

**SCOPING WORKSHOP FOR PHASE 2 OF
SINGAPORE – NEW ZEALAND BILATERAL
RESEARCH PROGRAMME ON FUTURE FOODS**

**DAY 1
30 JULY 2024**

OPENING KARAKIA

In Te Reo Māori (Māori language)

Tāwhia tō mana kia mau, kia māia

Ka huri taku aro ki te pae kahurangi, kei reira te oranga mōku

Mā mahi tahi, ka ora, ka puāwai

Ā mātau mahi katoa, ka pono, ka tika

TIHEI MAURI ORA

English translation

Retain and hold fast to your power, be bold, be brave

We turn our attention to the future, that's where the opportunities lie

By working together we will flourish and achieve greatness

Taking responsibility to commit to doing things right

Life force is alive

WORKSHOP PROGRAMME – DAY 1 (30 JULY)

SG time	NZ time	Duration	Item	Presenter / Moderator	
0930	1330	5 min	New Zealand Opening Remarks	Emily Robinson (MBIE)	
0935	1335	5 min	Singapore Opening Remarks	Colin Lim (A*STAR)	
0940	1340	25 min	SG-NZ Bilateral Project Presentation: “Te Rangahau Taha Wheako mō ngā Kai o Āpōpō: The Consumer Dimension of Future Foods”	Dr Teo Pey Sze (Apple), Dr Meika Foster	
1005	1405	25 min	SG-NZ Bilateral Project Presentation: “Realising the value of algae as a source of alternative protein”	Dr Rahman Talukder, Dr Tom Wheeler	
1030	1430	60 min	Parallel Session A Food Matrix	Parallel Session B Applied Consumer Insights	Session A – Roy, Catherine Session B – Colin, Milena
1130	1530	5 min	Summary of Parallel Session Discussions	Roy, Milena	
1135	1535	55 min	Break / Free Networking	-	
1230	1630	40 min	Panel discussion: “Lessons learnt from bilateral experience and new opportunities in Future Foods”.	Panel 1 – Roy Panel 2 – Milena	
			<i>Panel 1: Dr Tom Wheeler, Dr James Chan, Dr Santanu Deb-Choudhury</i> <i>Panel 2: Dr Larry Loo, Dr Ng Siew Bee, Dr Meika Foster</i>		
1310	1710	20 min	Combined Q&A for Panel discussion	Milena	
1330	1730	60 min	Free Networking	-	
1430		-	End of Day 1	-	

GROUND RULES FOR WORKSHOP

Please mute when not speaking

If you have any questions, you may surface them via:

- "Raise hand" button, and wait for moderator to invite you to speak
- "Chat box" - write your question and moderator will address it at next available opportunity

Please introduce yourself when speaking (name, institution)

NEW ZEALAND OPENING REMARKS

Ms Emily Robinson
Principal Policy Advisor, International Science
Partnerships
Science & Space Branch | Labour, Science &
Enterprise Group
Ministry of Business, Innovation and Employment

SINGAPORE OPENING REMARKS

Mr Colin Lim
Acting Director, Food and Nutrition Cluster
Biomedical Research Council, A*STAR

SG-NZ PHASE 1 PROJECTS OVERVIEW

Project Title	SG Lead PI	NZ Lead PI
Realising the value of algae as a source of alternative protein	Dr Rahman Talukder (SIFBI, A*STAR)	Dr Tom Wheeler (Cawthron Institute)
Understanding the interactions between plant-based protein & cellular agriculture	Prof Hanry Yu (NUS)	Dr Laura Domigan (University of Auckland)
Cooking and processing of seaweed to improve consumer acceptance, protein digestion & nutrient bioavailability	Dr James Chan (SIFBI, A*STAR)	Dr Santanu Deb-Choudhury (AgResearch)
Te Rangahau Taha Wheako mō ngā Kai o Āpōpō: The Consumer Dimension of Future Foods	Dr Ng Siew Bee (SIFBI, A*STAR)	Prof Joanne Hort (Massey University)



**SG-NZ BILATERAL PROJECT PRESENTATION:
“TE RANGAHAU TAHA WHEAKO MŌ NGĀ KAI O ĀPŌPŌ:
THE CONSUMER DIMENSION OF FUTURE FOODS”**

Presented by:
Dr Teo Pey Sze (Apple)
Dr Meika Foster

SG-NZ BILATERAL PROJECT PRESENTATION: “REALISING THE VALUE OF ALGAE AS A SOURCE OF ALTERNATIVE PROTEIN”

Presented by:
Dr Rahman Talukder
Dr Tom Wheeler

PARALLEL SESSIONS TO DISCUSS FUTURE FOODS CHALLENGE STATEMENTS

Session A: Food Matrix

- Moderated by Roy (A*STAR), Catherine (MBIE)

Session B: Applied Consumer Insights

- Moderated by Milena (MBIE), Colin (A*STAR)

Instructions

1. We will open two breakout rooms to discuss the workshop topics (duration: 60 min)
2. To join a room, click “Breakout Rooms” button, find the room you wish to join and click “Join”
3. If you wish to switch rooms, click “Leave Breakout Room” to return to main room, and select new breakout room to join
4. Please observe ground rules when asking questions
5. Everyone will return to main room after 60 minutes and moderators will summarize key takeaways

PARALLEL SESSION A – FOOD MATRIX

Understanding how ingredients interact and their impact on food organoleptic properties.

- Researchers should adopt holistic view of food matrix properties, including nutrition and bioavailability / digestibility; not only about lowering cost of AP production.
- Algal / microalgal proteins can be incorporated into AP products, but further research is required to understand the full properties of the range of compounds within their extracts, including how they interact with each other. Optimizing protein extraction yield from algae / microalgae may have diminishing returns, thus further research must look beyond yield. Need to identify industry partners to further algal protein development, particularly to seek full valorization of minimally processed algal extract as a new ingredient. Industry perspective will help with commercial considerations for AP product development, such as shelf life, cost and protein yield in scale-up.
- Further TEA / LCA required to understand impact of various plant-based materials on AP industry, including environmental impact.

Creating a food matrix with organoleptic attributes equal to or better than existing animal protein while maintaining cost parity.

- Hybrid meats: PBMs are nutritionally inferior. Combine plant and animal protein together to reduce cost of protein while retaining desirable organoleptic attributes. Interaction of plant and animal ingredients must be studied to improve hybrid products. Plant proteins requires appropriate processing to achieve the desired properties (e.g. remove off-tastes).
- Push towards minimal processing of ingredients for alternative protein and future foods.

Developing cost-effective future food ingredients (e.g. alternative proteins).

- Develop molecules that improve umami / kokumi to improve flavour and mouthfeel. Has potential to address high sodium content in ultraprocessed foods. Sensory studies are key to evaluate impact of new flavour ingredients on taste and texture of AP and other future food products.
- Develop sustainable forms of cell culture media for cultivated meat production.
- Insect protein are of interest, either for protein or other biomaterials such as chitin. Investigating allergens in insect proteins is an ongoing area of study. Glycoproteins in insect extract.

PARALLEL SESSION B – APPLIED CONSUMER INSIGHTS

Applying insights from local consumer preferences to regionalize alternative protein product development.

- There can be a lot of diversity (flavours, pigments, nutrients, textures) within a specific type of ingredient (e.g. seaweed species work by Pacific Harvest). Processing will alter these properties, as well as how ingredients are pair with.
- Need to develop understanding for how key compounds (at chemical level) affect the flavour, how to identify them and how does harvesting and processing affect them (flavour differentiation).
- Identifying flavour profiles and algal species in each country; after characterising them, research can link the chemical compounds to what is limiting consumer acceptance and identify approaches to remove these undesirable factors; hence improve consumer acceptance of future foods.
- Consider use of AI in food design: Potential to bring ingredients together by chemical composition/makeup (e.g. project by AgResearch). How we can take more creative methodological approaches with consumer engagement (beyond perception and traditional preferences) – co-creating scenarios of using new techniques and combinations of ingredients and preparation.
- Focusing on one nutrient alone may cause undesirable limitations and outcomes.
- Need to focus on point-of-difference offering in a competitive and saturated market (e.g. NZ seaweed in Asian market)
- Familiarity and exposure – how can we help younger generations evolve perceptions and acceptance of not-yet mainstream ingredients, while using insights from older generations?
- Increasing consumer uptake through engagement and education – are there new trends or forms of future foods we can look at as case studies?
- Investigate oral processing in different age groups; understand interactions between flavour release and texture
- Some work in characterising edible indigenous plants underway (AgResearch); there may be opportunity to review the unique role of native species and the environments they come to understand their utility in future food development.
- Lots of different products available that are in forms not traditionally eaten in certain markets or do not fit consumer needs (e.g. nuggets for children) – removing ‘alternative protein’ term could be useful in affecting perceptions and socialisation, particularly in children who do not understand what this is.
- Focus on needs of different age groups as a starting point in identifying gaps (e.g. abundance of micronutrients in seaweed and its ability to stimulate the palate)
- Creating an extraction industry at large scale will hinge on limitations such as growing, harvesting, processing – will define which ingredients/species are viable
- Consideration of mood and wellbeing – both in making food choices and post-consumption, changing dietary habits, different baseline palate preferences across cultures. Human trials are costly so start with characterisation experiments. How might we circumvent the need for human trials to derive consumer insights quickly?
- Lipids important for brain health and performance; incorporation of nutritionally valuable lipids into future foods.

BREAK / FREE NETWORKING

We will have a break till 12:30pm (Singapore Time) / 4:30pm (New Zealand Time)

We are providing breakout rooms for participants interested in networking and conversation. Feel free to stay around and make new connections, discuss potential collaborations, etc.

1. General
2. Food Matrix
3. Applied Consumer Insights
4. Smart & Sustainable Processes
5. Health & Nutrition

Instructions

1. To join a room, click “Breakout Rooms” button, find the room you wish to join and click “Join”
2. If you wish to switch rooms, click “Leave Breakout Room” to return to main room, and select new breakout room to join
3. You can also choose to stay in the main room
4. When break is over, breakout rooms will close and everyone will automatically return to the main room to continue the workshop programme

PANEL DISCUSSION: “LESSONS LEARNT FROM BILATERAL EXPERIENCE AND NEW OPPORTUNITIES IN FUTURE FOODS”

Panel 1: Dr Tom Wheeler, Dr James Chan, Dr Santanu Deb-Choudhury

- Moderated by Roy

Panel 2: Dr Larry Loo, Dr Ng Siew Bee, Dr Meika Foster, Prof Joanne Hort

- Moderated by Milena

Instructions

1. We will open two breakout rooms for each panel to have a moderator-led discussion on their bilateral project experiences (duration: 40 min).
2. Participants may join either room to listen to the discussion.
3. To join a room, click “Breakout Rooms” button, find the room you wish to join and click “Join”
4. If you wish to switch rooms, click “Leave Breakout Room” to return to main room, and select new breakout room to join
5. Please save your questions for both panels at the combined Q&A at the end of this session.

BILATERAL EXPERIENCE PANEL DISCUSSION: PANEL 1

Panel 1: Dr Tom Wheeler, Dr James Chan, Dr Santanu Deb-Choudhury

- Moderated by Roy

BILATERAL EXPERIENCE PANEL DISCUSSION: PANEL 2

Panel 2: Dr Larry Loo, Dr Ng Siew Bee, Dr Meika Foster, Prof Joanne Hort

- Moderated by Milena

COMBINED Q&A FOR PANEL DISCUSSION

Panel 1: Dr Tom Wheeler, Dr James Chan, Dr Santanu Deb-Choudhury

Panel 2: Dr Larry Loo, Dr Ng Siew Bee, Dr Meika Foster

We invite you to ask our panelists any questions regarding their experience working in this bilateral research programme.

CLOSING KARAKIA

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English translation

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To return to everyday duties
Enriched and unified
Greetings to all

FREE NETWORKING

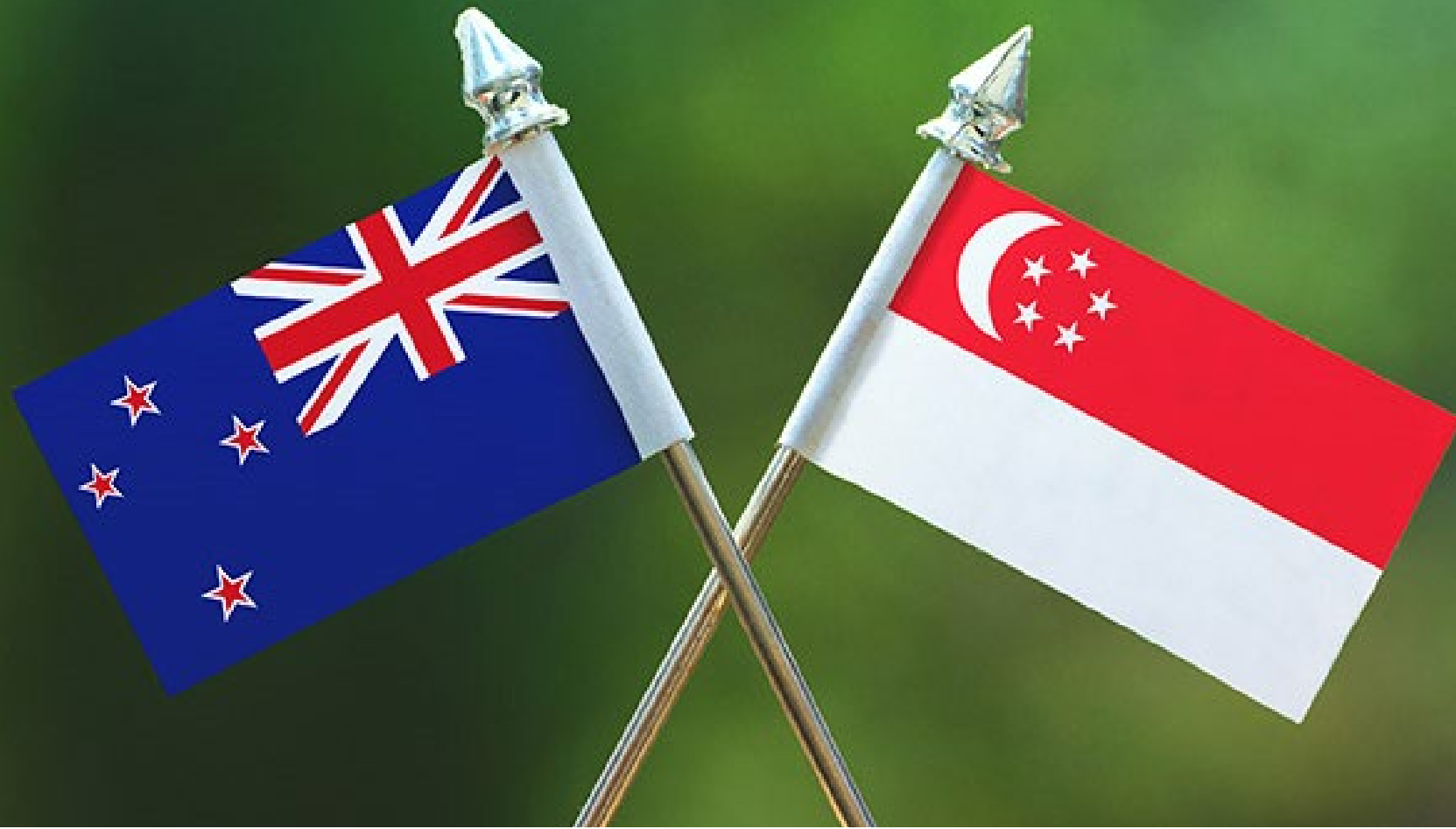
Workshop programme for Day 1 has ended.

Feel free to stay awhile and use our breakout rooms for networking and conversation.

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4. This meeting will end at 2:30pm (Singapore Time) / 6:30pm (New Zealand Time), and breakout rooms will close.



**SCOPING WORKSHOP FOR PHASE 2 OF
SINGAPORE – NEW ZEALAND BILATERAL
RESEARCH PROGRAMME ON FUTURE FOODS**

**DAY 2
31 JULY 2024**

OPENING KARAKIA

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WORKSHOP PROGRAMME – DAY 2 (31 JULY)

SG time	NZ time	Duration	Item	Presenter / Moderator	
0930	1330	25 min	SG-NZ Bilateral Project Presentation: “Understanding the interactions between plant-based protein & cellular agriculture”	Prof Harry Yu, Dr Laura Domingan	
0955	1355	25 min	SG-NZ Bilateral Project Presentation: “Cooking and processing of seaweed to improve consumer acceptance, protein digestion & nutrient bioavailability”	Dr James Chan, Dr Santanu Debchoudhury	
1020	1420	60 min	Parallel Session C Smart & Sustainable Processes	Parallel Session D Health & Nutrition	Session C – Roy, Catherine Session D – Colin, Milena
1120	1520	5 min	Summary of Parallel Session Discussions	Roy, Milena	
1125	1525	20 min	Workshop Q&A with A*STAR and MBIE	Roy	
1145	1545	5 min	Singapore Closing Statement	Colin Lim (A*STAR)	
1150	1550	5 min	New Zealand Closing Statement	Emily Robinson (MBIE)	
1155	1555	35 min	Free Networking	-	
1230	1630	-	End of Day 2	-	

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SG-NZ BILATERAL PROJECT PRESENTATION: “UNDERSTANDING THE INTERACTIONS BETWEEN PLANT-BASED PROTEIN & CELLULAR AGRICULTURE”

Presented by:
Zhou Hanzhang (Helen)
Dr Laura Domingan

SG-NZ BILATERAL PROJECT PRESENTATION: “REALISING THE VALUE OF ALGAE AS A SOURCE OF ALTERNATIVE PROTEIN”

Presented by:
Dr James Chan
Dr Santanu Deb-Choudhury

PARALLEL SESSIONS TO DISCUSS FUTURE FOODS CHALLENGE STATEMENTS

Session C: Smart & Sustainable Processes

- Moderated by Roy (A*STAR), Catherine (MBIE)

Session D: Health & Nutrition

- Moderated by Milena (MBIE), Colin (A*STAR)

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PARALLEL SESSION C – SMART & SUSTAINABLE PROCESSES

Developing technologies that facilitate scale-up of alternative protein production.

- Understanding composition and function on ingredient properties is key. Current ingredients in AP are over-refined; reducing processing can lower cost and improve nutritional quality, but studies required to understand how these minimally processed ingredients behave during texturization.
- Hybrid meat: Plant protein brings down cost, while cultivated cells confer “meatiness” properties to bridge the gap. Nestle has shown interest in hybrid product development.
- Microalgae requires innovative new technology for scaled-up production, in order to be used as AP ingredient at commercial scale.
- Shifting away from conventional energy-intensive food processing methods.
- Development of (scalable) food processing to enhance ingredient interaction. Current approaches to seeding cells on tissue scaffolds have low yield and poor scalability. Instead, can consider incorporation of cells as functional ingredient in hybrid meat, using novel technology to layer cells within plant protein structure.
- Sensors development to optimize throughput for food manufacturing / precision fermentation (digital twin). AI could play a role here.

Optimising food processing technologies towards net-zero carbon and waste.

- Waste stream valorization: Utilizing low-value meat cuts/by-products in combination with plant protein for hybrid meat products – plant-animal protein interactions necessitate scaffolding to achieve desired texture and taste.
- Develop alternative food processing technologies that Move away from energy-intensive food processing (e.g. HME)
- Shift toward minimal processing when creating future foods; reduces energy demand and improves access to other valuable nutrients in ingredients. Semi-refined ingredients obtained through non-thermal processing and conventional processing can be innovated on to achieve better digestibility and improved flavour profiles.
- Adopt local plant ingredients in AP product development – trends in Europe suggest using local ingredients like pea or fava can lead to increased consumer interest and cost reduction. This trend is absent in Asia, but is worth considering.
- Data and AI for food formulation, usage of consumer data to accelerate formulation.
- Therefore, food scaffolding and processing technologies that are energy efficient is necessary to address cost and flavour challenges with existing AP products.
- Shifting consumer demand for protein towards plant-derived sources can help reduce carbon footprint. Hybrid meats are a bridging product to shift consumer acceptance towards plant proteins in the near term.
- TEA / LCA can help prioritize ingredient selection and technology development for AP / future foods.

PARALLEL SESSION D – HEALTH & NUTRITION

Understanding the health impact of extended consumption of alternative proteins.

- Where are the emerging areas that we have complementary capabilities? On gut microbiome: there are distinct differences in functionality of gut microbiome between Singapore and New Zealand; there is a need to understand this better to obtain a comprehensive picture of uniqueness in populations. This allows targeted ingredient compositions and understanding how ingredients are affecting personalised nutrition. Precision nutrition could be a growth area in future foods.
- Complex interactions between gut microbiome, brain health, and immune system warrant further investigation. Research topics: in vitro modelling to investigate effect of gut microbiome on ingredients. How to modulate neurotransmitters through gut-brain axis (e.g. GABA, tryptophan) – e.g. gut microbiome mechanism affective neurotransmitter.
- Opportunities in data modelling and wearables to deliver social impact (e.g. social issues, mental health)
- Too much processed food available that is not healthy for children; need for products with less salt, sugar, fat.
- Elderly population needs attention – development of texture-modified foods (e.g. scale up of 3D printing) with enhanced nutritional value.
- Need more research demonstrating real health benefits of alternative proteins. This is challenging because clinical trials are expensive and complicated to implement; Non animal model are still the trend, particularly with developing technologies, AI.
- Measuring biomarkers for food intake (rather than dietary surveys) – e.g. unique metabolites which can be detected in blood. Can consider tapping on existing running clinical cohorts.
- Dietary variety (e.g. rainbow diet) – some outcomes from NZ's High Value Nutrition science challenge

Developing future foods with enhanced nutritional properties that enable healthy longevity.

- Proposed target challenge areas: CVD / metabolic disorders; auto-immune disease; gastrointestinal disorders. Seaweed has effect on thyroid and autoimmune diseases (clearing toxins from gut by glutamine), anti-inflammatory, and recovery from radiation
- Enrichment of ingredients e.g. omega 3 acids, nervonic acid. Omega 3 acids / media component enhancement for health aging.
- Identify top health concerns that are limiting health span of populations (gives focus/target); Aging-related markers; What macro and micro-nutrients are we lacking
- Consider ingredient interactions (more fundamental studies needed) and impact on nutritional quality of future foods.
- Use of fermentation to improve nutrition profiles – to explore opportunities to derive better value for indigenous foods (Māori; Asian foods)
- Opportunity in probiotics and prebiotics – seaweed as prebiotic (polysaccharides) to enhance gut health
- NZBIDA project: Using large databases and AI to help make products that combines different food characteristics to make food more appealing to consumers)

WORKSHOP Q&A WITH A*STAR AND MBIE

OTHER RESEARCH AREAS OF INTEREST FOR FUTURE FOODS?

ANY OTHER QUESTIONS?

SINGAPORE CLOSING STATEMENT

Mr Colin Lim

Acting Director, Food and Nutrition Cluster
Biomedical Research Council, A*STAR

**NEW
ZEALAND
CLOSING
STATEMENT**

Ms Emily Robinson

Principal Policy Advisor, International Science
Partnerships

Science & Space Branch | Labour, Science &
Enterprise Group

Ministry of Business, Innovation and Employment

CLOSING KARAKIA

In Te Reo Māori (Māori language)

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English translation

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Enriched and unified
Greetings to all

FREE NETWORKING

Workshop programme for Day 2 has ended.

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4. This meeting will end at 1:00pm (Singapore Time) / 5:00pm (New Zealand Time), and breakout rooms will close.

FREQUENTLY ASKED QUESTIONS FOR PHASE 2 GRANT CALL

- What is the timeline for launching Phase 2 of this bilateral grant call?
Grant call for phase 2 will be launched towards the end of 2024.
- How much funding is available in Phase 2?
More details will be released at a later date.
- How many projects will be funded in Phase 2?
More details will be released at a later date.
- What is the expected duration of projects in Phase 2?
Up to 3 years.
- What is the scope of research topics for the Phase 2 bilateral grant call?
Research topics for Phase 2 are currently being discussed between A*STAR and MBIE, but will be based on feedback gathered in this workshop and subject to finalization by Singapore and New Zealand.
- What is the expected TRL for proposals submitted in Phase 2?
Projects at intermediate TRLs aimed at R&D translational outcomes are highly favourable.
- Do phase 2 projects require industry collaborations?
No, but research teams are highly encouraged to explore company engagements and identify opportunities to translate research outcomes.
- A successful project aims to:
Address multiple research areas in a single research proposal.