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DEPARTMENT OF INDUSTRY, SCIENCE AND RESOURCES

MS24-000355

To: Minister for Industry and Science (For Decision)

UPDATE ON ASTRONOMY: THE EUROPEAN SOUTHERN OBSERVATORY (ESO) AND THE ANGLO-AUSTRALIAN TELESCOPE (AAT)

Timing: Routine

Recommendations: That you:

1. **Agree** that the department initiate an informal discussion with the European Southern Observatory on the parameters for negotiation of Australia's future participation, ^{s 47C}
s 47C

Agreed / Not agreed

2. **Agree** that the department conduct consultation with the AAT Consortium and Astronomy Australia Limited (AAL) and analysis on the future options for the Anglo Australian Telescope s 47C

Agreed / Not agreed

3. **Agree** to publish the evaluation report for the Access to World Leading Astronomy Infrastructure (AWLAI) program (see Attachment A) on the department's website.

Agreed / Not agreed

s 22(1)(a)(ii)

Minister:

Date:

Comments:

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Key Points:

1. We previously committed to providing you with the results of the independent evaluation undertaken by ACIL Allen of the AWLAI program, including the AAT and ESO Strategic Partnership (**MS23-001585** refers).

Evaluation Outcomes

2. The AWLAI program was established following the 2017-18 Budget, to support Australia's telescope capacity by:

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- a. Funding Australia's participation in a 10-year Strategic Partnership with the ESO, granting Australia access to ESO's 8.2m Very Large Telescope, one of the world's most advanced optical telescopes.
 - b. Continuing Commonwealth ownership of the AAT, Australia's largest optical telescope (3.9m), and transferring operational control to a Consortium of 11 Australian universities.
3. The AWLAI program evaluation was conducted to assess the impact of the program to date. It included a desktop review, citation analysis, stakeholder survey and interviews, and an estimated valuation of total economic return. There were 11 evaluation findings (outlined in Attachment A).

The evaluation found that the ESO Strategic Partnership:

- a. provides Australia with a neutral return on investment, with every \$1 of contributions generating approximately \$0.97 in value. It also found that this is likely to be underestimated given there are broader socio-economic impacts, knowledge advances and innovations that could not be quantified and would increase the total economic return.
- b. has achieved its intended outcomes of ensuring access to large telescopes and maintaining world-leading astronomy and instrumentation expertise in Australia. It has increased Australia's access to ESO facilities, astronomers' international competitiveness, levels of collaboration, scientific output and workforce capacity.
- c. should be considered for future accession, including an analysis of the financial costs and potential benefits of future membership.

The evaluation found that the AAT:

- a. is a well-built, high-quality facility that is oversubscribed and delivers valuable scientific output. However, it is ageing and is no longer world-class.
- b. has gradually diminishing scientific returns. An extension to the current arrangements for the AAT beyond 30 June 2025 would likely result in further diminishing scientific outcomes, but there needs to be longer-term clarity in the government's intentions for the AAT, so the sector can plan for any necessary changes if the AAT ceases to provide the current research capacity.

The Astronomy sector in Australia

4. Australian scientists need access to world-leading astronomy instrumentation to do world-leading science. The astronomy community, represented by the Academy of Science's National Committee for Astronomy and AAL, acknowledge that government investment in infrastructure to date has been significant, and that it is important to prioritise this investment to ensure maximum value and economic returns. To achieve this, the sector strategically prioritises astronomy facilities and infrastructure through its Decadal Plan (developed through the National Committee for Astronomy).

- a. The current Decadal Plan (2016-2025) identified securing a long-term partnership to an 8m class telescope (e.g. through the ESO) as the most pressing need for Australian astronomy. It also recognised resources would need to be increasingly redirected to a next-generation facility, and existing telescopes (like the AAT) may no longer be operated as national facilities in the future.
5. Astronomy is one of Australia's most successful areas of science measured by research output and international recognition. Australia's astronomical research institutions collectively perform 'well above world standard' according to the 2018 Excellence for Research in Australia (ERA) findings. The astronomy sector contributes to the broader innovation and research system and supports the refreshed National Science and Research priorities. It does this by attracting and inspiring students into the STEM workforce, and training professionals in mathematics, physics, computational and data science which are readily transferable skills to other sectors. This also helps to advance data and digital technologies, such as in fibre optics, robotics, adaptive optics, biomedicine, signal processing and satellite communications.

Timeline for next steps

6. Decisions regarding Australia's participation in the ESO and operation of the AAT are important to Australia's astronomy sector. They also reflect Australia's aspiration to maintain its world-leading astronomy expertise, and the contribution it makes to the broader innovation system and STEM workforce in Australia.
7. As there are long lead times for funding and outcomes of research infrastructure, the timing of government decisions need to be made purposefully to ensure the sustainability of the sector and to prevent researchers and expertise moving overseas.
8. The timeframe at Attachment B outlines the critical dates and lead times involved for consideration of ESO membership and the future of the AAT. It also shows expected delivery dates for the astronomy sector's Decadal Plan.

Options for ESO:

9. There are three options to consider regarding Australia's future relationship with the ESO. These include: securing full membership of ESO to enable Australian scientists access to world-leading optical telescopes; extending the Strategic Partnership to provide limited access to large optical telescopes; or allowing the Strategic Partnership to expire.
10. Securing full membership of ESO to enable Australian scientists access to world-leading optical telescopes:
 - a. Australia's 10-year Strategic Partnership with the ESO will expire in July 2027.
s 47C

- b. While the department has not formally discussed membership options with the ESO, accession to full membership before July 2028 is estimated to have an immediate fiscal impact of \$179¹ million (€108 million). If Australia accedes after July 2028, the immediate fiscal impact will increase by \$40 million (€24 million) to \$219 million (€132 million). An annual membership contribution of \$30 million (€18 million) would also be payable under either option. The exact entrance fee and percentage of in-kind contributions (which could be up to 25 per cent of Australia's accession fee) is subject to negotiation and approval by the ESO Council. Amounts are also indexed annually based on rates approved by Council.

c. s 47C

d. s 47C

11. s 47C

a. s 47C

- b. Under the current Strategic Partnership, Australia has access to a defined set of ESO optical telescopes and their astronomical instruments, at La Silla-Paranal Observatory in Chile. This includes the 8.2m Very Large Telescope (VLT). However, the current Strategic Partnership does not include access to the 39m Extremely Large Telescope (ELT), which is currently being constructed, and will be the world's largest optical telescope when it becomes operational in 2028. The estimated price for Australia's full membership would include access to the ELT.

c. s 47C

12. s 47C

a. s 47C

¹ Based on Department of Finance parameter exchange rate (April 2024) of 0.6053.

13. To explore these options, the department recommends that you agree to commence an informal discussion with ESO to enable Australia to clarify the parameters for a membership negotiation, without initiating a formal negotiation process. The issues to be clarified through an informal discussion would include:
 - a. the order of magnitude of an ESO entrance fee and membership fees;
 - b. scope for in-kind contribution to the entrance fee; and
 - c. scope to extend the Strategic Partnership.
14. s 47C

Future of the AAT:

15. Under the AWLAI program, the AAT was to be operated for 7 years by the AAT Consortium, consisting of the Australian National University (operator), the University of New South Wales, the University of Sydney, Macquarie University, Western Sydney University, the University of Melbourne, Swinburne University of Technology, Monash University, the University of Queensland, the University of Southern Queensland, and the University of Tasmania. s 47C
16. s 47C
- 17.
18.
 - a. s 47C
 - b. The department is investigating the possibility of providing financial support to the AAT during this time through an existing departmental grant (with funding that has previously been committed). The Consortium is unable to fund the shortfall.
 - c. s 47C

19. s 47C

20.

21. While the department conducts this consultation and analysis, it will take into consideration:

- a. The finalisation of the National Science and Research Priorities, noting astronomy's role in fundamental research, and the relationship between the AAT and other government astronomy investments.
- b. The Consortium is applying for funding to maintain AAT operation beyond 2025 via an ARC LIEF grant. The outcome of the grant application will be known in November 2024.
 - i. If the grant application is not successful, government may be asked to provide short term additional funding for the AAT in Budget 2025-2026.
- c. Progress on the AAT's refurbishment of the Two Degree Field system, the financial implications from lost revenue, and any additional funding provided to the AAT (for example, the 2025 ARC LIEF grant application).
- d. The importance of the AAT to the astronomy community, including its positioning within the next Decadal Plan 2026-2035, with draft expected in September 2024.

22. s 47C

Publishing the evaluation report

23. The department recommends you agree to publish the ACIL Allen Access to World Leading Astronomy Infrastructure evaluation report. This will give the astronomy community visibility of available evidence regarding the impact of the program. It will provide context for future decisions the sector needs to incorporate into their forthcoming Decadal Plan.

Background:

24. There are many examples of the astronomy sector's exceptional international performance and leadership, and the contribution it makes to the broader innovation system in Australia. This includes the Nobel Prize in Physics awarded to astronomer Distinguished Prof Brian Schmidt in 2011; the 2020 Prime Minister's Prize for Science awarded to four astronomers for their work on gravitational-wave detection; and the Prime Minister's Malcolm McIntosh Prize for Physical Scientist of the Year awarded to a CSIRO astronomer in 2021 for pioneering research into fast radio bursts. Australian researchers are also working at the convergence of optical astronomy, quantum and AI, for example, through current ARC-funded research to overcome the limits of optical systems designed by humans using computer algorithms.
25. Astronomy contributes to other Australian Government strategic objectives including diversity in STEM and advancing engagement with First Nations Australians. Some astronomy research organisations (ASTRO3D) have achieved gender equity, demonstrating the sector's ability to inspire diverse people to pursue STEM careers. There is growing recognition of First Nations astronomy in Australia, including through the observatory being developed with the Koonibba Community Aboriginal Corporation in South Australia; and the Wajarri Yamaji partnership with the Square Kilometre Array at Inyarrimanha Ilgari Bundara, the CSIRO Murchison Radio-astronomy Observatory.

Sensitivities and Handling:

26. s 47C

27. 50th anniversary celebrations for the AAT will be held in October 2024. King Charles was invited (by the Mayor of the Warrumbungle Shire) as he opened the facility.

Data referenced: Nil

Consultation: YES

28. AID (Evaluation Unit), SPD Budget Policy.

ATTACHMENTS:

- A: AWLAI Final Evaluation Report
- B: Timeline for ESO and AAT

