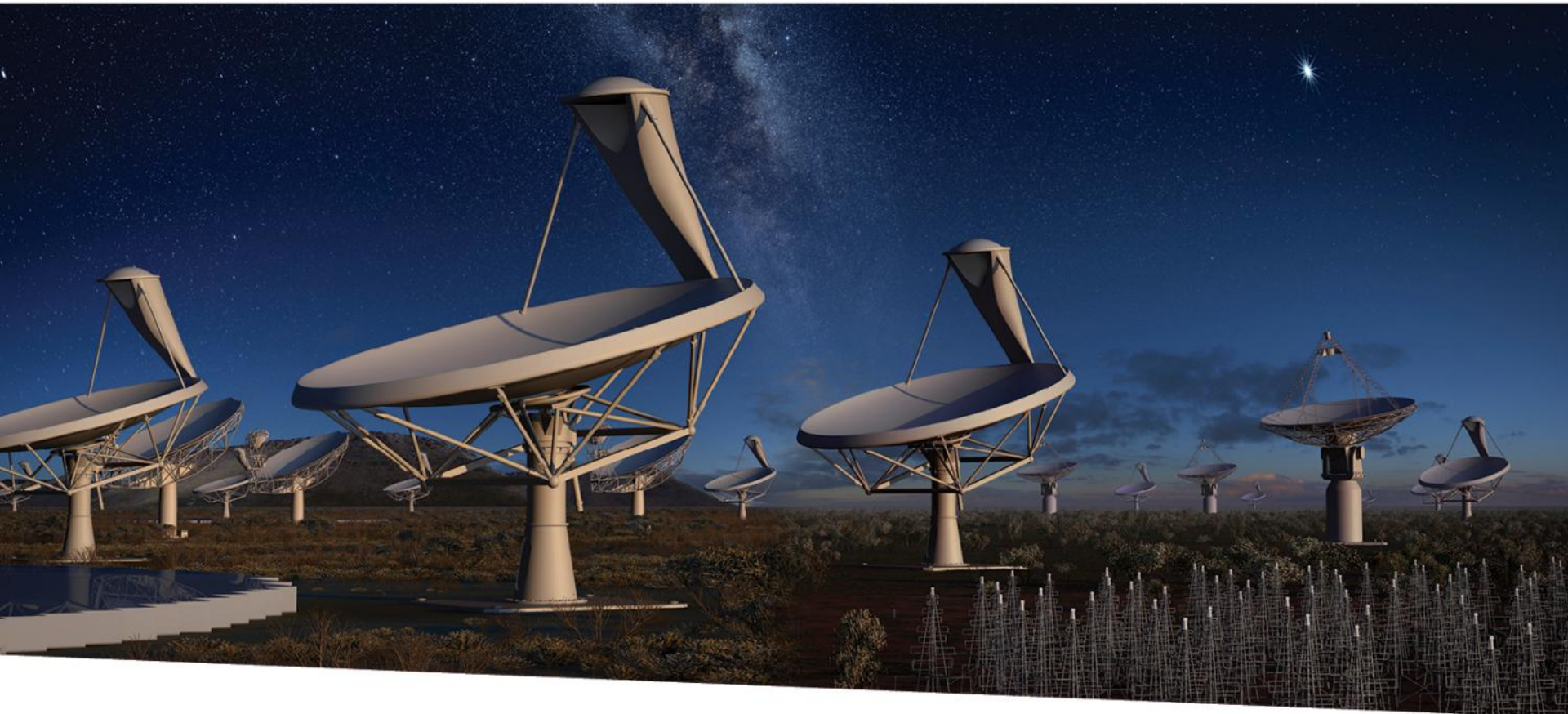


SKA: the global science facility for the 21st Century (short)



SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

Phil Crosby, Industry Liaison

C4SKA Meeting, February 2016

The SKA will be one of the great physics machines of 21st Century.

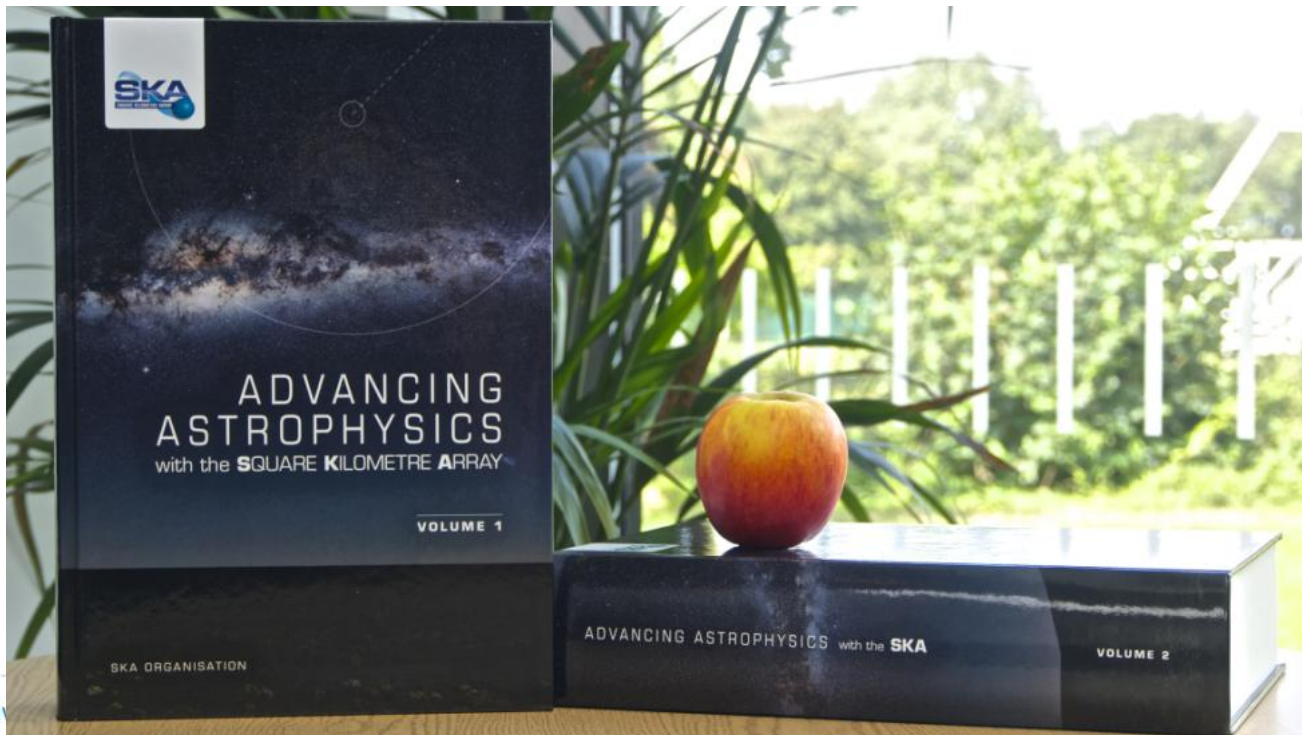


Science goals:

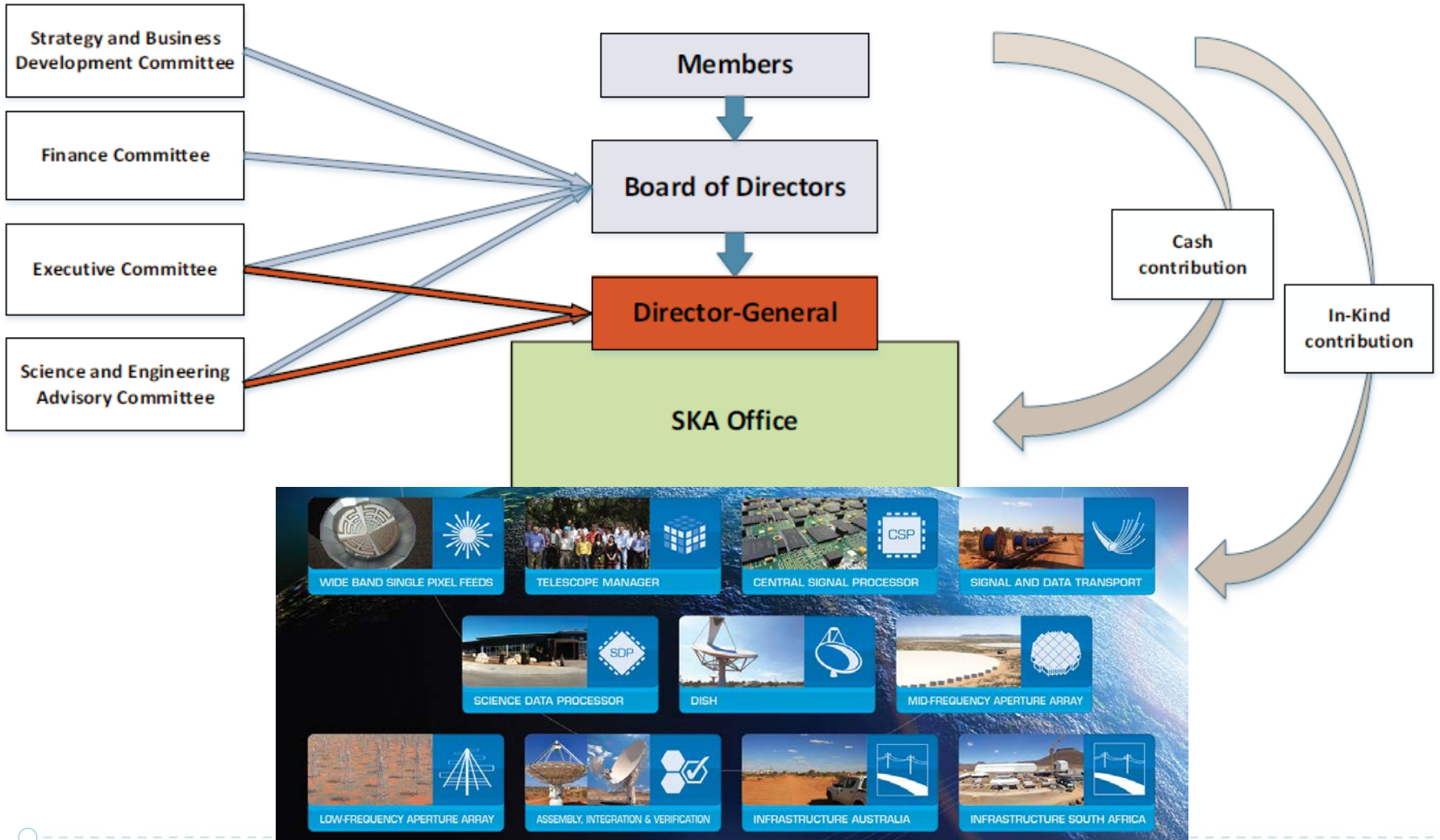
- Fundamental physics: Gravity, Dark Energy, Cosmic Magnetism
 - Astrophysics: Cosmic Dawn, First galaxies, galaxy assembly and evolution; proto-planetary discs, biomolecules, SETI + much more
 - The unknown: transients; +...????
- Broader science range than any other science facility on Earth.

SKA Science Book:

- 135 self-contained chapters; > 1200 authors
- Published electronically in Proceedings of Science, May 2015
- Hardcopy: 2 volumes, total weight 9kg!



SKA Ltd structure



SKA Organisation: 10 countries, more to join

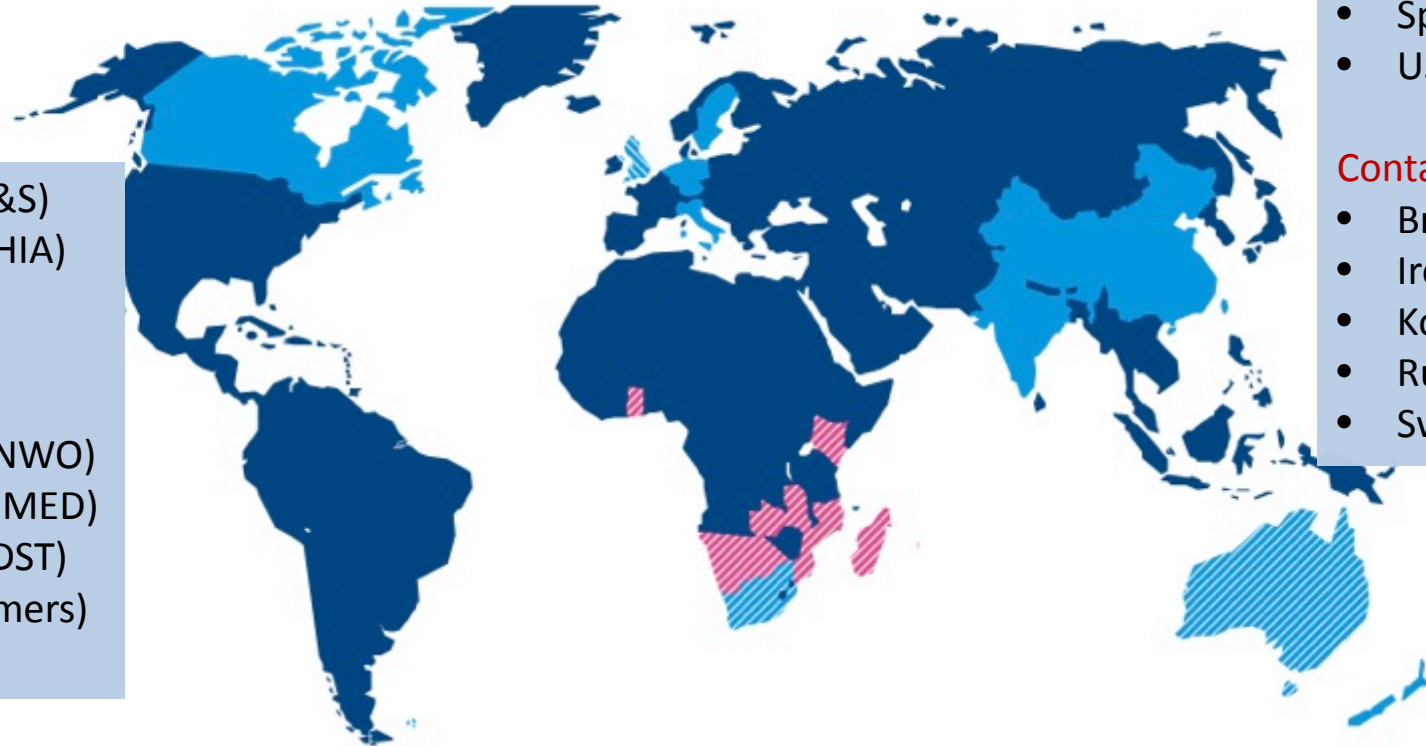
Observers:

- France
- Germany
- Japan
- Malta
- Portugal
- Spain
- USA

Contacts:

- Brazil
- Ireland
- Korea
- Russia
- Switzerland

- Australia (DoI&S)
- Canada (NRC-HIA)
- China (MOST)
- India (DAE)
- Italy (INAF)
- Netherlands (NWO)
- New Zealand (MED)
- South Africa (DST)
- Sweden (Chalmers)
- UK (STFC)



- Full members
- ▨ SKA Headquarters host country
- ▨ SKA Phase 1 and Phase 2 host countries



- ▨ African partner countries (non-member SKA Phase 2 host countries)

This map is intended for reference only and is not meant to represent legal borders

Project Milestones in 2015

- Re-baselining of the SKA project, to fit within the Board's €650M cost-cap
- The UK's commitment of £200M (~€270M)
- Almost all design consortia completed PDR; some system-level reviews; sub-system down-selects.
- Prioritisation of the SKA Science goals, and future SKA Key Science Projects captured
- Department of Atomic Energy take over India's membership of SKAO.
- Approval of SKAO budget for 2016 and 2017
- All-hands engineering meeting in Penticton, Canada (Nov 2015)
- Begin design of the new SKA HQ building at Jodrell Bank
- Announcement of \$294M funding for SKA by Australian PM
- Award of €4.95M grant EC H2020 programme funds for infrastructure design
- Start of negotiations to establish the SKA as an InterGovernmental Organisation governed by a Convention

Governance – towards an “IGO”

- SKA Member governments will negotiate the establishment of an intergovernmental organisation (IGO), similar to ESO/CERN/ITER/ESA.
- First meeting in Rome: 14-16 October; Minister Vicente (Italy) – Chair.
- Draft text of convention
 - Working groups:
 - Financial Protocol
 - Privileges and Immunities
 - Operations and Access
 - Procurement and IPR
- More meetings scheduled: January & April 2016
- IGO in place by Q4 2017+?





Science & Industry Access Policy



- That access should be based on scientific merit for scientists within **Member states**, evaluated via a single time assignment process – *approved*
- As an international organisation SKA will implement a *fair return* procurement policy, ensuring that **contributing Member States** receive construction contracts – *being finalised*



International Design Teams

- Project Management and System Engineering based at Jodrell Bank, Manchester, UK
- ~500 scientists & engineers in institutes and industry in 11 Member countries of the SKA




WIDE BAND SINGLE PIXEL FEEDS




TELESCOPE MANAGER




CSP

CENTRAL SIGNAL PROCESSOR




SIGNAL AND DATA TRANSPORT




SDP

SCIENCE DATA PROCESSOR




DISH




MID-FREQUENCY APERTURE ARRAY




LOW-FREQUENCY APERTURE ARRAY




ASSEMBLY, INTEGRATION & VERIFICATION




INFRASTRUCTURE AUSTRALIA

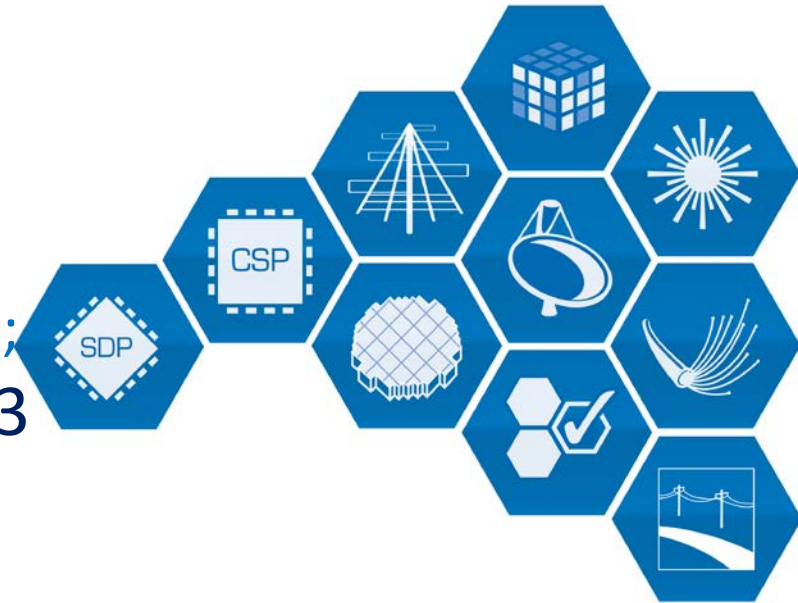



INFRASTRUCTURE SOUTH AFRICA

>€150M design effort – fully funded

Status of Design activities

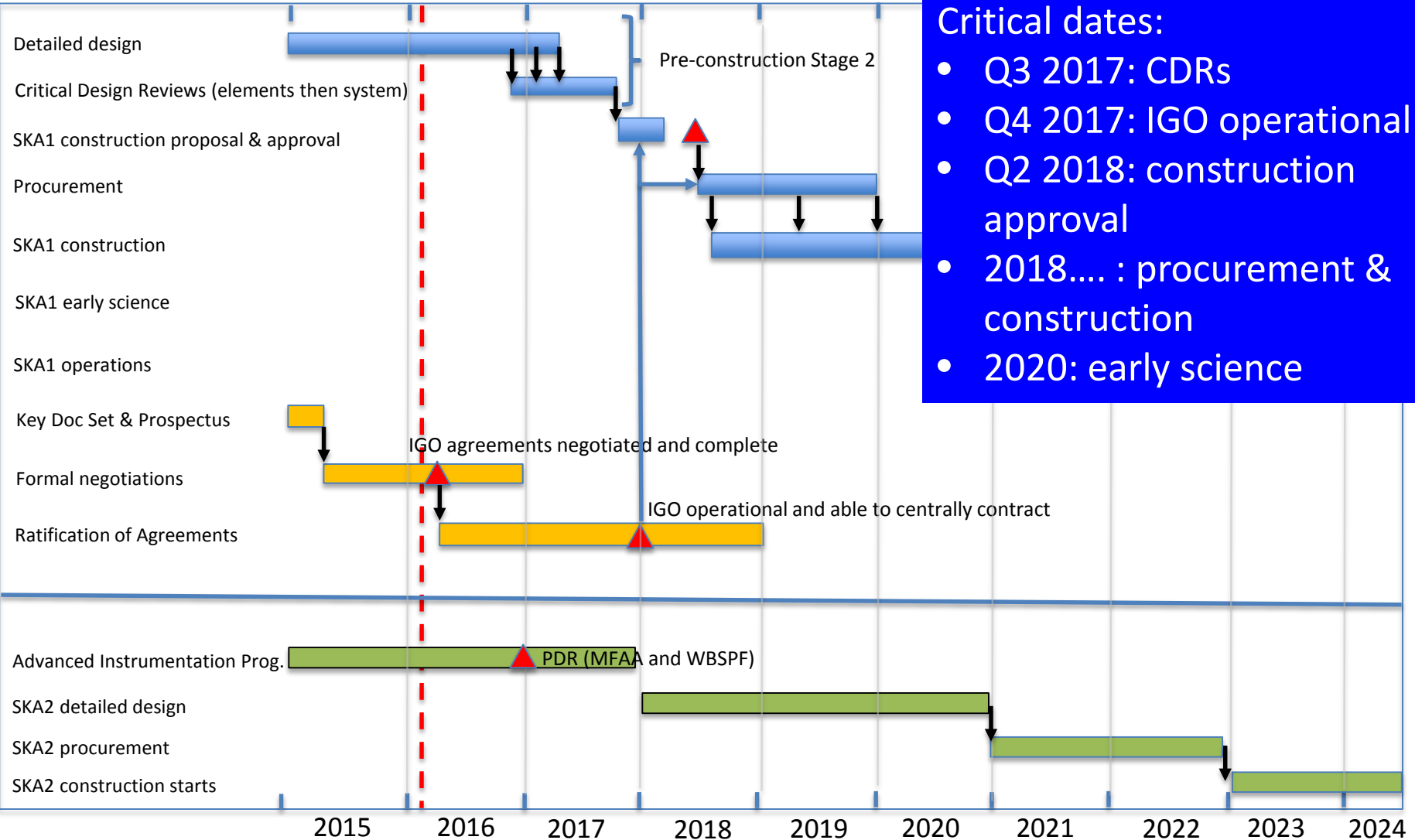
- All 9 consortia have completed Preliminary Design Reviews
 - Massive effort – 100s documents
 - Some issues, as expected, but closing off now
 - Detailed design moving to Stage 2;
- Operations Concepts Review: Q3 2015
- System Review Q1 2016
- Critical Design Reviews planned in August/September 2017



High-level SKA Schedule



KEY: Blue = SKA1 science & engineering; orange = policy; green = SKA2



The (One) Observatory

Revised project scope: March 2015

3 sites; 2 telescopes; HQ

Phase 1

Construction: 2018 – 2023

Construction cost: €650M

Operations cost: ~€75M/yr, TBD

(RSA) MeerKat integrated
(Aust) ASKAP incorporated, subject to negotiation
Advanced Instrumentation Program

SKA HQ: Jodrell Bank, UK

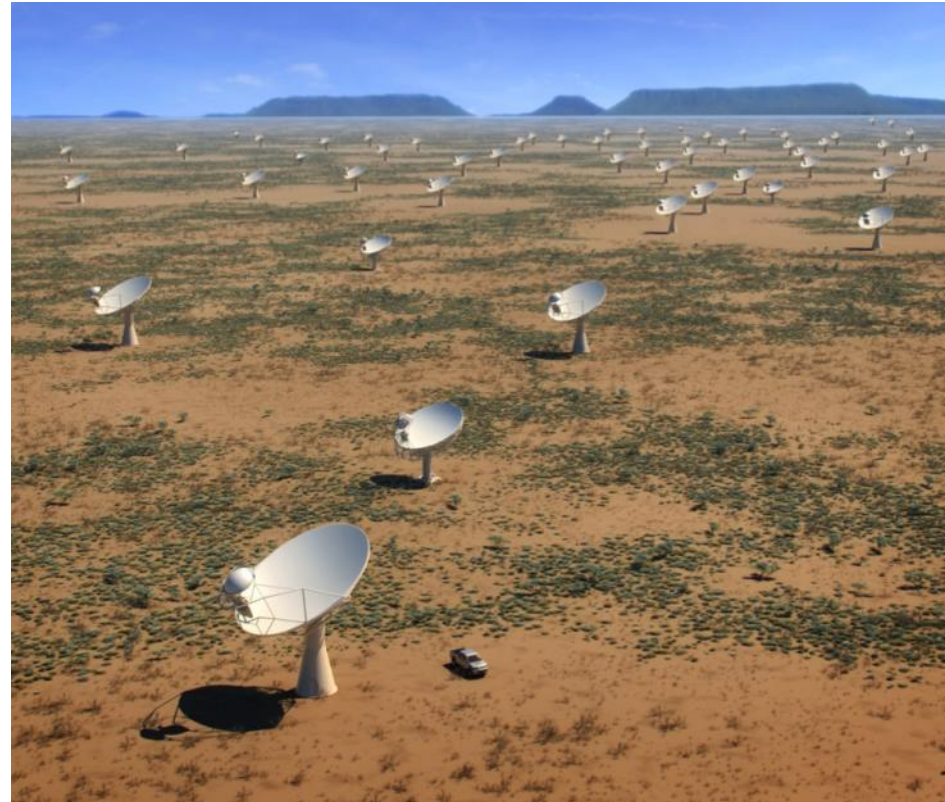


SKA-MID, Karoo, South Africa:



Phase 1: 200 15m dishes spread over 150km (2018 – 2023)

Phase 2: 2500 dishes spread over 3500km (2025 – 2033)



The Karoo

- 800km north of Cape Town
- Radio quiet protected by Astronomy Advantage Act
- Building on MeerKAT

SKA-LOW, Murchison, Australia:

Phase 1: 130,000 dipole antennas over 80km (2018 – 2023)

Phase 2: 500,000 dipoles over 250km (2025 – 2033)



Murchison Desert

- 800km north of Perth
- Very low popn density
- Radio quiet zone protected by ACMA
- ASKAP and MWA



○ precursors

Data Output Framed

- SKA Observatory will deliver quality-controlled, calibrated, science quality data to archives in Perth and/or Cape Town.
- It will not provide added-value software, pipelines etc which will be required to extract maximal science.
- Teams awarded Key Science time will be expected to find resources to develop additional tools
- Discussions on-going for nations to establish Regional Data Centres/Regional Science & Engineering Centres to help support SKA science and development engineering.

Procurement & Industry Engagement



Contributing to SKA: Strategy & principles



- Contributions to SKA in the construction phase are likely to be a mix of cash and in-kind offers from Members
- demonstrable 'return' has to be there
- There will be some minimum cash contribution necessary, at a level to be determined by the SKAO
- Risk assignment, and management of contingency, will be important considerations
- Some form of pre-qualification and supply chain quality assessment will be necessary
- Be familiar with the **Industry Engagement Strategy** – downloadable from SKA website





Procurement Policy of the SKA Observatory

(A work-in-Progress!)

- Applies to all contracts and agreements for the provision of goods, works and services, between the SKA Observatory (SKAO) and its Members and third parties.
- Such contracts and agreements may be financed by the SKAO or by third parties, in accordance with the Financial Protocol.
- This policy forms the framework for approval of SKA Procurement Rules, Regulations, and Procedures
- Contracts and agreements shall be awarded in accordance with the principles and aims detailed within a number of Articles (7)

Article 1: Propriety

- *As far as possible* obtain an appropriate balance of equity, transparency and competitiveness in all activities and processes.

Article 2: Return on investment

- Participating Members shall receive ‘*fair work return*’ during construction phases of the SKA Observatory (for non-infrastructure activities).
 - And endeavour for ‘*fair work return*’ for infrastructure
- ‘*Fair work return*’ will apply equally whether financial contributions are made as cash or in-kind .

Article 3: Project Procurement control

- SKAO will: determine the specification/value of the deliverable and, conduct final acceptance or otherwise against this specification.
- The responsibility to conduct procurement processes, contract management and payments shall either be
 - the SKAO in the case of a ‘cash SKA procurement process’, or
 - the Member country in the case of an ‘in-kind SKA procurement process’.

Article 4: Planning for procurement and valuation of work

- Major procurement opportunities will be identified, and communciated, in Procurement Plans.

Article 5: Cost Book

- A Cost Book shall be annexed to all Procurement Plans, and shall detail the goods, works or services and value to be procured. The determination of this Value shall be in accordance with an agreed Cost Book Valuation Methodology.

Article 6: Qualification

Prior to any major procurement, SKAO may require industrial pre-qualification for interested parties to ensure:

- that a proposed in-kind deliverable *can be* delivered by the proposed Member or
- to identify a smaller number of potential suppliers in a cash procurement.

Article 7: Selection criteria and advertisement of procurement opportunities

Procurement may be:

- Global
- Open outside the participating Members - but not global
- Restricted to the participating Members, or
- Restricted within the participating Member States.

Initial options shall be presented in the Procurement Plans.

Procedures will cover the publicity of tenders or in-kind contribution opportunities.

Article 7: Selection criteria and advertisement of procurement opportunities – more...

The SKAO procurement process shall endeavour to secure the best mix of quality and effectiveness for the least lifecycle price.

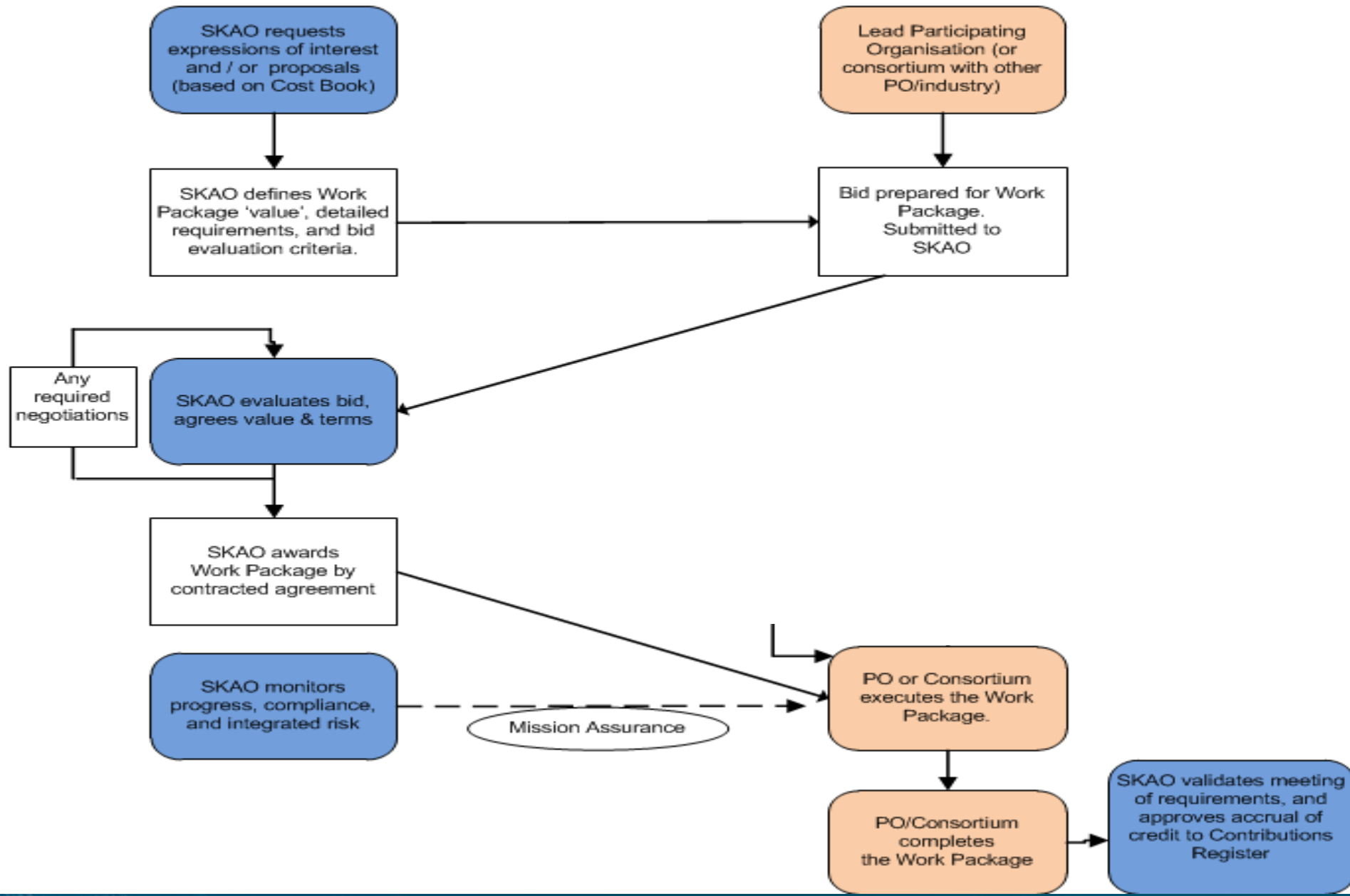
For any ‘in-kind SKA procurement process’, OR any ‘cash SKA procurement process’, the delivered goods, works or service shall be assigned an agreed value as prescribed in the Cost Book, or in the case of cash procurements, equal to the final cash procurement cost.

This Value shall reflect a financial contribution by an SKAO Member to the SKAO.

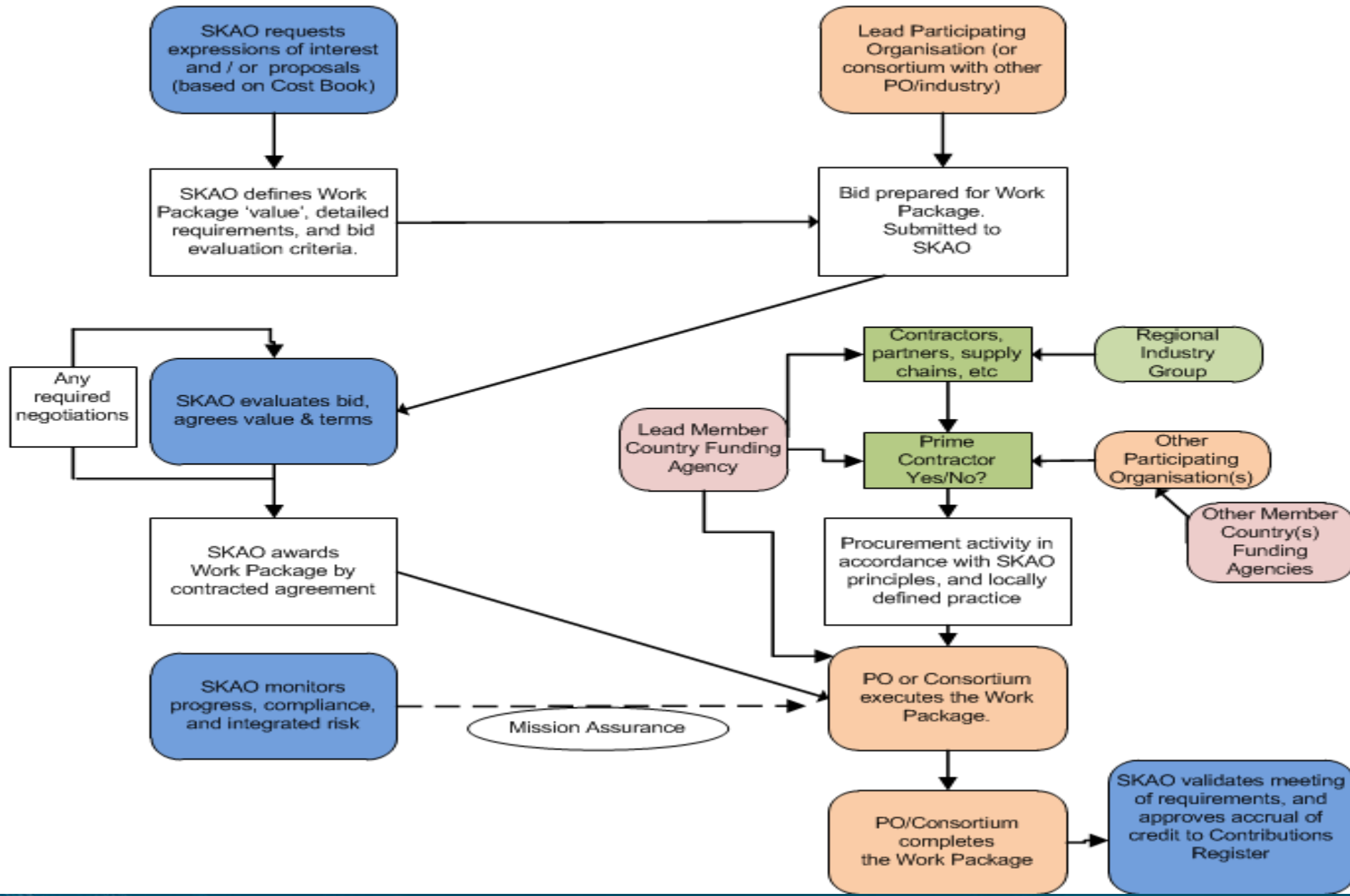
N.B. What's not defined (on purpose)

- the procurement or goods acquisition method.
- the method of vendor qualification to be applied.
- Article 7.1 opens the way for procurement beyond the 'standard' RFT approach. It recognises the need for innovative procurement.
- Specific timing of procurements is yet to be addressed.

Awarding, contracting, and execution of SKA construction 'in-kind' Work Package – Possible Model



Awarding, contracting, and execution of SKA construction 'in-kind' Work Package – Possible Model



Why Get Engaged Now?

- SKA Industry engagement is anticipated to fall broadly into three areas:
- **Strategic positioning** (specialist exchanges and training, technology mapping, programmatic support, and design partnerships); **NOW**
- **Industry development** (business creation, IP generation, teaming, supply chain development); **SOON**
- **Industry participation**; (contracts awarded, jobs and skills maintained and expanded, industry collaboration with academia). **LATER**

And there's real money:

- **Pre-Construction Phase - €120 million**
- **SKA (Phase 1) - €650 million**
- **SKA (Phase 2) - >€2 billion (estimate)**

Industry contact point network

- Challenge in project to **ensure capability exists** to deliver.....also to deliver the promised **fair return** for contributors (current, and potential for new contributors to join)
- Key role for a **global SKA industry network**:
 - Establishing group at present – both SKAO Members and those near project:
 - Plan formal kick-off meeting in mid 2016 (face-to-face)
 - **Initial survey of interests** in SKA countries against project requirements established broad understanding of priorities in SKA technology - **Done**
 - Then: a role for the network in supporting understanding interests as Cost Book and SKA1 Procurement Plan is developed
- The **Network will be critical** in helping to develop and then maintain database of industry with interest in SKA in Members (and outside Membership)
- To encourage industry visibility of project and foster strategic industry relationships
 - **This meeting one of several happening right now...**

The SKA Project – Industry Participation landscape ver 4.1



SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope



Thank you!
www.skatelescope.org