyanide from laboratory to pilot and ultimately deployment through a rigorous process of scientific testing in the laboratory, field trials of a first generation system (that was housed in a 20ft container), and eventually development of a compact system the size of a mini-fridge.

Today, the MES system has been deployed in 100 industrial sites in Singapore as part of the continuous water toxicity monitoring regime in PUB, enabling real-time surveillance with transmission of data and alerts, and instant toxic sample collection for further detailed water quality analysis.

5. Development of End-to-end Pilot Scale Recycling Process for Recovery of All Materials from Full-size Discarded Photovoltaic Modules

Winner: Singapore Polytechnic

Currently, majority of the end-of-life or defective modules end up in landfills, posing potential danger to the environment due to the leaching of toxic heavy metals (such as lead and silver) into ground water.

The team has successfully developed a patented technology for recovering all the valuable materials from crystalline silicon PV modules (as individual components, and in high yield and purity) with green chemistry.

Having been demonstrated in the laboratory with full sized commercial modules measuring 1.7m x 1m, the solution is ready to move beyond the laboratory scale, and into the pilot scale with funding support from the Ministry of National Development and the National Environment Agency.

CATEGORY: **ENGINEERING PROJECT**

6. National Centre for Infectious Diseases, Singapore

Winner: CPG Consultants Pte Ltd

The National Center for Infectious Diseases (NCID) is a purpose built healthcare facility to handle infectious outbreak.

The building services design is challenging as an isolation facility and also meeting the prevailing Green Mark standard.

To handle air borne infections, single pass air-conditioning is provided to avoid contamination within the facility and also to the occupants in the neighborhood.

7. Hunter Armoured Fighting Vehicle

Winners: Defence Science and Technology Agency (DSTA), Singapore Army and ST Engineering

The Hunter Armoured Fighting Vehicle (AFV), locally designed and developed by DSTA with the Singapore Army and ST Engineering, is the Army's first fully-digitalised fighting platform.

Replacing the Army's fleet of Ultra M113 AFVs, the Hunter is the most advanced armoured fighting vehicle in its weight class and provides Singapore's armoured forces with greater firepower, survivability, mobility, and networked warfighting capabilities, while enabling a four-fold increase in area of influence and requiring less manpower to operate.

In the pursuit of these objectives, the team introduced many first-of-its kind innovations such as the integrated combat cockpit, and spearheaded new design paradigms such as user-centred design, design for growth, design for support, design to cost and data-enabled by design, while transforming Army's processes and the local defence industry.

8. T226 of Thomson East Coast Line, Marina Bay Station

Winner: Kiso-Jiban Singapore Pte Ltd

Project T226 of Thomson East Coast Line, Marina Bay Station, will create an enormous benefit of connectivity for the public, by integrating three MRT lines.

In addition to the presence of existing MRT structures and the need to maintain train services, this complex engineering project posed tremendous challenges to engineers as the site is located on reclaimed land and the new tunnels are deep, up to 40m below ground.

The team successfully implemented innovative solutions like Horizontal Jet Grouting, purpose-built Rectangular Shield Machine and Ground Freezing which is the first to be used for a rail project in Singapore and that is also environmentally friendly.

9. Singapore Management University Connexion

Winner: Meinhardt (Singapore) Pte Ltd

The fast track project optimised the principles of Design for Manufacturing and Assembly (DfMA) for Civil & Structural, Mechanical & Electrical (M&E) and architectural facade work, resulting in substantial improvement in manpower productivity and enabling timely completion.

The primary structural solution adopted an innovative hybrid steel-cross laminated timber floor system that advocates 100% fabrication off-site, is highly buildable, sustainable and new in the local built environment.

The extensive use of pre-fabrication for the M&E systems and facade further enhanced construction productivity and safety on-site.

10. Largest Wildlife Shepherding in Singapore Using Innovative Engineering Solutions

Winner: Samwoh Corporation Pte Ltd

In 2016, Urban Redevelopment Authority (URA) collaborated with Samwoh to conduct land preparation work of a 300,000m² secondary forest in the vicinity of Yio Chu Kang and Lentor Drive. Knowing that it was the natural habitat of the wildlife, the project team put in due care and consideration of the animals' safety and wellbeing.

The deployment of numerous innovative engineering solutions, meticulous planning and systematic execution of the project team contributed to the successful execution of the largest wildlife shepherding initiative in Singapore with no animals being harmed over this 11-month operation. In the process, two endangered Sunda pangolins were handed over to the Singapore Zoological Gardens and some animals were released safely to the neighbouring habitats.

Learning from this unprecedented experience, Singapore can look forward to preserving nature while shaping the landscapes of tomorrow in the coming future.

CATEGORY: **TECHNOLOGY INNOVATION**

11. Recycling Various Wastes into High-Valued Engineering Aerogel Materials

Winner: National University of Singapore

Aerogels from various wastes can be produced continuously and 18 times faster than current methods. Aerogels can be reused and recycled.

During manufacturing, no toxic solvent is used; much less energy is being consumed; and no toxic waste is disposed into the environment.

Manufacturing cost can be 10 times less than current methods.

12. Co-digestion Technology of Food Waste and Used Water Sludge to Enhance Biogas Production

Winner: PUB, Singapore's National Water Agency

This project conducted by PUB Singapore in collaboration with National Environment Agency, Economic Development Board and Anaergia Singapore Pte Ltd aimed to harness the synergistic effect of co-digesting food waste and used water sludge to increase biogas production and decrease amount of sludge to be dewatered in PUB's Water Reclamation Plants.

This provides the opportunity for the Water Reclamation Plants to generate enough electricity for process usage, and can potentially allow them to achieve energy self-sufficiency (using only as much energy as the treatment process itself generates).

Through this demonstration, the team validated the synergistic effect of co-digesting food waste and used water sludge in the Singapore context, and will implement this in the upcoming Tuas NEXUS project.

CATEGORY: **YOUNG CREATORS**

13. A Wearable, Patient-Adaptive Freezing of Gait Detection System with Biofeedback Cueing for Parkinson's Disease Patients

Winner: National University of Singapore

Freezing of Gait (FoG) is a common motor-related impairment among Parkinson's disease patients, which substantially reduces their quality of life and puts them at risk of falls.

In this work, a wearable patient-specific FoG detection system is developed to provide timely biofeedback cues and hence help them regain control over their gait.

To achieve such an integration, features with low computational load are selected and dedicated hardware is designed that limits area and memory utilisation. In addition, the system is capable of learning in real time and thus allows the system to adapt to a patient during run-time.

14. Air Leakage Vacuum-Assisted Detection System without Aircraft Cabin Pressurisation

Winner: Republic Polytechnic

This technology development is focusing on the design and development of a vacuum-assisted air leakage detection system that is capable of detecting air leaks around doors, windows and access panels of cabins without air pressurisation.

A part from the new Reusable Flexible Vacuum Blanket with Seal, four innovative methods including Particle Velocity, Infrared Thermography, Ultrasound and Smoke Streamlines have been designed and validated on Learjet aircraft cabin.

All these newly-developed methods can greatly benefit aviation industry and aircraft maintenance centres as well as other industries (e.g., transportation, shipyard and buildings) by providing more effective and time-saving air leakage detection on windows and doors of trains, buses, ships, boats and buildings.

15. Interweave

Winners: Singapore Polytechnic, National University of Singapore

The Interweave aims to disrupt the construction of new buildings in Singapore by utilising the Continuous Multi-Objective Computational Approach for a more environmentally and socially sustainable future.

The team has formulated a bleeding edge Multi-Objective Continuous Computational Workflow approach that uses readily available or self-sourced datasets with various softwares to automatically iterate, compare and decide on the best approach between various disciplines, namely Civil, Mechanical, Electrical, Plumbing (MEP) and Architecture, not only enabling more environmentally friendly buildings in the future, but also providing an industry of professionals an environment to work in an interdisciplinary system.

The Interweave plans to set a precedence of buildings that engages the community, yet is commercially-viable and functional, with businesses and offices beneficial to one another, for instance, in the trialing of bleeding edge technologies, or production of materials used by other businesses.

Annex 2

Engineering Innovation Challenge 2020 Winners, Project Descriptions & Prizes

All prize winners who receive the champion, first runner-up, second runner-up, merit and shortlisted team award will receive a seed fund to kickstart the development of their project and prototype. Merit award teams from category one to three and category four will each receive an additional S\$300 and S\$1,000 respectively in cash. The top three teams in each category will also receive a trophy and additional cash prizes stated below.

Category 1 – Secondary Schools

Champion: (S-26) River Valley High School

GROWnite

This project is about incorporating ionising radiation into urban farming in order to improve crop quality, crop yield and rate of crop growth. This works towards increasing Singapore's local produce of vegetables, thus improving Singapore's overall food security.

S\$5,000

First Runner-Up: (S-01) School of Science and Technology

Investigation on How the Amount of Ionising Radiation Affects the Growth Rate of Vigna Radiata

This research investigates the amount of ionising radiation on the growth of Vigna Radiata. This research can determine how much ionising radiation is required to influence the development of Vigna Radiata positively. Vigna Radiata, also known as mung bean, is a plant that can proliferate and is known for its dietary properties. Its growth can be optimised utilising ionising radiation to grow faster and obtain more enhanced nutritional properties; consequently, strengthening food security as a whole.

S\$1,000

Second Runner-up: (S-12) Orchid Park Secondary School

UV Tunnel for Sushi Conveyor Belt

The purpose of this research project is to find a solution to reduce the wastage of sushi and reduce the risk of food poisoning as it goes through the conveyor

belt in a restaurant by using ionising radiation through a tunnel-shaped set-up.

S\$700

Category 2 – Junior Colleges

Champion: **(J-13) National Junior College**

Improving Materials for Packaging Food for Radiation Processing

This project aims to increase the effectiveness of irradiation by researching into methods of irradiation and materials used during the ionising radiation of fruits. The material used for ionising radiation is important as it has to be able to allow radiation to pass through the fruit easily and ensure large amounts of ionising radiation is not left in the fruit after the process. Materials sourced are currently used by the Food and Drug Administration (FDA), as well as materials with moisture and oxygen barriers which reduce chances of contamination to test the effectiveness of such materials. It is hypothesized that the combination of cellulose, which has high moisture and oxygen barriers and polyethylene, a current favourite for ionising radiation due to its penetrability, would be most favourable for ionising radiation. This hypothesis will be tested by measuring radiation levels with the Rad-X meter, in order to recommend materials for irradiation.

S\$6,000

First Runner-Up: **(J-18) Victoria Junior College**

Increasing Crop Yield by Reducing Arsenic Poisoning in Crops

This project reviews the problem of high arsenic levels in rice which causes it to be poisonous and thus inedible. Rice accumulates more arsenic than other food crops. The problem of arsenic poisoning amplifies this predicament as it leads to problems like cardiovascular disease, cancer and other deadly diseases which cause individuals to avoid the food source and can lead to increased hunger. We have devised a system of using ionising radiation to combat the issue of arsenic poisoning. It includes a Total Reflection X-ray Fluorescence spectroscopy, an oxidising agent and reverse osmosis process to detect high levels of arsenic compounds and remove them, keeping the arsenic

compound level below 100 parts per billion. This would significantly increase crop, especially rice, yield in regions with high concentration of arsenic compounds.

S\$1,000

Second Runner-up: **(J-03) Anglo-Chinese Junior College**

Gamma

Even though Singapore is a highly developed country, food insecurity still exists in some parts of this magnificent city. The issue of food wastage has become increasingly prominent in Singapore. At least 10 percent to 20 percent of prepared food goes to waste because they can only be stored for a short period of time. Therefore, it is necessary to reduce food wastage by extending the storage time of prepared meals, especially in hotel buffets, where there is a lot of excess food. These excess food products with prolonged shelf life could be sold to low-income families at a lower price to ensure that they have sufficient food that could last them for a longer period and hence ensure food security. Thus, we aim to make a smaller-scaled device to extend the shelf life of prepared meals by reducing microbial infestations.

S\$700

Category 3 – Polytechnics and ITE

Champion: **(P-04) Temasek Polytechnic**

Food Rejuvenator

In line with the food security roadmap for Singapore to reduce food wastage and food stockpile, a food rejuvenator utilizing the ionising radiation technology to kill pathogens is developed to extend the shelf-life of near expired food such as bread, one of the main contributor to food wastage in Singapore. An optimal dosage in the low to medium range will be studied to extend the shelf-life of bread for another two to three weeks for immediate consumption and for another one year for stockpiling purpose. The project will be carried out in a safe and controlled environment under the supervision of expertise in the ionising radiation technology. An education package to convince the beneficiaries who will be consuming the bread and Singaporeans at large that it is safe to consume irradiated food will be developed.

S\$7,000

First Runner-Up: **(I-06) ITE College West**

Improve Food Security with Enhanced Food Packing Methods

This project proposes an innovative route to enhance old method of food packaging with new technologies, and introduces innovative ways of converting food waste which is viable for food packing material. Using a 3D bio-printer to print out the film wrapper and apply a layer of antimicrobial on the surface using nanotechnology. The coating nanoparticles can result in decreasing permeability of gases and also allow the food to have a longer shelf life. Irradiation technology increases the tensile strength of the film wrapper as well as the risk of food-borne diseases and extends the food shelf life effectively. These innovative concepts aim to revolutionise food packaging in order to achieve high quality, safe and nutritious food products. Most importantly those concepts can help to reduce food waste issues faced in Singapore.

S\$1,000

Second Runner-up: **(I-04) ITE College East**

Photographic Film Ionizing Radiation Indicator

The objective of this project is to design and apply a simple, cost effective and safe method to qualitatively detect ionising radiation (IR) exposure to foods whose quality and nutritional value may be compromised when exposed to high IR levels. The proposed IR indicator device will comprise the use of photographic film whose colour density, when processed by a non-hazardous development solution, will change with IR exposure.

S\$700

Category 4 – Local and Overseas Universities

Champion: **(U-22) National University of Singapore**

BevSafe: A Hand Crank Powered Portable UV-C Based Beverage Disinfectant

A low cost portable UV-C based beverage disinfectant aimed at street food vendors in less economically developed countries to help reduce the spread of food-borne viral infections. The design is hand-crank powered and hence

does not require a power source. It utilises the principles of fluid mechanics – Dean's flow and baffle rings – to maximise the exposure of the beverage to the UV-C light.

S\$8,000

First Runner-Up: **(U-25) Nanyang Technological University**

BreadBuddy

Bread is a highly perishable food item with short lifespan, resulting in its large-scale disposal as bakeries strive to maximise their revenue; roughly 30 to 100 pieces of bread are discarded nightly per bakery in Singapore. With the promise of longer shelf life through Ultraviolet Germicidal Irradiation (UVGI), this team proposes BreadBuddy – a vending machine that sterilises, stores and distributes unsold buns to the needy for up to 24 hours after the sell-by date. BreadBuddy aims to improve food security by minimising bread waste from bakeries and channeling it to Singaporeans who face severe food insecurity. In addition to improving food security, the concept of BreadBuddy is a strong marker of companies' corporate social responsibility and serves as a viable secondary revenue stream for them. Lastly, BreadBuddy aims to increase visibility of such societal issues in Singapore, inspiring mindfulness in Singaporeans to be more conscious about the importance of food security.

S\$5,000

Second Runner-up: **(U-12) Chindwin Technological University Myanmar**

Innovative Food Irradiation Chamber

This project uses ionising radiation for food irradiation system. Ultraviolet C-type Radiation from UVC germicidal light will be used in this project which are proven to disturb the ribonucleic acid (RNA) of some viruses and microscopic organisms, molds and spores as well as fungi and yeasts. The aim of this project is to sterilize the surface of the food, purify the air and enable water disinfection.

S\$3,000