



SKA Operations WG

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Paris
Sep 2006



Need for Operational Model

- Impact on the design
- Impact on governance
- Impact on international collaboration model



SKA will be expensive!

$\geq 100\text{m€}/\text{yr}$ operating budget

- Operations money more difficult to obtain than construction money
- Can we break the 10% total construction cost/year paradigm?
 - 5% routine ops and maintenance,
 - 2-3% user support,
 - 2-3% upgrades
 - Separation of design, construction, and operations may not be sharp.
- Minimize staff needed to support operations
- Operations cost will depend on culture
 - i.e. user facility or program facility
- Need for pre-operations/commissioning budget



Important to consider life cycle costs

- Avoid short term construction savings at the expense of operations
- Self diagnosis and repair - “hot spares”
- Design for redundancy, robustness, graceful failure, easy diagnosis
- Some repairs can wait or never be fixed
- Construction budget must include adequate spares
- Must deal with planned obsolescence of COTS
 - e.g., computing hardware
- Software is expensive and is part of construction
 - Software should not be deferred to operational phase
 - Software development will continue
 - Software must be portable to next generation of computers

- Strong central management (Director)
 - Staff may be seconded from elsewhere, and even be located at a variety of locations, but must work under the Project Director
- Multi-tier system
 - Based on Large Hadron Collider model
 - » Tier 0 – Telescope
 - » Tier 1 - National scale regional centres
 - » Tier 2 – Small (specialised) regional centres
 - » Tier 3 - Institutes
 - Use of regional centres minimizes SKA impact on existing regional/national centres
 - Tier 2 and 3 centres could be specialised
 - will add to total cost



Some operational issues

- Power consumption
 - Now limiting factor for signal processing
 - Alternate power sources
- Cryogenics
 - Sensitivity v operations cost
- Balance between operational flexibility & cost
- User software
 - End to end software may not be feasible
 - Access for non-experts
 - Flexibility for expert users, difficult experiments
 - Routine long term programs
- VO

Task forces needed

- OWG
 - Coordination
 - Governance
 - Tier Structure
 - Operational cost models
- EWG
 - Power consumption
 - » Other power sources (thermal, wind, solar)
 - Cryogenic operations
 - Robustness tradeoff with performance
 - Fiber – buy or rent?
 - Software portability
- SWG
 - SKA culture – program or users, TACs,
 - Impact of failed antenna elements or stations on configuration – with simulations group
 - Day in the life of the SKA
- EWG/SWG
 - Commissioning
 - Data products, IVO interface



Governance Operations WG

- Transition from construction to operations
- Work packages
- Visas, employment conditions, contracts, customs, OHS
- RFI control (internal as well as external, legal and technical)
- Intellectual property rights
 - Tier Structure
 - » Responsibility of tiers to the SKA project
 - Identify or at least specify operations funding