New Zealand's Progress in the SKA

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COMPUTING FOR SKA COLLOQUIUM 2018

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NZ Background in the SKA

NZ was a founding member of the SKA Organisation

NZ had joint bid with Australia to host SKA until dual site decision in 2012

First substantial involvement by NZ in a mega-Science project, breaking new ground for NZ

NZ Government has always had priority on computing/software aspects of SKA

NZ SKA Alliance (NZA) formed by MBIE in 2013 to coordinate NZ's contributions to SKA

NZA joined Central Signal Processor (CSP) and Science Data Processor (SDP) consortia in 2013

Will be longest term multiway academic-industry collaboration

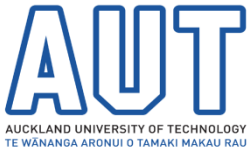
Largest NZ involvement in international ICT collaboration

NZ Inc approach to foster international collaborations and build reputation for NZ science+tech

NZ SKA Alliance Organisations

NZA has seven member organisations, six with contracted design work

Currently active in Preconstruction Design



Active in part

Associated organisations

SKA1 Data Rates

Biggest BIG data project in the world

- SKA1 has BIG Data on a scale that ICT Industry will be facing in 5-10 years time
- SKA2 will be an order of magnitude BIGGER yet

Raw data rates

- Dishes produce around 2 TB/s
- Antennas produce around 157 TB/s (0.3 TB/s per station)

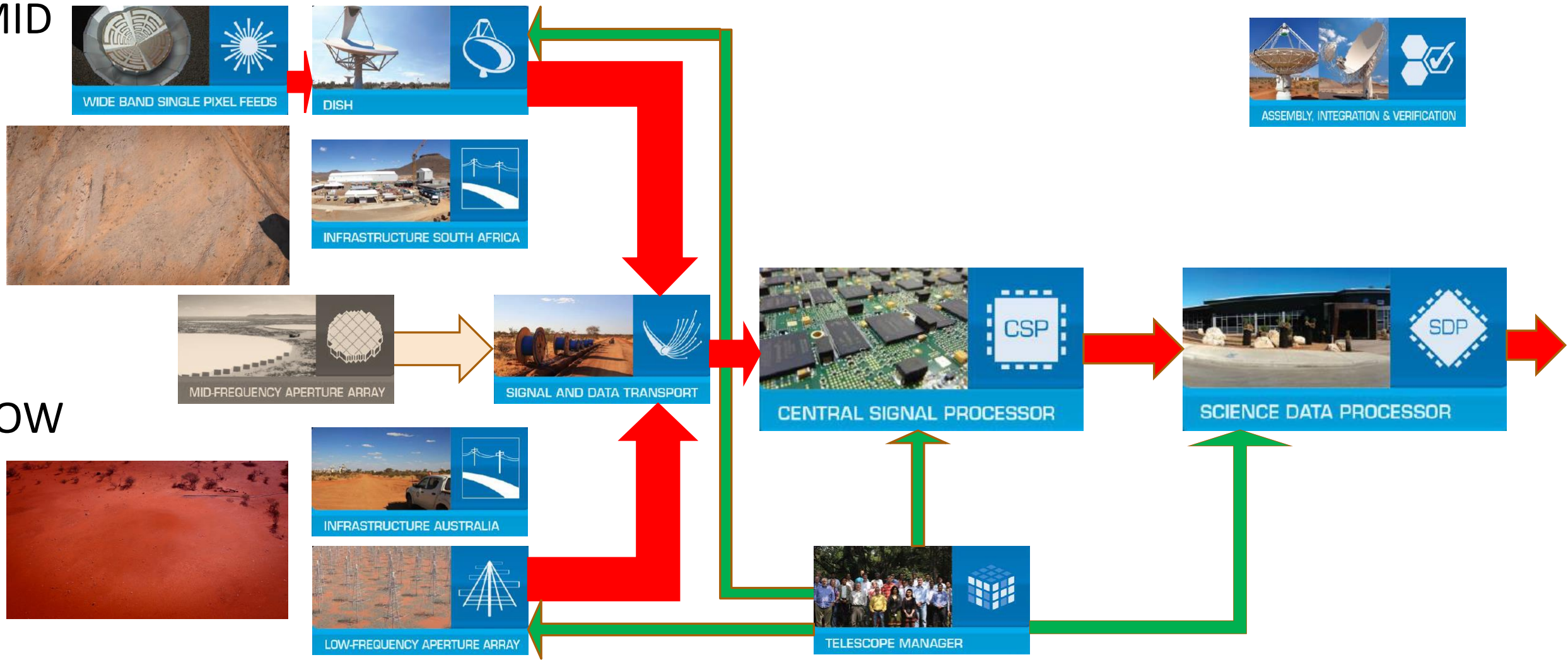
Central Signal Processor

- Real-time processing of data on the fly
- All data processed together in correlator, outputs up to 0.7 TB/s
- Pulsar Search pipeline must sift through data every few minutes to find new candidate pulsars

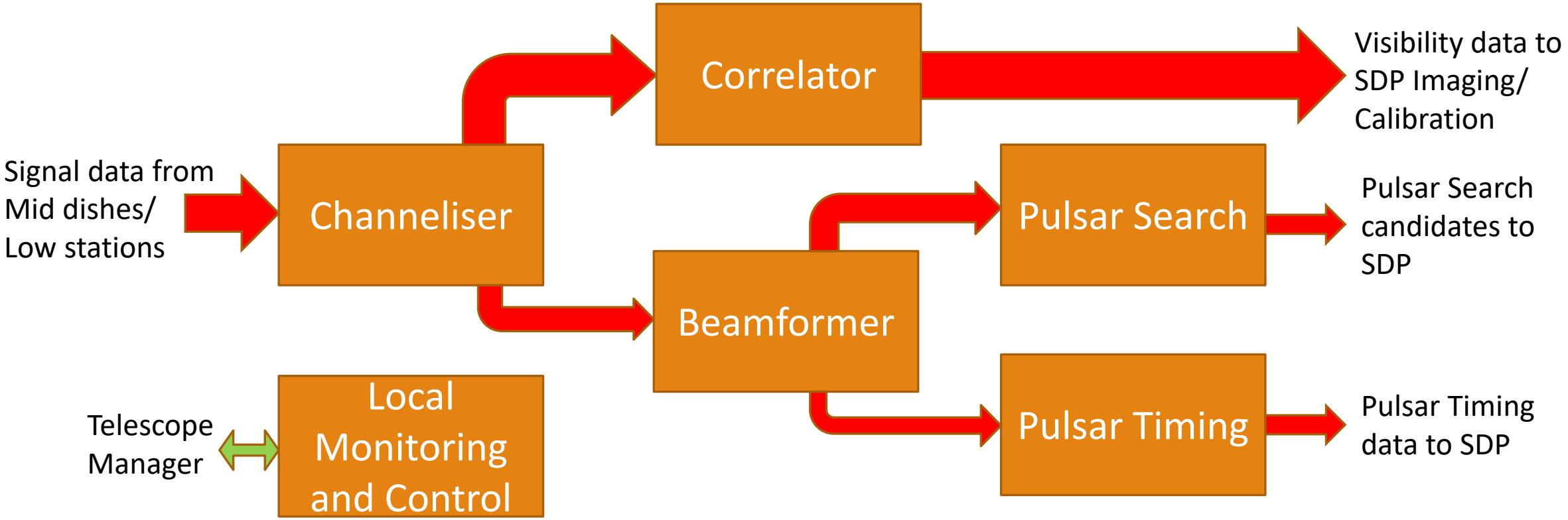
Science Data Processor

- Processing correlator output to form images of the sky will require approx 260 PetaFLOP machine
- Mix of real-time and off-line processing, a lot of iterative processing on data

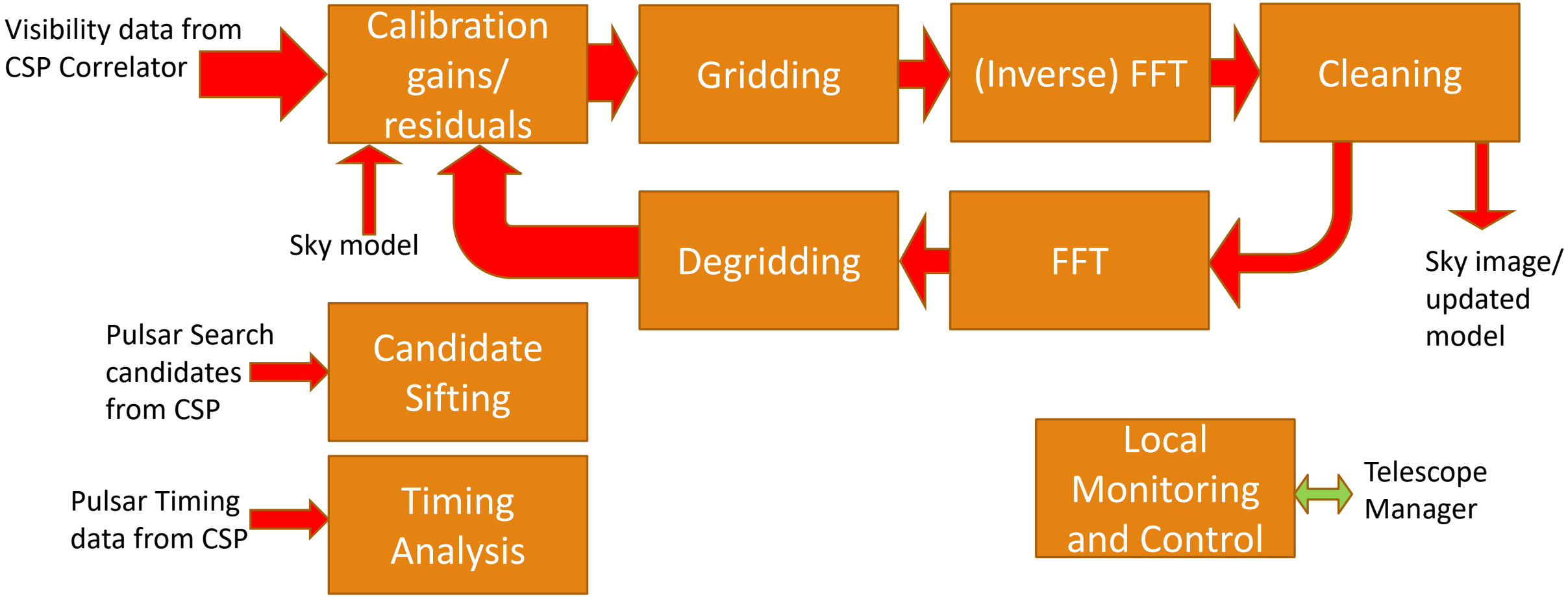
SKA1 Data Flow and International Consortia Teams



Central Signal Processor



Science Data Processor



Wider SKA Ecosystem

Many of the overseas organisations involved in SKA have smart people working on other interesting projects

- ASKAP, Curiosity rover, Dome, ISS, LHC, TMT

SKA giving foot in door for future mega-Science projects

- ngVLA default correlator based on Canadian-NZ frequency slicing design

SKA Big Data cooperation agreement with CERN in July 2017

- Framework for collaborative projects that addresses joint challenges in approaching Exascale computing and data storage

SKA joined European Open Science Cloud Project in November 2018

- Aims to facilitate universal access to scientific data through a single online platform, allowing both professional researchers and the general public to re-use data produced by other scientists

NZ Investment in the SKA

MBIE initially invested $327k/annum in correlator work 2014, now around $5M total in SKA

NZ organisations themselves invested around $10M total in SKA to give NZ greater impact

Funding employs over 12 FTE spread across six organisations, mix full-time and part-time

Dozens of research publications, five PhD students, over 30 technical reports for SKA

Nyriad startup around SKA data compression now largest employer in Cambridge (NZ)

Catalyst Cloud capability growth

Kiwinet Research and Business partnership award (2018)

Growing NZ astronomy community (now 25% of NZ astronomers targeting SKA)

NZ’s Involvement in SKA

Collaboration with CSIRO/ASTRON on the Low Correlator

Collaboration with NRC Canada on the Mid Correlator

Contributing to the Pulsar Search software led by Manchester

Collaboration with Swinburne University on Pulsar Timing software

Contributing to Compute Platform benchmarking

Investigating operating system requirements for Science Data Processor

Leading some middleware layers for the Science Data Processor (eg OpenStack, Kubernetes)

Advancing algorithms and HPC software for compute-intensive Imaging Pipeline

NZ embedded across key computing aspects of the SKA

NZ has signed up to bridging phase in lead up to SKA1 Construction

NZ's Future in the SKA

Ten year cost for NZ totals around $23M
- Full members guaranteed "fair work return" in contracts of at least 70% capital investment

Intergovernmental Organisation treaty initialled by NZ but NZ intends to not sign in March 2019

Small but very outspoken opposition from few NZ astronomers outside project
- Aiming to not have NZ full member of the SKA, NZ media need to carefully fact check claims

MBIE trying to "explore associate member" options as compromise
- If/when associate members are admitted their benefits will be determined by IGO full members
- Associates will not get a vote on SKA decisions, less work required from MBIE officials
- Likely only scientists from full member countries will be allowed to lead key science projects
- Likely contractors from full member countries will have preference where they demonstrate capability
- Potential NZ re-entry at later date may be infeasible if membership threshold put in place

Reputation of NZ as dependable partner in international collaborations
- Future uncertain at this stage but NZ team has surmounted many challenges over 12 years to get this far
- A lot of work to be done by NZ in bridging

Questions?

Thank You

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