



## BRIEFING

### Square Kilometre Array – Next Steps

<b>Date:</b>	30 May 2019	<b>Priority:</b>	Medium
<b>Security classification:</b>	In Confidence	<b>Tracking number:</b>	3582 18-19

Action sought		
	Action sought	Deadline
Hon Dr Megan Woods <b>Minister of Research, Science and Innovation</b>	<b>Agree</b> that New Zealand should not proceed with negotiation of an Associate Membership Agreement with the Square Kilometre Array	4 June 2019

Contact for telephone discussion (if required)			
Name	Position	Telephone	1st contact
Simon Rae	Manager, International Science Partnerships	Privacy [redacted]	✓

The following departments/agencies have been consulted

- Minister's office to complete:
- |   |  |
|---|--|
| <input type="checkbox"/> Approved             | <input type="checkbox"/> Declined            |
| <input type="checkbox"/> Noted                | <input type="checkbox"/> Needs change        |
| <input type="checkbox"/> Seen                 | <input type="checkbox"/> Overtaken by Events |
| <input type="checkbox"/> See Minister's Notes | <input type="checkbox"/> Withdrawn           |

#### Comments



## BRIEFING

### Square Kilometre Array Update and Future Steps

<b>Date:</b>	24 January 2019	<b>Priority:</b>	Low
<b>Security classification:</b>	In Confidence	<b>Tracking number:</b>	3582 18-19

#### Purpose

To seek your views on a preferred way forward on New Zealand's engagement with the Square Kilometre Array project.

#### Executive summary

In April last year you agreed that New Zealand should not become a full member of the Square Kilometre Array Observatory (SKAO) and instructed officials to prepare a mandate to negotiate an Associate Membership Agreement.

Our advice on full membership last year noted that any investment in the Square Kilometre Array project (SKA) would need to be supported by a complementary investment in astronomy research. Given competing priorities in the RS&I portfolio, we consider that investment difficult to justify. We therefore recommend that we should not seek Associate Membership of the SKAO.

A decision not to negotiate an Associate Membership agreement will be negatively received by stakeholders, and would require careful management our communications with the current SKA organisation and international partners.

#### Recommended action

The Ministry of Business, Innovation and Employment recommends that you:

- a **Agree** that New Zealand not pursue Associate Membership negotiations with the SKA Observatory:

Yes / No

- b **Agree** that officials should prepare a paper for Cabinet consideration noting this decision

Yes / No

Privacy of natural persons

Simon Rae  
**Manager, International Science Partnerships**  
Labour Science and Enterprise, MBIE

Hon Dr Megan Woods  
**Minister Research, Science and  
Innovation**

30 / 05 / 2019

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## Background

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1. In April 2018 [briefing 2553 17-18] you agreed that New Zealand should not become a full member of the new international organisation to be set up to build and operate the Square Kilometre Array Radio Telescope (SKA), the SKA Observatory (SKAO). You also agreed that officials should explore options for New Zealand to become an Associate Member of the SKAO, and that New Zealand should continue to engage in the project at existing levels.
2. You subsequently agreed [briefing 2860 17-18] that MBIE should prepare a Cabinet paper seeking a mandate to negotiate Associate Membership of the SKAO. Associate Membership would be in the form of a bilateral treaty between New Zealand and the SKAO itself and therefore requires a Cabinet Mandate before negotiations can commence. We have held off seeking a negotiating mandate because the SKAO's own preparatory process, which will determine the parameters of Associate Membership, has been delayed.

## The SKA project has made steady progress over the last year

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### The SKA Convention was signed on 12 March

3. The convention setting up the SKAO was signed in Rome on 12 March. The United Kingdom, China, Portugal, Italy, South Africa, the Netherlands, and Australia signed the Convention. The convention will enter into force once the three host countries (the UK, South Africa and Australia) and two other countries have ratified.
4. In preparation for entry into force of the convention, prospective members held the first meeting of the Convention Preparatory Taskforce (CPTF) on 13 March. The CPTF will finalise key policies for the SKAO, in particular on procurement, and will oversee negotiations with countries seeking Associate Membership of the SKAO. New Zealand attended this meeting as an observer.

### The SKA is now making steady progress towards construction

5. While signature of the convention has started the countdown towards entry into force and the creation of the SKAO, there are still a number of things that will need to happen before construction can begin.
6. Over the last six months, the SKA has made steady progress on the design of the telescope, with a number of subsystems now having gone through their critical design review. Further work is being undertaken in order to finalise a design that will allow for components of the telescope to be procured. There are still some design challenges to be overcome, and **International Relations** Nevertheless, the project is making steady progress.
7. Discussions have also begun on a funding schedule for the first phase of SKA construction. In order to begin construction, the SKAO must have enough funding available to be confident that it can afford the telescope with acceptable risk that further funds will be required. Members have previously agreed that costs will be capped at €650m (in 2012 Euros – now just under €700m), and that the design will be scaled to fit the funds available.
8. Existing members' commitments look likely to provide a significant portion of the funding required to begin construction. **International Relations**
9. Because we do not currently have a negotiating mandate for Associate Membership, we have indicated we should not be included in initial discussions on the funding schedule.

Because any New Zealand contribution would be small, our contribution will have limited impact on a construction decision either way.

### **We have revised down our estimate of the costs of membership**

10. In our advice to last year, we estimated the cost of full membership as between \$20-\$30m for the first ten years. We were aware that the top end of this estimate was high at the time, but we chose it because we considered there was a need to price in the risk that the telescope would be underfunded, and that operating costs would continue to increase, particularly given that they were not subject to the €650m funding cap.

11. Since then, the SKA has improved its cost estimates, International Relations

The effect of the funding cap on operating costs has also been the opposite of what we expected – the need to reduce computing power and the number of dishes to meet the cost cap will also decrease demands for power, bringing down the estimated operating cost. We now estimate the cost of full membership as between \$18-\$25m for the first ten years (working just off the most recent SKA cost estimate would produce a figure of \$18.5m for the first ten years, although this excludes some necessary domestic computing infrastructure). In this regard it is important to recognise that the expected full membership cost for New Zealand will anchor discussions with the SKA Observatory on what is a reasonable Associate Membership contribution.

### **The shape of Associate Membership is becoming clearer**

12. In our earlier advice we noted that there were significant uncertainties about what Associate Membership would look like. The CPTF is responsible for setting parameters for Associate Membership, and it held a useful discussion at its first meeting. That discussion suggested that the basic template for Associate Membership would be to adjust key membership rights and obligations, but leave a number of general rights and obligations intact. International Relations, Confidential information

13. Confidential information entrusted to the Government, International Relations

14. We are reasonably optimistic that we would be able to gain most of the critical benefits of full membership from an Associate Membership negotiation. The main question will be what other members expect of New Zealand as a minimum contribution. Below a certain level, the transaction costs of having New Zealand as an Associate Member may be seen to outweigh the benefits. Confidential information entrusted to the Government

### **The case for Associate Membership depends on our willingness to make complementary investments**

#### **Our exchanges with stakeholders over our previous advice have not changed our views on the value of membership to New Zealand**

15. Following your decision not to become a member of the SKAO, we have had a series of robust exchanges with stakeholders on our advice, particularly from an ICT perspective. If anything, those exchanges have left us less convinced of the merits of the investment from an ICT perspective.

16. One of the key arguments we used when we provided advice to you on full membership of the SKA Observatory was that investment in the SKA performed poorly relative to alternatives. The extensive engagement we have had with SKA stakeholders in the ICT community following that decision has reinforced our view that this is the right framework for assessing the value of the ICT investment, and that we can now express this choice more sharply: if we were to invest a certain sum in high performance computing research capability, would we choose to invest it in this way?
17. The consortium of organisations working on SKA design, the New Zealand SKA Alliance, does have some strengths. AUT has clearly done well in forming relationships with industry, and the SKA does provide built-in connections with high quality international partners. Nevertheless, we consider these strengths are outweighed by considerable weaknesses, in particular:
- Benefits are likely to be captured by a narrow range of commercial partners. This is likely to be narrowed further through the procurement process as not all New Zealand bids will be successful
  - The balance between private and public benefit is poorly defined in existing research contracts. Because they are for delivery of a final product, contracts let by the SKA will skew further towards private benefit. While there will be significant challenges to overcome in the construction phase, a significant portion of construction activity will fall outside standard definitions of R&D, and/or will be aimed at developing an essentially saleable product or service. We would normally expect this type of research to be funded by industry
  - International Relations  
[Redacted text]
  - Through any potential SKA procurement process we have limited control over which areas New Zealand SKA teams will work on in construction and operations, and therefore we are not choosing areas of further research, nor will we be able to assess the research value of expenditure (which we would normally do through an expert panel).
18. Proponents of the SKA have argued that the volume of data produced by the SKA is unique, and have described it as a “once in a generation opportunity” to be at the forefront of high performance computing development. We consider this overstates the case in favour of participation. The SKA does present an important problem space for high performance computing and data science, and New Zealand organisations involved with the SKA are engaging in the development of new techniques for addressing some of these challenges. But similar challenges occur in other science areas, and if this was a priority we would arguably be better served by an investment supporting existing science strengths in the relevant application domain, such as bioinformatics, complex organic system modelling, or climate science. MBIE is currently considering what is required to support data and computationally-intensive science through its work on eResearch [set out in briefing 1615 18-19].

### **Obtaining value from the telescope would require a complementary astronomy investment**

19. We remain of the view that any investment in the SKA needs to be justified at least in part on astronomy grounds. In our previous advice to you we indicated that an investment in the SKA would require a complementary investment in astronomy research to ensure that we were able to make good use of it as a piece of research infrastructure. An astronomy investment would also be critical in ensuring a user community to underpin a long-term technology development relationship with the SKA.

20. Our preliminary assessment is that a meaningful astronomy investment would be in the order of \$3 million per annum, spread across several fields of astronomy. This is about the size of the smaller Centres of Research Excellence (CoREs). Any smaller investment would likely be of too small a scale to be effective, but any larger investment would tend to imply too great a priority to astronomy within our broader science investments.
21. New Zealand potentially has sufficient research strength across a number of key astronomy sub-fields to create a credible research platform. There are also opportunities to align the New Zealand research community with Australia, International Relations [redacted]  
[redacted] There may also be synergies with investments we are making in space technologies, given the increasing use of space-based instruments for astronomical observation.
22. Considering the scale of a potential astronomy investment allows us to put an SKA investment in context. If we were to pay half of a “full” contribution to the SKA through Associate Membership, the cost would average out at around \$900,000 per annum for the first ten years. Seen in isolation, this would be a large share of an astronomy investment to dedicate to one piece of infrastructure. Nevertheless, we consider this to be potentially defensible once ongoing ICT benefits are taken into account.
23. We understand that there have been some discussions within the astronomy community about the potential for an astronomy platform, although there are different views as to how such a platform would relate to an SKA investment. We understand some in the astronomy community are interested in making a bid into the next round of CoRE funding for an astronomy CoRE, but this bid is not dependent on an investment in the SKA, nor is it guaranteed. We understand that current planning is for the CoRE round to provide final decisions in [redacted] Impending release

## **We recommend that we do not negotiate an Associate Membership Agreement**

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### **It is difficult to make the case for a strategic investment in astronomy**

24. It is difficult to make a case for a three million dollar astronomy investment outside of a contestable process (like the CoRE round). There are a number of spending pressures on the Government, and a number of potential investments we would recommend you make in the science system. Free and frank advice [redacted]  
[redacted] Over time, not pursuing an Associate Membership Agreement allow for reprioritisation of the \$1.2m annually allocated to SKA membership and design.

### **We consider risks to our bilateral relationships are manageable**

25. We would need to provide a clear justification to our international partners in the project why we have decided not to proceed with an Associate Membership negotiation, given that we have previously signalled our intent to do so. International Relations, Free and frank advice  
[redacted]  
[redacted]
26. Free and frank advice, International Relations  
[redacted]  
[redacted]  
[redacted]  
[redacted]

**International Relations, Free and frank advice**

27. Free and frank advice, International Relations [Redacted]

**Free and frank advice, International Relations**

28. Free and frank advice, International Relations [Redacted]

29. In order to mitigate this risk we recommend that we continue to contribute to the existing organisation until it is wound up. We have paid our contribution for 2019 already, and we expect to be asked for a contribution for 2020 early next year. The annual contribution for 2020 will be €270,000 (NZ\$460,000). In the event that the organisation's functions are transferred to the new SKAO some time during 2020 as planned, it is possible that some of this contribution will be refunded.

30. International Relations [Redacted]

31. International Relations [Redacted]

**We are sceptical of claims of wider reputational damage**

32. Stakeholders have claimed that a failure to follow through on the SKA will damage New Zealand's participation in other international cooperative science projects. In our view, this judgement misunderstands the way in which broad networks of relationships operate, the distinctions between different fields of science, and the importance of long-standing positive relationships that are likely to underpin engagement in other fields.

33. International Relations [Redacted]

**Domestic stakeholders are likely to react strongly**

34. There is a vocal group of domestic stakeholders who will strongly oppose any decision not to negotiate an Associate Membership agreement. Consequently we will need to give further thought to how we communicate any decision on Associate Membership. While we will be criticised for not consulting further, we have had substantial exchanges with stakeholders engaged in SKA design since your earlier decision, and these have not been convincing.

However, we have not engaged with the astronomy community as a whole, and we do not have a reliable sense of where the balance of views sits within that group. Our sense from communications we have received is that there is a full range of views within the astronomy community, and no consensus on the best outcome for the discipline.

## There are two options for how we could take forward an Associate Membership mandate with Cabinet

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35. If we do begin an Associate Membership negotiation process we should do this on the basis that you are at least willing to propose an astronomy investment for Budget 2020. There would be two potential ways of taking this forward:

- Option one: make the case to Cabinet up front for the SKA and a complementary astronomy investment, allowing us to negotiate from a position of certainty that we are willing to enter into an agreement.
- Option two: negotiate on the basis that New Zealand participation will ultimately be subject to decisions about prioritisation through the Budget 2020 process.

### Option one: make the case up front

36. Option one has the benefit that we would be able to provide certainty to our negotiating partners, maximising our negotiating leverage. It would avoid any risks that we could be seen as acting in bad faith that could arise if we made participation conditional on the 2020 budget process. It would also provide certainty for stakeholders engaged in SKA design that would allow them to plan confidently for the procurement process. On the negative side of the ledger, we are not currently well-placed to make the case for an astronomy investment, and we would not be able to weigh this investment against other options for investment in the science system.

### Option two: negotiate an agreement, but decide as part of Budget 2020

37. Option two preserves flexibility, and the ability to weigh an astronomy investment against other possible investments. It would, however, be more complicated to explain to stakeholders, and would probably not be well-received. International Relations

[Redacted]

38. We also do not consider that an astronomy investment will compare well to other investments we might make in the science system when viewed apart from the sunk costs we have invested in our SKA relationships. Free and frank advice

[Redacted] We can mitigate this risk by communicating our intent clearly, but experience suggests that messages of this nature can be easily misunderstood. In particular, this approach runs the risk of merely deferring a frank conversation with domestic stakeholders.

## Next steps

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39. If you agree with our recommendation that New Zealand not negotiate an Associate Membership agreement, we propose that you consider a short paper to Cabinet noting this decision. It is unclear whether the decision requires Cabinet approval – you would not be requesting a mandate to negotiate or to sign an agreement, both of which do require Cabinet approval. Nevertheless, there is an outstanding Cabinet report back from the original negotiating mandate. Having Cabinet minute a decision would also usefully complete the treaty process, and ensure that Cabinet colleagues understand the basis for the decision.



40. We would want to take opportunities presenting themselves in the near future to communicate and explain a decision not to proceed with Associate Membership to key international partners, and the SKA itself. The key events we need to take account of are:

- Regular science and innovation consultations with Australia in the margins of the Single Economic Market Senior Officials' Meeting on 18 June
- SKA 30<sup>th</sup> Board Meeting from 9-10 July

41. International Relations, Free and frank advice

[Redacted content]

42. We would ideally want to have a decision confirmed by Cabinet prior to the SKA Board meeting so that we could use this opportunity to explain the decision and discuss with the SKA any implications for New Zealand's ongoing involvement with the SKA. This is a critical step in minimising any risk of damage arising from the decision.

Proactive Release