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2. Introduction

- **Presenters**
  - Stephen Negus (Aurecon) – Project Director
  - Antony Schinckel (CSIRO) – ASKAP Director
  - Shandip Abeywickrema (Aurecon) – Lead Subsystem Engineer

- **Consortium Members**
3. Management Structure

- **SKAO**
  - **Aurecon**
  - **CSIRO**

- **INFRA SA**
  - **Horizon Power** (Power Supply)
  - **RZQ Solutions** (RFI Shielding)
  - **Rider Levett Bucknell** (Estimating)
  - **European organisations** (Specialist power studies TBC)
3. Management Structure

- **Consortium Lead**: Michelle Storey
- **Project Manager**: Rebecca Wheadon
- **Project Director**: Stephen Negus
- **SKAO**
- **DIICCSRTE**
4. Overview

- Infrastructure to support other elements of SKA1
- Includes:
  - Roads, buildings, power generation and distribution, reticulation, vehicles
- Proposed extensive re-use of existing MRO infrastructure, Pawsey Centre and MSF
4. Overview
4. Overview

Boolardy Station
- 346,000 hectare
  (3,460 sq km)

MRO
- 12,000 hectare
  (120 sq km)
4. Overview – MRO
4. Overview – MRO Control Bld

800 sq metres, RFI shielded, Geothermally cooled
4. Overview – ASKAP
4. Overview – ASKAP
4. Overview – ASKAP fibres

- 7776 fibres as ribbons (12 fibre)
- Waveguide-beyond-cutoff Penetration
4. Overview – MWA

128 16 element tiles
4. Overview – MSF

MRO Support Facility, Geraldton
- offices and laboratories
4. Overview – Pawsey

1,000 sq metres
- Cray supercomputers (ASKAP, MWA, other)
- SGI hierarchical storage and tape system
- Multi 10 Gb channels to MRO
4. Overview – configuration (?)
4. Overview

External Interfaces

- Determination of cost cap (SKAO)
- Telescope Foundations to suit telescope (LFAA and Dish)
- Power, reliability and redundancy requirements (CSP, SDP, LFAA, Dish, SaDT, TM, SAT)
- Number of racks required (CSP)
- Communications and RFI design to onsite standards (SKAO)
- Site occupational requirements of other work packages to determine construction camp, water, sanitation, vehicle etc. (CSP, SDP, LFAA, Dish, SaDT)
5. Work Breakdown Structure

Level 4 WBS Sub-Elements

- Infrastructure Engineering Management
- Infrastructure System Engineering
- Infrastructure Site Monitoring
- Infrastructure Power
- Infrastructure Access
- Infrastructure Water & Sanitation
- Infrastructure Buildings
- Infrastructure Telescope Foundations
- Infrastructure Communications
- Infrastructure Vehicles
5.1 Work Breakdown Structure

Infrastructure Engineering Management

• Work Included
  • Coordination of all project progress activities (Aurecon)
    • Project plan
    • Risk register
    • Financial management plan
    • Resource allocation plan
    • Reporting system

• Work Excluded
  • N/A
5.2 Work Breakdown Structure

Infrastructure System Engineering

- Work Included
  - Identification and implementation of systems engineering principles
    - Create SEMP
    - Interface Management
    - Performance Budgets
    - Verification
    - Configuration Control
    - Hazard analysis logistics

- Work Excluded
  - N/A
5.3 Work Breakdown Structure

Infrastructure Site Monitoring

- **Work Included**
  - Design of equipment and supporting analysis infrastructure (CSIRO)
    - Monitoring, analysis and reporting of site parameters
    - RFI
    - Tropospheric stability
    - Weather parameters such as wind, temperature and humidity

- **Work Excluded**
  - N/A
6.3 Proposal Review

Infrastructure Site Monitoring

- One monitoring station at each site essential
- INFRA AUS has current experience and designs available for equipment to monitor
- Most cost effective solution to utilise instrumentation that is already deployed for review and reporting
- Possible solution COTS product based RFI monitoring system, RF-over-fibre data feed to receiver
5.4 Work Breakdown Structure

Infrastructure Power

- Work Included
  - Provision of all power needs at all the SKA facilities
    - Review Power Generation supply options for lifetime of SKA
    - Provide whole of life analysis of generation options
    - Design of power reticulation network
    - Design of power filtering and UPS
    - Design review and reporting to ensure compliance with the RFI emissions specifications
    - Assessment of renewable power options
- Work Excluded
  - N/A
6.4 Proposal Review

Infrastructure Power

- MRO, MSF and Pawsey
- Interdependency of design with RFI implications
- Opportunity to collaborate with a number of potential European partners
- Assumed that minimisation of power consumption will be an important consideration for other Consortia
5.5 Work Breakdown Structure

Infrastructure Access

• Work Included
  • Design and specification of access roads and tracks
  • Design and specification of airstrip
  • Design and specification of signage and control for construction and operation

• Work Excluded
  • N/A
6.5 Proposal Review

Infrastructure Access

- Cost-benefit analysis of upgrade to existing main access road to MRO
- Roads designed on a ‘fit for usage criteria’
5.6 Work Breakdown Structure

Infrastructure Water & Sanitation

- Work Included
  - Design all water and sanitation services for construction and maintenance of SKA

- Work Excluded
  - Drinking water supplies
5.7 Work Breakdown Structure

Infrastructure Buildings

• Work Included
  • Design of all buildings to house equipment and personnel for SKA
  • Includes first aid centre, warehouse space as required, offices, dormitories, canteens, fuel station and garage/maintenance facility, buildings that house computers, networking equipment, data storage and power
    • Design of air-conditioning as well as generation of specific cooling mediums for the specialist equipment
    • HV and LV building electrical engineering
    • Building services engineering
    • Electrical power distribution
    • RUPS, UPS and Generator back up
5.7 Work Breakdown Structure

Infrastructure Buildings (Continued)

• Work Included
  • Fire engineering
  • Acoustics
  • Structural engineering
  • Civil engineering
  • Architecture
  • RF Shielding of the building
  • RF Emissions management

• Work Excluded
  • N/A
6.7 Proposal Review

Infrastructure Buildings

- All constructions necessary to house the equipment and personnel of the SKA
- Careful consideration is to be taken with the construction of RF shielded buildings
- Could include works to MRO, Boolardy homestead, MSF and Pawsey
- Expectation to reuse existing infrastructure
- Temporary construction camp to be provided
5.8 Work Breakdown Structure

Infrastructure Telescope Foundations

- **Work Included**
  - Design foundations for SKA Low and SKA Survey

- **Work Excluded**
  - N/A
6.8 Proposal Review

Infrastructure Telescope Foundations

• The foundations necessary to support LFAA and Dish
• Extensive experience to be carried forward from ASKAP
• Detailed design (Stage 2) following confirmation on the design criteria and performance specifications from other WP
5.9 Work Breakdown Structure

Infrastructure Communications

- Work Included
  - Design telephony and other communications onsite at all locations of SKA

- Work Excluded
  - N/A
Infrastructure Communications

- Includes the provision of communications within the SKA site and to the outside world (e.g. telephony or other communications)
- Liaise with SaDT on possibility of sharing optic fibre
- EMC taskforce guidelines required
5.10 Work Breakdown Structure

Infrastructure Vehicles

• Work Included
  • Includes all dedicated SKA on site vehicles for construction and maintenance phases
    • Review procurement methodology options
    • Identify other vehicle requirements such as cranes, EWP and drill rigs during construction and maintenance (input from AIV)
    • Determine vehicle whole of life maintenance and upgrade requirements for SKA

• Work Excluded
  • N/A
6.10 Proposal Review

Infrastructure Vehicles

- All dedicated SKA on site vehicles that may be necessary during construction and for maintenance and support of the facility
- Assessments will be made of the vehicle usage proposed during construction and operation phases
- Maintenance requirements of other consortia will be considered
7. Prototypes

- INFRA AUS will design infrastructure to suit other consortia prototypes
  - Dish antenna foundation
  - Possibly LFAA antenna foundation
- Possibly monitoring equipment
8. Challenges & Opportunities

- ICDs from SKAO for other consortia inputs to be sufficiently detailed to permit INFRA Aus to carry out scope
- Re-use of facilities
- Cable trenching solutions
- Cost effective power supply solutions
- Cost effective foundations design solutions
- Capex vs. Opex
- Alternatives to achieving performance requirements of codes and standards
- **More bang for your buck!**
9. Thank you and Questions