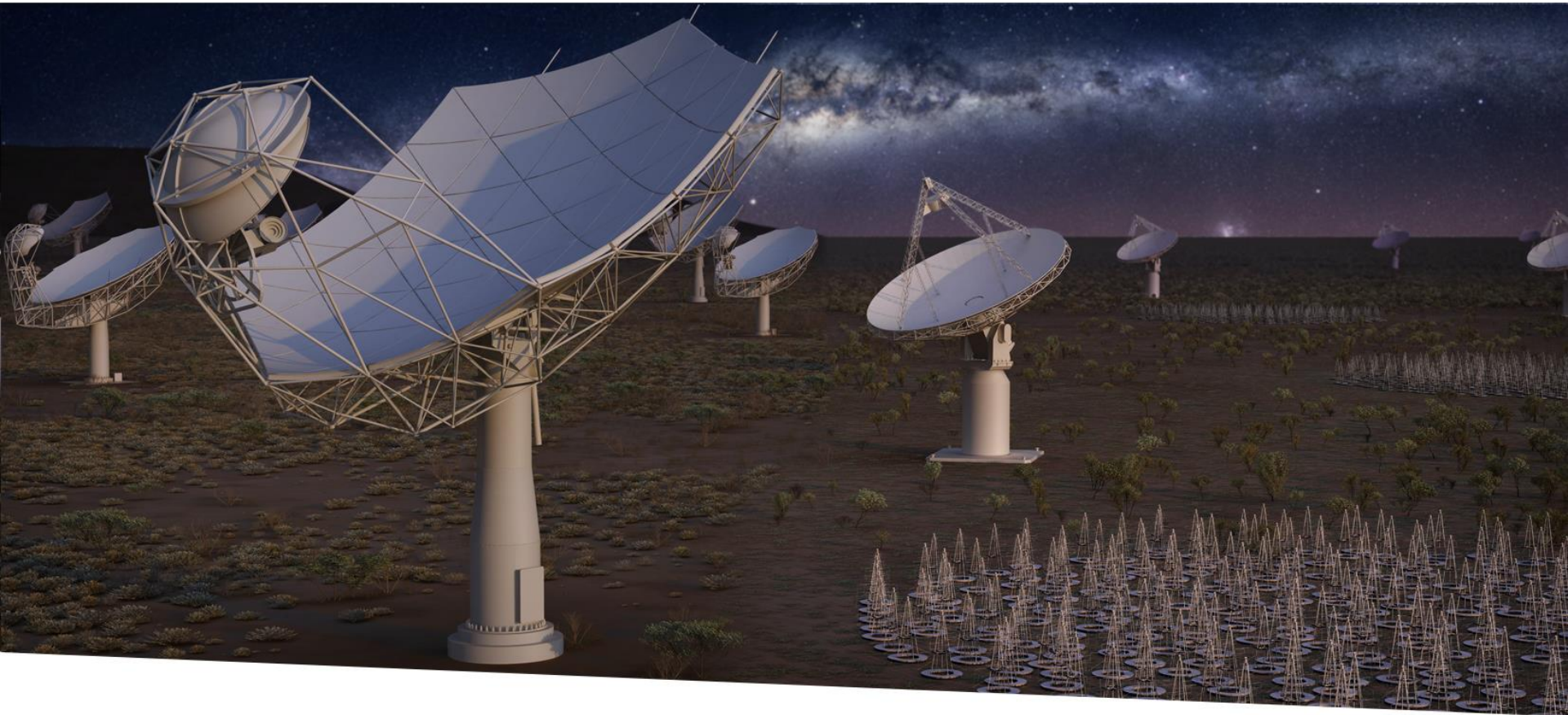


# General Progress – IGO, Procurement, and Industry



**SQUARE KILOMETRE ARRAY**

Exploring the Universe with the world's largest radio telescope

**Phil Crosby – Industry Liaison**

**February 2019**

# SKA HQ: Jodrell Bank, UK



€20M project; UK contribution

Building complete

~80 staff at present – growing to  
~150 on site

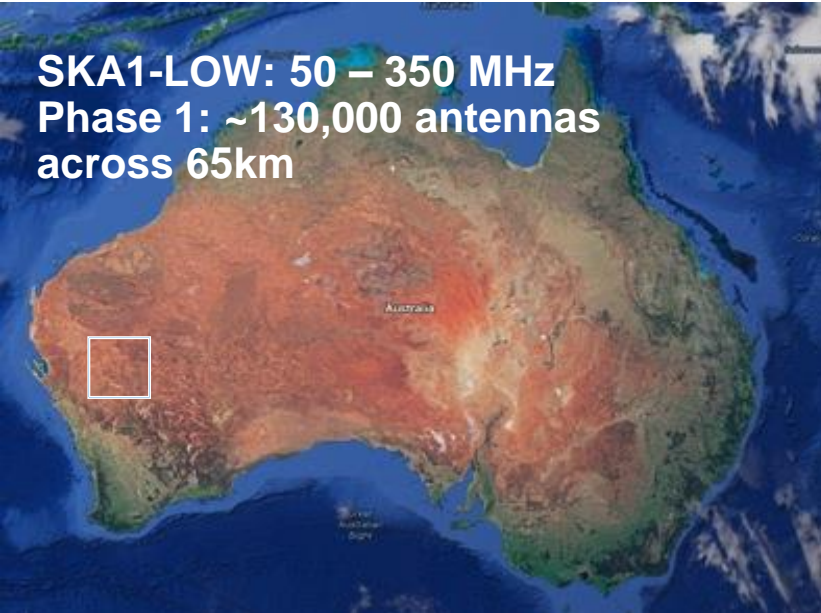


Exploring the Universe with the world's largest radio telescope

# SKA: HQ in UK; telescopes in AUS & RSA



**SKA1-LOW: 50 – 350 MHz**  
**Phase 1: ~130,000 antennas**  
**across 65km**



**SKA1-Mid: 350 MHz – 24 GHz**  
**Phase 1: 200 15-m dishes**  
**across 150 km**



# SKA Phase 1



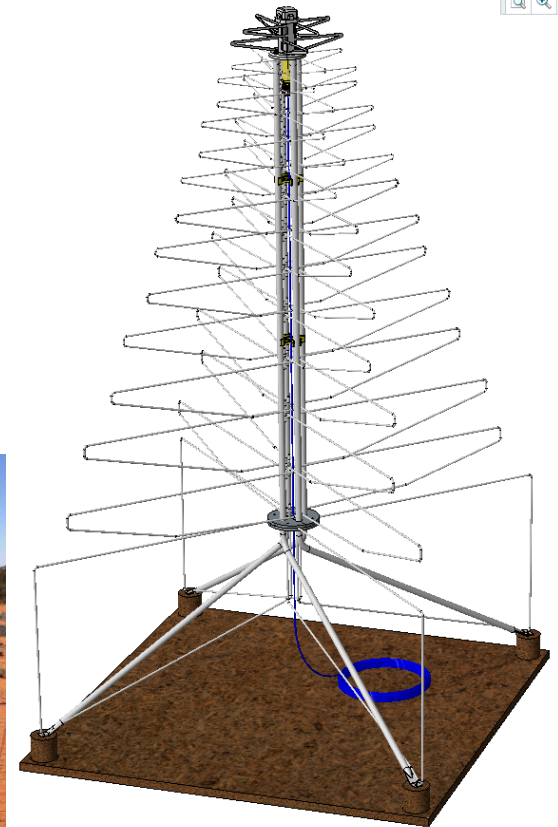
3 sites (AUS, RSA, UK-HQ)    2 telescopes (LOW, MID)    one Observatory (SKAO)  
Construction Cost-cap: €691M (2017)  
Construction: 2020-2027

**SKA1-Low:** 512 x 256 low-freq  
dipoles, 50 – 350 MHz  
65 km baselines  
Murchison, Western Australia

**SKA1-Mid:** 133 x 15m plus 64 x 13.5m  
dishes, 0.35 – 15 GHz  
120 km baselines  
Karoo, South Africa



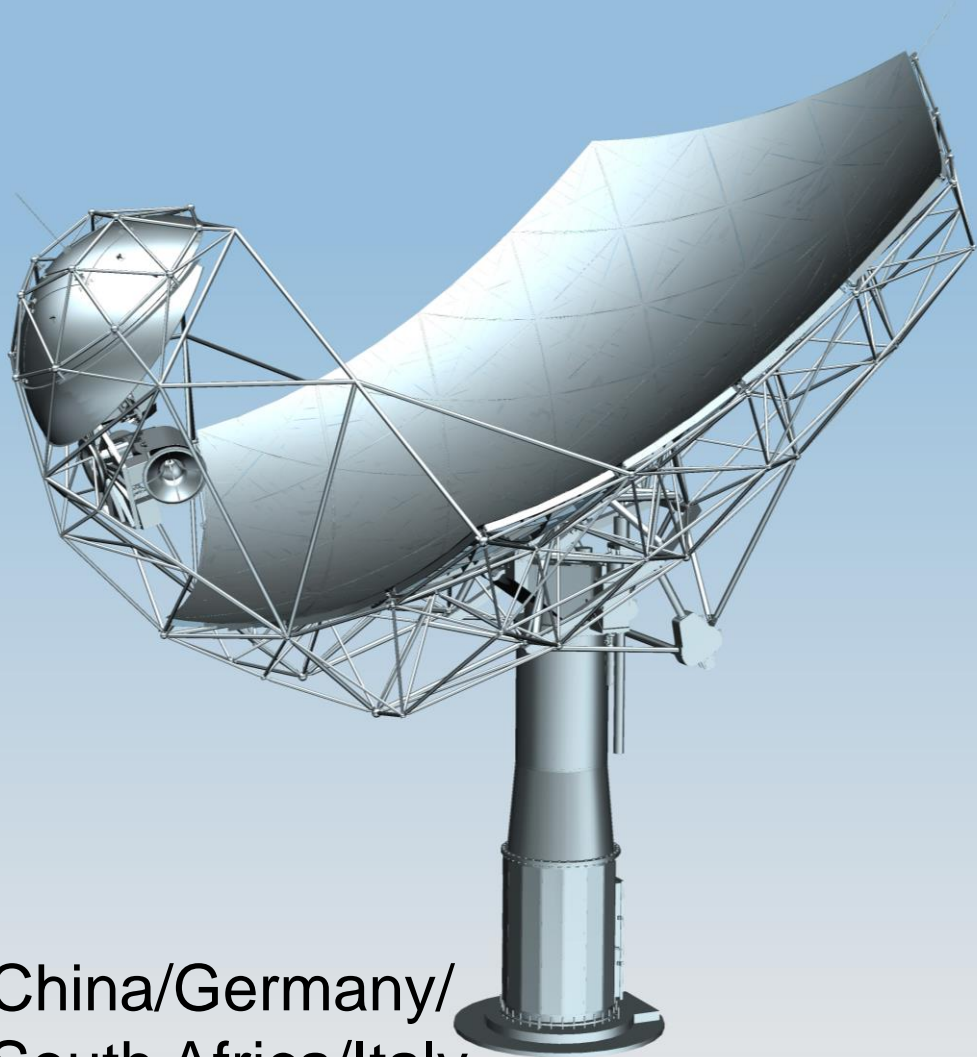
# Testing of SKA Low Prototypes



Two different designs tested at MRO during 2018



# Building SKA : dishes



China/Germany/  
South Africa/Italy



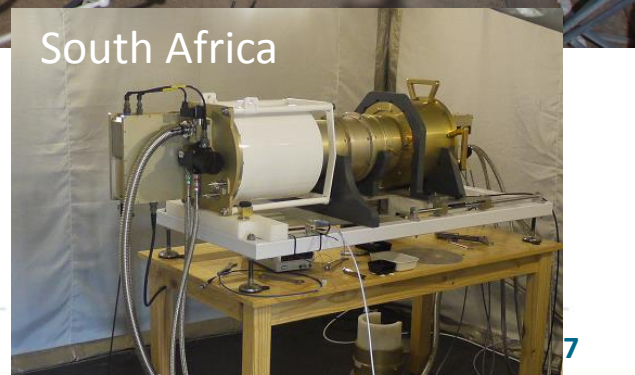
# SKA-P2: Karoo MPG funded



Italy



Sweden



South Africa

# Building SKA: industry collaborations



NL/Aus/NZ



Canada



protoNIP-01  
a GPU/FPGA based PSS prototype at the SKA1-  
Time Domain Team  
Manchester - Oxford - Bonn

UK/Aus

RSA/UK/India/NZ/Aus





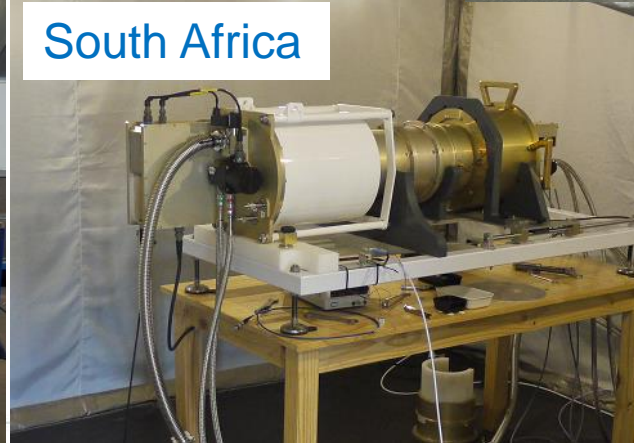
# Building SKA: prototypes

...being tested at MeerKAT.

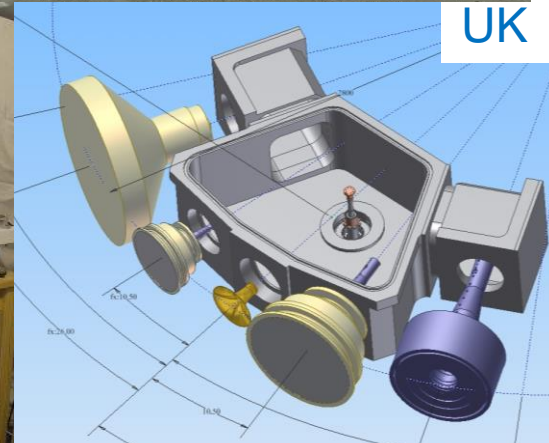
Band 1 receiver, leaving Sweden...



Italy



South Africa



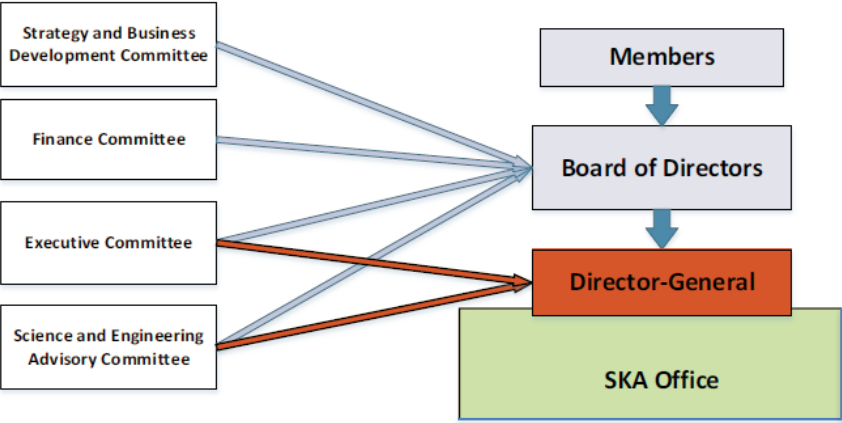
UK

telescope

# Transitioning to a 'new' SKA organisation

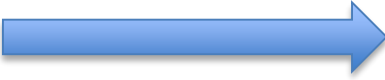


# Current SKA Organisation structure



SKA Office supported by:

- a joining fee and
- cash 'subscription'

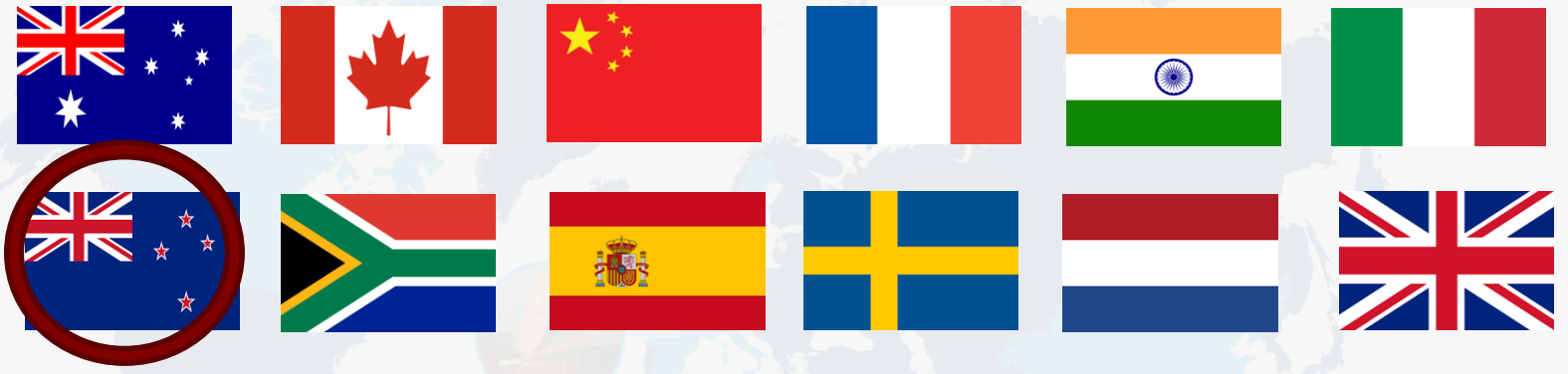


- WIDE BAND SINGLE PIXEL FEEDS
- TELESCOPE MANAGER
- CENTRAL SIGNAL PROCESSOR
- SIGNAL AND DATA TRANSPORT
- SCIENCE DATA PROCESSOR
- DISH
- MID-FREQUENCY APERTURE ARRAY
- LOW-FREQUENCY APERTURE ARRAY
- ASSEMBLY, INTEGRATION & VERIFICATION
- INFRASTRUCTURE AUSTRALIA
- INFRASTRUCTURE SOUTH AFRICA



- Global design effort organised in consortia.
- Supported by local funding

# SKA: A global Research Infrastructure



Potential Future Members

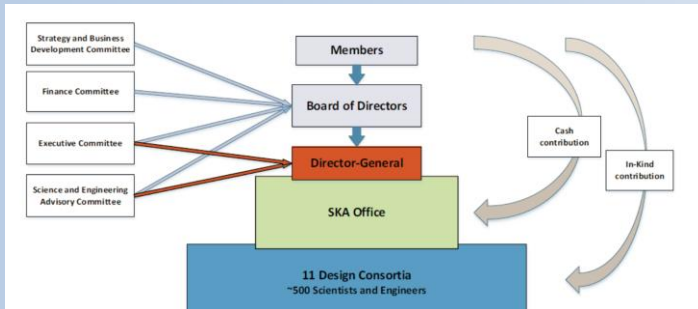


 **Members**  
Host Countries: Australia, South Africa, United Kingdom



 **African partner countries**

# Creating an IGO for the SKA



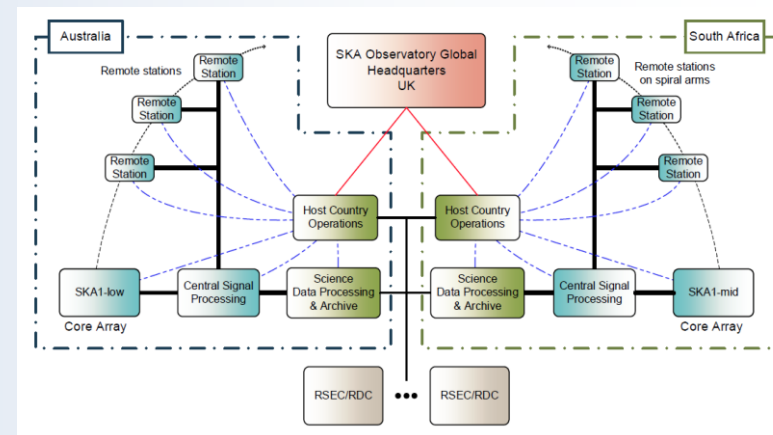
Design Phase

Construction Phase

2016

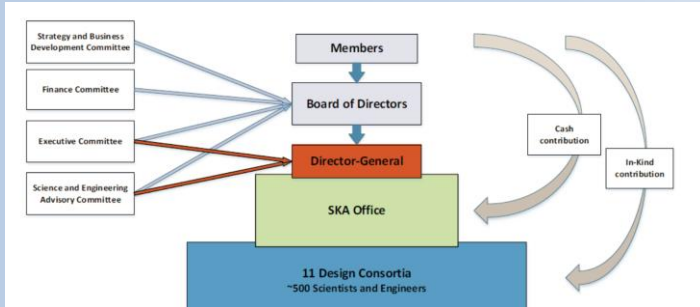


SKA Organisation Ltd  
UK company structure



SKA Observatory IGO

# Creating an IGO for the SKA



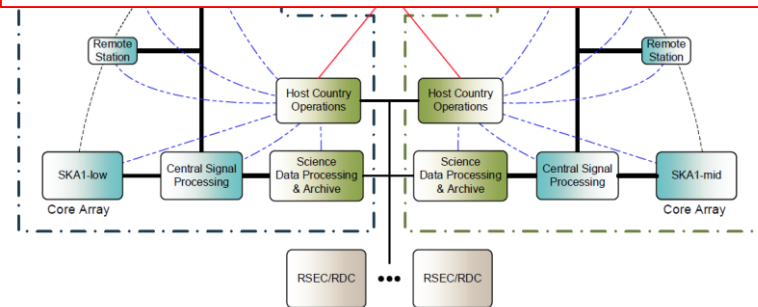
“to deliver the pre-construction phase....”



“The purpose of the SKAO shall be to facilitate and promote a global collaboration in radio astronomy with a view to the delivery of transformational science.”



**SKA Organisation Ltd**  
UK company structure



**SKA Observatory IGO**

# Establishing SKA as a Treaty Organisation



- SKA Organisation member governments agreed to develop an Intergovernmental Organisation in 2015
- Rationale:
  - Appropriate for a genuinely global research infrastructure of SKA's scale
  - Government commitment: political stability, funding stability
  - A level of independence in structure
  - 'Freedom to operate', specifically through procurement process, employment rules etc
- Building an organisation based on successful IGOs such as ITER, CERN
- Negotiations started October 2015 – led by Italian government.





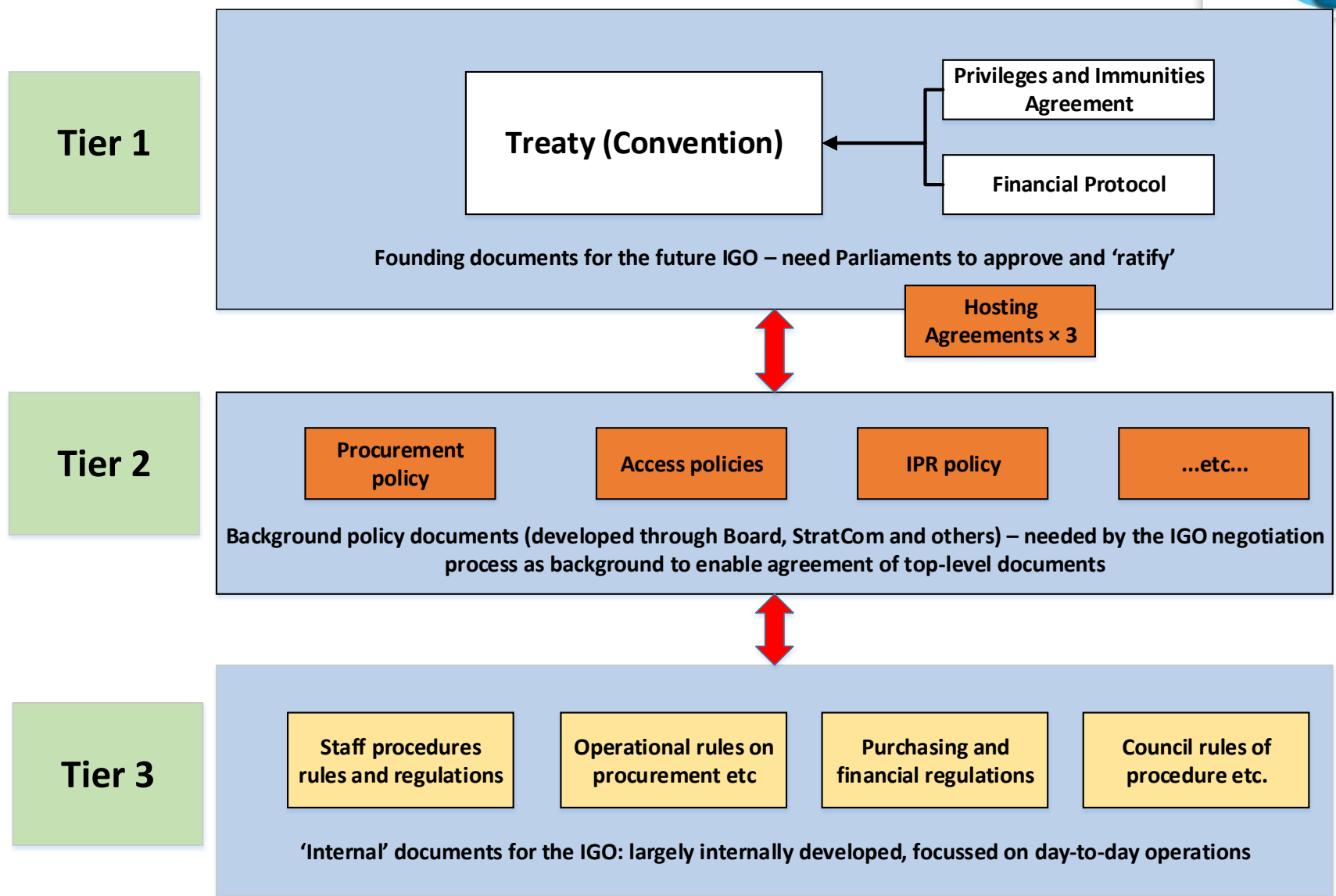






# Establishing the SKA Observatory

- Italian Ministry of Foreign Affairs announced signing – 12<sup>th</sup> March:
  - In Rome, likely at Ministry of Research;
  - Details being arranged now: signing of Convention and Final Record;
  - UK, RSA, AUS, IT, PT signing (plus NL, maybe China?)
  - Celebratory event alongside
- Following signing: first meeting of Council Preparatory Task Force
  - CPTF will prepare for first Council meeting, prepare for Observatory establishment
- ‘pre-CPTF’ discussions underway: Heads of Delegations group and StratCom progressing work





CONVENTION ESTABLISHING THE  
SQUARE KILOMETRE ARRAY OBSERVATORY

The Parties to this Convention,  
*DESIRING* to deliver one of the most visionary and ambitious science projects of the 21<sup>st</sup> century involving significant international cooperation,  
*COMMITTED* to testing the limits of engineering and scientific endeavour and to exploring fundamental questions in astronomy and physics,  
*NOTING* that the Square Kilometre Array will be a next generation radio telescope facility that has a discovery potential far greater than any previous instrument,  
*RECOGNISING* that the scale and ambition of the Square Kilometre Array demands a global effort with long-term investment,  
*EMBRACING* the potential for scientific discovery to contribute to advances in technology and innovation and to deliver a broader benefit for industry and society,  
*DEDICATED* to realizing the full ambition of the Square Kilometre Array Project,  
*ACKNOWLEDGING* the preparatory work done by the Square Kilometre Array Organisation in the establishment of the Square Kilometre Array Observatory,

Annex [...]   
Protocol on Privileges and Immunities of the Square Kilometre Array Observatory

The Parties to the Convention have agreed as follows:  
**Article 1**  
Definitions  
For the purposes of this Protocol:  
a) "Expert" means a person named by the SKAO as being in the service of the SKAO for a defined period of time;  
b) "Family" means, with respect to any person, the spouse or partner and/or dependent children forming part of such a person's household;  
c) "Official Activities" means all activities undertaken pursuant to the Convention including the SKAO's administrative activities;  
d) "Premises" means sites, buildings and facilities or parts thereof, irrespective of ownership, that are occupied exclusively by the SKAO for the performance of its Official Activities;  
e) "Representatives" means representatives of the Parties to attendance at meetings of organs or committees of the SKAO designated delegates, alternates, advisors and secretaries;  
f) "Staff" means members of staff or secretaries of the SKAO;  
g) "Archives" means correspondence, documents, manuscript films, recordings, computer and media data, data carriers, similar material belonging to or held by the SKAO and all contained therein; and  
h) "Immunity from legal process" means immunity from jurisdiction from execution measures.  
**Article 2**  
Domestic Law  
Unless otherwise provided by this Protocol, the activities of the SKAO, its Staff, Representatives and Experts shall be governed by the law applicable in the territory of the Member in which such activities are carried out.  
**Article 3**  
Immunity from Legal Process  
Within the scope of its official activities, the SKAO shall have immunity from legal process.

Privileges and Immunities

Annex [...]   
Financial Protocol of the Square Kilometre Array Observatory  
Preamble  
This Financial Protocol provides a policy framework under which all financial transactions, and other such related financial matters, will take place.

Tier 1

Foundational

Free

Procurement and Intellectual Property Working Group (PIPRPWG)  
SKA PROCUREMENT FRAMEWORK

**Purpose**  
This paper is an agreed position paper of the Working Group on procurement. The resultant framework will be issued as a Procurement Policy (to be developed together with more detailed Rules & Regulations). This would best be done by legal/procurement drafts.  
**Overview**  
The proposed framework comprises:  
• Objectives for the SKA procurement framework;  
• Principles for the SKA procurement framework; and  
• A high-level procurement framework and rules to be implemented by the future SKA Council consistent with the objectives and principles.  
**Objectives**  
The primary objective of procurement is to successfully acquire the goods, works and services required to deliver the SKA Project through cost, in-kind contributions or combination of both, while effectively managing risk.  
It is proposed that the following objectives support the 'primary' objective and be used to guide development of the Procurement Policy:  
• The Members achieve returns broadly proportional to their financial contribution to the Project (the Fair Share Return (FSR) principle) and specifically that:  
- during the construction phase each partner realises a minimum level of return (Possibly 75% but this requires modelling and agreement);  
- during the operations phase both free and non-free members have access to appropriate opportunities that will allow them to realise an acceptable level of return; and  
- accounting for return for infrastructure and non-infrastructure contracts will be done separately.  
• Where appropriate, members wish to enable positive outcomes for small and medium enterprises in Member Countries;  
• Where appropriate, Members want the procurement framework to facilitate consortia arrangements that operate across Member Countries;  
• The Members want a procurement framework that is supported by good governance.

Version 4 - 5 July 2016

Access Policy

Draft 0.17  
SKA Conventions Working Group on Operations and Access  
Preamble  
This Access Policy (hereon referred to as "Policy") applies to all access to the instruments and data of the Square Kilometre Array Observatory (SKAO).  
This Policy forms the framework for approval of the Access Rules and Regulations by the SKAO Council, established under the Convention establishing the Square Kilometre Array Observatory (hereon referred to as "Convention"). This Policy should be read alongside the provisions of the SKAO Financial Protocol and will take effect following approval by the SKAO Council.  
This Policy primarily pertains to the routine operations phase of the SKAO Project. Policies for science commissioning and early science phases will be determined by the SKAO Council.

Definitions

- Definitions in this Policy are the same as those in the Convention. Additional definitions that are specific to this Policy are below.
- "Access" means to use or benefit from the use of SKAO resources, including time on a telescope or computing-related resources.
  - "Time allocation" is the process by which Access is allocated to SKAO users.
  - "Key Science Projects (KSPs)" are observing projects that require large observing time allocations over a period longer than one Time allocation cycle.
  - "Principal Investigator (PI) projects" are observing projects allocated through competitive process that are not Key Science Projects.
  - "Director-General's Discretionary Time" is time allocated by the Director-General outside the normal process of assessment by the Time Allocation Committees.
  - "Share in the project" is as defined in the Financial Protocol.
  - "Open Time" is time available for scientists from Members, Associate Members and Non-members.
  - "Member Time" is time available for scientists from Members and Associate Members.
  - "Original data products" are data products produced by the SKAO.
  - "General data rights" are rights to analyse and publish data for any scientific purpose.

Strategic



SKAO INTELLECTUAL PROPERTY POLICY

Document number ..... SKAO-IPR-001  
Revision ..... 1  
Author ..... T. Kotze  
Date ..... 2016.06.17  
Status ..... Draft

Name	Designation	Affiliation	Date	Signature
JC Greenwood/T. Kotze		Owned by:		
Approved by:				
Released by:				

P. Diamond

Tier 2

Intermediate

Standard procedures rules and regulations

Operational rules on procurement etc

Financial regulations

Council rules of procedure etc.

Tier 3

'Internal' documents for the IGO: largely internally developed, focused on day-to-day operations



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Date: 01/17  
SKA Convention Working Group on Operations and Access  
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2. "Time allocation" is the process by which Access is allocated to SKAO users.  
3. "Time allocation priority" refers to the ranking system that assigns large observing time allocations over a period longer than one Time Allocation Cycle.  
4. "Proposed Investigator (PI) projects" are observing projects allocated through competitive processes that are not Time Allocation Priority.  
5. "SKAO Council's Disciplinary Time" is time allocated by the Director-General outside the normal process of assessment by the Time Allocation Committee.  
6. "Share of the project" is as defined in the Financial Protocol.  
7. "Open Time" is time available for scientists from Members, Associate Members and non-members.  
8. "Member Time" is time available for scientists from Members and Associate Members.  
9. "Original data products" are data products produced by the SKAO.  
10. "General data rights" are rights to analyse and publish data for any scientific purpose.

SKAO Policy Book  
**SKAO INTELLECTUAL PROPERTY POLICY**  
Document Number: SKAO-POL-IPR-001  
Revision: 1.0  
Author: SKAO Council  
Date: 2016-06-01  
Status: Approved  
Name: \_\_\_\_\_ Designated: \_\_\_\_\_ Date: \_\_\_\_\_  
Signed by: \_\_\_\_\_  
IC: \_\_\_\_\_  
Date: \_\_\_\_\_  
Approved by: \_\_\_\_\_  
Signed by: \_\_\_\_\_  
Date: \_\_\_\_\_

Measurement and Individual Property Working Group (MIP/WG)  
**SKA PROCUREMENT FRAMEWORK**  
Purpose  
The purpose of this Procurement Framework is to provide a common framework for all procurement activities of the SKAO. This Framework will be used to guide the development of procurement documents and to ensure consistency in procurement processes across the SKAO.  
Objectives  
The objectives of this Procurement Framework are:  
1. To provide a common framework for all procurement activities of the SKAO.  
2. To ensure consistency in procurement processes across the SKAO.  
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Procurement Policy

Procurement Policy

SKAO Council, Strategic Board, Strategic Management

Revision: 1.27

Documents

Tier 1

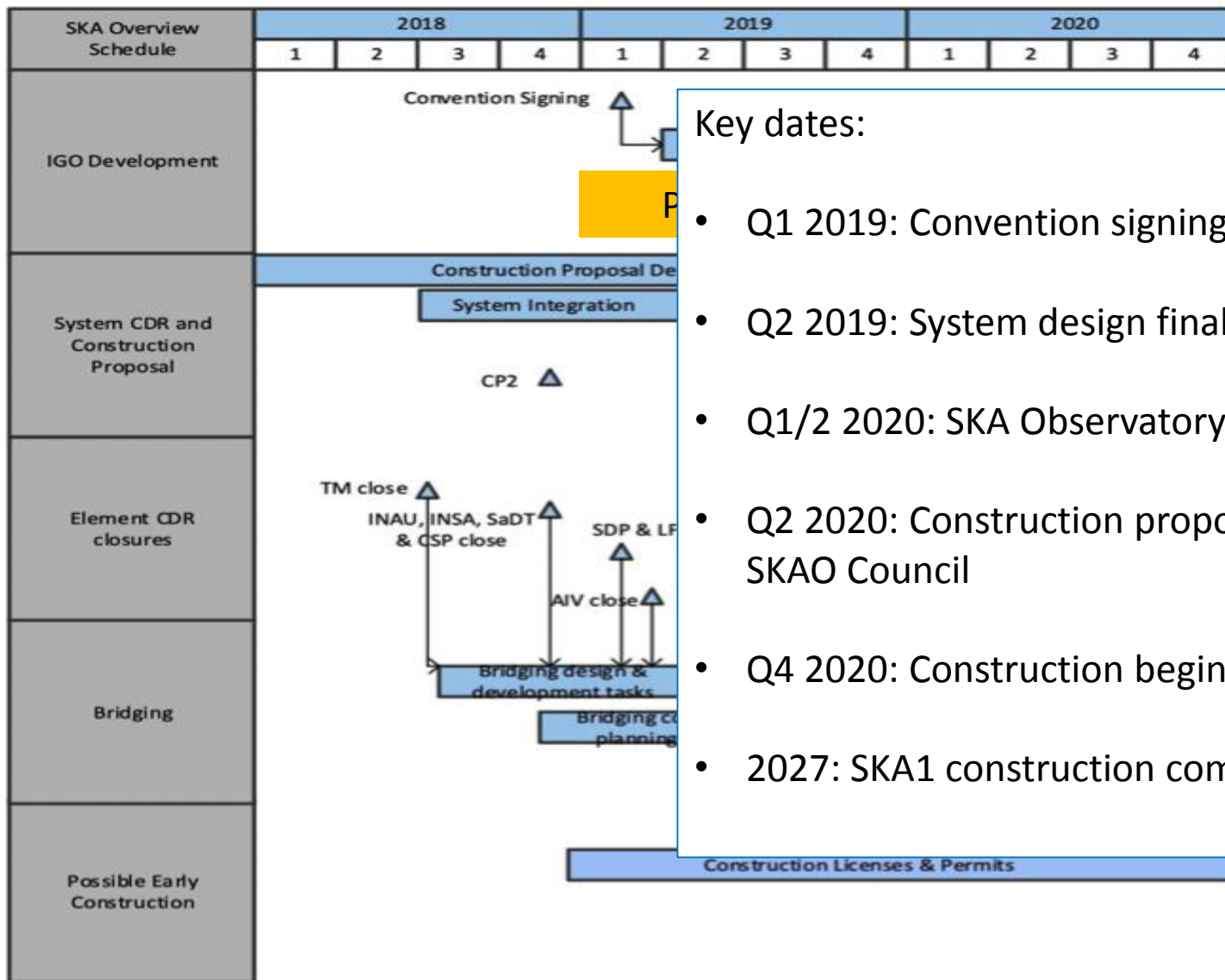
Tier 2

Tier 3

Staff procedures rules and regulations  
Detailed process documents/policies to be developed  
Council rules of procedure etc.

'Internal' documents for the IGO: largely internally developed, focussed on day-to-day operations

# How does this fit timewise?



## Key dates:

- Q1 2019: Convention signing
- Q2 2019: System design final
- Q1/2 2020: SKA Observatory exists
- Q2 2020: Construction proposal submitted to SKAO Council
- Q4 2020: Construction begins
- 2027: SKA1 construction complete

# Priority issues

- Funding shares
  - Developing the ‘Funding Schedule’ ready for establishing the Observatory and construction
  - Who contributes what to the SKA Observatory
  - Priority for the first Council meeting
- Rules for later ‘joiners’ to the Observatory
  - Potentially an access fee for joining later
- Rules for Associate Members (NZ?)
  - Development of generic understanding of terms and conditions for Associate Members

# Priority issues

- IP policy:
  - Completion of concepts into policy
  - Ensuring access to IPR required for project
  - Sharing of foreground IPR
  
- Operations and access policies:
  - Finalisation of operations model
  - Access: link between access and contribution
  - Who or what will operate the telescopes?

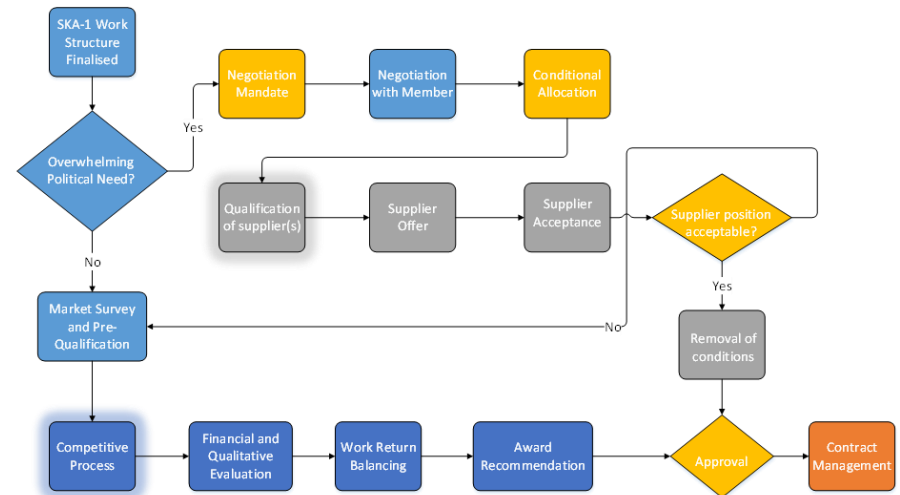


# Procurement policy development

- Process will need to accommodate:
  - central cash procurement (Observatory to industry); and
  - provision of in-kind contributions (by institutes/industry)
- Default mode will be to ensure best value through competitive process (as per Convention)
- Discussions now around:
  - Potential ‘conditional’ direct allocation of work in some areas, but with strings attached for the participant
  - Identifying opportunities where in-kind participation might be advantageous
- Office and Working Group developing final policy for approval by Observatory Council

# Priority Issues

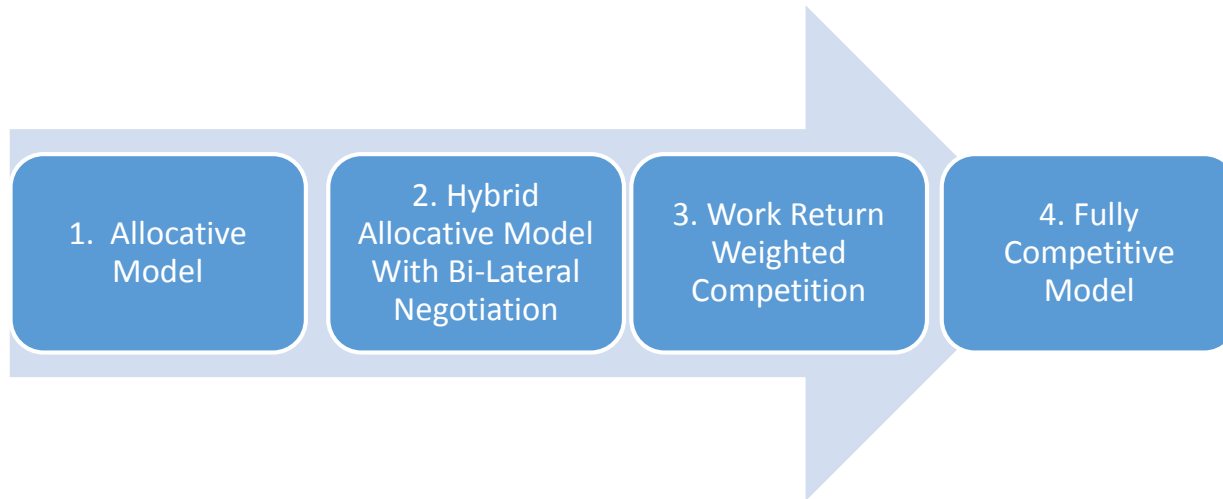
- Procurement policy:
  - Finalisation of ideas – balancing allocative and competitive approaches
  - Ensuring fairness across the partnership: setting tolerance for Fair Work Return
  - Goal: high-level procurement policy – Q2 2019
  - Establishment of Industry Liaison activities, under the SKA-ILO group scrutiny



# SKA-1 Construction Procurement



The SKA Office explored a range of possible procurement models:



Each of the models has a number of very obvious advantages and disadvantages

## SKA-1 Procurement Challenge

- 5 years into pre-construction most of our Members are now heavily invested in specific work-packages
- given sizable 'sunk' investments in specific pre-construction Work-packages most Members now don't want significant change

# Competition vs. Member Needs

- *A competitive procurement model with an associated fair work return mechanisms looks great*
- *However, whilst this model can achieve a reasonable overall financial 'fair work return' for Members, it can't achieve Member's needs to show a return on investment from pre-construction work.*
- *Only a more allocative/negotiated model can approach this outcome.*

# Idealism versus Reality



- Most big project procurement professionals advocate **competition**, it provides the ‘customer’ with excellent leverage over suppliers!
- **However**, procurement professionals working for the SKA must recognise stakeholder needs and aspirations
- **Therefore**, competition cannot be universally applied

## ***So what will work?***

- A ‘hybrid’ approach that accommodates allocation and competition whilst retaining ‘Basic Principles of Procurement’

# Basic Principles of Procurement



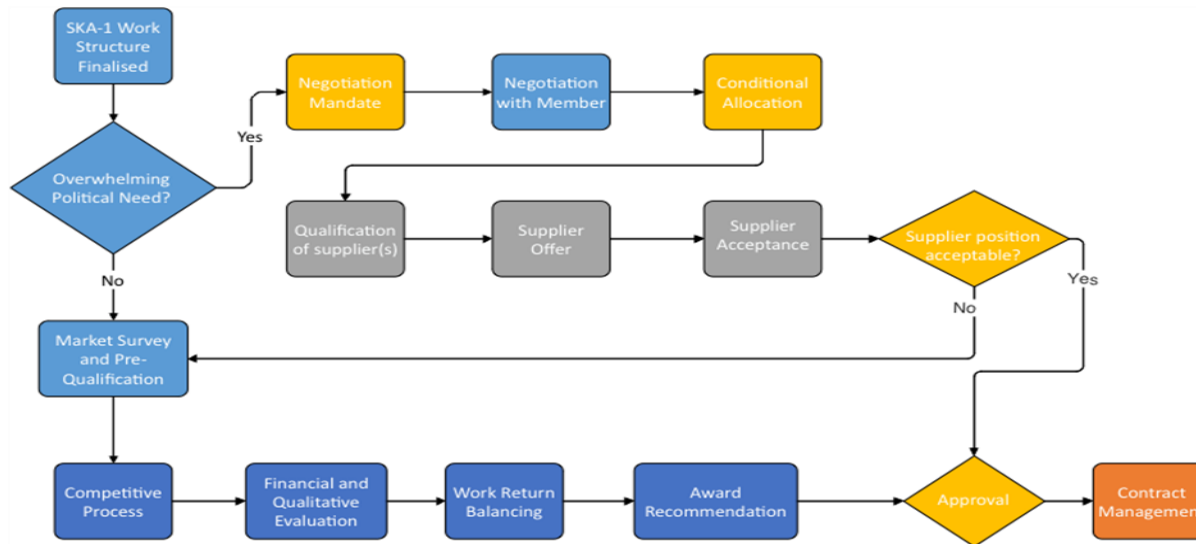
***'Basic Principles of Procurement'*** should always be adopted, irrespective of model:

- Quality due-diligence = better commercial decision making
- Competent supply chain = predictable positive performance, access to niche suppliers
- Accurate scopes of work = predictable positive deliverables
- Compliant technical solutions = predictable positive deliverables
- Workable contract management = early warning (ideally), better change management
  
- Transparency = fewer disputes, better relationships
- Clear commercial agreements = all of the above!
- ***A 'relationship contracting' mode' where it's judged to work best = the parties embrace a shared risk/responsibility in delivering.***

An effective procurement process is always based on these principles

- **Competitive** procurement allows for these principles to be applied in a certain order
- Applying an **allocative model** does not mean ignoring the basic principles, however the order in which they are applied needs changing
- The overall procurement process will probably be less **efficient** but there won't be a great loss of **effectiveness**.

# Hybrid Model



- Enables Members with an overwhelming political need to deliver a particular package of work (and it fits in a financial, capability, and risk sense).
- Everything else – competitive with fair work return mechanism (handicap system)
- Members without allocation likely to win competitive procurements because of the proposed work-return handicap system.
- Allocations are 'conditional' until contractual arrangements are finalised, some control over supply chain is maintained.
- Procurement Principles are respected



# Procurement through Conditional Allocation



- Direct relationship with supplier
  - Qualification of the supplier along axes of technical, financial, proven reputation, and management capability
  - Agreement by supplier for specific management processes
  - Supplier offer determined to be complete and credible.
- Indirect relationship with supplier through intermediary institution
  - Institution agreement on specific management processes
  - Qualification of the supplier along axes of technical, financial, and management capability
  - Supplier offer determined to be complete and credible

# Likely in-kind rules

- Everything suitable for in-kind delivery identified up-front
  - In-kind either allocated (negotiated) single source or completed,
- 3 core in-kind rules:
- Must accept cost book
  - Must achieve schedule (consequences for default)
  - Must demonstrate that funding stream is in place
- Everything else treated as a cash procurement
  - Conflicts between cash procurement and in-kind contributions shall not occur (not compatible)
  - A Member's contribution cannot all be in-kind, cash will always be required to build the Observatory!
  - Fair work return applies to both in-kind contributions and cash, in-kind contributions are valued at cost book
  - Some kind of legally binding agreement with a technical annex

# Conclusions

- Exciting times ahead....
- Signing date confirmed
- Route to establishing the Observatory clear
- Procurement Policy -> Procedures -> process.
- Much work to do to see Observatory in place for 2020

# SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope



# Thank you