What if the theoretical possibilities of dark energy inspired us to push our boundaries?

47

Dark Energy

GenAI

Within Reach | Transitional | **Visionary**

A deeper understanding of dark energy, the force pulling the universe's expansion, opens new doors to advance space travel, discover limitless energy for Earth, and inspire curiosity about science and humanity.

UNCERTAINTIES

Systems, Technology

MEGATREND (Most significant)

Borderless World – Fluid Economies

TRENDS

Future of Space
International Collaboration
Mobilising Innovation

TECHNOLOGIES

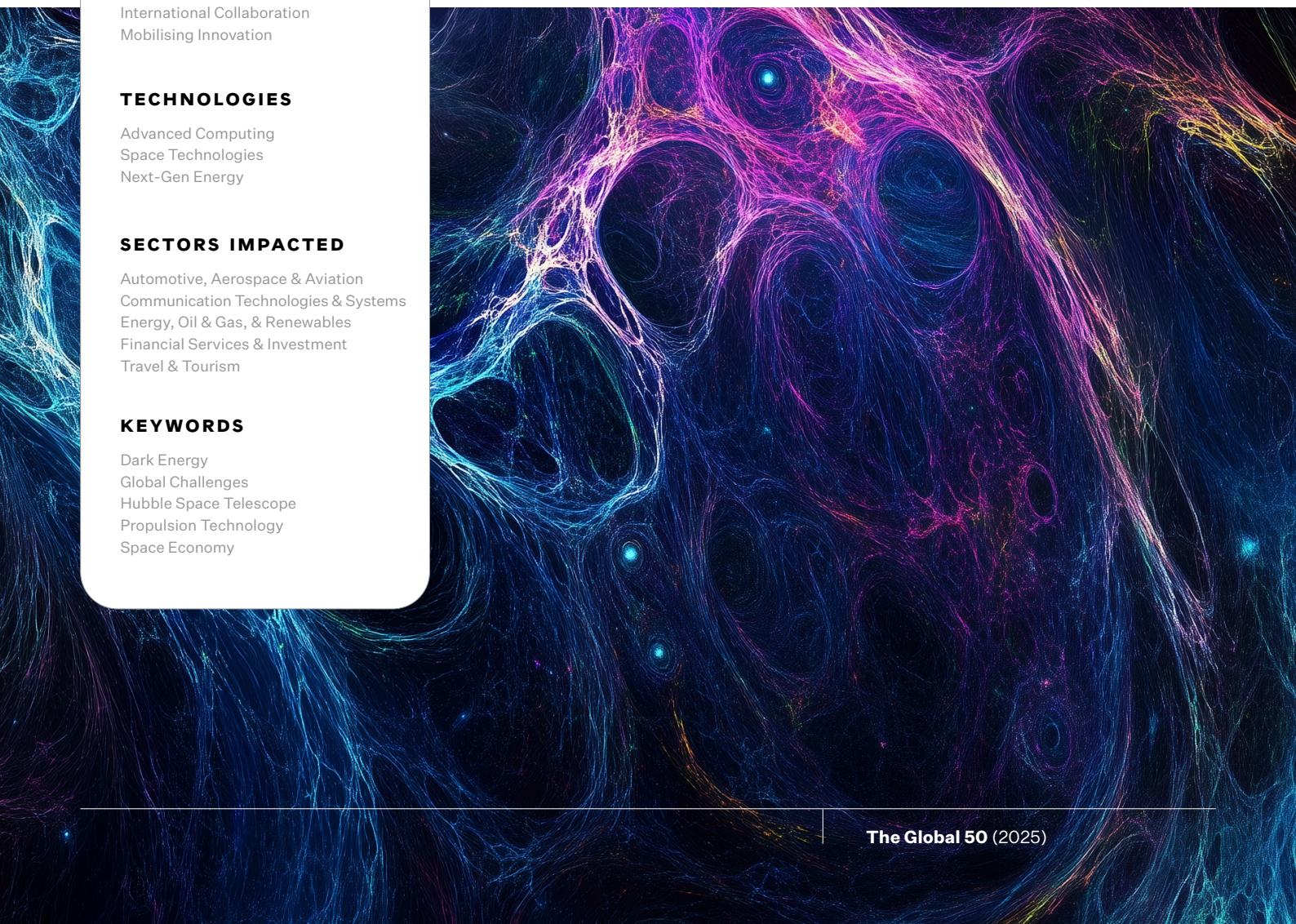
Advanced Computing
Space Technologies
Next-Gen Energy

SECTORS IMPACTED

Automotive, Aerospace & Aviation
Communication Technologies & Systems
Energy, Oil & Gas, & Renewables
Financial Services & Investment
Travel & Tourism

KEYWORDS

Dark Energy
Global Challenges
Hubble Space Telescope
Propulsion Technology
Space Economy



WHY IT MATTERS TODAY

By 2035, the space economy is expected to reach a value of

$1.8 trillion

up from $630 billion in 2023, growing annually by **9% and outpacing global GDP growth**

There is growing interest in the space economy. The National Aeronautics and Space Administration (NASA), along with other space agencies, are preparing for a return to the Moon with the Artemis programme, aiming for a long-term human presence there in the 2030s.[1220] By 2035, the space economy is expected to reach a value of $1.8 trillion, up from $630 billion in 2023, growing annually by 9% and outpacing global GDP growth.[1221] Through partnerships, innovation and robust business and science infrastructure, the UAE Space Agency aims to position the United Arab Emirates as a hub for space startups and a leader in the global space economy.[1222] Through the UAE's National Space Strategy 2030, over $6 billion has been invested in space-related industries, with ongoing funding through the $820 million National Space Fund.[1223]

Complex problems and increasing uncertainties, such as climate change, call for new solutions. Space has often inspired new approaches on Earth.[1224] As the world deals with the increasing impacts of climate change, there is a pressing need for clean, abundant energy sources. Despite record clean energy deployment,[1225] global energy-related carbon dioxide emissions grew by 1.1% in 2023, increasing by 410 million tonnes to reach a new record high of 37.4 billion tonnes.[1226] With experts estimating a 10–25% chance of climate change having catastrophic outcomes by 2100,[1227] space exploration offers a pathway to resilience, enabling humanity to adapt and thrive in an increasingly uncertain world.

Space has often inspired new approaches on **Earth.**

THE OPPORTUNITY

BENEFITS

Unlimited clean energy; shorter space travel times.

RISKS

Inability to move from theory to development.

While theoretical and with many unknowns, dark energy is currently thought to make up about 68% of the universe's total energy.[1228] While we cannot directly measure it, we assume it exists because of the accelerating expansion of the universe.[1229] Thanks to the launch of the Hubble Space Telescope,[1230] we are able to better estimate the age of our universe. The universe was estimated to be between 9.7 and 19.5 billion years old, based on the Hubble constant (an estimate of the universe's rate of expansion).[1231] However, with continued observations from the telescope, uncertainty in the Hubble constant has decreased from 10% in early 2000s to just 2% in 2019,[1232] refining the estimate of the universe's age to 13.8 billion years.[1233]

A potential application of dark energy could involve a spaceship tapping into the universe's expansion for propulsion. Although estimates of speed remain speculative, a recent simulation combined a neutral particle beam with a laser beam for a propulsion system to reach 7.5% of the speed of light with a 1 kg payload.[1234] Such a concept and technology alone could shrink the estimated duration of a journey to Mars (225 million km on average) from three years[1235] to just under three hours,[o] so imagine the possibilities with dark energy.

Still largely unknown,[1236] dark energy could inspire new technologies and open up new possibilities for humanity. Applications of dark energy on Earth could involve using the universe's expanding energy for limitless, emission-free power or inspiring new energy technologies.

Dark energy is currently thought to make up about **68% of the universe's total energy**

[o] Calculated based on a speed of light of just under 300,000,000 metres per second.