

NEA-SPRING Joint Innovation Call for Environmental Services Solutions

1. INTRODUCTION

Arising from the Environmental Services Industry Transformation Map (ES ITM) launched on 11 December 2017, the National Environment Agency (NEA) and SPRING Singapore have jointly launched an innovation call to encourage greater use of technology and automation to increase the overall productivity in the cleaning and waste management industry.

2. OVERVIEW

The purpose of this innovation call is to evaluate and test-bed suitable technologies that can improve the efficiency of both NEA and industry operations related to cleaning and waste management, and support local Small and Medium Enterprises (SMEs)/start-ups in developing competitive technologies for application in the Environmental Services sector.

Interested qualifying parties are invited to submit proposals that can address the four problem statements:

Cleaning Industry:

- a. **To develop a safe, efficient and cost effective kitchen exhaust duct cleaning solution**
- b. **To develop a self-cleaning toilet to enhance productivity of cleaners and improve toilet cleanliness for users**

Waste Management Industry:

- c. **To reduce the physical strain of the work crew in waste collection operation**
- d. **To develop a cost-effective and efficient on-site non-domestic mixed waste treatment system**

Please refer to **Annex A** on the scope of the problem statements.

3. ELIGIBILITY INFORMATION

3.1 Project Team

Project lead(s) and members of the project team must be identified for each proposal. NEA reserves the right to appoint/nominate a Co-lead to be part of the project team who will jointly oversee the project R&D and test-bedding phases during the project period.

3.2 Type of Solutions

The proposed solutions must address the requirements of the problem statements in this Innovation Call. They should fulfil the following criteria:

- a) Solutions must not be readily or commercially available in the market.

- b) Development of the solutions must not have commenced at the point of proposal submission.
- c) Technologies should aim to:
 - Enhance safety of operations; and/or
 - Reduce reliance of manpower; and/or
 - Improve quality, consistency and service delivery; and/or
 - Achieve cost-savings; and/or
 - Improve efficiency/productivity.

3.3 Development and test-bedding of the solutions

The development and test-bedding of the solutions could be carried out in the following phases:

- a) **Research and Development (R&D) Phase:** Involves the development of the solution and prototyping. Proposal shall proceed to the Test-bedding Phase only upon successful completion of the R&D Phase.
- b) **Test-bedding Phase:** Involves test-bedding of the proposed within NEA or relevant premises/sites in Singapore.
- c) **Pilot Deployment Phase:** NEA reserves the right to scale up and implement the proposed solution at subsequent stages should the successful applicant fulfil the scope of works and meet the deliverables specified in the Project Agreement, provided always that the expected outcomes are deemed to be in compliance with the Deliverables, timely and appropriate for implementation.

4 EVALUATION CRITERIA

Proposals will be assessed based on the technical and commercialisation merits of the technology in the following areas:

- a) **Effectiveness of solutions (30%):**

Proposals will be assessed on how their solutions effectively address the respective problem statements. The proposals would also be evaluated on the method (i.e. whether a transformative or incremental improvement approach was taken, beyond the current or conventional methods) and relevance to Singapore's context and NEA or industry's needs.

- b) **Feasibility of solutions to be deployed in actual environments (30%):**

Solutions will be assessed on their technical and economic feasibility for deployment in an actual working environment. Assessment will be done on their estimated operating and life cycle costs upon deployment to ascertain their cost-effectiveness against existing solutions, if any.

- c) **Cost effectiveness and potential to scale up and ease of implementation (20%):**

Solutions will be assessed on their cost effectiveness for scaling up on a large-scale basis in various premises/sites/operations. Proposed solutions should pose

minimal/no nuisance and disruption to existing operations. Minimal alterations to install and operate on existing building/infrastructure are preferred.

d) **Capacity & expertise to undertake and execute the project (20%):**

The project team will be assessed on whether they have the requisite capabilities and resources to undertake the research/innovation project.

5 FUNDING OF PROPOSAL

5.1 Eligible qualifying costs include:

- a) **Manpower costs:** This only applies to staff or new hires directly involved in the project; or specific capability from a third-party service provider (e.g. capabilities for the enhancement/development of software/prototyping). This does not include employees employed for other job functions and/or job scopes outside of the proposal.
- b) **Equipment/Software:** Core equipment/tools required for developing front-end/backend application (e.g. software/mobile application) and/or prototyping. This includes purchase price, and costs related to R&D and test-bed phases. (e.g. delivery, installation, handling, etc.) Only project related technical software and equipment that is non-existing within the organisation may be supported. Operational costs such as cost of capital works, general infrastructure, general purpose IT communication equipment, office software and equipment, and furniture and fittings, etc will not be supported.
- c) **Testing and Certification:** Third-party testing and certification services to ensure that proposed solutions comply with required standards and regulations.
- d) **Consultancy (Professors/Experts):** Consultancy or advisory cost for Professors/Experts may not be supported if specifically relevant to meeting the milestones and deliverables of the project.
- e) **Intellectual Property (IP):** Licensing/Technology/Acquisition/Patent related costs in direct relation to the technology must be stated in proposal. Supporting documents such as a copy of the original source must be provided.

5.2 The call is targeted at local SMEs/start-ups with the following funding support for successful applicants:

Organisation Type	Funding Supported
Local ¹ SMEs / start-ups	Up to 70% of qualifying project cost

➔ Interested foreign technology providers are recommended to work with local SMEs / start-ups.

¹ For SMEs, the companies must fulfil the following criteria:

- a) Registered and operating in Singapore, and
- b) Have minimum 30% local shareholding, and
- c) Have group annual sales turnover of not more than S\$100 million, or group employment of not more than 200 employees

- For the problem statement 2(d): 'To develop a cost-effective and efficient on-site non-domestic mixed waste treatment system', funding availability for foreign technology providers will be assessed on a case-by-case basis.

6 DISBURSEMENT OF FUNDS

6.1 Funds will be disbursed at three project milestones on a reimbursement basis:

- a) First milestone: Completion of the Research & Development (R&D) phase.
- b) Second milestone: Completion of installation of the technology/solution for test-bedding and actual demonstration.
- c) Third milestone: Completion of the final deliverables for the project.

6.2 The total funds requested shall not exceed the approved quantum. Total funds disbursed at completion of first two milestones shall be capped at 50% of the total approved funding.

6.3 There should be no request for additional funds unless there are strong and valid justifications. Any additional funding will be subject to NEA's approval. Companies are advised to provide thorough and accurate breakdown costs of their proposal during the submission.

7 RIGHTS OF AWARDING

NEA and SPRING Singapore reserves the right to select proposals to be awarded. For the avoidance of doubt, NEA and SPRING Singapore also reserves the right not to award funding to any proposal.

8 TIMELINE OF INNOVATION CALL

The Innovation Call will be opened between 29 January 2018 and 26 April 2018 (both dates inclusive). The deadline for submission is on 26 April 2018 at 12 noon (Singapore time, GMT+8). To submit here.

9 CONTACT PERSON

For further enquiries on this Innovation Call, please email NEA at [\[ESITM_Innovation@nea.gov.sg\]](mailto:ESITM_Innovation@nea.gov.sg).

ANNEX A - SCOPE OF THE PROBLEM STATEMENTS

Please refer to the attached problem statements for the full details.

[A] To develop a safe, efficient and cost effective kitchen exhaust duct cleaning solution	
Background	<p>Kitchen Exhaust Ducts (KED) have to be cleaned regularly to prevent grease accumulation inside the ducts which poses potential fire hazards. Without a proper cleaning regime, this risk of spreading fire along KED to neighbouring stalls will increase significantly which could affect a few stalls and not just one stall if fire incident occurs.</p> <p>Currently, KED are being degreased manually by cleaners which is labour-intensive. Cleaners are equipped only with spray bottles of degreasing agent and, scrappers and cloths to scrape and wipe off the grease. They have to crawl through the ducts and work within confined spaces.</p> <p>When KED have limited entry points, access panels will have to be cut out from KED for cleaners to enter. Generally, cleaners will only clean areas which they can possibly reach. Therefore, they are unable to clean hard to reach areas, especially long vertical ducts.</p> <p>As KED are cleaned manually, it is a time-consuming process. Depending on the length of KED, it may take a few nights for cleaners to degrease KED serving a large food establishment.</p> <p>The proposed solution should be able to clean all parts of KED, including interior and exterior of KED, vertical ducts, ducts of different shapes (e.g. rectangular and circle ducts), kitchen exhaust fan blades, grilles, louvres and small ducts etc. In addition, the proposed solution should be less labour-intensive and time-consuming, less intrusive (i.e. does not require cutting of access panels) and provide higher cleaning standard.</p>
Desired Outcome	<p>Safe, efficient and effective method for kitchen exhaust duct cleaning. Reduce the risk of spreading of fire due to grease accumulation in kitchen exhaust ducts.</p>
Key Requirements	<p>The proposed solution should meet the following requirements:</p> <ol style="list-style-type: none"> 1. The proposed solution should function in the greasy conditions typically found in environment in food preparation and cooking areas of commercial kitchens where KED are installed.

	<p>2. (a) Existing KED are able to withstand the weight of cleaning equipment used for degreasing without causing structural damages.</p> <p>(b) KED comes in different shapes and sizes so there is no one-size-fits-all solution.</p> <p>(c) The equipment is able to clean the interior and exterior of KED ducts at angles of elevation of up to 90 degrees. It is able to clean hard-to-clean areas, e.g. kitchen exhaust fan blades, grilles, louvres and, spiral and small ducts.</p> <p>(d) The equipment can be remotely operated.</p> <p>(e) The equipment used is able to operate in a greasy environment and does not cause damage / degrade existing KED and Kitchen Exhaust System's integrity.</p> <p>(f) The total power consumption of equipment(s) used does not exceed power supply allowable in the premise, and will not cause a power trip. QP/LEW is to certify the installation of the system is safe for the purpose of the trial.</p> <p>(g) The proposed solution does not disrupt business operations and it is able to comply with any statutory regulation on permissible noise, work hours and worksite safety. The cleaning of the KED is to be carried out after operation hours of the hawker centres. Operation hours varies from centre to centre.</p> <p>(h) The proposed solution should be able to take photos or videos or both of the conditions of the duct and also the cleaning process.</p> <p>(i) The proposed solution should be able to provide reports with before and after photographs after every cleaning service.</p> <p>3. The proposed solution is less time-consuming and labour-intensive as compared to manual cleaning. Cost of engaging proposed solution does not exceed existing market rates.</p>
<p>Timeframe for development of proposed solution</p>	<p>The target milestones are:</p> <ol style="list-style-type: none"> 1. Completion of working prototype ready for evaluation 6 months after the start of project. 2. Completion of full functional end product ready for pilot deployment 10 months after the start of project.

[B] To develop a self-cleaning toilet to enhance productivity of cleaners and improve toilet cleanliness for users

Background	<p>Public toilets are subject to high usage.</p> <p>Despite having toilet cleaners deployed to clean the public toilets (e.g. food centres, coffee shops, bus terminals, etc.) according to a fixed schedule, the level of cleanliness is often impaired by improper toilet usage by users (e.g. strewing of toilet papers on floors, urinating on floor). A proposed solution is required to facilitate a self-toilet cleaning system that can be activated upon reaching a number of uses and/ or scheduled basis.</p> <p>Although toilet facilities are being inspected regularly, fault calls are commonly received for toilet breakdowns (e.g. WC flushing components failure, WC chokage, pipe leakage). A proposed solution is required to alert the facilities maintenance contractor immediately when breakdowns are detected and, thus, reduce toilet downtime.</p>
Desired Outcome	<p>The outcome of the solution should lead to higher cleaning and maintenance efficiency, higher cleanliness level, better user satisfaction, and lesser reliance on manpower.</p>
Key Requirements	<p>The proposed solution should meet the following requirements:</p> <ol style="list-style-type: none"> 1. The proposed solution should function in a wet environment in public toilets. 2. (a) Automated self-cleaning equipment used must be able to operate in wet environment. (b) The total power consumption of equipment(s) used does not exceed power supply allowable in the premise and cause a power trip. QP/LEW is to certify the installation of the system is safe for the purpose of the trial. (c) The equipment installed in toilets do not intrude the privacy of toilet users. 3. Cleaning standard has to comply with SS 499:2002 (2015) Cleaning Service Industry – Cleaning Performance for Commercial Premises. 4. (a) The proposed solution will facilitate self-cleaning (washing & drying) based on number of users & schedule and, replenishment of toilet cleaning supplies/inventory and toilet parts repairs/ replacement.

	<p>(b) It should be able to reduce manpower, increase toilet cleanliness standard (e.g higher Happy Toilet Rating, higher user satisfaction), reduce downtime during toilet repair works, and is reliable, easy to maintain and water-saving.</p> <p>(c) The system will be able to collate data on toilet usage and breakdown etc., analyse and translate such data into reports and findings.</p> <p>(d) It provides data on web based dashboard to allow users to access remotely on smartphone, iPad and PC etc.</p> <p>(e) It allows integration with other systems when required.</p> <p>(f) It allows system upgrade to the latest operating system etc.</p> <p>(g) It is protected from cyberattack, hacking and unauthorised access etc.</p>
<p>Timeframe for development of proposed solution</p>	<p>The target milestones are:</p> <ol style="list-style-type: none"> 1. Completion of working prototype ready for evaluation 6 months after the start of project. 2. Completion of full functional end product ready for pilot deployment 10 months after the start of project.

[C] To reduce the physical strain of the work crew in waste collection operation

Background	<p>Each public waste collection team requires the use of 2 crew members to perform collection from a mix of bin types on different road conditions.</p> <p>Collection process may require the crew to push and pull the bins against uneven terrains, up/down slopes, against drains, gutters and kerbs.</p> <p>Certain routes require waste collection crew to collect from trade premises with 660L bins which are filled to the brim. Such filled bins may weigh as heavy as 300-400kg. Additionally, the crew may need to lift the heavy bins from grass verge/kerbs and bring down to ground level.</p> <ul style="list-style-type: none"> - 2 crew members will have coordinate in the manoeuvring and lifting of the heavy bins. - In certain road conditions, the driver will also have to alight from his cabin to help directing traffic, resulting in delayed collection, prolonged road obstruction and unproductive operations. - Additionally, repeat of such actions daily may result in workplace injuries to the crew overtime. <p>A proposed solution is required to help in the collection operation without compromising on the operational productivity and safety. Such solution will be used by the waste collection crew and should also be portable, easy to use and safe to operate.</p>
Desired Outcome	<p>Using an assistive technology to aid in the waste collection crew's daily operation to collect heavy bins from a variety of road conditions.</p> <p>Such system should:</p> <ol style="list-style-type: none"> 1. Improve productivity and safety of operations 2. Improve ease of operations 3. Portability of assistive device 4. Cost effective solution
Key Requirements	<p>The proposed solutions should be meet the following requirements:</p> <ol style="list-style-type: none"> 1. Device should help improve the work life of the collection crews. 2. Device should be easy to operate. 3. Device should be easily transportable and stored in the truck when travelling from location to location

	<p>4. Device may be motorised and/or mechanically driven but must not compromise current collection operations. Considerations will be given for device which can improve current operational productivity and safety.</p> <p>5. Cost effectiveness</p>
<p>Timeframe for development of proposed solution</p>	<p>The target milestones are:</p> <ol style="list-style-type: none"> 1. Completion of site evaluation, equipment concept design & detailed drawings 3 months after the start of project 2. Completion of working prototype ready for evaluation 6 months after the start of project. 3. Trial of working prototype with solution adopter for 3 months 4. Provide reports and findings on data collated during trial phase 5. Completion of full functional end product ready for pilot deployment 12 months after the start of project.

[D] To develop a cost-effective and efficient on-site non-domestic mixed waste treatment system

Background	<p>Non-domestic waste is collected by licensed general waste collectors (GWCs) and treated at licensed waste disposal facilities. While premises segregates recyclables from their wastes to be recycled by the main waste management contractor, there are still significant amount of general waste collected by GWCs and sent to incineration plant and then to landfill. Examples of such general waste could be food wastes mixed with paper, plastic, packaging and potential metals which reduces the “recyclability” of the individual waste streams.</p> <p>Currently, the only type of waste treatment installed at facility level is on-site food waste treatment machines. However, as they are used to treat source segregated food waste, general waste are currently being collected by GWCs for incineration.</p> <p>As general wastes is made up of different types of wastes, the challenge is to look for a versatile system to effectively and efficiently (such as a self-sustaining system where power output is higher than input. Efficiency for hot water could be measured in terms of cost savings from conventional hot water generation) treat the general waste to higher value by-product such as electricity, hot water, etc.</p> <p>Another key challenge is to propose a system which can function within the waste management facility in existing premises, such as bin centres.</p>
Desired Outcome	<p>An on-site waste treatment system within existing premises’ waste management facility to effectively treat their own general wastes. A versatile system to effectively and efficiently treat the general waste (made up of different types of waste streams) to higher value by-product such as electricity, hot water, etc.</p>
Key Requirements	<p>The proposed solution should meet the following requirements:</p> <ol style="list-style-type: none"> 1. There should be minimal noise from the proposed system operation 2. (a) The proposed system will need to fit into the existing premises’ waste facilities or in spaces of proximity. Note: As different premises generates varying amount of general waste, proposals to include the recommended treatment capacity up to 35 tonnes of general wastes/day. Depending on the recommended treatment capacity, shortlisted companies will be invited for a site survey and are expected to refine their proposals according to the site-specific environment.

	<p>(b) Total power consumption of equipment(s) used must be within total allowable power supply in the premises to prevent power trips. QP/LEW is to certify the installation of the system is safe for the purpose of the trial.</p> <p>(c) The general waste profile comprises food waste, paper, plastic and packaging waste. Thus, the system should be a versatile system to effectively and efficiently treat the general waste.</p> <p>3. The proposed system must not cause any public health issues and comply with the EPHA and its relevant Subsidiary legislation.</p> <p>4. The proposed system must comply with the necessary building regulation requirement.</p> <p>5. Operation of the system should be efficient (e.g. cost efficient, energy efficient) and manpower should also be efficient.</p>
<p>Timeframe for development of proposed solution</p>	<p>The target milestones are:</p> <ol style="list-style-type: none"> 1. Completion of site evaluation, equipment concept design & detailed drawings 3 months from start of project 2. Necessary regulatory approval 6 months after the start of project 3. Completion of working prototype ready for evaluation 8 months after the start of project. 4. Trial of working prototype with solution adopter for 3 months 5. Provide reports and findings on data collated during trial 6. Completion of full functional end product ready for pilot deployment 15 months after the start of project