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Committee Secretary
Joint Standing Committee on Treaties
PO Box 6021
Parliament House
Canberra ACT 2600
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Dear Secretary,

CSIRO writes to strongly support Australia's ratification of the Convention Establishing the Square Kilometre Array Observatory.

The Square Kilometre Array (SKA) project is an international effort by many member countries to build the world's largest, most advanced radio telescopes in South Africa and Australia. The SKA aims to answer some of the biggest questions in astronomy and its unparalleled sensitivity, resolution and scanning speed will enable scientific discoveries including:

- Galaxy evolution, cosmology and dark energy - why is the Universe expanding?
- Gravity in pulsars and black holes - does Einstein's general relativity hold true in the most extreme areas of the Universe?
- The cosmic dawn - what did the young Universe look like?

CSIRO has been involved in the SKA since early planning in the 1990s. CSIRO established the world's premier radio quiet site, the Murchison Radio-astronomy Observatory (MRO) in Western Australia (WA) to attract this mega-science project.

The first phase of SKA will consist of two telescopes:

- Australia will house the SKA's low frequency telescope: SKA1-Low. SKA1-Low will comprise up to 131 000 antennas in clusters along spiral arms spanning 80 kilometres (km). Its science aims include detecting the first galaxies to shine after the Big Bang.
- South Africa will house the mid frequency telescope: SKA1-Mid. SKA1-Mid will comprise 200 dishes up to 15 metres in diameter and spread over 150 km.

Benefits of involvement in the SKA

The SKA project presents a unique opportunity for Australia, catalysing innovation in science, engineering, computing and commercialisation. Opportunities for Australian industry involvement are anticipated across a range of fields from construction and antenna assembly, through to high performance computing and software development. After construction there also will be opportunities for industry throughout the 50-year operational life of the instrument.

Radio astronomy has led to the development of new technologies with applications in important fields such as communications, computer science, medical imaging and advanced manufacturing. Similarly, the SKA is expected to generate spin-off technologies with broad applications. Co-hosting the SKA will enhance Australia's science reputation, provide scientists and industry with international collaboration opportunities and inspire the next generation of scientists and engineers.

The SKA's unprecedented data processing requirements will require new techniques in the big data and supercomputing sector. Radio astronomy already presents some of the greatest challenges in big data. Solutions to these challenges for radio astronomy will quickly translate into capabilities for this large commercial sector. Hosting the SKA is anticipated to place Australia in a position of advantage in relation to the global big data industry.

Australia's roles in the SKA

Murchison Radio-astronomy Observatory. CSIRO is the lessee of the 350 000 hectare Boolardy Station pastoral lease and, encompassed within that land under a separate lease, the 12 000 hectare MRO. This site already hosts the ASKAP, MWA, and EDGES telescopes¹, and will host SKA1-Low. CSIRO will be the Site Entity, responsible for the operations of the site on behalf of the Australian Government.

Operating partner. CSIRO is in the process of developing a partnership agreement with the SKA Observatory for the two organisations to jointly operate the SKA in Australia. It is intended that CSIRO provide most of the staff for the operations of the telescope here, funded by the Observatory.

Construction. Australia will play a major role in constructing the SKA in Australia, potentially building the site infrastructure for the telescope and working with international partners to deliver high-speed digital processing, the antenna stations, integration of the telescope as a whole and software.

Supercomputing. Australia's winning bid to host the SKA included 500 square metres of white (empty) space in the Pawsey Supercomputing Centre in Perth for the purpose of housing the supercomputer for SKA1-Low. This will provide an outstanding opportunity for Australia to leverage its radio astronomy and related big data skills into other areas.

SKA Regional Centre. SKA member nations will establish computing facilities in their regions to distribute data to astronomers and enable them to undertake further analysis of these data. CSIRO and the Department of Industry Innovation and Science have each provided \$2 million to university collaborators in WA to develop a roadmap towards Australia's SKA Regional Centre. This collaboration is starting with improving software tools for ASKAP and MWA and building towards full SKA operations.

CSIRO is available to assist the Committee further on these matters. Please contact Dr Douglas Bock CSIRO Astronomy and Space for further assistance (ph 02 9372 4300 douglas.bock@csiro.au).

Yours sincerely

David Williams
Executive Director

¹ The Australian Square Kilometre Array Pathfinder (ASKAP) is built and operated by CSIRO. The Murchison Widefield Array (MWA) is operated by Curtin University on behalf of an international consortium. The Experiment to Detect the Epoch of Reionisation (EDGES) instrument is built and operated by Arizona State University and the Massachusetts Institute of Technology's Haystack Observatory.