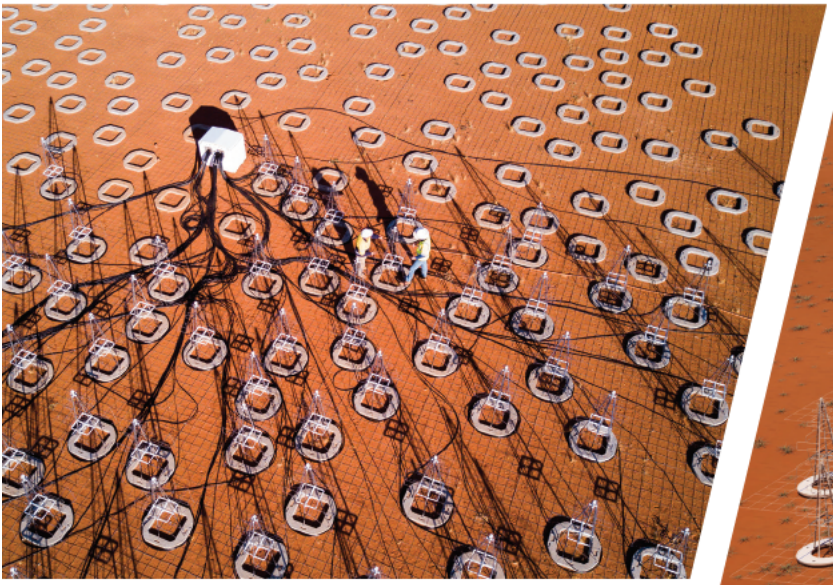
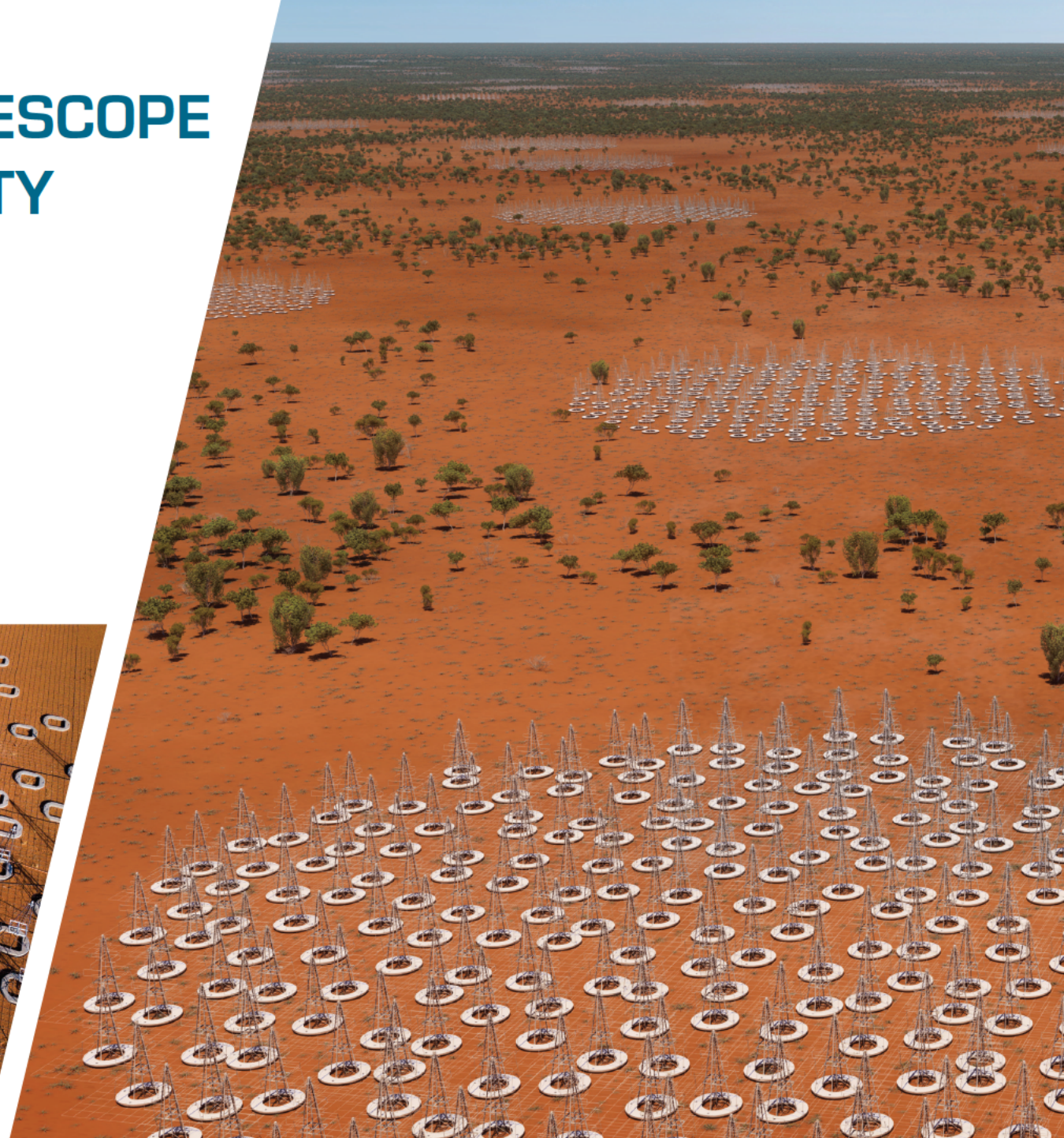
IMAGINE A BIG TELESCOPE

SKA
SQUARE KILOMETRE ARRAY
Australia

IMAGINE A TELESCOPE AS BIG AS A CITY

We're going to build one! The Square Kilometre Array, or SKA, is an enormous telescope that will to be built on two continents over the next decade. Instead of capturing visible light like an optical telescope, the SKA radio telescope will be made up of lots of antennas, picking up radio waves from space.





Australia will be home to a forest of 2m tall Christmas-tree-shaped antennas. In the first phase there will be more than 130 000 spread over 65km, and in Phase 2 there will be up to a million! At the same time, South Africa will host a couple of hundred giant 'dish' antennas, expanding in Phase 2 into the thousands.

IMAGINE A TELESCOPE SO POWERFUL IT CAN SEE BACK TO THE BEGINNING OF THE UNIVERSE

Radio waves from the furthest reaches of the Universe take billions of years to reach Earth, holding the secrets of what happened when those waves were first released. Detect these signals from far enough away, and you can find out what happened as far back as the beginning of the Universe!

The SKA will be the most sensitive telescope ever built, capable of capturing faint signals from soon after the Big Bang and every era since. The mysteries that can be unlocked with this capability are fascinating.

Image: This radio view of the Milky Way only just begins to show how vast the Universe is – every background dot is a Galaxy! Great image Natasha Hurley-Walker (Curtin University/ICRAR) and the GLEAM Team!

THE SKA WILL TACKLE SOME OF THE BIGGEST MYSTERIES OF OUR UNIVERSE

How did the first stars and galaxies form?

The period when pockets of the Universe's hydrogen soup collapsed to form the first stars is called the "Epoch of Reionisation". The SKA will be sensitive enough to look back more than 12 billion years to explore how this took place.

How do galaxies evolve and what is dark energy?

The 2011 Nobel Prize in Physics was awarded for discovering that despite the pull of gravity, the Universe is expanding at an increasing rate. The SKA may help scientists win another Nobel Prize for discovering why this is happening.

Were Einstein's theories right?

The emissions from spinning stars called pulsars are detected from Earth as regular radio pulses. Astronomers will test Einstein's theory of gravity by looking for rare changes in pulsar emissions caused by gravity from a nearby black hole disrupting the fabric of space-time.

What is the role of giant magnetic fields in space?

It takes a highly sensitive telescope to survey the magnetic fields of distant galaxies. SKA surveys may help us learn where magnetic fields come from and how they affect how stars form and evolve.

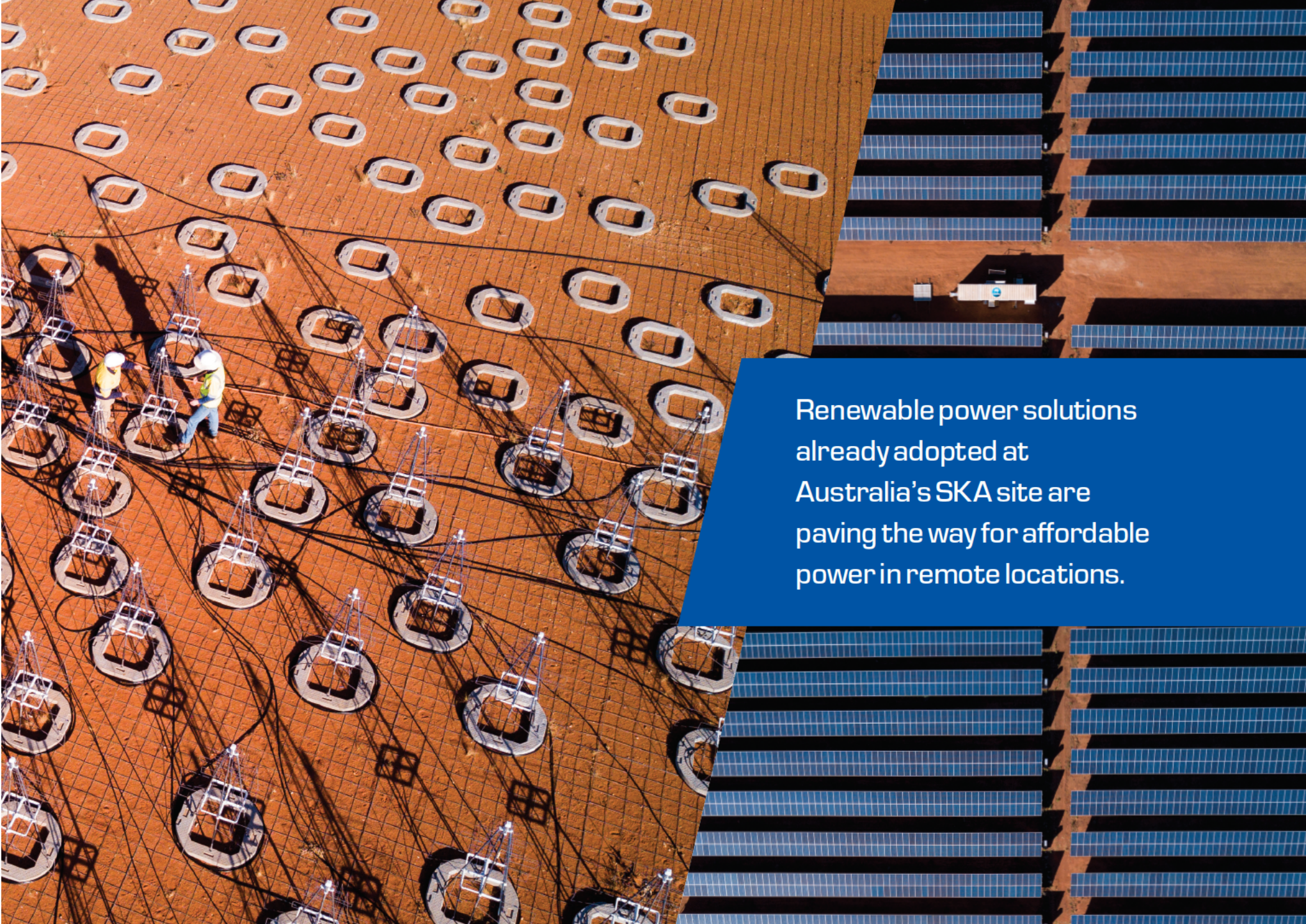
Is there life out there?

Scientists use clever techniques to detect planets in the "Goldilocks zone" of distant stars, where conditions are just right for life to exist. With the SKA, they will study the formation of these planets and search for the building blocks of life.

IMAGINE A TELESCOPE SO ADVANCED IT GIVES RISE TO LIFE-CHANGING TECHNOLOGIES

The full vision for the SKA has more than a million connected antennas producing more data than today's entire global internet traffic. New computing techniques to manage and process these huge data volumes will change the way many industries deliver value for their customers.

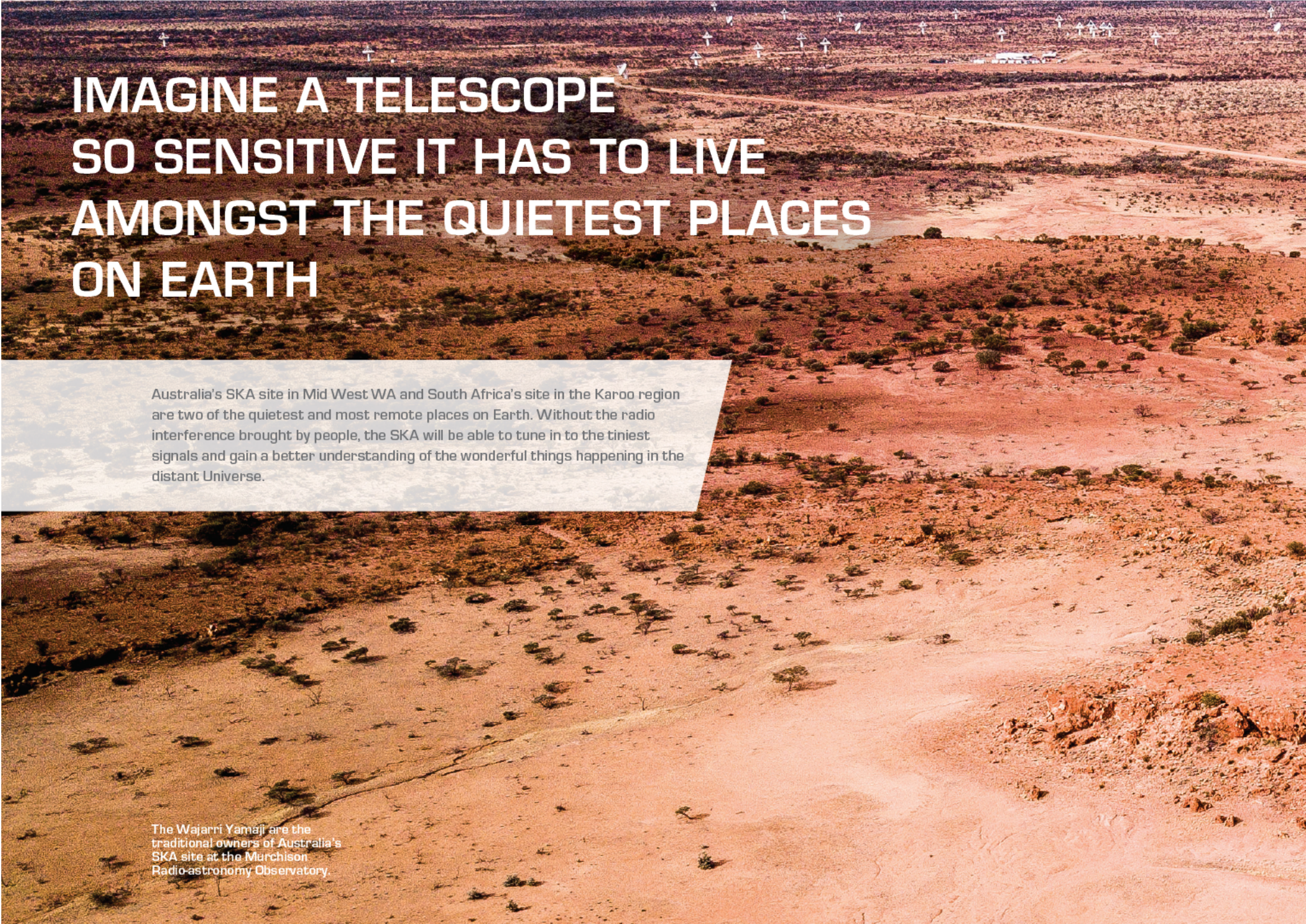
Companies around the world are inventing new SKA technologies to meet all sorts of challenges of scale, complexity and remoteness. New technologies – like the precision timing needed to synchronise a million antennas, and accurate imaging to resolve the faint signals of distant galaxies – can all be re-purposed in ways we may not have even thought of yet, to make our lives better.



Renewable power solutions already adopted at Australia's SKA site are paving the way for affordable power in remote locations.

IMAGINE A TELESCOPE SO SENSITIVE IT HAS TO LIVE AMONGST THE QUIETEST PLACES ON EARTH

Australia's SKA site in Mid West WA and South Africa's site in the Karoo region are two of the quietest and most remote places on Earth. Without the radio interference brought by people, the SKA will be able to tune in to the tiniest signals and gain a better understanding of the wonderful things happening in the distant Universe.



The Wajarri Yamaji are the traditional owners of Australia's SKA site at the Murchison Radio-astronomy Observatory.

Two world-class SKA precursor telescopes are already performing ground-breaking research at Australia's SKA site.

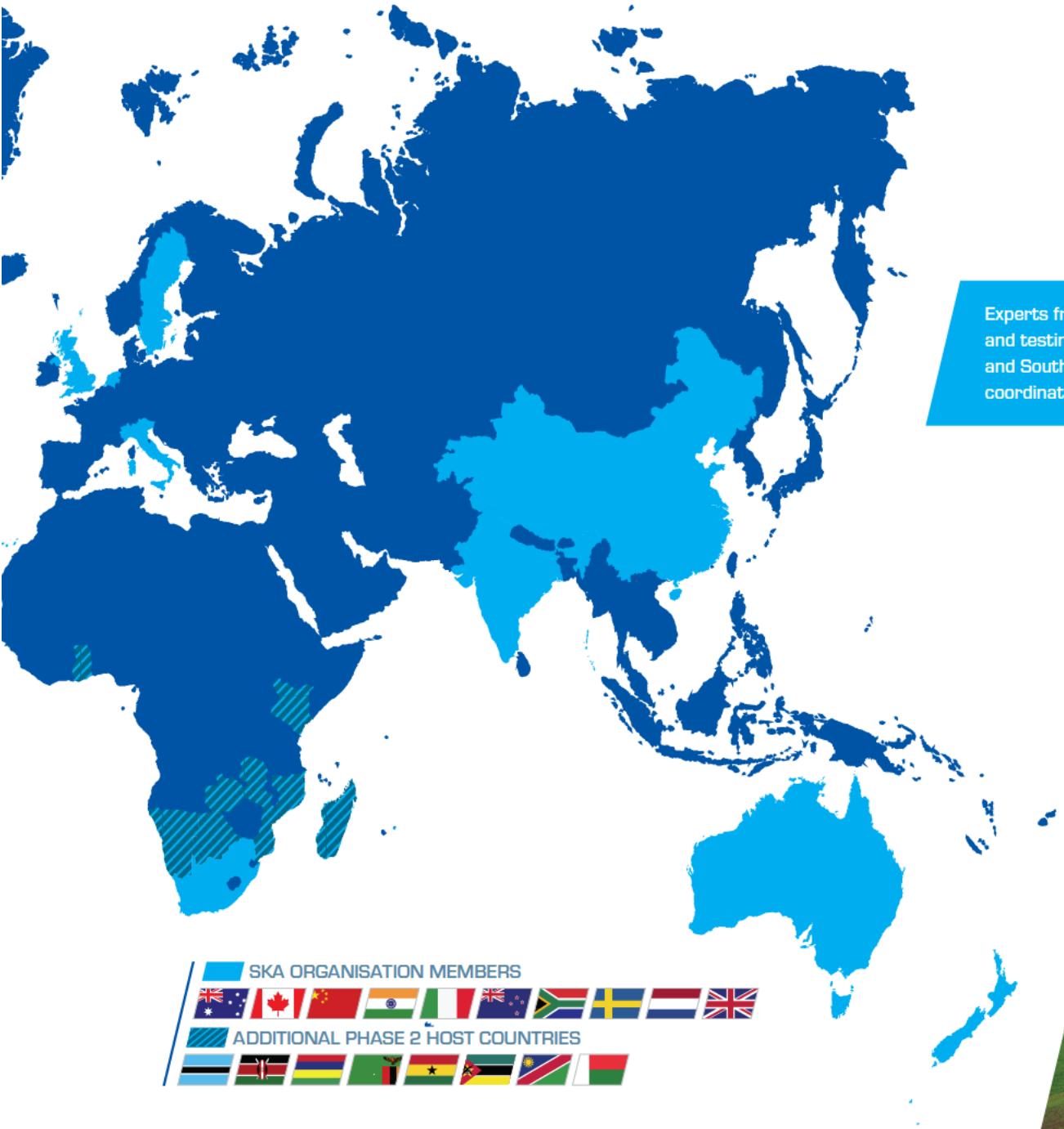
The 4096-dipole antenna Murchison Widefield Array (MWA) (above) has already gathered 16 Petabytes of data since it began operations in 2013. These observations have led to more than 100 scientific papers and helped map more than 300 000 galaxies! In its spare time it's helping develop technology for the SKA low-frequency array in Australia.

The 36-dish Australian SKA Pathfinder (ASKAP) (below) will be the world's fastest survey radio telescope thanks to innovative phased array feed receiver technology developed by Australia's national science agency, CSIRO. This technology is being investigated as part of a long-term program to keep the SKA at the cutting-edge of astronomy for decades to come.

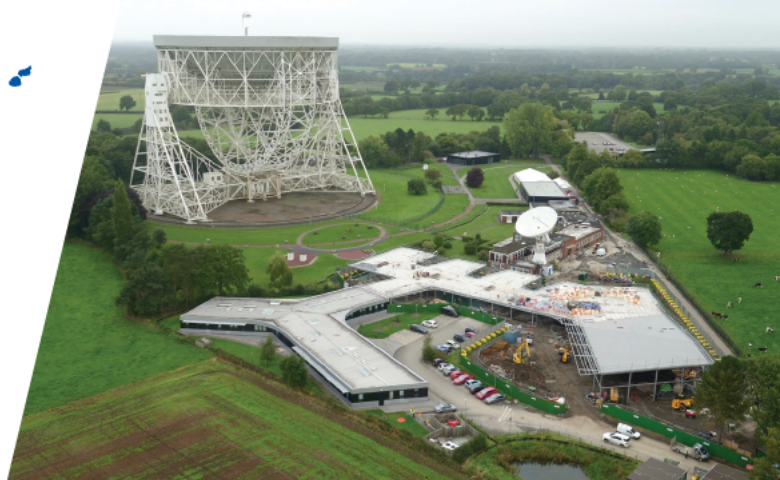
IMAGINE A TELESCOPE SO EXCITING THAT THOUSANDS OF PEOPLE AROUND THE WORLD ARE WORKING TOGETHER TO BUILD IT

Big telescopes need big brains! The brightest minds from around 20 countries are right now figuring out how to make the SKA do incredible things. In Australia, institutions like CSIRO, ICRAR and several universities are playing their part to make the SKA a reality.

The SKA is a big project that excites minds and connects science with industry and the broader public. We don't know everything the SKA will discover about humanity's role in the Universe, but stay tuned and we'll find out together.



Experts from around the world are right now installing and testing new technology on SKA sites in Australia and South Africa. The world-wide SKA design effort is coordinated by the Global SKA Headquarters in the UK.



Imagine what else you could find out about the SKA...

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