Package Number	20220510-AUW
Package Name	Provision of Barossa Infield Production Management System and Export Management System
Scope of Work **(* To be confirmed)**	VENDOR shall supply all necessary engineering design, modelling, and project management services, software and software licenses and initial tuning, relevant documentation, testing, installation, and commissioning services (software and hardware) to meet the requirements of the Infield Production Management System, Export Management System and Engineering Simulator. The Infield Production Management System (IPMS) shall essentially provide four major functions which are virtual flow metering, real-time integrity monitoring, automatic forecasting, and on-demand forecasting. The above functions shall use a transient multiphase hydraulic model of the subsea production system with field measurements as boundary conditions to calculate the current state of the system. The current state shall be used for hydrate monitoring, liquids management, leak/restriction detection, and as initial condition for forecasts. Virtual metering shall use a combination of models with wellbore measurements as boundary conditions to predict well phase rates and monitor the wells. The purpose of the transient multiphase hydraulic model is to provide real-time monitoring of information about the subsea production system that cannot be measured. This includes pressures, temperatures, flowrates, densities, compositions, and hold ups throughout the network. The purpose of the forecast models is to predict future operating conditions in order to anticipate any potential operational problems. This includes predicting system conditions, as well as FPSO and onshore reception conditions like levels, pressures, temperatures, and flow rates. The Export Management System (EMS) shall provide several of the same functions as that of the IPMS, however the model scope only covers the export pipeline and export gas compressor trains. These features are Real-time Process Monitoring, automatic forecasting and on-demand forecasting. Provide the Engineering Simulator which shall allow users to utilise an online system snapshot and design input data for running extensive simulations, and it can be used for pipeline and process planning. Deliver the IPMS, EMS and Engineering Simulator requirements as outlined below: • Provide the following modelling capabilities for IPMS: o Virtual Flow Metering shall calculate the multiphase flowrates at the wellheads and across the infield network as well as detect water breakthrough. o Real-time Process Monitoring shall provide real-time information and alerts to help guide operators during all operational scenarios while actively monitoring flowlines. This includes the following functions described in more detail in subsequent sections - Operation Monitoring, Chemical Tracking, Hydrate Advisory, Liquid Management, Leak Detection System and Restriction Detection System. o Automatic Forecasting shall provide information about the trajectory of current operations and theoretical conditions for a specific period into the future. The functions shall include forecasting of operational envelopes, Hydrate Risk Monitoring, Cooldown and No Touch Times, and Liquid Tracking as described in more detail in subsequent sections. o On-Demand Forecast Tool shall provide operators, site engineers, and remote

support engineers to try out operational scenarios before execution in the field for viability analysis. The functions shall include flowline depressurisation, settle-out and ramp-up.

- Provide the following modelling capabilities for EMS:
  - Real-time Process Monitoring shall provide real-time information and alerts to help guide operators during all operational scenarios while actively monitoring theexport pipeline. This includes the following functions described in more detail in subsequent sections - Operation Monitoring, Leak Detection System and Restriction Detection System.
  - Automatic and On-Demand Forecasting provides information about the trajectoryof current operations and theoretical conditions. The functions shall include Survival Time Forecast that covers various operating scenarios (line pack and de-pack duration) described in more detail in subsequent sections.
- Provide the following modelling capabilities for the Engineering Simulator:
  - The Engineering Simulator (ES) shall be an independent system from the IPMS and EMS. It shall allow users to simulate field conditions and various scenarios locally from any PC with the ES software installed.
  - The ES software shall allow engineers to perform engineering studies on the field. It shall perform transient simulations of integrated subsea, FPSO and onshore facilities and controls.
  - It shall be used for building and validating start-up, shutdown, and other operating procedures, validation of control schemes, controller tuning, and performing offline simulations.

General Technical Requirements

The IPMS and EMS components shall possess the following, at a minimum:

- The ability to simulate multiphase flow from reservoir sand face to the flow meters of the second-stage and test separators in the case of IPMS, and from export gas metering skids to the last fiscal meter onshore of the DLNG receiving facility in the case of EMS.
  - More specifically, multiphase flow is to be simulated in wells, across subsea equipment, flowlines, risers and receiving separators utilising on pressure, temperature, valve status, and any other physical metering information from the ICSS.
- The systems shall incorporate an industry recognized multiphase (gas, water, condensate) flow modelling and simulation capable of both steady state and transient modes with high speed, stability and robustness.
- The ability for tuning the systems to ensure thermal and hydraulics modelling is within the calculation accuracy required by the Barossa project, fluids, and flow conditions.
- The tuning process may be carried out either online/manually and offsite/onsite by company operation personnel. A log of system changes shall be made available for debugging and restoration purposes.
- Validated well test data and actual metering information from the field should be utilised for tuning and benchmarking of the IPMS and EMS.
- The estimated uncertainty and error analysis of calculated values related to key variables shall be reported.
- Possess the ability to model and simulate a range of user-defined well start-up scenarios to help determine optimum field start-up duration.

	• Possess the ability to model and simulate a range of user-defined production ramp-up and ramp down scenarios to help with liquid management at the FPSO/onshore. **General Non-Technical Requirements** The IPMS/EMS non-technical requirements include, but are not limited to, the following items: • Ability to be accessed from the Barossa FPSO vessel and the onshore support locations. • Ability to communicate inputs and outputs via OPC communication protocol to various applications including direct communication with the ICSS. • System shall comply with Company standards, security and information protection mechanisms. • System hardware and software shall comply with Company standards. • Ability to update and maintain the IPMS and EMS by Company with minimal involvement from VENDOR. • Ability to access IPMS and EMS remotely to provide support and maintenance. • Open architecture to allow for future expansion of current Barossa facilities which may include future wells and manifolds, future compression, new functional requirements, modified fluid files or parameters and new sensors. • Maintainability of security requirements including password updates, anti-virus and patching. • VENDOR shall comply with backup and recovery requirements and shall provide a plan for backup and recovery. • Produce detailed Support and Operator User Manuals for IPMS, EMS and ES. Indicative Timeframe: • Estimated contract award: Q3 2022* • Estimated delivery: Q4 2023 implemented onboard vessel, Singapore & Australia*

Project Registration

Santos is committed to ensuring Australian Industry the opportunity to participate in the Barossa Project. Expressions of Interest are invited from contractors and suppliers with the relevant capability and capacity to undertake the scope of work.

This is a request for specific expressions of interest. Contractors and suppliers will be considered for prequalification and tender if suitably qualified against this package.

Scope level definition:

Full scope: Able to produce / supply all the package.

All registrations are to be completed via ICN Gateway *BarossaOffshore.icn.org.au*. Please contact the ICNNT if registration assistance is required. Contact details: (08) 8922 9422 or *resources@icnnt.org.au*.

Project Website: Santos Australia