

**National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000**

**Justification for Other than Full and Open Competition
[FAR 6.303-2(b)(1)]**

Summary Information:

Initiating Office: NASA Ames Research Center
Aerothermodynamics Branch (TSA)

Purchase Request No.: 4200502227

Procurement Title: Fiber Laser Banks for NASA Ames Research Center's Arc Jet Facility

Total Estimated Value: \$6.8 Million Total , consisting of a \$ **FOIA Ex. 5** base for the purchase of two (2) systems and options for the purchase of two (2) additional systems at **FOIA Ex. 5** each

Period of Performance: 1 July 2014 – 30 September 2015 (Base). Each option would extend the period of performance 12 months. Period of Performance is 1 July 2014 – 30 September 2017, if all options are exercised.

Statutory Authority: 10 USC 2304(c)(1), *Only One Responsible Source and No Other Supplies or Services Will Satisfy Agency Requirements*
[FAR 6.303-2(b)(4)]

This Justification for other than full and open competition has been prepared in accordance with the requirements of Federal Acquisition Regulation (FAR) [6.303](#) and NASA FAR Supplement (NFS) [1806.303](#).

A. Nature and/or description of the action being approved. [FAR 6.303-2(b)(2)]

NASA Ames Research Center (ARC) proposes to enter into a sole source contract with IPG Photonics Corporation of Oxford, MA for the purchase of high power fiber laser (HPFL) Banks (systems). The contract will be for a base purchase of two (2) complete systems and will include two (2) options to procure additional systems in FY16 and FY17. NASA ARC conducted extensive market research over the past year to locate a competitive industry providing high power fiber laser banks for our heat shield testing. Our results demonstrated that only one company can produce the systems required with this power capacity.

These laser banks will be used to add radiative heating in NASA's existing arc-heated facility for testing of Earth atmosphere re-entry heat shield materials. The combined (radiative and convective) heating provided by the laser system and the existing arc-heater is required to qualify thermal protection materials for the human-occupied Orion Multi-Purpose Crew Vehicle (MPCV). At 200 kW, this system will result in a combined heating capability unmatched in the nation and likely the world.

B. A description of the supplies or services required to meet the agency's needs (including estimated value). [FAR 6.303-2(b)(3)]

This procurement provides for delivery and operational demonstration for up to four (4) 50 kW fiber laser banks over the course of three years. These laser banks will be utilized to add radiative heating to ARC's arc jet facility for testing of re-entry heat shield materials. Each bank will have the following characteristics: continuous wave (CW) laser operation, 1070-1080 nm laser wavelength, 50 kW, minimum laser output, 20-meter minimum feeding fiber length, 20 minutes minimum run duration, 20% minimum wall plug efficiency. The offeror will provide support systems required for system cooling, system commissioning, and operator training services.

The estimated dollar value of this action including all options is \$6.8 million. The estimate is based on market research and resultant Request for Information (RFI) results. The contract will have a base purchase of two laser systems and will include options for two additional laser systems, subject to available funding and continued need. The period of performance for the base award will be 1 July 2014 – 30 Sep 2015. The contract will contain two options for additional lasers systems. Each option exercised will extend the period of performance by twelve (12) months.

C. An identification of the statutory authority permitting other than full and open competition. [FAR 6.303-2(b)(4)]

The statutory authority for this proposed action is 10 U.S.C. 2304(c)(1), as implemented by FAR Subpart 6.302-1(b)(2), Only One Responsible Source and No Other Supplies or Services Will Satisfy Agency Requirements. The supplies and services required by the agency are available from only one responsible source, IPG Photonics Corporation of Oxford, MA, and no other supplies or services will satisfy NASA's requirements.

D. A demonstration that the proposed contractor's unique qualifications or the nature of the acquisition requires use of authority cited. [FAR 6.303-2(b)(5)]

NASA ARC's Arc Jet Facility has a need for high power laser banks. The thermal protection materials required for the Orion MPCV to re-enter the Earth's atmosphere have already been selected based on test results from existing ARC Jet Facilities. The addition of a fiber-laser based radiative heating source to the arc jets is required to improve the fidelity of the test data and to assure that these selected materials have adequate safety margins to carry human occupants.

As a precursor to the selection of the fiber-laser radiative heating approach, NASA conducted trade studies to evaluate other options, such as high-intensity lamps, for heating the material coupons. No other heating mechanism could be accommodated within the confines of the arc jet testing chamber. Thus, a beamed laser was selected as the method for providing energy to the test sample. A subsequent study of the available types of beamed lasers determined that a continuous-wave fiber laser at a fixed wavelength of approximately 1080 nm was the preferred method. Results from small-scale testing of the Orion MPCV thermal protection materials using a lower power (10 kW) fiber-laser system subsequently established the technical validity of using this laser to accomplish the required radiative testing. A laser of this power is only available from IPG Photonics Corporation.

E. A description of efforts made to ensure that offers are solicited from as many potential sources as is practicable, including whether a notice was or will be publicized as required by [FAR Subpart 5.2](#) and, if not, which exception under [5.202](#) applies. [FAR 6.303-2(b)(6)]

An RFI NNA14LASERS, was posted on 11 December 2013 on the NASA Acquisition Internet Service (NAIS) and the Federal Business Opportunities (FBO) portal, closing on 15 January 2014. This announcement was intended to identify possible sources to fulfill ARC's requirements for additional radiative heating for its arc jet facility. The RFI specified requirements for the laser system that were consistent with meeting the test conditions validated by the small-scale test.

Three vendors submitted responses to the RFI. Two respondents were not capable sources, as the products offered were of low power. IPG Photonics submitted a response that demonstrated its capability to meet the requirements.

NASA staff also conducted independent market research to determine if alternate sources of fiber laser systems totaling 200 kW were available. This research was conducted using the industry classification code for the lasers, and by using key word searches within the following sources:

1. A review of lists of contractors in GSA website and NASA Vendor database
2. A review of the Small Business Innovative Research (SBIR) database
3. Web-based searches for providers of high power fiber laser systems

Other steps taken to identify and encourage competitive sources involved those of the Small Business Specialist that resulted in identification of two additional companies that are suppliers of low-powered fiber laser systems. After consulting with the customer, these laser systems do not meet the requirements.

A second synopsis was posted on NAIS and the FBO portal on 25 February 2014 for fifteen (15) days to announce ARC's intent to negotiate and award a contract to IPG Photonics Corporation for these high power laser banks. The announcement included information on how interested parties could submit their capabilities and stated that all firms submitting their capabilities would be considered by the Government. We received no responses to this second synopsis.

F. A determination by the contracting officer that the anticipated cost to the Government will be fair and reasonable. [FAR 6.303-2(b)(7)]

Upon approval of this justification, a request for proposal will be issued to IPG Photonics. The firm will be required to submit a firm fixed price proposal. Prior to execution of the contractual instrument, evaluation of the proposal and a price analysis will be performed in accordance with FAR 15.404. The analysis will include price evaluative techniques to ensure the final negotiated price is fair and reasonable. In addition, as this requirement has been determined to be commercial, other than cost or pricing data may be requested and considered in the determination of a fair and reasonable price (FAR 15.403-1(b)(3) – Exceptions to Certified Cost or Pricing Data Requirements). Pre-negotiation objectives will be prepared prior to the initiation of negotiations and will be approved in accordance with [FAR 15.406](#) prior to the conduct of negotiations.

G. A description of the market research conducted (see Part 10) and the results or a statement of the reason market research was not conducted. [FAR 6.303-2(b)(8)]

In accordance with FAR Part 10, a market survey of available fiber laser systems in the commercial market was accomplished using the following techniques:

- 1) A review of GSA contractors was performed to identify those with potential to satisfy the requirements, which resulted in nine identified vendors. Three respondents acknowledged their inability to support the requirements. Five of the remaining six were determined to be providers of electronic test equipment with no laser systems offered. The remaining vendor on the list offered only very low-power laser systems at operating wavelengths outside of the required range.
- 2) A search of the Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) database was conducted using search criteria including the following terms: fiber laser, high power fiber laser, continuous wave fiber laser, and 50 kW fiber laser. This search did not result in the discovery of a business that was working on, or offering, a high power laser system with the required performance.
- 3) A web-based search for suppliers of fiber laser systems identified eight potential vendors. One of these vendors was IPG Photonics, which was found to provide a system capable of meeting the specified requirements. Five of these vendors were determined to be providers of low power fiber laser systems in the 1 kW to 4 kW range, well below the requirement. A sixth vendor provided a low power laser system with an operating frequency below the specified requirement. The remaining vendor was determined to be a supplier and not a manufacturer of systems that utilize fiber laser systems to accomplish industrial applications or offer the fiber laser system independent of their handling systems.

H. Any other facts supporting the use of other than full and open competition. [FAR 6.303-2(b)(9)]

Two US Air Force material research facilities have chosen to employ the IPG Photonics fiber-laser bank system for similar testing applications. ARC technical personnel consulted with personnel at these facilities and confirmed that no other vendor offers integrated systems capable of delivering 10-50 kW through a fiber to support this type of testing. IPG Photonics has a proven track record of delivering the laser banks, required support equipment, and the system commissioning and training services as a commercial product. This is confirmed by a recent news article in the 06 December 2013 edition of Laser Focus World where they report the first commercial delivery of a “100 kW fiber laser, a surprisingly small system developed by IPG Photonics (Oxford, MA), ... sold to the NADEX Laser R&D Center (Nagoya City, Japan).”

The NASA project team assigned to add this radiative laser energy source has extensive knowledge of the operations of large-scale arc jet facilities. Based on extensive technical trade studies, they have determined that this fiber laser solution is the most practical and cost effective means to improve NASA’s ability to test and evaluate the Orion MPCV atmospheric re-entry heat shield materials at the scale and flow conditions necessary for human flight qualification.

I. A listing of the sources, if any, that expressed, in writing, an interest in the acquisition. [FAR 6.303-2(b)(10)]

1. Laser Mechanisms, Inc. – laser beam delivery experts
2. Tony Baird Electronics, Inc. – electronics system integration experts
3. IPG Photonics Corporation – high power laser manufacturer

J. A statement of the actions, if any, the agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required. [FAR 6.303-2(b)11]

It is NASA's intent to develop advanced capability within the agency to support future requirements for this testing. The information received as a result of this contract will facilitate NASA's efforts to develop and maintain this testing capability.

The number of high power fiber laser system applications has also proven to be very limited in recent history. The agency action of awarding this contract will support the advancement of employing this type of system for material testing, which may have the potential to expand the fiber laser system manufacturing industry.

Signature Page

Requirement Initiator:

Peter Zell
Project Manager

I certify that the facts presented in this justification are accurate and complete.



Signature

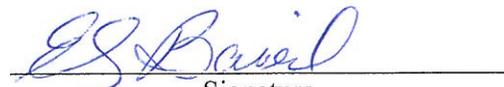


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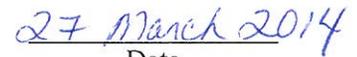
Contracting Officer:

Elizabeth Baierl

I hereby determine that the anticipated cost to the Government will be fair and reasonable and certify that this justification is accurate and complete to the best of my knowledge and belief. [FAR 6.303-2(b)(12)]



Signature



Date

CONCURRENCE:

Directorate Manager:

Eugene Tu
Exploration Technology
Directorate (Code T)



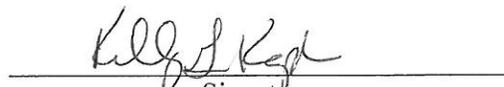
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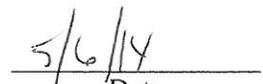
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Procurement Officer:

Kelly G. Kaplan



Signature



Date

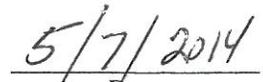
APPROVAL:

Center Competition Advocate:

Lewis S.G. Braxton III
ARC Deputy Director



Signature



Date

cc (after approval):
JA Admin Asst: 241-1