ANNEXURE I

ANNEXURE B

SPECIFICATION:

"(ANSYS) OR SIMILAR/EQUIVALENT" SOFTWARE LICENSE AVAILABILITY AND DATA MANAGEMENT INCLUDING THE PROVISION OF SOFTWARE MAINTENANCE AND SUPPORT FOR ENGINEERING SOFTWARE REQUESTED BY TRANSNET ENGINEERING

REVISION 0

DATE RELEASED

(June 7, 2023)

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1.0. PURPOSE

Transnet Engineering (TE) seeks that the following be provided, either by the principal software developer or an authorized local reseller appointed by the respective principal software developer;

- Software license availability and data management for the requested engineering software including the provision of annual Software Maintenance and Support.

2.0. REQUIREMENTS

2.1. Description of Required Software Package availability

A description of the software package appears under Appendix A.

2.2. Annual Software Maintenance and Support

The requirements for annual Software Maintenance and Support are detailed under Appendix B.

3.0. APPENDICES

APPENDIX A: DESCRIPTION OF THE REQUIRED ENGINEERING SOFTWARE:

NAME OF CURRENT SOFTWARE:	ANSYS
Please note that any equivalent or similar software product may be offered to comply with this tender	

DESCRIPTION OF SOFTWARE REQUIREMENTS:
Software packages must be licensed to have the capability, functionality and benefits as required and specified below: **<u>Supplier Status</u>** 1. Document from principal software developer confirming if the tenderer is a "Principal Software Developer" / "Sole Distributor" / "Approved Reseller": • It is **mandatory** that a document confirming that the tenderer is the principal software developer or authorised by the principal software developer as a sole distributor/approved reseller for South Africa for all the proposed software is submitted with the tender. In the case of an authorised sole distributor/approved reseller, the document must also clearly state if authorisation is renewable and if so, the next renewal date as well as associated period of authorisation must be indicated. **<u>Engineering Software Requirements</u>** 2. All proposed software must comply to similar/equivalent technical capability, functionality and benefits of the existing software as utilised in Transnet Engineering

- Tenderers must provide documented evidence that the proposed software has similar /equivalent technical capability, functionality and benefits of the existing software as utilised in Transnet Engineering. (This includes similar/equivalent standard features, embedded and special functionalities). Key requirements are listed as follow:

Number	Key technical capability, functionality and benefits utilised in Transnet Engineering
1	**ANSYS Geometric interface and CADD manipulation** Be able to: • Import computer aided design (CADD) data from PTC creo and native formats • Edit, repair and create any geometry • De-feature CAD models, extract fluid domains or simplify models for simulation, including a strong focus on mid-surfing cadd models • Create, import, or repair sheet metal designs
2	**ANSYS Mechanical** ANSYS Mechanical includes the following functionality: • Geometric Idealization (Spring, mass, damper, beams and shells, layered composites, solids) • Solver Capabilities (Linear and non-linear static, prestress effects, linear perturbation, nonlinear geometry, linear and nonlinear buckling, steady state analysis applied to transient conditions) • Material models (Linear, Anisotropic, Temperature dependent, Hyper, Plasticity, Rate Dependent, Isotropic, Advanced non-linear, Composites) • Topology optimisation (Structural, modal, thermal, inertial, symmetry) • Multi Analysis (sub-modeling, data mapping, Multiphysics data

	mapping, initial state, advanced multi stage) • Vibration (modal, modal pre-stressed, modal damped, transient mode-super position, harmonic super position, harmonic, spectrum) • Explicit Dynamics (FE (Lagrange) solver, Euler solvers, meshless solvers, implicit-explicit deformations and material states, fluid-structure interaction (FSI), part activate and de-activate) • Thermal (steady state, transient, conduction, convection, radiation to space and surface to surface, phase change, shells and layered shells thermal) • Optimization (design exploration, parameters, design point studies, correlation analyses, design of experiments, sensitivity analyses, goal driven optimization) • Advanced features (geometry modelling, ANSYS Customisation Suite, command snippet support, batch run capability, external code interfaces, on the fly processing, 3rd party FE model import) • HPC structures (parallel solving, parallel meshing, GPU acceleration, Cloud based solving (AEU required)
3	**ANSYS Fluids** ANSYS Fluids includes the following functionality: • Solver capabilities (Steady state, transient flow, 2D and 3D flow, time dependent boundary conditions, customizable materials library, fan models, periodic domains, flow driven solid motion (6DOF), pressure based coupled solver, density based coupled solver,) • Meshing capabilities (Hexahedral mesh, tetrahedral mesh, polyhedral mesh, boundary layers/inflation layers meshing, overset mesh, dynamic mesh refinement, dynamic solution-adaptive meshing, polyhedral unstructured solution-adaptive mesh refinement, mesh refinement seeding) • Single phase, non-reacting flows (compressible and

	incompressible flow, porous media, turbulence (isotropic, anisotropic, unsteady, laminar/turbulent transition, acoustic modelling) • Heat transfer (natural convection, conduction and heat transfer, shell conduction, internal radiation, external radiation, solar radiation, simplified heat exchanger model, non-equilibrium thermal model, porous media) • Multiphase (discrete phase modelling, macroscopic particle models, inert particle tracking, liquid droplets) • Free surface flows – multiphase (Implicit and explicit VOF, coupled VOF, open channel flow and wave, surface tension, phase change, cavitation) • Optimization (parameters, design point studies, correlation analyses, design of experiments, sensitivity analyses, goal driven optimization, adjoint solver, mesh morphing) • High rheology materials (viscoelastic, extrusion models, blow moulding models, fibre spinning models) • HPS (parallel solving, meshing, batch solving, GPU support) • Scripting capability (automating model setups, language: Python) • Couple with mechanical modules to run CFD-FEA models.
4	**Ansys Maxwell** • Is an electromagnetic field solver for electric machines, transformers, wireless charging, permanent magnet latches, actuators, and other electromechanical devices. • It solves static, frequency-domain and time-varying magnetic and electric fields. • Maxwell also offers specialized design interfaces for electric machines and power converters. • It includes 3-D/2-D magnetic transient, AC electromagnetic,

	magnetostatic, electrostatic, DC conduction and electric transient solvers to accurately solve for field parameters including force, torque, capacitance, inductance, resistance and impedance. • The following features and capabilities shall be presented as part of the offering: o Automatic adaptive meshing techniques. o Multiphysics coupling workflow. o Able to perform advance magnetic modelling and subsequent calculations such as core loss, vector hysteresis, four-quadrant simulation for permanent magnets, magnetostriction and magnetoelastic analysis, Litz wire loss and manufacturing effects on loss computation. o Specialized interfaces for Maxwell (or similar) for both electric machines and power converters. o Classical motor performance calculations (RMxprt [or similar]) which can automatically generate geometries, motion, mechanical setup, material properties, core loss, winding and source setup for detailed finite element analysis. o Multidomain power electronics simulator (Simplorer [or similar]) for electrical, magnetic, mechanical, fluid and thermal systems that seamlessly integrates three fundamental component libraries namely Circuits, Block diagrams, and State machines. With integrated analysis by connection to electromagnetics and thermal tools. o Magnetic design and optimisation tools (PExprt [or similar]) for ferrite transformers and inductors. o Output transient electromagnetic forces to multi body dynamics software (Maxwell to Ansys Rigid body dynamics [or similar]). o Model parameterisation and optimisation through the use of various optimisation algorithms (Optimetrics [or similar]).	

- The existing software modules as identified by the original software developer as well as the quantities currently in use at Transnet are listed as follow:

Number	Original Software Developer Identification	Quantity
1	ANSYS MECH ENTERPRICE SOLVER	3
2	ANSYS MECHANICAL PREPPOST	5
3	ANSYS GEOMETRY INTERFACE	2
4	ANSYS CFD PRO	1
5	ANSYS CFD PREMIUM	1
6	ANSYS MECH PRO	2
7	ANSYS MECH ENTERPRISE	1
8	ANSYS MECH CFD MAXWELL 3D	2
9	ANSYS DISCOVERY MODELING	1
10	SLA HRS,	212 (hours)
11	SLA DAYS USER W/SHOPS	24

Installation and Proficiency Timelines

3. Timelines for the complete installation of proposed software:

- Tenderers must provide an accurate and detailed project plan detailing the steps and timelines for the complete installation of the proposed software (This applies to both software upgrades as well as alternative software). The plan must be submitted as a hard copy. The format of the project plan must be the MS Project default option or similar.

4. Proficiency of users between current software and proposed software:

- Tenderers must provide a detailed project plan which they will execute to assist in the proficiency of the existing users of the current software, on the proposed software. The plan must be submitted as a hard copy. The format of the project plan must be the MS Project default option or similar.

System Infrastructure and Configuration

5. System infrastructure required by Transnet:

- As part of this tender submission, it is **mandatory** that tenderers provide Transnet with a comprehensive system requirement document detailing the hardware and licensing architecture requirements for the software to operate efficiently.

6. Central server software systems for multiple user installations:

- Tenderers must provide documented evidence that software can be stored on a central server and then installed and identically configured onto various machines countrywide in order to ensure software configuration uniformity across Transnet.

7. Data management and control systems required by Transnet:

- As part of this tender submission, it is **mandatory** that tenderers provide Transnet with a comprehensive systems requirements document for the software data storage and control systems detailing hardware and architecture requirements for the data systems to operate efficiently. Tenderers must provide two separate documents where one document details systems where Transnet is the custodian which owns, controls, manages and maintain the system and another where the principal software developer or their authorised agent is the custodian which owns, controls, manages and maintains the system. Please note that this is an option which Transnet reserves the right to accept or decline.

Software Dependencies

8. Independent or Dependent software:

- It is **mandatory** that tenderers must provide Transnet with documented details of whether the proposed software operates as independent/stand-alone software, or whether the proposed software

is dependent on the availability of additional software from a different principal software developer in order to be operational.

9. Dependent software requirements from Transnet:

- If additional software from a different principal software developer is required in order for the dependent software to operate, the tenderer must provide documentation which clearly states whether Transnet will be required to acquire the additional software, or whether the additional software is "embedded" and thus provided and licensed by the principal software developer. Transnet prefers not to approach the market for additional software.

Legacy Data Migration

10. Migration of current software data format, storage and control system to proposed software data format, storage and control system:

- Tenderer to provide evidence by way of a physical technical demonstration that the proposed software can import/access, transform, process, store and ultimately continuously utilize legacy software data without compromising any current data integrity. Should the proposed software not be able migrate the data directly and successfully, an alternative method may be proposed. If it is necessary that the data migration requires additional software from a different principal software developer in order for the legacy data to be migrated successfully, the tenderer must provide documentation which clearly states whether Transnet will be required to acquire the additional software in order to ensure successful and efficient data migration, or whether the additional software license/s will be provided and licensed by the tenderer/principal software developer. Existing Transnet data will be made available for this demonstration up to one calendar week before the demonstration is scheduled. The evaluation will be based on integrity of the data which has been

migrated and the speed of the migration process. A second set of Transnet data which will be made available at the time of the demonstration must also be migrated during the demonstration as confirmation of the proposed method.

Software Technical Demonstration

11. Software Technology Demonstration to confirm technical and performance compliance of the proposed software:

- Tenderers must do a technical demonstration to confirm that the proposed software complies to the requirements of this technical specification. As a requirement the following must be demonstrated.

Number	Features to be Demonstrated
1	ANSYS – FEA/CFD Software Package Fluent with Fluent meshing - Meshing – Hexahedral, tetrahedral, polyhedral, boundary layers, mesh refinement. - Solving: - Incompressible and compressible fluids - Steady state and transient. - Heat transfer – Conduction, convection and radiation - Multiphase flows - Free Surface flows - Optimization - High performance computing (Multiprocessing) - Scripting - Coupling CFD- FEA - Post processing
2	ANSYS Mechanical + Space claim - Import computer aided design (CADD) data - Edit, repair and create any geometry - De-feature and mid-surfing cadd models - Geometric Idealization (Spring, mass, damper, beams and shells) - Solve a model of Linear and non-linear static nature

	- Solve a buckling and transient model - Show material models of non-linear and hyper elaststic nature - Show topology optimisation - Show sub-modeling and data mapping - Show modal and harmonic super position analsyses - Show explicit dynamic for FE (Lagrange) implicit-explicit deformations - Demonstrate fluid-structure interaction (FSI) solver - Demonstrate thermal steady state and transient analyses for conduction, convection, radiation - Show HPC and cloud based solving
3	ANSYS Maxwell: - Low-frequency Electromagnetic simulation. - Automatic adaptive meshing. - Multidomain system modeling. - Compatibility with the interfaces to simulate as per the compatibility table. - Model parameterization and optimization. - Electromagnetic materials database. - Classical motor performance calculations. - Scripting

Please note that any equivalent or similar software product may be offered to comply with this tender

APPENDIX B: ANNUAL SOFTWARE MAINTENANCE SUPPORT

DESCRIPTION OF ANNUAL SOFTWARE MAINTENANCE AND SUPPORT REQUIREMENTS:

Annual Software Maintenance and Support must as a minimum comply to the requirements specified below:

Software Maintenance and Support

1. All software packages must be provided with annual Software Maintenance Support to ensure that the subscription and perpetual

software packages which are utilized by TE are:

- continuously maintained for the period of the contracts to operate with the latest technical enhancements and software releases as released by the principal software developer;
    - i.e. timeously provided with notifications of minor and major upgrades.
    - i.e. provided with software version support timelines for upgrade planning.
- continuously supported for the period of the contracts by timeously making available all the relevant and latest documentation which supports the latest technical enhancements and software releases;
- continuously supported for the period of the contracts with the necessary end-user support from the approved and authorised local reseller and/or principal software developer. The required Software Maintenance Support also includes 24/7 high-quality support (i.e., so-called Hot Line support) which must be responded to within 8 hours of notification advice during weekday business hours, should there be any problems which are experienced whilst users operate the software during the execution for their tasks. This on-site/off-site support includes as a minimum:
    - Software and hardware configuration and installation assistance.
    - License management tools which allows the installation, configuration, and uninstallation of licenses to suit the needs of

Transnet Engineering.

- Software performance problem corrections.
- Software system problem resolution.
- Tier 2/3 support access from the principal software developer,
- All technical support personnel must be certified by the principal software developer.

Sample Software Maintenance and Support Specification

2. It is **mandatory** that a sample of the proposed annual Software Maintenance and Support specification, which encompasses the above as a minimum must be submitted as part of the tender submission to validate compliance and/or highlight exclusions.