STATEMENT OF CONSIDERATION

REQUEST BY **UNITED TECHNOLOGIES RESEARCH CENTER** FOR AN ADVANCED WAIVER OF DOMESTIC AND FOREIGN RIGHTS TO INVENTIONS MADE IN RELATION TO THE:

NOVEL ROTATING HEAT EXCHANGER FOR HVAC APPLICATION

THE ABOVE-REFERENCED SYSTEM BEING DEVELOPED UNDER DOE CONTRACT DE-AC04-94AL85000 AND SANDIA NATIONAL LABORATORY/UNITED TECHNOLOGY RESEARCH CENTER PROPOSAL P.400.0221. DOE WAIVER NO.: W(A) 2015-009.

The petitioner for the above-referenced subject matter technology, **United Technology Research Center** (UTRC) requests a waiver for all domestic and foreign patent rights to inventions that may be conceived or first actually reduced-to-practice in the course of the project work tasks that are proposed according to Research Proposal P.400.0221 between UTRC (hereinafter referred to as the Petitioner) and Sandia National Laboratories (hereinafter referred to as SNL).

The scope of the research proposal comprises the integration of high thermal density heat exchangers with heating, ventilation, and air conditioning (HVAC) applications. Under the research agreement the Petitioner will provide support to SNL in regard to the development and demonstration of residential HVAC rotating heat exchanger technology applications. And further, the Petitioner will evaluate the resultant technology's potential for commercialization. An increase in the effectiveness of rotating heat exchange technology could lead to improvements in the cycle efficiency of residential HVACs. Accordingly, improvements in the cycle efficiency of residential HVACs could potentially lead to an increased usage of heat pumps in cold climate areas, with a positive outcome of this action being the reduction of energy usage in these cold climate areas.

Specifically, the Petitioner will engage with SNL to define and provide requirements for a scale prototype unit (the unit to be designed and fabricated by SNL) and provide design support for a scaled-up configuration and liquid-side flow circuit of a heat exchanger that is compatible with HVAC applications. The Petitioner will fabricate the baseplate of the prototype heat exchanger in addition to evaluating and characterizing the performance of the prototype unit under relevant HVAC boundary conditions. Further, the Petitioner shall assess—based on system modeling—potential system-level impact metrics that will be calculated in relation to the results obtained from the unit prototype testing.

The total anticipated cost of the award to UTRC is $413,281. This amount includes UTRC's contribution of $82,656, which is approximately twenty percent (20%) of the award cost. The waiver is contingent upon the petitioner maintaining in aggregate twenty percent cost-sharing over the course of the award. The cost share with DOE covers the period from January 1, 2014 through September 30, 2015.

Recognized as a research leader in the fields of thermal and fluid sciences the Petitioner is currently affiliated with the multiple core-business units that comprise United Technologies Corporation (UTC). As such, the Petitioner directly works with internal business units of UTC and outside partners to develop technological solutions that can be transitioned into product development for commercial applications. Previously, the Petitioner successfully completed

performance tasks in the DARPA sponsored Micro-technologies for Air-Cooled Exchangers (MACE) program, the research objectives of the program relating to technologies that are associated with centrifugal heat sinks that comprise micro-fabricated powered enhanced surfaces. Technologies acquired as a result of the MACE program have been the subject of invention disclosures relating to concepts that are associated with the integration of rotating heat exchangers within HVAC systems. Additionally, UTC has an intellectual property portfolio comprising multiple issued patents relating to heat exchanger technology and fabrication, and HVAC systems design and operation.

UTC has a substantial and established commercial position in HVAC systems, power electronics cooling, and heat exchanger technology. UTC has a proven record of seeking commercialization opportunities and it is the Petitioner's intent to promote the commercialization of the technology requested under this waiver. Other products recently developed by UTC that had early stage DOE support of UTRC lead projects include: the PureComfort® brand combined cooling, heating and power system, the advanced stationary and mobile Fuel Cell system, and the PureCycle® brand of ORC products.

UTC has a large portfolio of products in a wide array of differing technological fields. UTC utilizes these technological developments across the span of its entire intellectual property portfolio and the Petitioner serves a facilitating role in the cross utilization of this developmental technology. As such, multiple applications have been identified by the petitioner that may benefit from the technology that is to be developed during the proposed research program. Ownership of the intellectual property resulting from the research collaboration is essential to enable the Petitioner to utilize any resultant technology across the scope of its intellectual property portfolio, in addition to aiding in efforts to appeal to a broader field of financial sources that can be engaged to help deploy the resultant technology within commercial products.

Currently, the proposed target technology is at a low technology readiness level relative to other HVAC&R applications. If UTC is to successfully carry forward and commercialize the technology that is to be assessed under this project it would require agreements with additional business partners in order to reduce the cost and complexity for the development of any related applications. The target research technology represents a subcomponent of larger technological systems and applications. Thus, it would stand to reason that current market leaders will respond to the Petitioner's research and commercialization efforts with similar and competing technologies in order to raise the performance levels of their respective HVAC systems. The overall improved efficiency of HVAC systems would raise the industry as a whole and contribute to DOE's goals of increasing energy efficiency and reducing greenhouse gas emissions.

The Petitioner has agreed to abide by 35 U.S.C. §§ 202, 203, and 204, as well as the provisions of the Standard Patents Rights clause for an Advanced Waiver. Further, the Petitioner has agreed to the provisions of the U.S. Competitiveness clause that requires the Petitioner to substantially manufacture any products embodying or produced through any waived invention within the United States, unless the Petitioner can convince the DOE that to do so is not logistically or commercially feasible. Further, the Petitioner will abide by the export control laws and will require its licensees, if any, to do the same.

In consideration of the Petitioner's developed and demonstrated capabilities in HVAC related fields, and its existing efforts to secure the intellectual property that is associated with the

process, it is concluded that the granting of the requested waiver will most likely result in the good faith efforts of the Petitioner to commercialize the intellectual property to be developed under the forthcoming research agreement.

Thus, upon the evaluation of the present Petition for Waiver in view of the objectives and considerations as set forth in 10 CFR 784, it is recommended that the requested waiver be granted.

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Wendell A. Peete, Jr.
NNSA Patent Attorney
NNSA Office of the General Counsel

Based on the foregoing Statement of Considerations and the representations of the attached Waiver Petition, it is determined that the interests of the United States and the general public will best be served by a waiver of patent rights of the scope described above and, therefore, the waiver is granted.

CONCURRENCE:

[redacted]

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Date: 3/24/2016

APPROVAL:

[redacted]

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Date: 3/29/2016