

STATEMENT OF CONSIDERATIONS

REQUEST BY TRANE U.S., INC. FOR AN ADVANCE WAIVER OF DOMESTIC AND FOREIGN PATENT RIGHTS UNDER THE U.S. DEPARTMENT OF ENERGY (“DOE”) BUILDING TECHNOLOGIES OFFICE LAB CALL (DE-LC-000L095) W(A)2023-002

Trane U.S., Inc. (“TRANE”) has requested a waiver of domestic and foreign patent rights for all inventions that may be or have been conceived or first actually reduced to practice by TRANE’s employees in the course of or under a subcontract issued by the National Renewable Energy Laboratory (“NREL”) entitled “Ice Storage for Efficient and Flexible Decarbonization of Hydronic Space Heating” (“subject inventions”). The subcontract no. SUB-2022-10431 was made by NREL under DOE’s Building Technologies Office (“BTO”) Lab Call (DE-LC-000L095) entitled “BTO Emerging Technologies FY 2022 AOP Lab Call.”

As set forth in TRANE’s petition for this waiver, the general objective of the project is to develop model predictive controls (“MPC”), optimal sizing methodologies, and software code for a storage source heat pump (“SSHP”) cooling and heating system that is designed to promote decarbonization by using below room-temperature thermal storage. The SSHP system will include hardware components and system layouts, much of which have been developed by TRANE prior to the subcontract, and which TRANE expects to further develop during the subcontract. The SSHP system is eventually expected to deploy in commercial markets in the United States, particularly in large metropolitan areas in the northern half of the country such as New York City, where carbon emissions may be relatively high due to high demand for heating and significant vehicular traffic.

The period of performance for this project is three (3) years and the total amount of the subcontract ranges from \$391,670 to \$474,670, depending on which work options, if any, that NREL chooses to authorize. The total amount of TRANE’s cost share contribution ranges from \$90,557 to \$173,557, similarly depending on which work options, if any, that NREL chooses to authorize. Therefore, TRANE’s total cost share contribution to the subcontract will range from 23% to 37%. This waiver is contingent upon TRANE maintaining, in aggregate and depending on which work options are authorized by NREL, at least 23% to 37% cost sharing percentage over the course of the award.

TRANE is a U.S. affiliate of Trane Technologies plc (an Ireland corporation formerly known as Ingersoll Rand plc) that was founded in 1913 and has more than 29,000 employees. TRANE’s business activities focus on optimizing indoor environments through a broad portfolio of energy-efficient heating, ventilating and air conditioning systems, building, contracting and energy services, parts support and advanced controls for homes and commercial buildings. More particularly, TRANE recently invested \$193 million in sustainably-driven research and development as exemplified by its 2030 Gigaton Challenge. For this campaign, TRANE has committed to reducing customers’ GHG (greenhouse gases) footprints by one billion metric tons of CO₂e by accelerating use of high efficiency equipment, increasing system-level energy efficiency, reducing food loss in the global food chain, and transitioning to low GWP (global

warming potential) refrigerants, and encouraging refrigerant reclamation. TRANE has annual U.S. sales of more than \$8 billion for heating, ventilation, air conditioning and refrigeration (“HVACR”) systems, as well as energy conservation and renewable energy products, and has over 500 active U.S. patents.

Regarding the technology of the current project, TRANE has previously invested approximately \$3 million in the SSHP system for engineering time and system development. Now, TRANE intends to further develop the SSHP system to prepare for scaled-up manufacturing and deployment in the commercial marketplace. TRANE has already invested in the development of related products including its CALMAC thermal storage tanks, ACX heat pumps, and water-cooled screw chiller products, which are manufactured in the United States. These existing TRANE products form key building blocks of various SSHP system configurations, the control of which may be refined by applying MPC techniques created under the present subcontract. In addition, developing new MPC technology is expected to lead to further opportunities to optimize the SSHP system and may lead to identification of additional cases where MPC techniques could economically operate other HVACR systems. TRANE estimates that the MPC coding technology developed under this project could be production-ready in less than twenty-four (24) months.

As is customary in the HVACR industry, software controls are licensed by an original equipment manufacturer (“OEM”), typically for the life of its equipment or some other shorter period, as part of a sale of the equipment that uses the software. Accordingly, TRANE does not otherwise expect to require independent licenses of the MPC technology related to its commercial use.

TRANE believes that the scope of work for the MPC technology is a subset of possible approaches for operating a SSHP system. Therefore, a grant of a patent waiver is not expected to generate a regulated industry standard or a standards essential patent. Moreover, the MPC technology is not expected to place TRANE in a more preferred or dominant position in the HVACR industry because there are several OEMs that are developing and commercializing similar products with a focus on decarbonization and electrification.

This waiver shall be subject to the march-in rights and preference for U.S. industry provisions, as well as a U.S. Government license, comparable to those set out in 35 U.S.C. 202-204. Further, the waiver shall be subject to the attached U.S. Competitiveness provision paragraph (t). In brief, products embodying a waived subject invention or produced through the use of a waived subject invention will be manufactured substantially in the United States unless TRANE can show to the satisfaction of DOE that it is not commercially feasible to do so.

Considering the foregoing, it is believed that granting a waiver to possible subject inventions will provide TRANE with the necessary incentive to commercialize the results of the subcontract in a manner that will make products that embody the subject inventions available to the public in the shortest period of time. Therefore, upon evaluation of the waiver petition, and

in view of the objectives and considerations set forth in 10 CFR 784, all of which have been considered, it is recommended that the requested waiver be granted.

[Redacted Signature]

Jonathan L. ("Jay") Pettit
Patent Attorney
Golden Field Office

Date: _____

Based upon the foregoing Statement of Considerations and representations in the attached waiver petition, it is determined that the interests of the United States and the general public will be best served by a waiver of patent rights of the scope determined above, and therefore the waiver is granted. This waiver shall not apply to any modification or extension of the subcontract, where through such modification or extension, the purpose, scope, or cost of the subcontract has been substantially altered.

CONCURRENCE:

[Redacted Signature]

Mandy Mahoney
Office Director
Buildings Technologies Office

Date: _____

APPROVAL:

[Redacted Signature]

Brian Lally
Assistant General Counsel for Technology
Transfer and Intellectual Property

Date: _____

(t) U.S. COMPETITIVENESS

The Contractor agrees that any products embodying any waived invention or produced through the use of any waived invention will be manufactured substantially in the United States, unless the Contractor can show to the satisfaction of DOE that it is not commercially feasible to do so. In the event DOE agrees to foreign manufacture, there will be a requirement that the Government's support of the technology be recognized in some appropriate manner, e.g., recoupment of the Government's investment, etc. The Contractor further agrees to make the above condition binding on any assignee or licensee or any entity otherwise acquiring rights to any waived invention, including subsequent assignees or licensees. Should the Contractor or other such entity receiving rights in any waived invention undergo a change in ownership amounting to a controlling interest, then the waiver, assignment, license, or other transfer of rights in any waived invention is suspended until approved in writing by DOE.