MEDIA RELEASE

23 July 2021

Presenting Winners of the Singapore Energy Grand Challenge

With the growing urgency to tackle climate change, there is a need for greater sustainability as outlined in the Singapore Green Plan 2030. This will include the need to change the way we produce and consume energy. The Energy Market Authority (EMA) is leading efforts to engage stakeholders, including the industry, research community and the youth to co-create solutions for Singapore's Energy Story and build a more sustainable future. Details of the Singapore's Energy Story can be found in Annex A.

2.   At EMA's Energy Innovation 2021, Ms Low Yen Ling, Minister of State for the Ministry of Trade and Industry & Ministry of Culture, Community and Youth, today announced the winners of the Singapore Energy Grand Challenge (SEGC) for two categories – (i) Industry and Research Community and (ii) Youth. The industry and research community were invited to co-create energy efficient solutions to benefit Singapore businesses, whereas the youth were invited to share their ideas on how their carbon-free neighbourhood or schools could be like.

   a. **SEGC (Industry and Research Community)**: The winners are Research & Development projects from the Nanyang Technological University (NTU) and the National University of Singapore (NUS) for their ideas to improve energy efficiency in waste-to-energy plants and commercial buildings respectively.

   b. **SEGC (Youth)**: Winners of the <u>Junior Category</u> comprising lower secondary students:
   - Champion: 3R Girls Team from Raffles Girls' School
   - 1st runner-up: Team Mighty Chondria from Nanyang Girls' High School
   - 2nd runner-up: Team Proficient from Bedok Green Secondary School

   Winners of the <u>Senior Category</u> comprising upper secondary and junior college students:
   - Champion: Team Electrae from Dunman High School
   - 1st runner-up: Team Energae from Dunman High School
   - 2nd runner-up: Team Goaty from Anderson Serangoon Junior College

3.   EMA's Chief Executive, Mr Ngiam Shih Chun, said: "Everyone has a part to play in helping Singapore move towards a more sustainable energy future. The SEGC is one way of co-creating solutions with our communities, from youths to industry players and researchers. My heartiest congratulations to the winners of the SEGC for their innovative solutions. I look forward to our collective action to decarbonise our energy sector and make Singapore a model of sustainability to the world."

SEGC (Industry and Research Community)

4.   SEGC (Industry and Research Community) was launched in September 2020 to encourage the industry and research community to work together and co-create innovative energy efficiency solutions to lower Singapore's energy demand, and enhance the competitiveness of businesses in Singapore. This saw 31 proposals received from various teams.

5.   NTU will develop a solution that uses sound waves to pre-condition and accumulate pollutants in the waste exhaust from industrial plants. This improves the efficiency of removing pollutants in the filtering process and can achieve at least 10-15% in energy savings from fan power and accompanying separation systems. With the SEGC grant awarded by EMA, this solution will move beyond its current proof-of-concept into real-world testing at the Waste-To-Energy Research Facility (WTERF) in partnership with JFE Engineering Corporation.

6.   To reduce our electricity demand from air-conditioning and build a more sustainable Singapore, NUS will develop a novel material to more effectively absorb moisture in the air and cool the air efficiently. Waste heat from air-conditioning will also be tapped on to release the moisture absorbed and restore the moisture absorbing material for continuous use. The project will be piloted in commercial air-conditioning systems in collaboration with Mitsubishi Electric. If successful, the solution could improve the overall energy efficiency of air-conditioning systems by 30% or more. More details of both projects can be found in Annex B.

SEGC (Youth)

7.   The second edition of SEGC (Youth) was launched in March 2021 to engage youth on sustainability issues and garner innovative ideas based on the theme "How would your carbon-free school or neighbourhood in Singapore look like in 2050?". A total of 87 teams across 29 secondary schools and junior colleges took part in the challenge. Participants had to use Microsoft's Minecraft: Education Edition to create their ideal carbon-free world and showcase their aspirations for Singapore.

8.   A team from Raffles Girls' School (Secondary) clinched the championship for the Junior Category with their holistic presentation of innovative low-carbon ideas for

Singapore in the year 2050. Their ideas included the use of hydrogen-powered vehicles and Maglev trains to reduce overall carbon emissions as well as intelligent solar-powered street lighting equipped with motion sensors. For the Senior category, a team from Dunman High School was crowned the champion for their innovative ideas such as the use of bioluminescent algae for lighting and artificial intelligence to optimise overall energy usage. The team also received the highest number of votes from members of the public. More details on the winning teams can be found in Annex C.

9.   The judging panel for the SEGC comprised representatives from EMA, Infocomm Media Development Authority, Microsoft Singapore, Durapower Holdings and Maxeon Solar.

10.   Mr Kevin Wo, Managing Director, Microsoft Singapore said, "As we address climate change through the Singapore Green Plan, it's great to see that our youths can bring their carbon-free aspirations to life through immersive learning environments from Microsoft like Minecraft: Education Edition. Through the eyes of our youths, we too can draw inspiration from their ideas and take collective action to build a sustainable future for our nation."

11.   The winning teams for both categories each received a $5,000 cash prize and a Challenge Trophy for their schools, while the 1st runner-up and 2nd runner-up teams received $3,000 and $2,000 respectively. More information on the next edition of the SEGC (Youth) will be shared in the first half of 2022.

Annex A: Factsheet for Singapore's Vision to be a Bright Green Spark
Annex B: Details of Awarded Projects Under the Inaugural SEGC (Industry and Research Community)
Annex C: Information on Minecraft: Education Edition and the Winning Teams of SEGC (Youth) 2021

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About the Energy Market Authority

The Energy Market Authority (EMA) is a statutory board under the Ministry of Trade and Industry. Our main goals are to ensure a reliable and secure energy supply, promote effective competition in the energy market and develop a dynamic energy sector in Singapore. Through our work, EMA seeks to forge a progressive energy landscape for sustained growth.

Website: www.ema.gov.sg | Follow us: Instagram: @EMA_Singapore | Facebook: facebook.com/EnergyMarketAuthority | Twitter: @EMA_Sg

About Microsoft

Microsoft (Nasdaq "MSFT" @microsoft) enables digital transformation for the era of an intelligent cloud and an intelligent edge. Its mission is to empower every person and every organization on the planet to achieve more.

FACTSHEET FOR SINGAPORE'S VISION TO BE A BRIGHT GREEN SPARK

To tackle climate change concerns, Singapore has to change the way we produce and consume energy. Minister for Trade and Industry Mr Chan Chun Sing shared Singapore's aspiration to be a "Bright Green Spark" at the Singapore International Energy Week (SIEW) in October 2020 to be an inspiration to other cities as we move towards a cleaner, more reliable and affordable energy future.

2.   We will harness four switches to transform and diversify our energy supply. The four switches are natural gas, solar energy, regional power grids, and emerging low-carbon alternatives. This will be supported by energy conservation efforts and improving energy efficiency across all sectors.

1st Switch: Natural Gas

Natural gas is the cleanest form of fossil fuel and will continue to be a dominant fuel for Singapore's electricity generation in the near future. EMA will continue to diversify our gas sources and work with our power generation companies to improve the efficiency of their power plants.

2nd Switch: Solar

Solar is the most promising renewable energy source for Singapore. Energy storage systems are also vital as they help us manage the intermittency of renewable energy sources. Singapore is working towards a solar target of 1.5 gigawatt-peak by 2025, and at least 2 gigawatt-peak by 2030, with an energy storage deployment target of at least 200 megawatts beyond 2025.

3rd Switch: Regional Power Grids

We are studying ways to develop regional power grids for cost-competitive and low-carbon energy. This could be realised through bilateral cooperation and regional initiatives. For a start, we intend to embark on a two-year trial for 100 megawatts [1]of electricity imports from Peninsular Malaysia to Singapore. We are also initiating cross-border power trade under the 4-country Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP).

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[1] This will make up about 1.5% of Singapore's peak electricity demand (based on 2020's figures).

4th Switch: Emerging Low-Carbon Alternatives

We are exploring emerging low-carbon solutions (e.g. carbon capture, utilisation and storage technologies, low-carbon hydrogen) that can help reduce Singapore's carbon footprint.

We will continue to improve our energy efficiency in the various sectors. We will also empower households with more information to help them better manage their electricity consumption.

3.   Visit www.beyondthecurrent.gov.sg for more information.

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**DETAILS OF AWARDED PROJECTS UNDER THE INAUGURAL SEGC
(INDUSTRY AND RESEARCH COMMUNITY)**

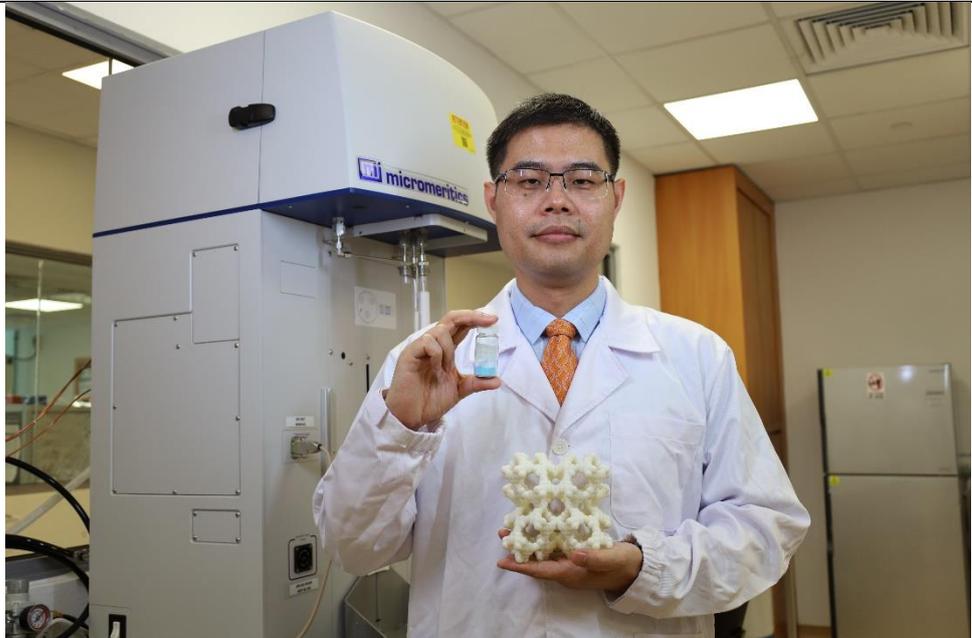|	
Project Title	Deriving Energy Savings from Particle Separation in Industrial Plants through Acoustics Pre-conditioning
Principal Investigator	Assistant Professor Ng Bing Feng
Co-Investigators	Associate Professor Wan Man Pun Assistant Professor Grzegorz Lisak
Host Institution	Nanyang Technological University
Industry Collaborator	JFE Engineering Corporation
Description	Removing pollutants from the waste exhaust is an essential component in most industrial operations. However, this process is challenging and energy intensive. **Project Aim:** In this project, sound waves are used to pre-condition pollutants prior to going through existing filtration systems. This will form larger agglomerates that can be removed more easily. The project will demonstrate this technology in the Waste-to-Energy Research Facility at Tuas, alongside industrial partner JFE Engineering Corporation. **Project Outcomes**: If successful, the solution will enhance particle separation and filtration capabilities in WTE plants and achieve at least 10-15% energy savings from fan power and the accompanying separation systems. Emissions of fine particles from industrial exhausts will also be reduced, lowering the environmental footprint and supporting Singapore's goals towards a more sustainable future.

Photos
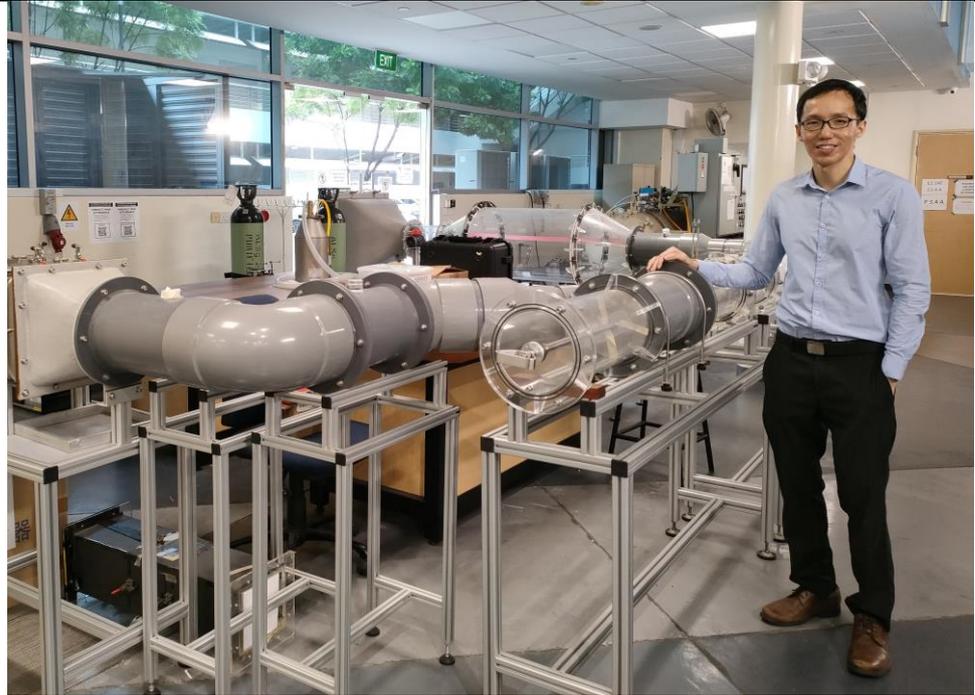
Assistant Professor Ng Bing Feng with the lab setup for acoustics agglomeration at the School of Mechanical and Aerospace Engineering, NTU Singapore.
Source: NTU Singapore

The Waste-to-Energy Research Facility (WTERF) at Tuas South.
Source: NTU Singapore

Project Title	Efficient Dehumidification Solution for Air-Conditioning System
Principal Investigator	Assoc Prof Zhao Dan
Co-Investigators	Associate Professor Chua Jian Jon, Ernest
Host Institution	National University of Singapore
Industry Collaborator	Mitsubishi Electric
Description	Singapore's building sector accounts for 31% of total electricity consumption, of which 60% is used on cooling. The high energy consumption is associated with high humidity as a result of the island's tropical climate. Commercial air-conditioners relying on vapour compression technology suffer from low energy efficiency under such conditions. **Project Aim:** The project will focus on a new type of sorbent, based on metal-organic frameworks (MOFs), to remove water in the air before cooling, thus reducing energy consumption. A "smart" polymer switch is embedded in the MOFs to capture or release the trapped water by changing the temperature. The switch can be operated using waste heat and thus reduce electricity consumption. **Project Outcomes**: The project team will fabricate a prototype air-conditioner based on "smart" MOFs and test its dehumidification and cooling performance. Successful prototypes are expected to show 30% or more energy savings over current "5-ticks" air-conditioners used in local households or offices.
Photos	 Associate Professor Zhao Dan holding a vial of MOF material and its 3D-printed structure model. Source: National University of Singapore

**INFORMATION ON MINECRAFT: EDUCATION EDITION AND
THE WINNING TEAMS OF SEGC (YOUTH) 2021**

Minecraft: Education Edition (M:EE) is designed for educational settings with teachers around the world. M:EE offers immersive game-based learning through remote and onsite classroom-friendly features, immersive multi-player environments, as well as lessons, build challenges and Science, Technology, Engineering and Mathematics (STEM) curriculum.

JUNIOR CATEGORY

Champion: 3R Girls Team **Raffles Girls' School (Secondary)** Members (from left to right): Kong Zi Yau Bernadette (Jiang Zirou), Victoria Teo Yue Tong, Tan Xuan Ying *Click here to view the team's video entry*	Our SEGC journey was a great learning experience for all of us. We had to pick up Minecraft from scratch, research and discuss among ourselves the low-carbon neighbourhood we would like to have in the future and get it all done within a short timeline. Plenty of effort and time are invested but there is tremendous satisfaction and pride when we visit our world which ultimately summarises our learning journey. Initially, we were attracted by the advertised prize money. But upon embarking on the journey, we have learnt so much about Singapore's Energy Story. We understood the trade-offs between energy security, economic competitiveness and environmental sustainability. We firmly believe that with advances in technology and higher level of environmental consciousness in Singaporeans, we can achieve a delicate balance and we want to show how we can achieve this balance in our world.

1st Runner-up: Team Mighty Chondria **Nanyang Girls' High School** Members (from left to right): Xu Shaozhe, Chen Yifei Allegra, Tan Wen Li Glenda, *Click here to view the team's video entry*	Before this competition, only one of us had experience playing Minecraft. Thus, in the beginning, we struggled quite a lot with translating the vision we had in our heads into our Minecraft world. Although we ended up spending upwards of four hours a day on the competition, especially towards the due date of the semi-finals, the time flew by fast as we chatted while building in Minecraft and got a lot closer to each other. Despite the large amount of time spent, we never regretted signing up. What kept us going was our passion for energy conservation and our interest in using Minecraft: Education Edition for a good cause. Over the course of the competition, we realised that using sustainable energy isn't as simple as it seems; instead of switching immediately, one has to consider other factors such as cost and reliability so as not to disrupt the lives of Singaporeans all over the island. This is the essence of the Energy Trilemma. In addition, while it may seem daunting to switch over to a whole new way of generating electricity, through the modifications we made to the building in our submission, we hope to demonstrate that these methods can be easily integrated into daily life, and thus encourage people to switch over to more sustainable energy sources. Our story doesn't stop here. Let us write a better future, together.
2nd Runner-up: Team Proficient **Bedok Green Secondary School**	The competition excited us as all of us have prior experience in Minecraft. We wanted to showcase the ideas we personally created and ideas we had found interesting and innovative along the way. The competition was enjoyable and brain stimulating as we needed to think about sustainable and creative ideas and ways to present them in Minecraft. We had learnt many things about carbon emissions from various power generation sources. The

takeaway from this competition was the enjoyment of searching up ideas and designing buildings with friends. In a nutshell, the competition was a blast. It was eye-opening for us and we hope that there will be another opportunity like this for us to learn from.

Members (from left to right):
Sim Kai Feng, Zacq Leong Guang Yao, Tan Guan Xu

Click [here](#) to view the team's video entry

SENIOR CATEGORY

Champion: Team Electrae **Dunman High School** Members (from left to right): Ng Jin Seang Jordan, Kwok Zheng Feng, Jake Kee Chong Han *Click here to view the team's video entry*	We grew up playing Minecraft together and all the skills we utilised for this competition were all honed when we played the game together as kids. As such, it was definitely an exciting experience for us to apply such skills, in a familiar and homely team environment, and build the best Energy World for the judges. Our competition experience was a fun and rewarding experience. Through multiple stages of brainstorming and research, we learnt many new skills, such as working together, networking, and even video editing. While we have nearly a decade's worth of experience in Minecraft, other soft skills like these were not tested in the time we played. As such, we were able to develop these new skills in the journey of constructing (and promoting) our Energy World. Since we split the work of building various sectors of the Energy World, it was an enjoyable experience when we pieced our ideas together and watched the end product of the video showcase. The beauty of the Energy World showcased in the video made all the late nights and hundreds of hours spent on it worth it.
1st Runner-up: Team Energae **Dunman High School**	Working on this competition has been incredibly eye-opening and fun, especially since we were able to use Minecraft, a game we have all enjoyed since we were kids, to express our ideas. Learning about Singapore's Energy Story has helped our team to see how far we have come. Seeing the developments and advancements we have today, it reminds us to appreciate the hard work that previous generations have put in to achieve what we have now! Our group is thankful for the chance to take part in this event and thankful for the experience.

Members (from left to right):
Ang Guan Yu Jasper, Tan York Yang, Chng Yongzhi Kevan, Aaron Ang Chen Yee

Click here to view the team's video entry

2nd Runner-up: Team Goaty
Anderson Serangoon Junior College

Members (from left to right):
Koh Li Tian, Ernest Tan Jian Yu, Janel Lee Mei Er, Germaine Yeo

Click here to view the team's video entry

Our SEGC (Youth) experience has been rewarding. To know that we have a chance to take charge of our future is relieving and through the guidance provided, this competition has been full of learning opportunities and self-enlightenment. With the heavy commitments of being a J2 student, it was nearly impossible to find the time to work on our world and many sleepless sacrifices had to be made. However, it was worth the sacrifice because it was gratifying, working as a team tirelessly to turn a plain plot of land into a beautiful neighbourhood, with careful thought about how every corner of space can be feasibly considered to be implemented with unique energy enhancing methods throughout the entire neighbourhood.

Not to mention, only one of us had experience with coding, and none of us had used Minecraft: Education Edition before, so it was a really cool experience to have to rely on each other and learn about coding and exploring the functionalities that the platform had that were unknown to us before. We are very thankful for the experience gained from this competition, where we can apply

	some of the skills learnt here in the future! We hope to see some real change done for Singapore to reach our net-zero emissions aspiration together.