



**REQUEST FOR INFORMATION**

**LARGE-SCALE FLOATING SOLAR PHOTOVOLTAIC SYSTEM**

**Economic Development Board  
250 North Bridge Road  
#28-00, Raffles City Tower  
Singapore 179101**

**ISSUANCE DATE: 31 OCTOBER 2018**

**REQUEST FOR INFORMATION**

**LARGE-SCALE FLOATING SOLAR PHOTOVOLTAIC SYSTEM**

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## **PART 1 TERMS AND CONDITIONS OF RFI**

### **1. INVITATION TO SUBMIT**

1.1 The Economic Development Board (EDB) invites Proposals for 'Request for Information (RFI) – Large-scale Floating Solar Photovoltaic (FPV) System for Private Sector Consumption' as published in the website at <https://www.edb.gov.sg/en/news-and-resources/news/edb-explores-potential-for-100mwp-floating-solar-pv-system.html> on **31 October 2018**.

1.2 This RFI is part of a two-stage model to explore the potential deployment of a large-scale FPV system (the "System") to generate renewable energy for private sector consumption in Singapore. More information on the two-stage model can be found in Part 2. The main private sector stakeholders for the deployment of the System include, but are not limited to:

- a) Renewable energy user: The renewable energy user consumes the electricity generated by the System.
- b) Environmental consultant: The environmental consultant conducts the environmental impact studies to assess the environmental impact of the System.
- c) Engineering consultant: The engineering consultant conducts relevant engineering studies to propose the engineering design and assess the technical feasibility of the System.
- d) System builder: The system builder constructs and deploys the System.
- e) System owner: The system owner owns the System and is responsible for the operation and maintenance of the System.

The parties listed in items (b) to (e) above are collectively referred to as the "Solution Providers".

1.3 This RFI is only open to companies that are renewable energy users. Interested companies are to submit a Proposal that contains sufficient information for EDB, the Government of Singapore and such other agencies of the Government of Singapore as EDB considers appropriate in its discretion (the "Relevant Government Agencies"), to evaluate the economic viability of the System. The information required is outlined in Part 2, Annex D.

1.4 Companies may wish to, but are not required, to form a consortium to submit the Proposal. If a consortium is formed, the Proposal is to be submitted by such member of the consortium as would be the main off-taker of the electricity generated by the System (the "Lead Member"). Where a Proposer is a

consortium, all members of the consortium should be renewable energy users and no member of the consortium should seek to own the System or onward sell the electricity generated by the System. Documentary proof must be provided that the Lead Member is authorised by all members of the consortium to submit, sign the Proposal, receive instruction, give any information, accept any contract, and act for and on behalf of all members of the consortium. The documentary proof could be in the form of:

- a) Relevant provision(s) in the certified copy of the consortium or partnership agreement; or
- b) Certified copies of Power of Attorney

1.5 Proposers are required to submit their Proposals and drop them in a sealed envelope to **Tender Box 1** located at:

**Economic Development Board (EDB)**

250 North Bridge Road  
#22-00 Raffles City Tower  
Singapore 179101  
Attention: Mr Joseph Tay and Ms Neo Shu Fang  
Energy, Chemical and Materials

1.6 Should Proposers have any queries on any aspect of the RFI document, these shall be promptly directed via email to [project\\_fpv@edb.gov.sg](mailto:project_fpv@edb.gov.sg) no later than **25 January 2019**.

1.7 A one-off Q&A session for all interested parties will be organized on **30 November 2018**, 10 to 11.30am at a venue to be confirmed. Interested parties are required to register their interest via <https://www.eventbrite.sg/e/qa-session-rfi-for-large-scale-floating-solar-pv-system-tickets-51934670999>, and to submit their list of questions for the Q&A session, if any, by sending to the email address mentioned in Part 1, Section 1.6, by **27 November 2018**. Those who register their interest will be informed of the details ahead of the session.

1.8 Any additional material information that may arise during the submission period (**31 October 2018 to 15 February 2019**) will be published through the issue of a corrigendum on the website link: <https://www.edb.gov.sg/en/news-and-resources/news/edb-explores-potential-for-100mwp-floating-solar-pv-system.html>. Multiple corrigenda may be published on that website link during the submission period. The last corrigendum will be issued no later than **31 January 2019**. The onus lies with the Proposers to check the website link regularly during this period, to download the updated information and incorporate this into their Proposals for submission.

- 1.9 Proposers must submit in hardcopy **two (2) originals copies** of their Proposals, in accordance with the guidelines provided in Part 2, and inclusive of **Annex D**, enclosed and sealed under plain cover clearly marked “**Request for Information – Large-scale Floating Solar Photovoltaic System for Private Sector Consumption**” to EDB by **15 February 2019, 1200 hours, GMT +8** at the address indicated in Part 1, Section 1.5.
- 1.10 Proposals which are not in compliance with instructions, terms and conditions set out in this RFI are subject to disqualification.

## **2. ACCEPTANCE AND PROCESS**

- 2.1 By registering its intention to participate in this RFI, the Proposer accepts that it is bound by the terms and conditions set out in this RFI.
- 2.2 Neither the RFI nor the RFI process shall create any binding contractual, equitable or other obligation on EDB or any right (whether expressed or implied) in favour of a Proposer that is enforceable against EDB. In particular, and without limitation to the foregoing, this RFI does not constitute a contractual offer.
- 2.3 Any Proposals submitted in response to this RFI document will be subject to further discussions and enhancements with EDB and the Relevant Government Agencies. Proposers may be required to submit more detailed Proposals or to conduct presentations and discussions on their Proposals to EDB and the Relevant Government Agencies during the review process, and/or make available any relevant facilities for EDB’s and the Relevant Government Agencies’ visit and assessment.
- 2.4 If there is any conflict or inconsistency between the terms and conditions set out in this RFI and the terms contained in any Proposal, the terms and conditions set out in this RFI shall prevail.

## **3. CONFIDENTIALITY**

- 3.1 Proposals submitted in connection with this RFI will be treated as confidential and will not be returned. By submitting a Proposal, the Proposer hereby consents to any disclosure by EDB of its Proposal to the Relevant Government Agencies and such other advisers to the foregoing (who may or may not be related parties, and which includes the Solar Energy Research Institute of

Singapore (SERIS)), the project manager and consultant for the Floating Solar Photovoltaic Testbed at Tengeh Reservoir) as EDB considers appropriate in its discretion.

- 3.2 No Proposer shall make any public statements regarding this RFI without the prior written consent of EDB. Further, the Proposer shall ensure that all information it receives as a result of participating in this RFI is kept confidential and shall not disclose or distribute any such information to any person in any manner without the prior written consent of EDB.

#### **4. COLLECTION OF INFORMATION**

- 4.1 The Proposer hereby authorises EDB to collect relevant information from the Proposer and such third parties as EDB considers relevant to the process and to use that information as part of its evaluation of the Proposer's Proposal.

#### **5. CONFLICT OF INTEREST**

- 5.1 The Proposer shall disclose any actual or potential conflict of interest in relation to the matters covered by this RFI.

#### **6. OWNERSHIP OF PROPOSALS**

- 6.1 The Proposals submitted to EDB in response to this RFI shall be retained by EDB. The Proposer shall retain ownership of the intellectual property in its Proposal. However, by submitting a Proposal, the Proposer hereby grants to EDB a royalty-free licence to use, copy, adapt, modify and reproduce all or any part of its Proposal for the purpose of evaluating the Proposal and for the purpose of any subsequent discussions that may be undertaken by EDB with that Proposer.

#### **7. INFORMATION COMPLETE AND ACCURATE**

- 7.1 By submitting a Proposal, the Proposer warrants that all information in the Proposal is complete and accurate in all respects. The Proposer also warrants to EDB that the provision of such information to EDB, and the use of it by EDB or any of the Relevant Government Agencies for the evaluation of its response and for any subsequent discussions that may be undertaken, will not infringe any third party intellectual property rights.

## **8. PROPOSERS TO INFORM THEMSELVES**

- 8.1 Without prejudice to the generality of Part 1, Section 11 below, EDB hereby disclaims to the fullest extent permitted by law, any liability for loss or damage resulting from changes to technical specifications, statements made or data provided to Proposers in the course of their preparation of their Proposals, or within the RFI itself or subsequent discussions that may be undertaken by EDB with any Proposer. Each Proposer shall rely on its own assessment as to the accuracy and completeness of information provided in connection with the RFI.

## **9. EXPENSE OF THE PROPOSERS**

- 9.1 All costs and expenses incurred by the Proposers in the preparation and submission of their Proposals, and in attending to any of the clarifications and queries arising from the consideration of the Proposals shall be borne entirely by the respective Proposers and no claim for costs or expenses shall be entertained by EDB.

## **10. EXCLUSION OF LIABILITY**

- 10.1. To the fullest extent permitted by the law, EDB hereby disclaims any liability on its part, or on the part of any of its employees, subcontractors and agents to any party (whether in contract tort or otherwise) for any damage, loss or cost arising from or in connection with this RFI.

## **11. RIGHTS RESERVED BY EDB**

- 11.1. Notwithstanding any other provision in this RFI, EDB reserves the right to:
- a) Reject all or any of the Proposals;
  - b) Accept or reject any late or non-conforming Proposal. Where EDB accepts a late Proposal, this will be in accordance with good practice and consistent with any public law obligations;
  - c) Seek further details or clarification from a Proposer about any aspect of its Proposal;
  - d) Involve any of the parties listed Part 1, Section 3.1 in any part of the evaluation process;
  - e) Have full rights to the usage of any information in any Proposal;
  - f) Amend, suspend or withdraw all or any part of the RFI or the RFI process by way of written notice on <https://www.edb.gov.sg/en/news-and->

[resources/news/edb-explores-potential-for-100mwp-floating-solar-pv-system.html](https://www.edb.gov.sg/en/news-and-resources/news/edb-explores-potential-for-100mwp-floating-solar-pv-system.html)

- g) Alter timelines by way of written notice on <https://www.edb.gov.sg/en/news-and-resources/news/edb-explores-potential-for-100mwp-floating-solar-pv-system.html>; and
- h) Subject the Proposer to disqualification, should the Proposer infringe any clauses in this RFI.

11.2. For the avoidance of doubt, nothing in this RFI shall serve as a commitment by EDB, or any party to whom EDB discloses any Proposal, to undertake any further action in respect of any Proposal received.

11.3. Upon the conclusion of the RFI assessment, EDB reserves the right to enter into exclusive negotiations with the selected Proposer (the “Selected Proposer”) to define the terms of a Memorandum of Understanding (MOU) to be signed between the Selected Proposer, and EDB and the Relevant Government Agencies. The MOU will confer the exclusive right to develop the System to the Selected Proposer. The terms of this MOU may differ from the specifications, and terms and conditions stipulated in this RFI document, and may also differ from any submissions from the Selected Proposer.

## **12. GOVERNING LAW**

12.1. This RFI is governed by Singapore law. Any dispute under this RFI shall be referred to arbitration under the Rules of Conciliation and Arbitration of the Singapore International Arbitration Centre before a single arbitrator. The arbitration proceeding shall be conducted in English and located at Singapore.

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## **PART 2      SPECIFICATIONS**

### **1.      INTRODUCTION**

- 1.1 In October 2016, PUB, Singapore’s national water agency, and EDB launched a 1MWp Floating Solar Photovoltaic (FPV) testbed at Tengeh Reservoir (the “Testbed”) to study the technical, economic and environmental feasibility of deploying FPV systems on Singapore’s reservoirs. The Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore (NUS) acted as the project manager and oversaw the design, construction, testing, commissioning and the scientific evaluations of the Testbed.
- 1.2 Multiple local and foreign companies participated in the Testbed. Leading PV system integration companies (SolarGy, Phoenix, Sunseap, BBR, Upsolar, REC, Sharp and Million Lighting) used a number of tier-one PV module manufacturers (Trina Solar, REC, JA Solar, Upsolar, Sharp, Yingli etc.) to study the modules’ performance on water bodies. Floating system products from Ciel & Terre, 4C Solar, NRG Energia, Solaris, Koine, Takiron, Sumitomo Mitsui, the Housing Development Board and Siam Cement Group were deployed at the Testbed. The systems also used on-grid solar inverters from SMA, ABB, Huawei and Sungrow. The aim was to test different solar PV and floatation technologies to ascertain the best combinations for wider application in Singapore.
- 1.3 Studies conducted at the Testbed showed that there were no observable changes in the reservoir’s water quality and no significant impact on the surrounding wildlife. FPV systems were also found to perform five to fifteen percent better than typical solar PV rooftop systems in Singapore due to the better cooling effect at the reservoir.
- 1.4 The adoption of renewable energy is of keen interest to the private sector. Many multinational corporations have signed onto the RE100 initiative to commit to 100% renewable electricity. This is because of companies’ commitment to sustainability and the rapidly declining costs of renewable energy. In Singapore, the availability of renewable energy is increasingly viewed by companies as a favourable consideration for future investment and expansion plans. With the industry sector alone accounting for about 60% of Singapore’s overall greenhouse gas emissions, the adoption of electricity generated from renewable energy sources will also significantly aid Singapore’s effort to reduce our overall greenhouse gas emissions.

- 1.5 To support the private sector's efforts to adopt renewable energy, EDB has launched a Request for Information (RFI) for a large-scale FPV system (the "System").
- 1.6 While there has been strong interest in FPV systems globally, the sector is relatively nascent and few such systems have been deployed commercially. Therefore, the potential deployment of the System in Singapore presents a unique opportunity for Singapore-based companies to acquire the relevant project development and engineering capabilities that could support the growth of the sector.

## **2. OBJECTIVES**

- 2.1 The purpose of this RFI is to invite Proposals from interested companies, that are renewable energy users, to determine the level of demand and willingness to pay for electricity generated from the System. This RFI is part of a two-stage model to explore the potential deployment of the System.

## **3. A TWO-STAGE MODEL**

- 3.1 As a large-scale, commercial FPV system has never been deployed on Singapore's reservoirs before, the Singapore Government has decided to adopt a two-stage model, involving an Exploratory Stage and an Evaluation Stage, for the deployment of the System. The two-stage model aims to address uncertainties around local demand for renewable energy and the willingness to pay for such renewable energy, which affect the economic viability of the System.

### **3.2 Exploratory Stage**

The Exploratory Stage aims to determine the renewable energy user that will commit to off-take the electricity generated from the System. This will address the uncertainty around the level of demand for the electricity generated from the System and the willingness to pay for such electricity. The renewable energy user will be determined via this RFI. The assessment will be primarily based on the price offered (P) for the electricity generated from the System, the track record of the renewable energy user, and other criteria listed in Section 13. At the end of the Exploratory Stage, EDB will enter into exclusive negotiations with the selected renewable energy user (the "Selected Proposer") to define the terms of a Memorandum of Understanding (MOU) to be signed between the

Selected Proposer, and EDB and the Relevant Government Agencies. The MOU will confer the exclusive right to develop the System to the Selected Proposer.

### 3.3 Evaluation Stage (One)

The Selected Proposer from the Exploratory Stage will be responsible for developing the System. This includes conducting the necessary engineering and environmental impact studies to determine the technical feasibility and environmental impact of the System. The Selected Proposer may appoint suitable engineering and environmental consultancies to conduct the necessary engineering and environmental impact studies. The findings of the environmental impact studies shall be shared for the purpose of soliciting inputs and comments from EDB, Relevant Government Agencies and any other relevant public stakeholders as EDB considers appropriate in its discretion. Any decision to deploy the System is contingent on the results of the engineering and environmental impact studies.

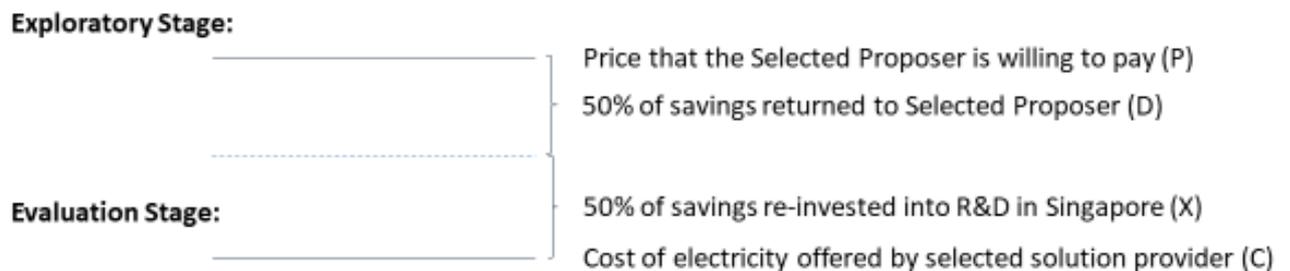
After the engineering and environmental impact studies are completed, the Selected Proposer shall consult with EDB and such agencies of Government of Singapore whose approvals are necessary for the deployment of the System (“Relevant Approving Authorities”).

### 3.4 Evaluation Stage (Two)

Once the approval to deploy the System is given, the Selected Proposer shall conduct an open selection of system builders and owners to build, own and operate the System. In selecting the system builders and owners, the evaluation criteria should include requirements from EDB and the Relevant Government Agencies, and the evaluation committee should include representatives from EDB. Key evaluation criteria include the cost of electricity offered by the solution provider (C), which should factor in a proposed water surface rental fee, and the track record of the solution provider (see Section 6 and 9).

3.5 The selected Solution Providers from Evaluation Stage (One) and (Two) will henceforth be collectively known as the “Selected Solution Providers”.

### 3.6 Visual Depiction of the Two-Stage Model



- 3.7 To encourage competitive bidding in the open selection during the Evaluation Stage (Two), the price indicated by the Selected Proposer (P) will not be publicized. There could be potential savings for the Selected Proposer, which will be determined by the difference between P and C. 50% of the savings should be re-invested into research and development in Singapore in areas including but not limited to the water-energy nexus, energy management and reservoir ecology. The price that the Selected Proposer will eventually pay for electricity generated by the System will be  $P - D$ .

## 4. **FLOATING PHOTOVOLTAIC SYSTEM AT KRANJI RESERVOIR**

- 4.1 Given its large water surface area, Kranji Reservoir has been identified as the most suitable reservoir for the potential deployment of the System. It is estimated that a small portion of Kranji's surface could yield up to 100MWp of floating solar PV. Kranji Reservoir is currently managed by PUB. Please refer to Annex A for a map of the reservoir. It is recommended that the Proposer puts forth a Proposal for a System that is up to 100MWp of floating solar PV on the reservoir.
- 4.2 Kranji Reservoir is surrounded by a number of Nature Areas that together form Singapore's largest remaining tract of freshwater marshes. It is also located adjacent to Sungei Buloh Wetland Reserve and Mandai Mangroves and Mudflats. This region is a critical hotspot for wetland biodiversity, in particular birdlife. In addition to rare resident species restricted to freshwater wetlands, the area is also an important stopover and wintering site for migratory birds migrating along the East Asian-Australasian Flyway. Besides that, the wetlands also support rare plants found nowhere else in Singapore. Please refer to Annex A1 for a map of Kranji Reservoir relative to the surrounding nature reserve and nature areas.

## 5. TECHNICAL AND REGULATORY REQUIREMENTS

- 5.1 The System should comply with the technical and regulatory requirements prescribed by PUB and the other Relevant Approving Authorities, including but not limited to the National Parks Board (NParks), Energy Market Authority (EMA), Singapore Land Authority (SLA) and the Urban Redevelopment Authority (URA).

### Main Technical Requirements

- 5.2 Water quality and environmental impact studies must be conducted to assess the impact of the System on reservoir water quality, reservoir ecology, as well as the natural ecosystems and associated biodiversity that surround the reservoir. In particular, impacts to the freshwater and coastal wetlands surrounding the reservoir, and by extension the resident and migratory birds that use these habitats, must be documented and evaluated. None of the above are to be compromised by the System (including all associated ancillary infrastructure). The Relevant Approving Authorities' (including but not limited to the Ministry of National Development (MND), URA, PUB, NParks, Agri-Food and Veterinary Authority of Singapore (AVA) and National Environment Agency (NEA)) approval shall be sought for the scope and findings of the water quality and environmental impact studies, as well as implementation of any mitigation measures. Refer to Annex B for proposed scope of works for water quality and environmental impact studies.
- 5.3 The deployment of the System is contingent on whether the findings of the studies demonstrate that the system will have an insignificant impact on the reservoir water quality and area's biodiversity, or if there are measures that can be put in place to minimise the impacts to meet a standard acceptable to PUB and NParks. Full detailed requirements by PUB and NParks will be provided at a later stage. Provision should be made for additional time and resources in consulting and soliciting feedback from the relevant stakeholders with respect to the findings of the environmental impact studies.
- 5.4 EDB and the Relevant Government Agencies reserves the right to include additional requirements on top of the recommended mitigation measures from the findings in 5.2 and 5.3.
- 5.5 At all times throughout the project duration (deployment, installation, operation and maintenance), it would be mandatory to ensure that the water quality and reservoir ecology are not compromised by or as a consequence of the System. In any instance, should water quality and reservoir ecology be compromised, the Selected Proposer and/or the Selected Solution Providers will be required

to make good the water quality, to a standard acceptable to PUB, in accordance to PUB's instructions and requirements.

- 5.6 PUB will determine if there is any adverse impact of the System on reservoir health status and water treatability through water quality monitoring (i.e. dissolved oxygen levels at bottom layer drop to below 2mg/L and 10% increase in nutrient and organic contents from baseline levels) before and after the installation of the System. If water quality of the reservoir is adversely affected by the System and the Selected Proposer and/or the Selected Solution Providers are not able to make good the water quality, to a standard acceptable to PUB, PUB reserves the right to request the Selected Proposer and/or the Selected Solution Providers to remove all equipment associated with the System within 60 working days (from date of notice from PUB). The Selected Proposer and/or the Selected Solution Providers are then required to reinstate the reservoir to its original condition or an agreed state as agreed then by PUB, at no cost to PUB.
- 5.7 Water quality and sediment monitoring to assess the impact of the System (sampling locations, parameters and frequency to be fixed by PUB) are required and quarterly monitoring reports have to be submitted to PUB. A sample of this report can be found in Annex C. Three online water quality monitoring stations under the System area shall be installed and PUB shall be granted access to the online water quality monitoring data. The station locations are subject to PUB's recommendation and approval. Any water quality relevant or related incidents should be reported to PUB within 2 hours. All online water quality monitoring equipment shall be installed and maintained by the Selected Proposer and/or the Selected Solution Providers.
- 5.8 Experienced water quality and environmental impact specialists shall be engaged to carry out the water quality and environmental studies. The environmental impact study team must, at the minimum, include an experienced avian ecologist who is able to assess and evaluate the impacts of the project on both resident and migratory birds that utilise the habitats around Kranji Reservoir. A wetland ecologist should also be part of the team to assess and evaluate the impact of the overall project on the ecosystems around the reservoir.
- 5.9 An accredited laboratory for the testing of water and sediment samples should be engaged. Based on the deployable area and the technical requirements, the Selected Proposer and/or the Selected Solution Providers are required to provide a general plan of the System it intends to deploy, including the capacity, relevant power infrastructure and operations and maintenance support activities. The Selected Proposer and/or the Selected Solution Providers may

indicate proposed deployment plans (e.g. 2-phased deployment) and preferred timeline (if any).

- 5.10 The design of the System shall be submitted to PUB for approval, prior to implementation. The design should include the provision of walkways between System arrays (widths of at least 600mm) to facilitate collection of water samples within the System site by PUB staff (or contractor), where required.
- 5.11 All necessary precautionary measures should be taken to avoid and prevent accidents and mishaps, and to ensure the safety of workers and PUB officers (including contractor workers) at or in the vicinity of the System. In the event of any accident or incident occurring at the Site involving personal injury, work-related illness or death to any personnel, the Selected Proposer and/or the Selected Solution Providers shall notify PUB, as soon as possible or in any event no later than 2 hours upon receiving news of such occurrence. The Selected Proposer and/or the Selected Solution Providers shall be responsible to promptly report the accident or incident (if required) to the relevant authorities. A written report detailing the incident or accident shall be submitted to PUB within 12 hours from the occurrence of the incident or accident.
- 5.12 If the Selected Proposer and/or the Selected Solution Providers do not perform 5.5 to 5.11 within the stipulated timeline, PUB reserves the right to carry out the necessary actions on behalf of the Selected Proposer and/or the Selected Solution Providers. All costs associated with this will be recovered from the Selected Proposer and/or the Selected Solution Providers.

## **6. WATER RESERVOIR SURFACE RENTAL**

- 6.1 The Selected Proposer is required to work out the arrangement for use of reservoir space for the System on Kranji Reservoir, in consultation with PUB and SLA. PUB and SLA's approvals must be sought, before the Selected Proposer proceeds with Evaluation Stage (Two).
- 6.2 The water reservoir surface rental fee will be determined in Evaluation Stage (Two) where potential Solution Providers are required to bid their proposed water reservoir surface rental fee.

## **7. POWER PURCHASE AGREEMENT**

- 7.1 The Selected Proposer is expected to enter into a Power Purchase Agreement (PPA) with the eventual party that will build, own and operate the System. As

such, the Proposer is required to indicate the key terms of the PPA that it is willing to commit to, including the price of electricity, the quantity of electricity and the duration of the PPA.

- 7.2 The Proposer is required to indicate all cost assumptions in arriving at the PPA terms. This would include estimations of the total cost of deploying the System (PV panels, cabling, inverters, environmental impact studies, operations and maintenance etc.) and the cost of financing such a System. The Proposer should note that it shall bear all the costs relating to the engineering and environmental impact studies and consultation with EDB, the Relevant Government Agencies and any other relevant stakeholders as EDB considers appropriate in its discretion, conducted prior to the deployment of the System.
- 7.3 The Proposer is encouraged to propose variants to the conventional fixed price PPA if the objective of ensuring the bankability of the System can still be met.

## **8. PUBLIC ENGAGEMENT**

- 8.1 The Selected Proposer and/or Selected Solution Providers are required to lead all engagements with the relevant public stakeholders, such as the nature groups, during the development of the System.
- 8.2 The Selected Proposer and/or Selected Solution Providers are required to inform EDB and Relevant Government Agencies of any public engagement plans, throughout the development phase of the System.

## **9. SELECTION OF SOLUTION PROVIDERS**

- 9.1 The Selected Proposer will be responsible for contracting the Solution Providers that will carry out the engineering and environmental impact studies for the System, and to eventually build, own and operate the System.
- 9.2 For the selection of the Solution Providers in Evaluation Stage (Two), the evaluation criteria should include requirements from PUB, EDB and other Relevant Government Agencies. The evaluation should include the following criteria:
- Cost of the electricity generated from the System, of which the water reservoir surface rental fee would be a component;
  - Track record in Singapore;
  - Technical competency; and
  - Financial ability.

9.3 The Proposer is encouraged to suggest other critical evaluation parameters for the selection of the Solution Providers in the Evaluation Stage (Two).

## **10. DEMONSTRATION OF COMPETENCE**

10.1 The Proposer shall demonstrate their financial ability to make good their commitment of funds and other resources for the duration of the PPA.

10.2 The Proposer shall provide evidence, if applicable, to demonstrate their experience and track record that is relevant to developing large-scale renewable energy projects. These could include performance reports and media coverage of these developments, with information on the date of the project, name of the client, project description, the Proposer's role in the project, as well as the contract value. The Proposer should also provide information on the track record of the companies that are part of the consortium in similar projects.

10.3 The Proposer shall also demonstrate how they, together with any other commercial partners, are able to ensure the successful development of the System. This will include:

- Project Management during the initial planning and development phase (please provide project team organization chart, project team composition, staffing, roles and responsibilities, etc).
- Execution and implementation throughout the development of the System. This should also take into consideration if the necessary capabilities are existing in Singapore, and if not, how these will be built up over time.

## **11. ECONOMIC ACTIVITIES**

11.1 In line with the economic development objectives of System, EDB is keen to understand how the availability of renewable energy in Singapore (through the System) enables the Proposer's existing and/or future plans for business investments in Singapore.

11.2 In addition, the Proposer shall provide details on any incremental economic activities that may be carried out in Singapore as a result of the System. These economic activities may include, but are not limited to:

- **Research and Development:** Research and technology development activities in areas related to renewable energy, water-energy nexus, energy management, including but not limited to battery integration and forecasting. R&D partnerships with research institutes in Singapore can be included.
- **Project Development and Asset Management:** Activities in renewable energy project development and project financing; renewable energy asset management and analytics etc.
- **Sustainability:** Activities in corporate sustainability.
- **Other spin-offs:** Any incremental investments or economic spin-offs by other parties, as a result of the deployment of the System.

## 12. INSURANCE & LIABILITY

- 12.1 The Proposer is to indicate the proposed insurance coverage plan that it plans to take out and maintain at its own expense if awarded. The insurance coverage plan will include full and comprehensive insurance for Public Liabilities and Work Injury Compensation Policies, etc. against all losses, liabilities, claims by third parties, damages, costs and expenses of any and every kind (including any legal fees and expenses) which EDB and Relevant Government Agencies may incur or be subject to and arising out of or attributed to, directly or indirectly, the development of System.
- 12.2 EDB and Relevant Government Agencies undertake no responsibility in respect of any life, health, accident, travel and other insurances which may be necessary or desirable for the personnel of authorized subcontractors and specialists associated with the Proposer(s) for the purpose of the RFI, nor for such members of the family of any such person.

### 13. ASSESSMENT CRITERIA

13.1 The assessment criteria of the RFI will include:

S/N	Assessment Criteria	Weightage (%)
1	Quality of Proposal, including the price of electricity, the quantity of electricity and the duration of the PPA.	45
2	Economic Activities, including: <ul style="list-style-type: none"><li>• Existing and/or new business investments in Singapore that would be enabled by the availability of renewable energy generated from the System;</li><li>• New economic activities conducted in Singapore as a result of the System.</li></ul>	30
3	Financial Capability of the Proposer, both globally and in Singapore.	15
4	Track Record, which includes past experiences in developing renewable energy projects and purchasing electricity generated from renewable energy sources. Experience in FPV systems would be favoured.	10

## **14. NON-PERFORMANCE, FINANCIAL PENALTIES AND TERMINATION**

14.1 Should there be any non-performance or failure by the Selected Proposer and/or the Selected Solution Providers to meet any conditions or guidelines that have been set out for the following scenarios as described in Part 2, Section 14.2, EDB and Relevant Government Agencies reserve the right to:

- a) Require the payment of liquidated damages and/or;
- b) Terminate the project.

14.2 The scenarios are as follows:

- a) Premature exit by Selected Proposer and/or the Selected Solution Providers from the System before the end of the project period.

14.3 In the event of Scenario 14.2 a) above, ownership of all assets, which are associated with the System or otherwise stipulated, will be transferred from the Selected Proposer and/or the Selected Solution Providers to EDB and/or its nominee, which may be one of the Relevant Government Agencies. EDB and/or Relevant Government Agencies reserve the right to appoint party/parties to divest the assets to.

## **15. OTHER KEY DETAILS**

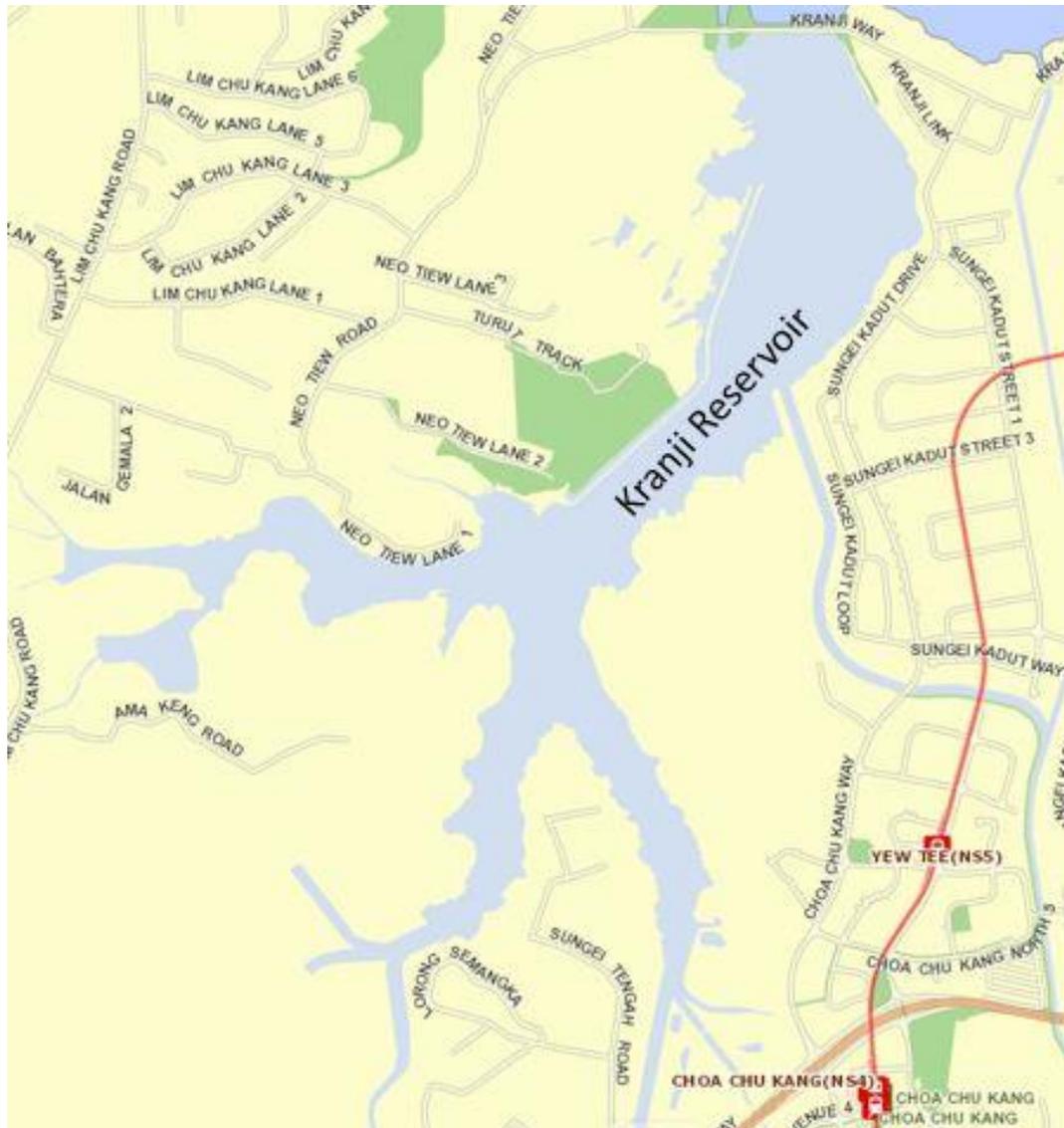
15.1 EDB reserves the right to not award to any Proposers, if none of the Proposers can adequately meet the requirements and objectives of this RFI.

15.2 The RFI will be carried out based on the following timeline. This timeline is indicative and is subject to changes.

<b>S/N</b>	<b>RFI Milestone</b>	<b>Timeline</b>
1	Launch of RFI	<b>31 October 2018</b>
2	Deadline for indication of interest to attend one-off Q&A session and submission of list of questions for Q&A session	<b>27 November 2018</b>
3	One-off Q&A session	<b>30 November 2018</b>
4	Deadline for submission of queries to EDB via email	<b>25 January 2019</b>
5	Latest date for issuance of corrigendum, if required	<b>31 January 2019</b>

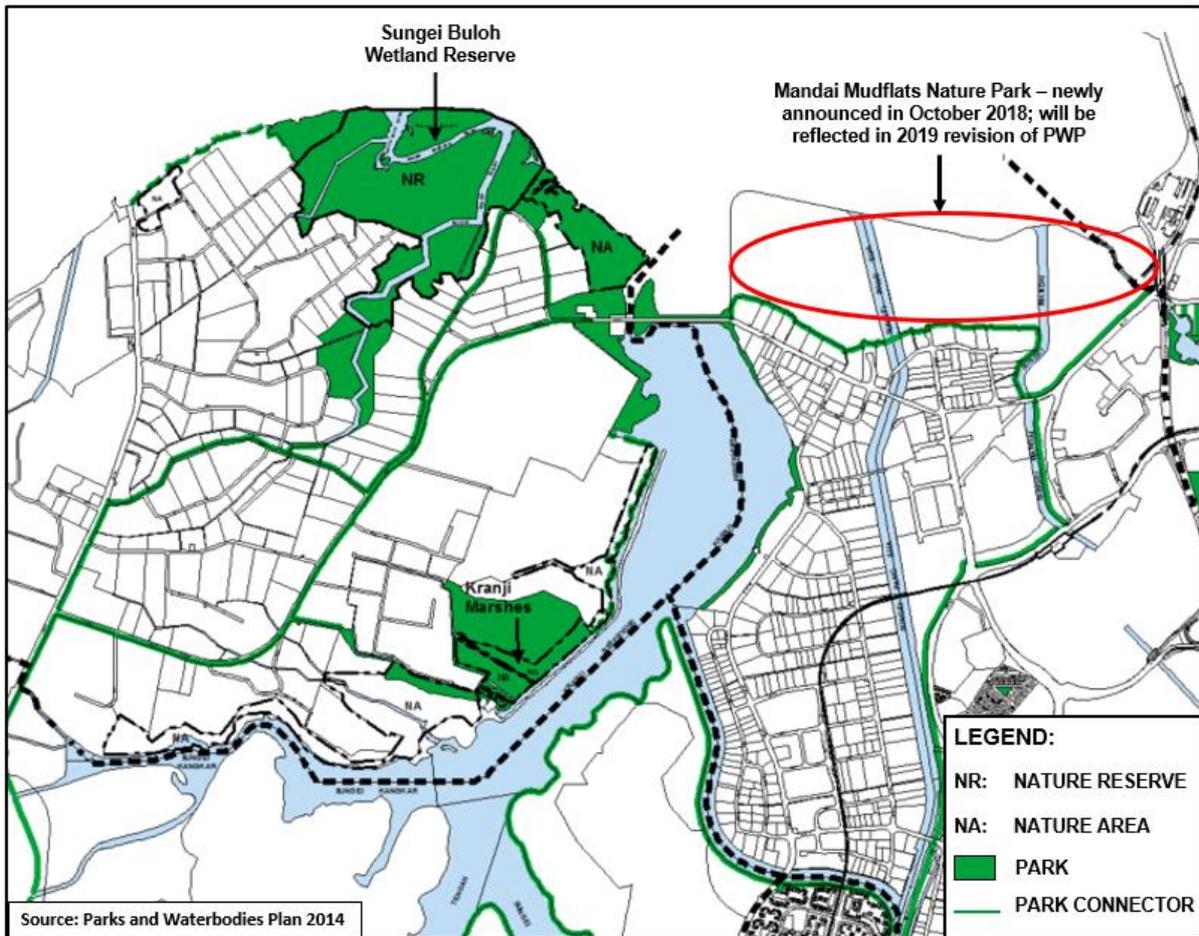
6	End of submission period of RFI	<b>15 February 2019 1200 hours, GMT+8</b>
7	Evaluation of Proposals <ul style="list-style-type: none"> <li>• EDB to evaluate, request for presentations and discussions to clarify, if deemed necessary.</li> </ul>	<b>February to April 2019</b>
8	Selection of Proposer	<b>By end April of 2019</b>
9	MOU with Selected Proposer	<b>By end June of 2019</b>
10	Selection of Evaluation Stage (One) solution providers	<b>4Q 2019</b>
11	Engineering and environmental impact studies and consultation with relevant stakeholders	<b>1Q 2020 to 1Q 2021</b>
12	Evaluation Stage (Two) solution providers	<b>2Q 2021</b>
13	Construction of the System	<b>3Q 2021</b>
14	The System to be operational	<b>1Q 2022</b>

## ANNEX A: Map of Kranji Reservoir



Source: PUB

## ANNEX A1: Surrounding Nature Reserve & Nature Areas



## **ANNEX B: General Specifications for Studies**

### **The objectives of the water quality impact assessment are to:**

- Monitor and evaluate the impacts to water quality from the installation of the floating solar PV (FPV) system (the “System”) at Kranji reservoir.
- Provide recommendations, including suggestions of optimal configurations of the System, for minimising and mitigating water quality impacts.
- Develop an understanding of how the proposed System affects water circulation in Kranji Reservoir, using a hydrodynamic and water quality model (i.e. ELCOM-CAEDYM or Delft3D).
- Develop a year-long heat budget incorporating the System’s impact to the Kranji Reservoir water quality model, and evaluate probable long-term circulation and water quality impact due to the proposed System at Kranji Reservoir.

### **The scope of works of water quality impact assessment should include but is not limited to the following:**

1. Collection of water and sediment samples in reservoirs. The parameters to be analysed include but are not limited to the following:  
Water samples:  
BOD, COD, TSS, Chlorophyll-a, TOC, DOC, NH<sub>3</sub>, NO<sub>3</sub>, TN, PO<sub>4</sub>, TP, Geosmin, 2-MIB, Anatoxin, Cylindrospermopsin, Microcystins  
Sediment samples:  
Al, Sb, Ba, Cr, Mg, Ni, As, Bo, Cd, Ca, Mn, Hg, Be, Pb
2. Development and calibration of Kranji catchment model (i.e. SWMM or Sobek).
  - Existing data provided by PUB (i.e. flows and water levels in drains, rainfall, etc.)
3. Set up basic grid for hydrodynamic model of Kranji
  - Existing data provided by PUB (i.e. bathymetry, meteorology, inflows and outflows at Kranji)
4. Develop heat flux module in modelling system to account for observed System impact from the modelled water circulation.
5. Develop a most probable climatic year heat budget based on the CFD data to be water quality data and carry out initial one year Kranji scenario simulations to evaluate likely spread of results due to the System. Then, evaluate most probably impact of the System to Kranji circulation and water quality.
6. Based on modelled data, provide qualitative and, where appropriate, quantitative assessment of indirect effects arising from or as a consequence of the System at Kranji Reservoir, including but not limited to the following:
  - Effects on reservoir water quality throughout the lifetime of the System
  - Potential effects arising from the maintenance of the System and reservoir operations along the corridor between the reservoir edge and the floating solar panels.

7. Recommend any avoidance or mitigation measures which could be implemented to reduce overall direct and indirect impacts to water quality arising or as a consequence of the System at Kranji Reservoir. The mitigation measures shall cover pre-construction, construction, installation and operation stages of the Project.

**Expected deliverables:**

- Inception reports
- Water quality baseline reports
- Draft water quality impact reports (for PUB's review)
- Final water quality impact reports (for PUB's review)

**The scope of works for the environmental impact studies should include but is not limited to\*:**

- Establishing the baseline environmental conditions. In addition to the water quality parameters mentioned above, a detailed baseline study of the flora and fauna of the area needs to be conducted. Particular attention should be given to the resident and migratory birds that utilise Kranji Reservoir and their respective usage patterns.
- Impact assessment of proposed project. This should cover both the construction and operational phases of the System. In view of Kranji's importance as a nationally important site for migratory birds, a detailed impact assessment of potential impacts of the System to these birds will need to be conducted.
- Development of mitigation measures to reduce the impacts highlighted under the Impact Assessment section
- Development of an Environmental Management and Monitoring Plan (EMMP) to ensure that the recommended mitigation measures are implemented and are effective in reducing the identified impacts arising from the System, during both the construction and operation phase,
- Requirements by other technical agencies (NEA, AVA)

**\* Relevant Government Agencies will scope the environmental impact study with the Selected Proposer and/or the Selected Solution Providers when more details on the System are available.**

## **ANNEX C: Reports and Manuals**

The Proposer shall submit reports and manuals which include, but not limited to, the following:

- Analysis of Kranji Catchment and Reservoir water quantity and quality data
- A detailed report highlighting the findings of the environmental impact study/ environmental impact assessment and associated impact assessment and proposed mitigation measures.
- Hydrological and hydrodynamic model schematisation of Kranji Catchment and Reservoir
- Structure, substances and processes of the water quality models including sediment, phytoplankton, light regime and bacterial pollutants sub-models
- Pollutant sources
- Process coefficients
- Model set-up including horizontal discretization, vertical schematization, computational grid and bathymetry and boundary forcing
- Model inputs including flow field, dispersion, inflows and outflows, loads, initial conditions and meteorological forcing
- Preparation of model input files and interpretation of output files
- Model calibration process
- Simulation and validation results
- Conclusion and recommendation

## **ANNEX D: Template for Proposal Submission**

Please include information as requested in **ALL** sections in the Proposal.

PART A – DETAILS OF PROPOSER

PART B – LEVEL OF DEMAND FOR FLOATING SOLAR PV

PART C – POWER PURCHASE AGREEMENT

PART D – SELECTION OF SOLUTION PROVIDERS

PART E – DEMONSTRATION OF COMPETENCE

PART F – ECONOMIC SPIN-OFFS

PART G – INSURANCE & LIABILITY

PART H – DECLARATION

This Proposal contains (pages):	
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### **PART A – DETAILS OF PROPOSER**

#### **A1 ORGANISATION**

Please provide an outline and profile of the organisation and its Singapore entity that will be consuming the electricity generated by the System. For the Proposer, as well as each company in the consortium (if any), please provide:

- Name
- Address
- Telephone/fax number
- Company profile (e.g. business focus, area of business)
- Key corporate data (e.g. number of employees)
- ACRA business profile
- Audited financial statements and annual reports for the past three (3) years

#### **A2 CONTACT DETAILS**

Please provide at least 2 points of contact who will serve as liaison persons for EDB.

For each point of contact, please provide the following information:

- Name
- Designation
- Company
- Telephone/fax number
- Email address
- Mailing address

## **PART B – LEVEL OF DEMAND FOR FLOATING SOLAR PV**

Please provide information on the size of the System that the Proposer intends to develop and how that relates to the Proposer's overall demand for renewable energy in Singapore.

## **PART C – POWER PURCHASE AGREEMENT**

Please provide information on the key terms of the PPA that the Proposer is willing to commit to, including the price of electricity, the quantity of electricity and the duration of the PPA.

Please provide information to explain the PPA terms indicated. This would include estimations of the total cost of deploying the System (PV panels, cabling, inverters, environmental impact studies, operations and maintenance etc.) and the cost of financing such a system.

Please provide information on any suggested innovative variants to the conventional PPA if the objective of ensuring the bankability of the System can still be met.

Please state all assumptions used in providing the information above.

## **PART D – SELECTION OF SOLUTION PROVIDERS**

Please provide information on possible parameters that the Proposer will look at in selecting Solution Providers to carry out the engineering and environmental impact studies for the System, and to eventually build, own and operate the System.

## **PART E – DEMONSTRATION OF COMPETENCE**

### **E1 FINANCIAL COMPETENCE**

Please provide information on the financial competence of the Proposer to oversee the development of the System and to purchase the electricity generated from the System.

## E2 TRACK RECORD

Please provide information on the track record of the Proposer and companies in the Consortium in similar projects, indicating the year in which the project was done, project description and the company's role in the project

Year		Project Description		Role (Brief Description)	

## E3 ABILITY TO EXECUTE

Please provide information on the following:

- Project management during the initial planning and development phase
  - Project team organisation chart
  - Project team composition, staffing, roles and responsibilities
  - Any other pertinent information
  
- Execution and implementation throughout Project Period
  - Operations team composition, roles and responsibilities
  - Training requirements to ramp up the operations team
  - Any other pertinent information

## **PART F – ECONOMIC SPIN-OFFS**

Please provide information on the economic activities which are above and beyond the core operations of the System that will be carried out in Singapore by each company that is part of the Consortium, including:

- Type of activities that will be carried out in Singapore that are above and beyond the core operations of the System
- Number of employees for each activity, with an accompanying timeline for ramp-up

## **PART G – INSURANCE AND LIABILITY**

Please indicate the proposed insurance coverage plan for the System.

**PART H – DECLARATION**

In submitting this Proposal, I/we declare that the facts stated in this Proposal and the accompanying information are true and the company/organisation(s) that is/are part of the Consortium is/are free from any litigation pertaining to projects in Singapore.

**Signature of Management  
Representative from  
Proposer/Lead Member**

**Name of Proposer/Lead Member  
and Company Stamp**

**Name and Designation**

**Date**

