UNITED STATES PATENT AND TRADEMARK OFFICE

DYNAENERGETICS EUROPE GMBH and
DYNAENERGETICS US, INC.

Petitioner

v.

QINETIQ LIMITED

Patent Owner

Case: PGR2023-00003
Patent No. 11,215,039

DECLARATION OF MARCO SERRA

I, Marco Serra, hereby declare as follows:

I. Background

1. I have been retained by Petitioner, DynaEnergetics Europe GmbH and DynaEnergetics US, Inc. (collectively "DynaEnergetics") in connection with the above-captioned Post Grant Review ("PGR") proceeding involving U.S. Patent No. 11,215,039 ("the '039 Patent") (Ex. 1001).

2. I have been asked by DynaEnergetics to offer opinions regarding the '039 Patent and claims 1-5 (the "Challenged Claims") of the '039 Patent, as set forth in the Petition for PGR ("the Petition"). This declaration sets forth the opinions I have reached to date regarding these matters.

3. I am being compensated by DynaEnergetics at my standard hourly consulting rate of $230 per hour for my time spent on this matter. My compensation is not contingent on the outcome of the PGR or on the substance of my opinions.

4. I have no financial interest in DynaEnergetics or Patent Owner.

II. Education and Work History

5. I have a M.Eng in mechanical engineering from the University of Pretoria (South Africa, 1993) and a SM in Engineering and Management from the Massachusetts Institute of Technology (USA, 2002). I began working as a mechanical engineer in 1993.

6. I have extensive experience with modeling and simulation software programs for use in designing, testing, and evaluating downhole tools and equipment, including perforating equipment such as shaped charges. Of specific relevance to this matter, I have extensive experience in the modeling and simulation of oil well completions in which the dynamic response of the wellbore fluid and tool string structural components to the release of energy by the detonation of strings of shaped charges, is calculated. This work, which has been conducted over approximately the last 15 years has, amongst other things, required the characterization of simulated shaped charge performance against data obtained in field tests for the performance of various types of shaped charges. This was done in order to accurately represent the shaped charges and tool string in a computationally advantageous configuration. This specific aspect of the work required the modeling and simulation of each field test, including shaped charges, and the calibration of equation of state and other parameters to match simulated performance to experimental performance, validating each charge model for use in the larger string models. This type of activity is done iteratively and, incidentally, produces a library of data relating shaped charge design parameters to shaped charge performance and provides a reference or store of information that can be used to guide shaped charge selection or shaped charge design activities with the aim of enhancing or optimizing shaped charge performance in accordance with some desired characteristic. The

validated shaped charge models are then available for use in simulations aimed at optimizing perforation string performance with regard to perforation cleanout and well skin, a measure of well flow resistance, to obtain optimal communication between the oil-bearing formation and the well.

7. Furthermore, over the years I have also simulated API Section IV shaped charge tests in detail to evaluate their performance and validate them against the results of actual API Section IV tests in order to calibrate equation of state parameters. Such simulations and/or tests evaluate shaped charge performance in an environment representative of downhole conditions, attempting to characterize the hole that will be created by the shaped charge in similar conditions downhole.

8. Attached as Appendix A is a copy of my current C.V. further elaborating on my professional background and qualifications.

III. Materials Considered

9. In forming my opinions, I have reviewed the ’039 Patent and its prosecution history. I have also reviewed and considered prior art references, and other documents and information as set forth in this declaration.

10. In reaching my opinions, I have relied upon my experience in the field and also considered the viewpoint of a person of ordinary skill in the art (“POSITA”) at the time of the earliest claimed priority date of the ’039 Patent. As explained

below, I am familiar with the level of a person of ordinary skill in the art regarding the technology at issue as of that time.

IV. OVERVIEW OF THE TECHNOLOGY

A. Technology Background

11. The '039 Patent is generally directed to explosive charges ("shaped charges") detonated deep underground in oil and gas wells to perforate rock formations and liberate the oil and gas trapped in the rock. Below I discuss shaped charge technology generally and certain fundamental shaped charge design principles.

1. Shaped charges and perforating

12. A shaped charge (shown below) consists of three primary components—a case, an explosive, and a liner. The liner is conventionally positioned on top of the explosive within the case—i.e., the explosive is positioned between the case and the liner in order to direct as much of the energy released by the explosive detonation toward the liner as possible.

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