Speech by Dr Rob Adam, SKA South Africa Project Director, at the 37th Agri Northern Cape Congress, The Horse Shoe Inn, Kimberley, Northern Cape Province 24 August 2016

Johannes Möller, President of Agri South Africa
Omri van Zyl, CEO Agri SA
Henk van Wyk, President of Agri Northern Cape
Henning Myburg, CEO Agri Northern Cape
Distinguished guests

It's a pleasure to be here at the 37th Agri Northern Cape Congress.

I thank Agri Northern Cape for this opportunity to speak on this platform and to introduce myself to Agri NC. As from the 1st of January this year, I have taken over the reins as SKA South Africa Project Director from Dr Bernie Fanaroff who spoke here last year. I am not entirely new to SKA; in addition to joining the SKA South Africa as Project Director designate in 2015, I spearheaded SKA in South Africa in its early days when I was Director General at the Department of Science and Technology. While serving as the CEO of the African Nuclear Energy Corporation (NECSA) from 2006 to 2012 and later the Group Executive at Aveng, I chaired the South African SKA Steering Committee.

My vision for the SKA South Africa is to continue building our relationship with all the communities surrounding the SKA site in the Karoo. I wish to make it clear that we are willing to co-operate with Agri SA and Agri NC, the Northern Cape Province, the districts and as far as possible, with every interest group in

that area. We can already show remarkable progress on the MeerKAT instrument, our Human Capital Development programme and the work we are doing in collaboration with our African partner countries. Although we are a global project we have to make sure that we are sensitive and inclusive of the needs of the communities in the Karoo. SKA is after all the science infrastructure project in the world with the largest geographic extent and so we are bound to affect other people.

We appreciate the support and goodwill shown by Agri SA, its people and structures and are really encouraged by the personal interest shown by Johannes Möller, Henk van Wyk and their team to come and see for themselves and to encourage even deeper co-operation in the best interest of all concerned.

We have a major task at hand but are proud to share our early successes. We want to invite you to continue being part of this project. Together people always make the difference no matter how diverse or how difficult the early beginnings may seem.

SKA is a global project with South Africa being one of the 10 member countries of the SKA Organisation. The SKA is headquartered at the Jodrell Bank Observatory, near Manchester in the United Kingdom. Approximately 100 organisations and companies from 20 countries are participating in the design and development of SKA.

Following a competitive bidding process, South Africa and Australia were both shortlisted in 2006 and on the 25th of May 2012, the SKA Organisation announced that the SKA would be co-located in both countries. The site selections followed seven

years of rigorous independent testing and our site in the Karoo met all the criteria. South Africa will host the SKA Phase I MID Frequency (SKA I MID) telescope which will consist of the 64-antenna MeerKAT instrument that is currently being constructed, and an additional 133 dishes bringing the total dishes for SKA-I to just under 200. Construction of the 133 dishes will commence in 2018 through to 2023. Phase II of the telescope, which is scheduled for construction between 2023 and 2030, will consist of an approximate total of 3,000 dishes spread across Africa (9 countries) and Australia.

Approval has been obtained from the Ministers of Science and Technology and of Finance to purchase land for the SKA core site. Land purchases are subject to negotiation and the valuation of farms in the Northern Cape, and the services of a professional valuer have been obtained. In accordance with the Steps that were communicated in the last Agri NC Congress, all the landowners were contacted and notified. Valuations were undertaken on all the 36 portions of land and negotiations are underway with 16 owners. The rest (10 owners) have been finalized. 4 of these have concluded alternative solutions.

Discussions are underway between the 10 SKA member countries on the establishment of an international treaty and to begin the procurement process for SKA-1. The SKA Board has approved a construction strategy.

The MeerKAT is being constructed on the SKA site in the Northern Cape as the first part of the SKA-1 and will be the last element to be integrated into SKA-1 so that the period for doing South African led science on MeerKAT is maximized. The telescope will consist of 64 dishes and it will be the most

powerful radio telescope in the world, prior to the SKA. The following key milestones have been reached in the MeerKAT project:

1) 23 antennas were installed by the end of June 2016;
2) The testing of the first antennas has confirmed that all requirements on the integrated antennas are being met;
3) The MeerKAT “first light” image of the sky produced with only 16 antennas, shows that MeerKAT will join the ranks of the world’s great scientific instruments: in a small patch of sky (less than 0.01 percent), it shows more than 1,300 galaxies in the distant universe, compared to 70 known in the previous best image, obtained with a telescope in Australia. These results show that the 16-dish AR1 MeerKAT is already the best radio telescope of its kind in the Southern hemisphere, and indicate that when fully completed with 64 dishes by the end of 2017, it should indeed be the world’s most powerful radio telescope.

The launch of the first phase of the MeerKAT telescope marks a significant achievement for SKA. Through MeerKAT, South Africa is playing a key role in the design and development of technology for SKA. The Southern African team of over 100 young scientists and engineers has developed technologies and systems for the MeerKAT telescope. As a bonus, the MeerKAT is performing nearly twice as well as it had originally been specified – at no increase in cost.

The site chosen near Carnarvon in the Karoo for the location of the MeerKAT and SKA telescopes provides unique opportunities for other similar radio astronomy installations, mainly because of the low levels of Radio Frequency

Interference (RFI), but also because of the extensive infrastructural developments taking place on the site. Drawn by this advantage, the University of California at Berkeley and the University of Cambridge have submitted a proposal to the National Science Foundation for USD20 million to establish a new low-frequency radio telescope on the SKA site. Their decision to invest was informed by both South Africa's commitment to preserving the site for radio astronomy through the Astronomy Geographic Advantage Act of 2007 and by the local scientific, technical and engineering competency that has been developed around the MeerKAT and SKA projects. This telescope is known as the Hydrogen Epoch of Re-ionization Array (HERA) and has the potential to deliver Nobel Prize-winning work, as well as providing employment for South African engineers, artisans and construction workers during the build phase.

HERA is a truly Karoo-based instrument. Construction materials are sourced and fabricated from within South Africa – predominantly from the Carnarvon area. The bulk materials for construction are light industry materials such as wood and PVC pipe, therefore there is opportunity for local businesses who don't necessarily have a "high technology" customer base. We have local contractors installing our main support poles, cutting our structural elements to size, and making up our reflector surface panels from bulk-supplied material. Similarly, for our construction crew in the prototype phase, we assembled a team of local young people who have taken on the construction and made it their own. Two SKA South Africa interns, who were part of the optic fibre-training programme in 2015, are included in the team of four.

It is true that SKA will be changing the face of this area and we will have an impact on the local economy. However, we are partnering with the South African Earth Observation Network (SAEON) to conduct studies that would inform the management of the land. As an international flagship science project, it is a key requirement that SKA demonstrates informed and responsible management of the terrestrial infrastructure on which SKA is being built. SAEON has recognised the potential value of long-term ecological research on the location of the SKA site in an area, which is projected to experience large amounts of climate change over the next 50 years. This also presents a rare opportunity to study the changes that are likely to take place when the land use of the area changes from extensive farming to conservation-orientated management. Results from these studies will assist SKA South Africa to manage the SKA site according to best-practice environmental principles and make decisions on ecological changes or problems at the site as they occur. Potential issues include alien plant control, herbivore and predator management and associated changes in veld condition. These problems will require baseline data against which changes and the results of management actions can be measured. The research at SKA will be integrated into the broader SAEON research and monitoring strategy. This will aid to inform management of the SKA as well as broader science in the wider Karoo region.

The area where the SKA is situated was declared by ICASA as an underserviced area in terms of telecommunications. Prior to the SKA developments in the area, of the rural landline infrastructure was limited and had fallen into a state of disrepair due to vast distances and low user numbers. This, together with sparse cell phone coverage (which is managed by individual

national phone coverage operators) had led to the area being declared by ICASA as an underserviced area. As part of its on-going initiatives to support and invest into the local communities, SKA South Africa subsidises high-speed satellite broadband connectivity in the area. This service is provided by the YahClick system, from VOX Telecoms, which won the contract through a tender. The technology provides satellite internet connectivity and voice telephone services, accessible by both farm owners and farm workers, who only pay for usage (SKA South Africa has fully subsidised the cost of the equipment). The SKA South Africa will further support the Karoo communities with access to mobile communication solutions. The open tender for proposals for technology solutions to provide mobile communication services closed on the 15th July 2016. SKA has committed to work with the local communities on a needs-based approach to provide telecommunication solutions.

For the first time last year, learners from Carnarvon High School achieved university admission grades in mathematics and physical science. The reason for this was the investment by SKA South Africa in employing an excellent Maths and Science teacher who is seconded to Carnarvon High School. The five successful students have received full cost undergraduate bursaries to various South African universities.

Efforts are under way to develop business in the Northern Cape from basic business assistance to improved skills training in order to participate in infrastructure and services opportunities provided by the SKA South Africa.

SKA is also positioning itself to contribute to the knowledge economy of South Africa through stimulation of the high tech sector of the economy. The socio-economic circumstances of the communities living close to the site are a key concern of the SKA SA management team. We are committed to developing these communities and providing business opportunities to small businesses in the area where such activities are aligned with our business. This is demonstrated by the collaboration, initiated by SKA SA, between ABSA, our civil construction contractor NMC and SKA SA, which provides companies from the local towns surrounding the SKA site with access to bridging finance to assist their participation in the construction of the road to site. The long-term strategic intention is to assist local companies to be ready for participation in the construction of the first phase of the SKA.

However, SKA SA has focused on developing skills and opportunities for young people from Carnarvon and the surrounding towns, as part of the SKA SA Human Capital Development Programme. Some of the results are as follows:

- SKA SA has since 2011 awarded 105 student bursaries for learners from surrounding towns to attend Carnarvon High School. Carnarvon High School is the only High School in the area that offers maths and science. SKA SA has provided qualified teachers for maths and science. Five of these students achieved matric exemptions in maths and science in 2015, a first for Carnarvon High School, and have been sponsored by SKA SA to study physics and computer science at university.
- SKA SA has awarded 56 bursaries for artisans and many for technician training for young people from the Karoo.

Seven of these young people has completed or are completing their training at the Losberg site, 90 kilometres outside Carnarvon, and will work as electricians, diesel mechanics, fitters and turners, and in instrumentation and control at SKA SA.

- SKA SA has employed many local people in the Carnarvon area, including four young interns after they received training in optical fibre technology.
- So far, SKA SA has spent more than R2,5 million on laptops, training and connectivity, with 366 new computers with state-of-the-art software being donated to schools and the library in Carnarvon.

Big Data is seen as the area with the largest potential for wider benefit from SA's involvement in the MeerKAT and SKA. The Inter-University Centre for Data Intensive Astrophysics (IDIA) has been established at UCT, UWC and North-West University, and Sol Plaatje University has been invited to become an Associate Member. This is to focus on enabling SA scientists to be globally competitive in this new era of data intensive research. An initial are of focus will be on providing support for the MeerKAT large survey projects.

IN SUMMARY:

- Science and engineering research is critical for innovation and can help develop our economy and create jobs.
- Projects such as the SKA will assist South Africa to move the economy from a resource-based economy to a knowledge-based economy.
- The SKA will drive technology development and innovation, which will ensure that our country produces highly competitive technology products.

- The pre-construction preparations of the SKA have already created jobs in surrounding areas.
- Local communities in the area are already benefitting from youth investment projects, community development initiatives such as the Knowledge Resource Centre, SMME development and education support.
- To date, SKA South Africa has invested over R50 million to enable South African companies to participate in the design work of the SKA, developing intellectual property, building expertise and international competitiveness.
- Companies in the Northern Cape are also being developed, from basic business assistance to improved skills training in order to participate in infrastructure and services opportunities provided by the SKA.
- SKA South Africa facilitated the provision of a funding programme from ABSA for emerging contractors in the Karoo.

Challenges will always be there with a project of this nature and magnitude but we stand ready to work with you to solve these.

To quote the Minister of Science and Technology, Minister Pandor, “The future for our country and the African continent depends on our development of talented scientists and entrepreneurs working in scarce skills fields who can take up the opportunity to develop new technologies and innovative solutions for our pressing problems.”

SKA is the one of the world’s premier science infrastructure projects and South Africans stand to benefit greatly from hosting this project.

I thank you.