



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

HEADQUARTERS

SPACE TECHNOLOGY MISSION DIRECTORATE

300 E Street, SW

Washington, DC 20546-0001

SOLAR ELECTRIC PROPULSION FLIGHT DEMONSTRATION PARTNERSHIP

REQUEST FOR INFORMATION

NNH17ZOA003L

Request for Information Issued: August 8, 2017

Responses to the Request for Information Due: September 8, 2017

(5:00pm Eastern)

Catalog of Federal Domestic Assistance (CFDA) Number 43.012

OMB Approval Number 2700-0092

Responders are reminded:

REQUEST FOR INFORMATION (RFI): THIS IS *NOT* A REQUEST FOR PROPOSAL, QUOTATION, OR INVITATION TO BID NOTICE.

1.0 Summary

The National Aeronautics and Space Administration (NASA) Space Technology Mission Directorate (STMD) is seeking information on potential partners for a technology demonstration of specific solar electric propulsion (SEP) technology as described below.

2.0 SEP Background

NASA has been developing advanced solar electric propulsion (SEP) technologies in the form of large, lightweight, deployable, flexible blanket solar arrays and a 13-kilowatt Hall Effect thruster with magnetic shielding for long life operation. This effort is intended to benefit human missions to Mars, activities in cis-lunar space, and highly-capable science missions. The advanced SEP technology could also provide more affordable primary power and highly efficient orbit transfer and station-keeping capabilities for commercial space missions.

NASA is interested in a commercial or other government agency partnership for a potential flight demonstration of these advanced SEP technologies, and in particular, the 13-kilowatt Hall Effect thruster electric propulsion string. The electric propulsion string includes a Hall Effect thruster, a power processing unit (PPU), and a xenon flow controller. Under an existing contract, NASA expects to complete the development and qualification of the electric propulsion string by 2019. NASA would like to see a flight demonstration that employs one or several of these electric propulsion strings as soon as possible following ground qualification of the system. An objective of the flight demonstration is to operate one or more of the electric propulsion strings in the space environment for extended periods of time with the goal of processing in the range of 1000 kilograms of xenon propellant per thruster. The objectives of the demonstration would also include characterization of the performance of the propulsion system and exhaust plume interaction with the spacecraft. The inclusion of the advanced solar array technology that is extensible to deep space NASA missions would also be highly desirable. Some of the key parameters of the electric propulsion components are provided for reference in Table 1.

In a potential partnership, NASA would provide the electric propulsion strings, diagnostic instrumentation, and subject matter expertise for the flight demonstration at no cost. NASA seeks a partner who could provide a spacecraft and launch for the demonstration at a minimal, or preferably no additional, cost to NASA. NASA would expect the partner to share all flight data relevant to the performance of the SEP system and its interactions with other spacecraft elements and systems. It is expected that the partner would utilize this spacecraft and mission for their own additional commercial, scientific, or government purposes.

NASA anticipates using this electric propulsion system as part of future exploration mission elements including the proposed Power and Propulsion Element for the Deep Space Gateway and the Deep Space Transport. The flight demonstration that is the subject of this RFI would be intended to provide an early demonstration to promote more rapid commercial infusion of the technology. Another potential

benefit to NASA would be the reduction of technical risk for the Deep Space Gateway and subsequent NASA exploration applications by demonstrating the SEP technology in advance.

Table 1: Electric Propulsion System Key Reference Parameters

Reference Parameters	Estimates and Ranges
Thruster Mass	50 kg
Thruster Dimensions	520 mm dia x 200 mm height
Thrust Range	200 - 590 mN
Specific Impulse Range	2000 - 2600 s
Xenon Flow Rate into Thruster	12 - 23 mg/s
Total Xenon Throughput	1770 kg
Xenon Flow Controller Mass	2 kg
Xenon Flow Controller Dimensions	340 x 190 x 80 mm
PPU Mass	50 kg
PPU Dimensions	520 x 900 x 200 mm
PPU Input Power	95 - 140 V, 3.4 - 13.3 kW
Maximum PPU Heat Dissipation	880 W

3.0 Information Requested

The specific objective of this RFI is to solicit information that will assist STMD in developing a potential partnership opportunity for a spaceflight demonstration of SEP technology as described in Section 2.0. This RFI solicits brief descriptions of potential flight demonstration mission concepts from interested parties. NASA is seeking a demonstration opportunity that could be accomplished as early as possible and at the lowest possible overall cost to NASA. The following should be included in the response:

- **Company Information:** Company name and address, point-of-contact name, e-mail address and phone number.
- **Spaceflight Approach:** Describe the mission that could potentially include an opportunity to demonstrate the SEP technology including: how much electrical power would be available to the electric propulsion system and over what timeframe, how many electric propulsion strings could be included and operated on the spacecraft, the size and type of electrical power generation to be used including size and type of solar arrays, the overall mission profile including approximate orbital altitudes and inclinations or interplanetary trajectories, the overall duration of the mission and the duration of the phase in which the SEP technology could be demonstrated, the presence of any other electric or chemical propulsion systems, the overall size and mass of the spacecraft, any significant modifications to the spacecraft design needed to accommodate the electric propulsion system, the proposed launch vehicle, and the major payloads and/or objectives of the mission aside from the SEP demonstration.
- **Funding:** A description and estimate of any funding, labor, or in-kind contributions that the partner would expect NASA to provide in addition to NASA's provision of the electric propulsion strings and diagnostic instrumentation.
- **Schedule:** An estimated schedule for the spaceflight and major milestones for its development including the integration of the NASA electric propulsion system and diagnostic instrumentation.
- **Participants:** Project participants and other planned or potential partners.

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- **Other Factors:** Any other significant assumptions or factors that might affect the suitability of the proposed mission as a SEP technology demonstration.

4.0 RFI Questions

If you have questions concerning this RFI prior to submitting a response, please send your questions to stmd-SEP_rfi@nasaprs.com and reference, in the subject line, the title of the RFI. NASA will review the questions and post a response in the Frequently Asked Questions (FAQs) document that will be posted on the RFI Website in NSPIRES. Questions must be submitted by August 23, 2017 to be considered by NASA for a response.

5.0 Submitting Responses

Responses to the Space Technology Mission Directorate Solar Electric Propulsion Flight Demonstration Partnership Request for Information (NNH17ZOA003L) must be submitted electronically using the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) at <http://nspires.nasaprs.com/>. It is important to note that some of the functionality of the NSPIRES system uses terminology that does not necessarily apply to the collection of RFI data. For instance, when submitting responses to this RFI, submitters will be prompted to “Access Proposals/NOIs in the NSPIRES Options Page.” Use of the term “proposals” and “notices of intent” in these instructions does not mean that NASA is inviting proposals or offers in response to this RFI.

Responses are limited to no more than 15 pages and should be uploaded as a single PDF file attachment not to exceed 10MB at the NSPIRES web site (<http://nspires.nasaprs.com>). The information provided in response to this RFI will not be disclosed publicly or used outside of the government for any purposes.

NSPIRES Account Registration

All respondents are required to register with NSPIRES and are urged to access this site well in advance of the RFI due date to familiarize themselves with its structure and enter the requested identifier information. This data site is secure and all information entered is strictly for NASA use only. Respondents do not have to affiliate with an organization during registration to submit an RFI. Respondents will submit the RFI directly and do not have to have an authorized organizational representative submit on their behalf. To register for an account, go to: <http://nspires.nasaprs.com/external/> and click on “Getting an Account” on the left hand margin of the screen.

Creating Your RFI Response

Responses must be submitted using the “Notice of Intent (NOI)” module within the NSPIRES system. To initiate an RFI response:

- Log in using your NSPIRES user name and password (<http://nspires.nasaprs.com/external/>)
- Access “Proposals/NOIs” in the NSPIRES Options Page.
- Click on the “Create NOI” button on the right side of the screen. Select the “Space Technology Mission Directorate, Solar Electric Propulsion Flight Demonstration Partnership Request for Information (NNH17ZOA003L)”.
- Follow the step-by-step instructions provided in NSPIRES to complete your RFI.

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- Utilize the “Summary” element of the RFI to provide a concise paragraph summarizing your response to this RFI (limited to 4,000 characters).

Requests for assistance in accessing and/or using the NSPIRES website should be submitted by e-mail to nspires-help@nasaprs.com or by telephone to (202) 479-9376 Monday through Friday, 8:00 AM – 6:00 PM Eastern Time. FAQs on NSPIRES may be accessed through the Proposal Online Help site at <http://nspires.nasaprs.com/external/help.do>. Tutorials of NSPIRES are available at <http://nspires.nasaprs.com/tutorials/index.html>.

The information is requested for planning purposes only, subject to Federal Acquisition Regulation (FAR) Clause 52.215-3, entitled "Solicitation for Information for Planning Purposes." The release of this RFI does not indicate that the government will issue a solicitation in this area nor does it obligate the government to invest any resources specific to the targeted technology area.