



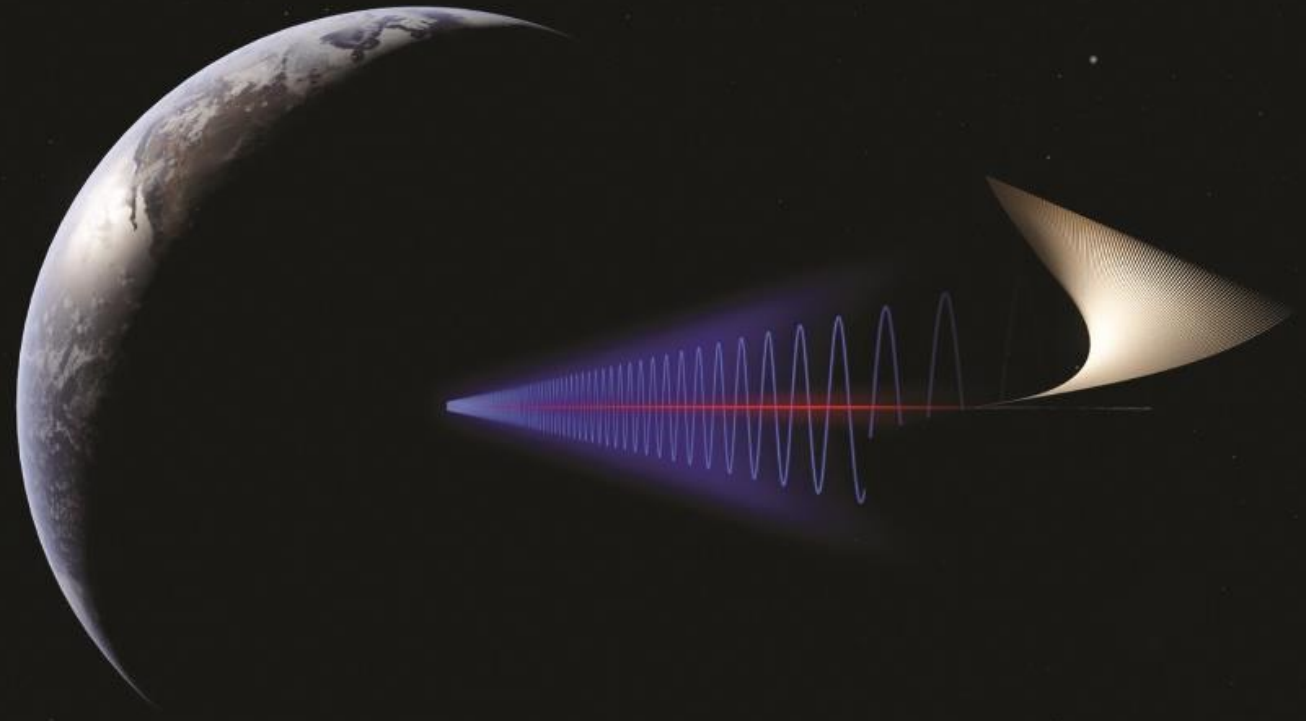
Space Energy
Initiative



The Space Energy Initiative

The UK approach to developing
Space Based Solar Power

David A. Homfray
ISDC 2022





Space Energy Initiative




Overview

- ❖ Net Zero from a UK perspective
- ❖ SBSP
- ❖ The SEI
 - ❖ Approach
 - ❖ Programme
 - ❖ International





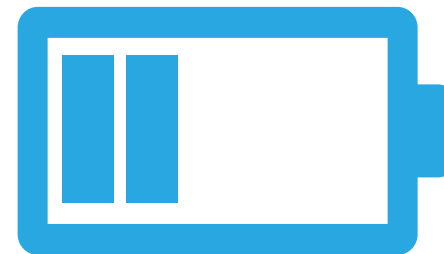
One Power Generation Method ?

Type	How many for 40B MWhr?	How quick?	Current speed	Issues
	2000 x Hinkley Point C (0.02B MWhr each)	0.2/day	5-20 years	Not mass produced, politics, not all countries nuclear, burn once
	1,200,000 km ² (35000 MWhr/km ²)	100km ² /day	5km ² /day	Geopolitical cooperation, only suited to certain areas, intermittent, needs global infrastructure, storage
	7,000,000 (6M MWhr for 3MW onshore)	650/day	1 every 28 days	Concrete, geopolitical cooperation, only suited to certain areas, intermittent, needs global infrastructure, storage

- No silver bullet
- Accelerate **current** low carbon technologies
 - Massively increase build of renewables
 - Incentivise energy efficiency
 - Increase big fission build
- Accelerate **new** low carbon technologies
 - Fusion
 - Small Modular (Fission) Reactors
 - Compact Advanced Modular (Fission) Reactors
 - **Space Based Solar Power**

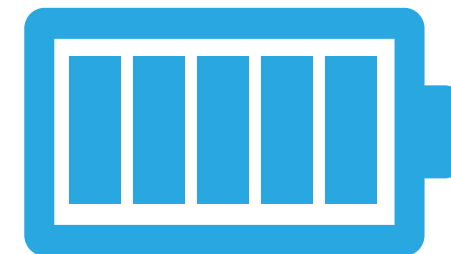
2018

20 Billion MWhr

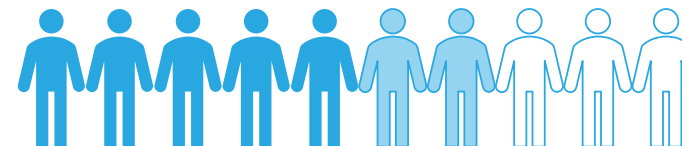


2050

50 Billion MWhr



International Energy Outlook 2019



2018

7 Billion

2B no access to electricity



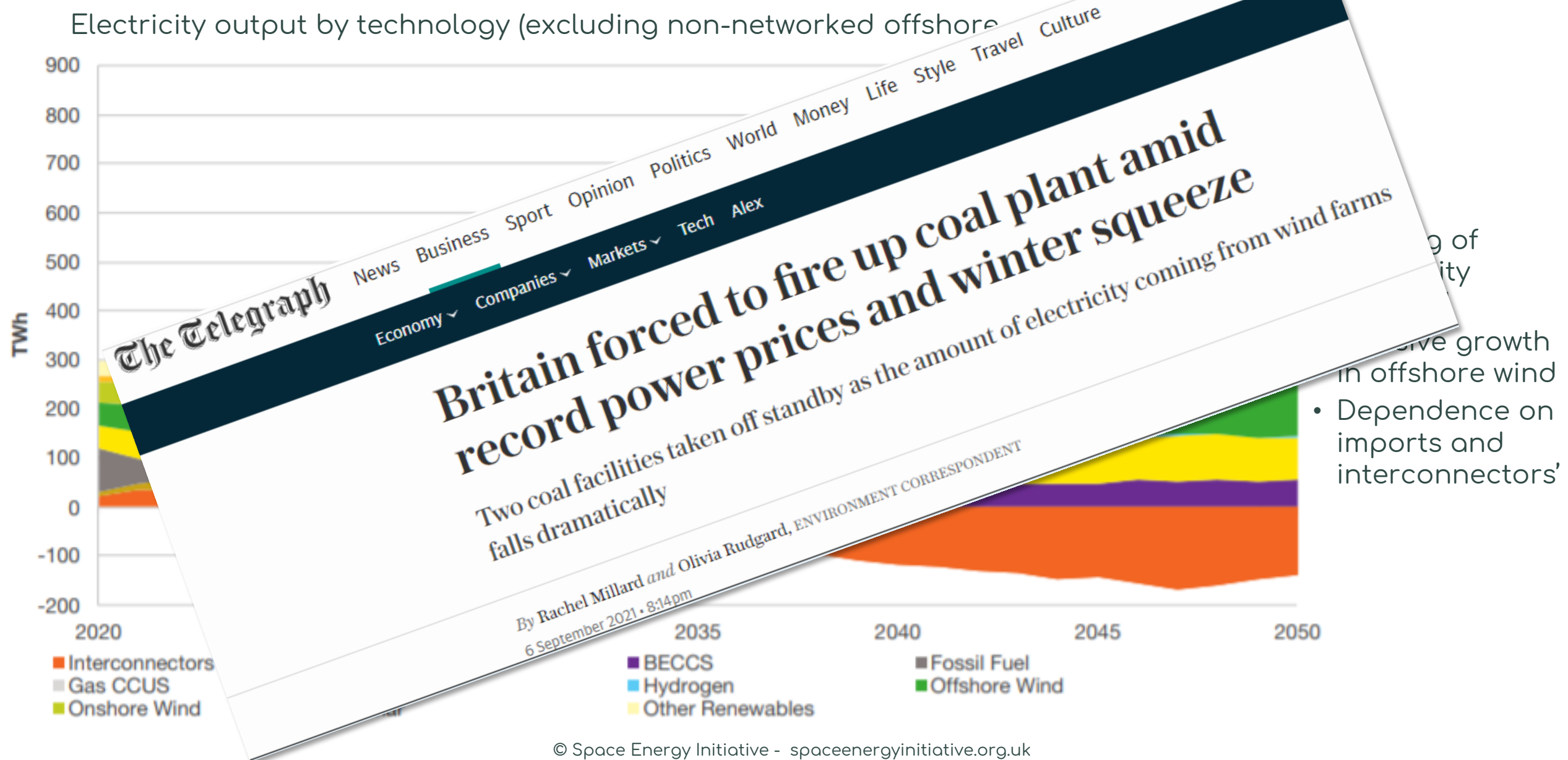
2050

9 Billion

- Only ~10,250 days left till 2050
- Need to electrify everything (transport, heating etc.)
- <20% of current generation considered low carbon
- Need to replace or add 40B MWhr by 2050
 - Or 4M MWhr/day every day for 10,000 days



Electricity output by technology (excluding non-networked offshore)





Net Zero pathways include:



Growth of
intermittent
wind / solar



Growth of
nuclear and
biomass



Carbon
capture and
storage



Clean
hydrogen
generation



Societal
change

We need new technologies which are:



Affordable
& reliable



Resilient,
with security
of supply



Operational
at scale
by 2050



Supporting
prosperity and
jobs

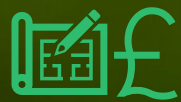
... but there are many difficulties:



Requires
baseload or
storage



Sustainability,
scalability,
high cost



Technical
immaturity,
high cost

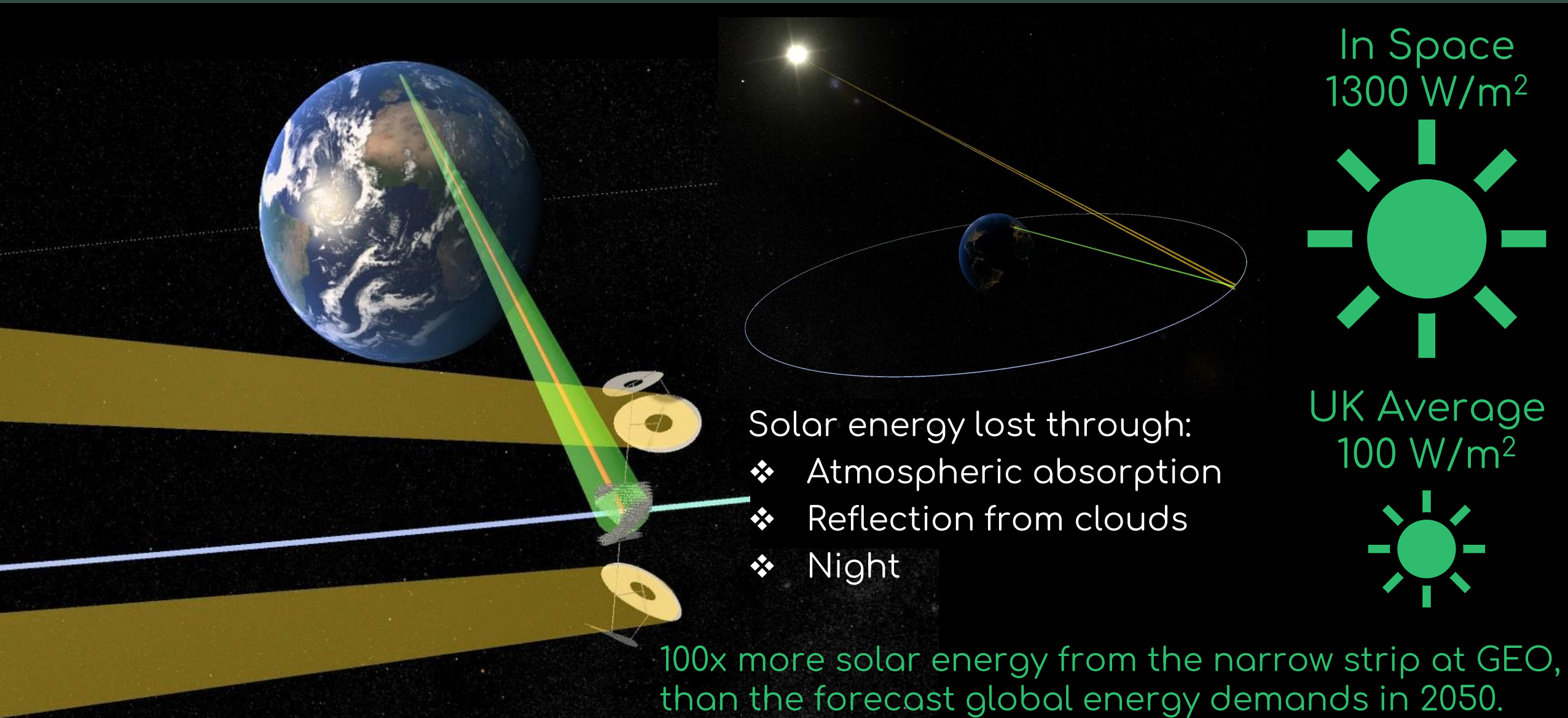


High cost of
electrolysis



Political,
energy poverty?

Space Based Solar Power
offers new options

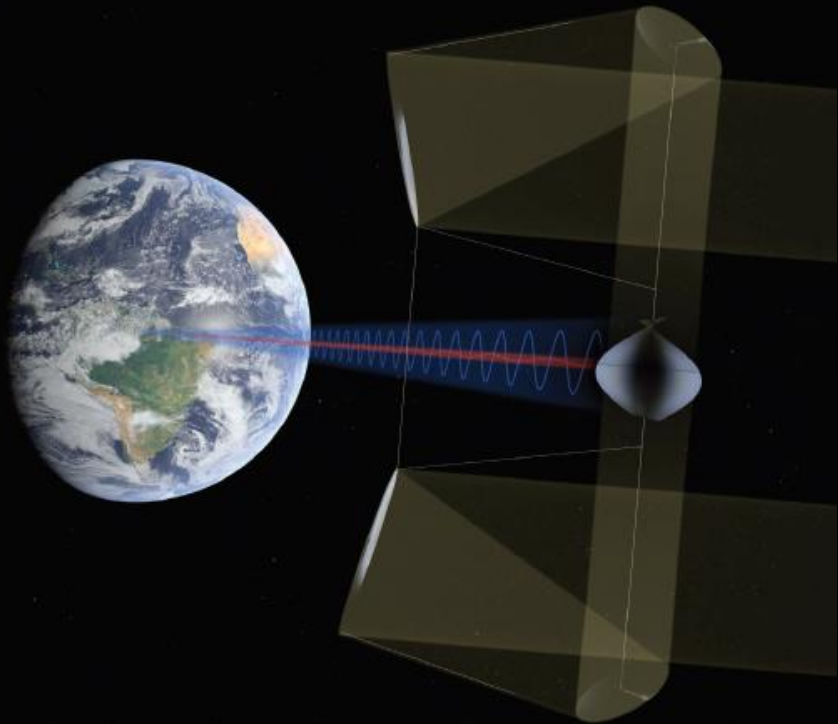




REPORT

SPACE BASED SOLAR POWER

De-risking the pathway to Net Zero



Frazer-Nash findings conclude that SBSP...



- ✔ is technically viable
- ✔ offers new options to deliver Net Zero
- ✔ development is well aligned to Government priorities
- ✔ leading concepts offer a competitive LCOE
- ✔ gives broader economic benefits for the UK
- 💰 could be developed within 12 year timeframe
- ! Requires competitive reusable space launch market
- ✔ offers opportunity for UK environmental leadership

Recommendations are made to...

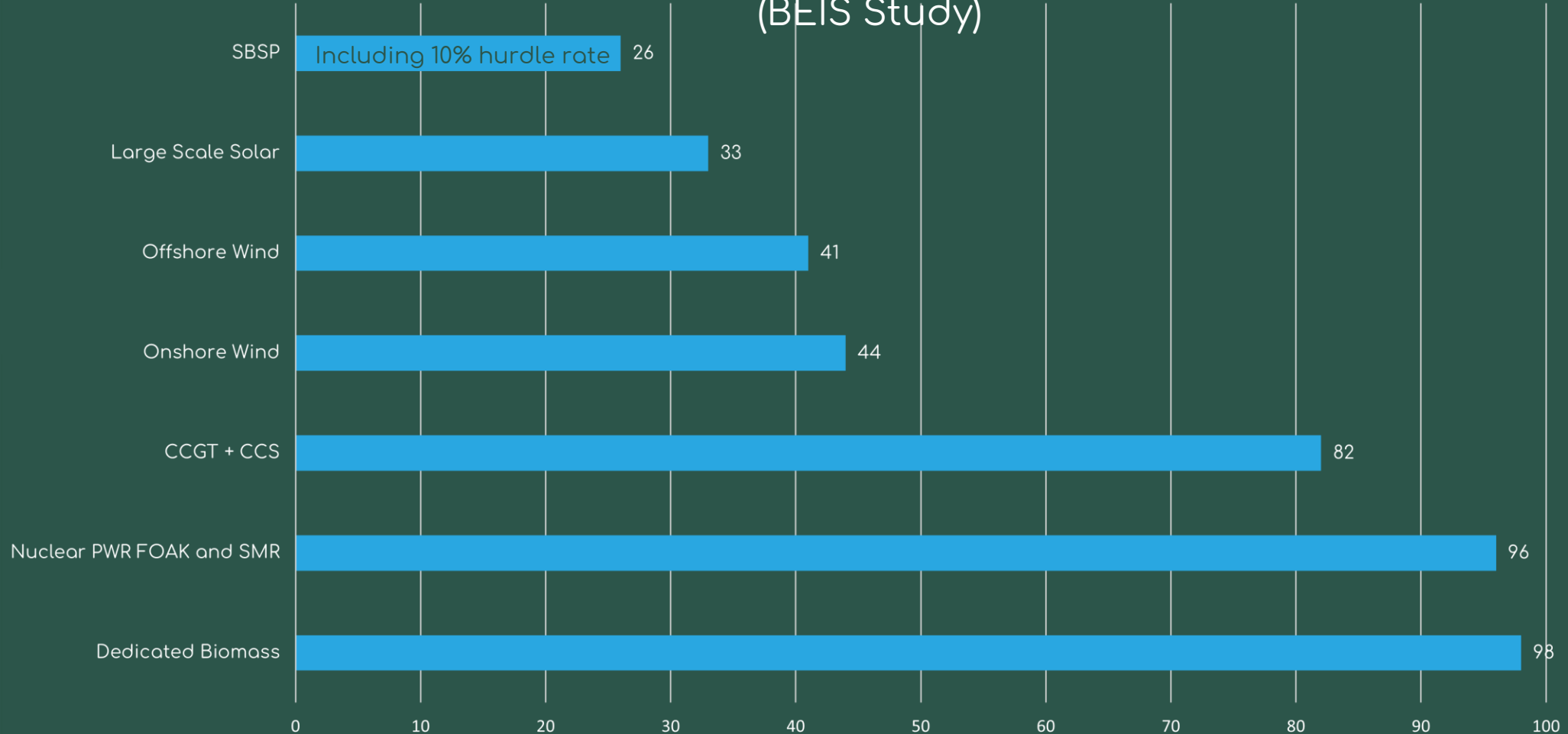
- Embed SBSP in Government policies
- Embark on structured development programme
- Seek international collaboration





Levelised Cost of Electricity – Comparison

(BEIS Study)



LCoE £ / MWh, 2040 Baseline

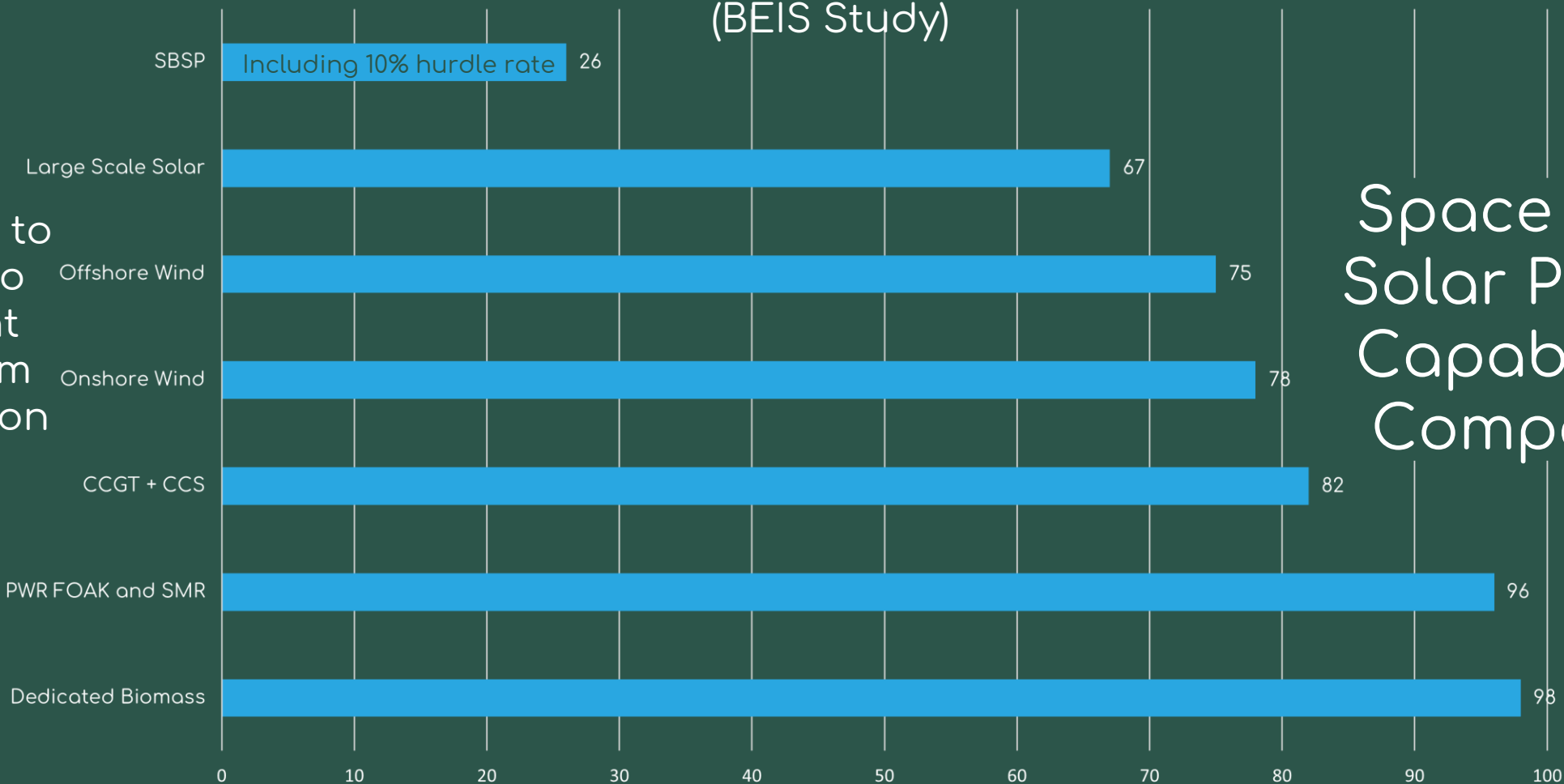


Levelised Cost of Electricity – Comparison

(BEIS Study)

Adjusted to
take into
account
of system
integration
costs

Space Based
Solar Power is
Capable and
Competitive



LCoE £ / MWh, 2040 Baseline



Space Energy Initiative

The Space Energy Initiative – A Collaboration

The Space
Energy Initiative
(SEI)



ALPINE



Department for
Business, Energy
& Industrial Strategy



CGI

fieldfisher



Department for
International Trade





- SBSP signposted in National Space Strategy
- BEIS launching SBSP Innovation Programme £3M over 2 years
- BEIS, DIT, UKSA joined SEI - close collaborative working
 - sit on Advisory Board, Core Team & International WG
- Cabinet Office has approved Great Branding for SEI
- Developing joint strategy on international outreach
- Meetings at ministerial levels across COP26, space, science and energy

"The study supports a case for developing SBSP and the government is minded to fund an innovation programme looking at developing relevant technologies that also have broader terrestrial applications and could still contribute to UK's climate change commitments, whether SBSP is deployed or not."



Department for
Business, Energy
& Industrial Strategy



National Space Strategy





Space Energy Initiative

United Nations
Support

“We need to ensure that no-one and no place is left behind in our urbanising world. The Space Energy Initiative allows us to consume and generate energy equitably, distribute it with equity and ensure the opportunities that arise from its use contribute to human dignity”

Ms Maimunah Mohd Sharif
United Nations Under-Secretary General
and Executive Director UN Habitat
March 2022

UN HABITAT
FOR A BETTER URBAN FUTURE

*A better quality of life for all in
an urbanizing world*

PRESS RELEASE

UN-Habitat supports the Space Energy Initiative to help develop sustainable cities

London 10 March 2022 – UN-Habitat Executive Director Maimunah Mohd Sharif today expressed her support for technological initiatives that use space-based solar power to produce clean, renewable, and affordable power that cities can use to build green and more sustainable communities.

Launched in London, the Space Energy Initiative comes at a time when much of the world relies on fossil-based fuels that are both expensive and heavily polluting.

“Advances in science and technology have made it possible for us to make this giant leap forward towards harnessing and transmitting the power of the sun to provide our planet with clean energy. More importantly, we can do this adequately, affordably, and equitably,” the UN-Habitat Executive Director told the London event.

British Member of Parliament Mark Garnier, who announced the launch of the Space Energy Initiative, said, “We all recognise the urgent need to think big and act now to reduce our reliance on carbon fuels to better protect the environment and our precious climate, while also increasing high-tech jobs and growth. I am delighted as Chair of the Advisory Board to witness for myself the commitment from every member of the Space Energy Initiative.”

More than half the world’s population currently lives in cities, and this is expected to rise to 70 per cent by 2030. Cities need to learn to keep up with the necessary growth whilst reducing the high-energy-consuming construction materials they use as well as the energy people use for daily consumption.

Reminding the audience that the energy consumed is not evenly distributed, the Executive Director pointed out that it is the most vulnerable who live in cramped informal settlements shrouded in darkness and suffer the most.

“We need to ensure that no one and no place is left behind in our urbanizing world. The Space Energy Initiative allows us to consume and generate energy equitably, distribute it with equity and ensure the opportunities that arise from its use contribute to human dignity,” she said.

Solar-based energy has very low environmental footprint and needs only modest infrastructure on Earth, either on land or coastal areas, while generating large scale electricity at very low cost.

[Video Link](#)

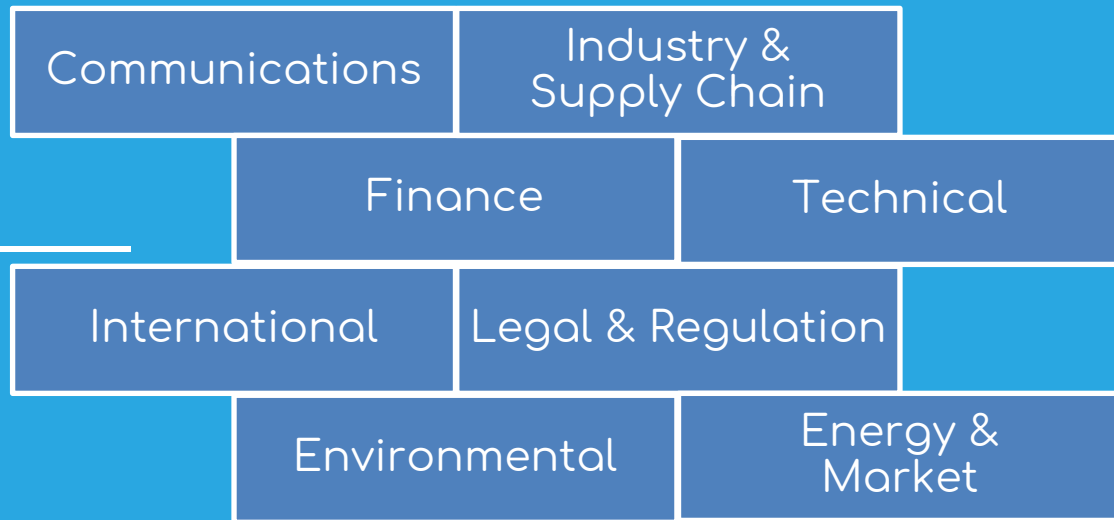
Space Based Solar
Power to help deliver
Net Zero





SEI Activities

Working Groups



Delivering



Build support
with policy
makers and
public



Develop
investable,
integrated
plan



Build capability
and deliver
value



Secure
public/private
funding



International
outreach to
partners



❖ System of Systems approach

❖ Integration of

❖ Space & energy

❖ PESTLE

❖ Requirements & R&D



❖ Build and learn

❖ Learn by doing, fail fast

❖ Build momentum

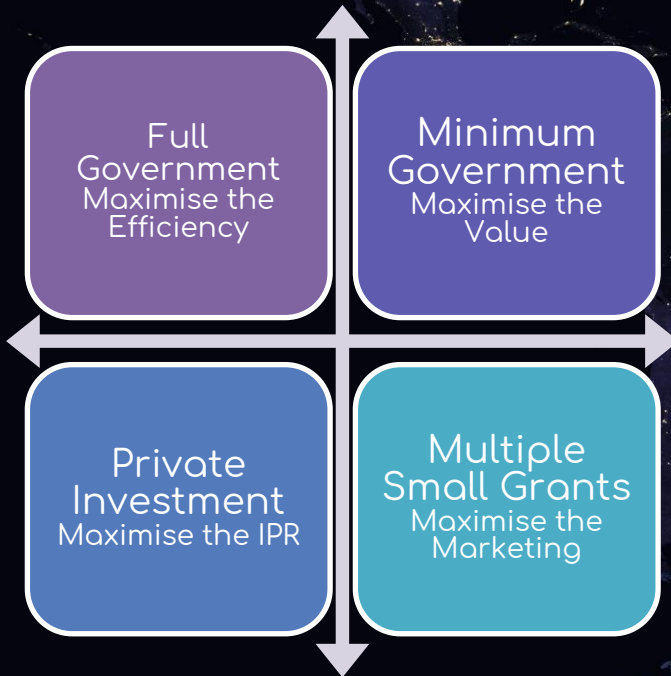


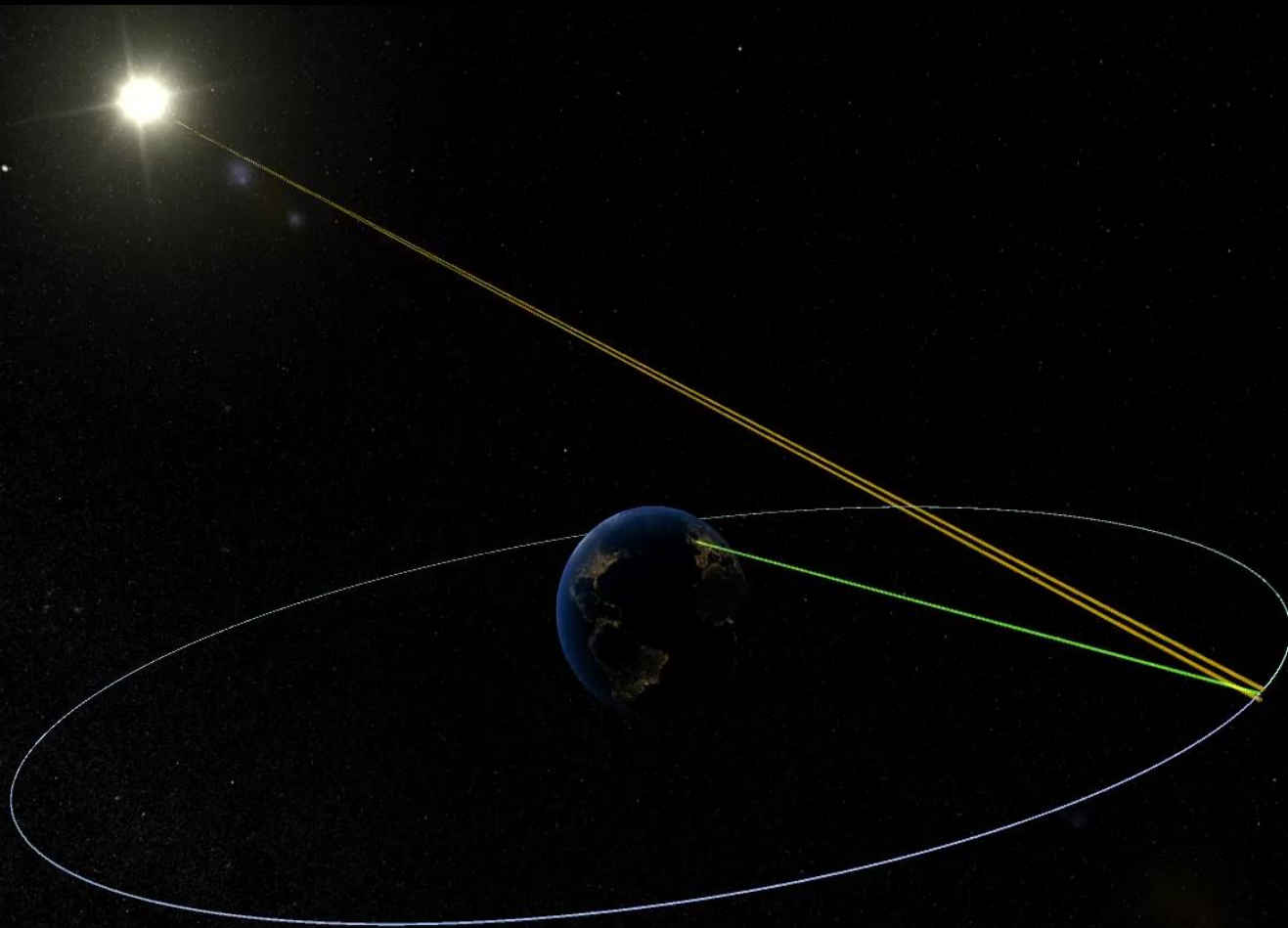
❖ Make the Journey valuable

❖ Technology demonstrators deliver commercial value

❖ Spin-out and spillover

❖ Nested programmes to focus on value generation





We need SBSP to turn Net Zero from aspiration to reality.

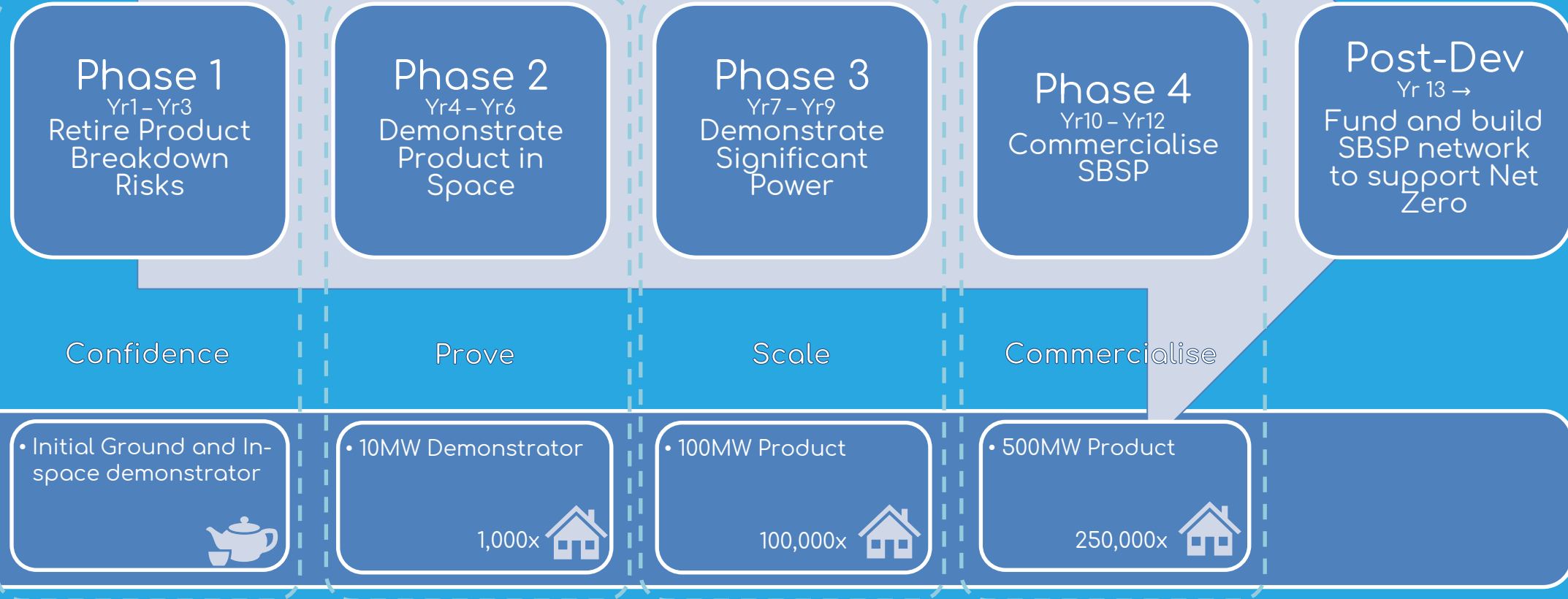
We plan to demonstrate SBSP feasibility with a series of technology products within the next five years, and an operational baseload system within 12 years.

Delivery of >30GW by 2040s

This requires an agile, commercial approach to development.

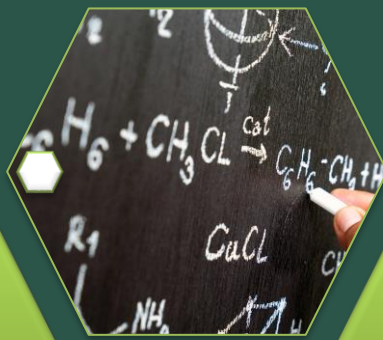


Development Programme





Space Energy Initiative



Logistics

Launch

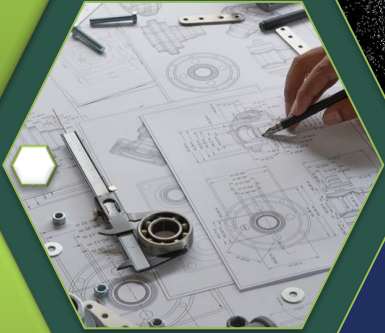
Investment

Regulation



Engineering

Technical



Perception

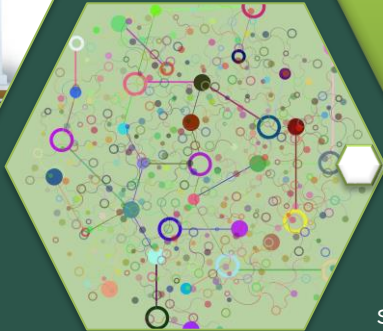
Environment



Complexity



Hostile
Actors



Programme Risk



The Global SBSP Community could come together on:

- ❖ Spectrum allocation
- ❖ Standards
- ❖ Operating Norms
- ❖ Open source results when not infringing IP
- ❖ Encourage capacity (launch, IOSM, manufacturing)

Forums

- ❖ IAA Permanent Committee on SBSP
- ❖ Energy related forum ???



[Video Link](#)

Leadership voices of
support for the Space
Energy Initiative

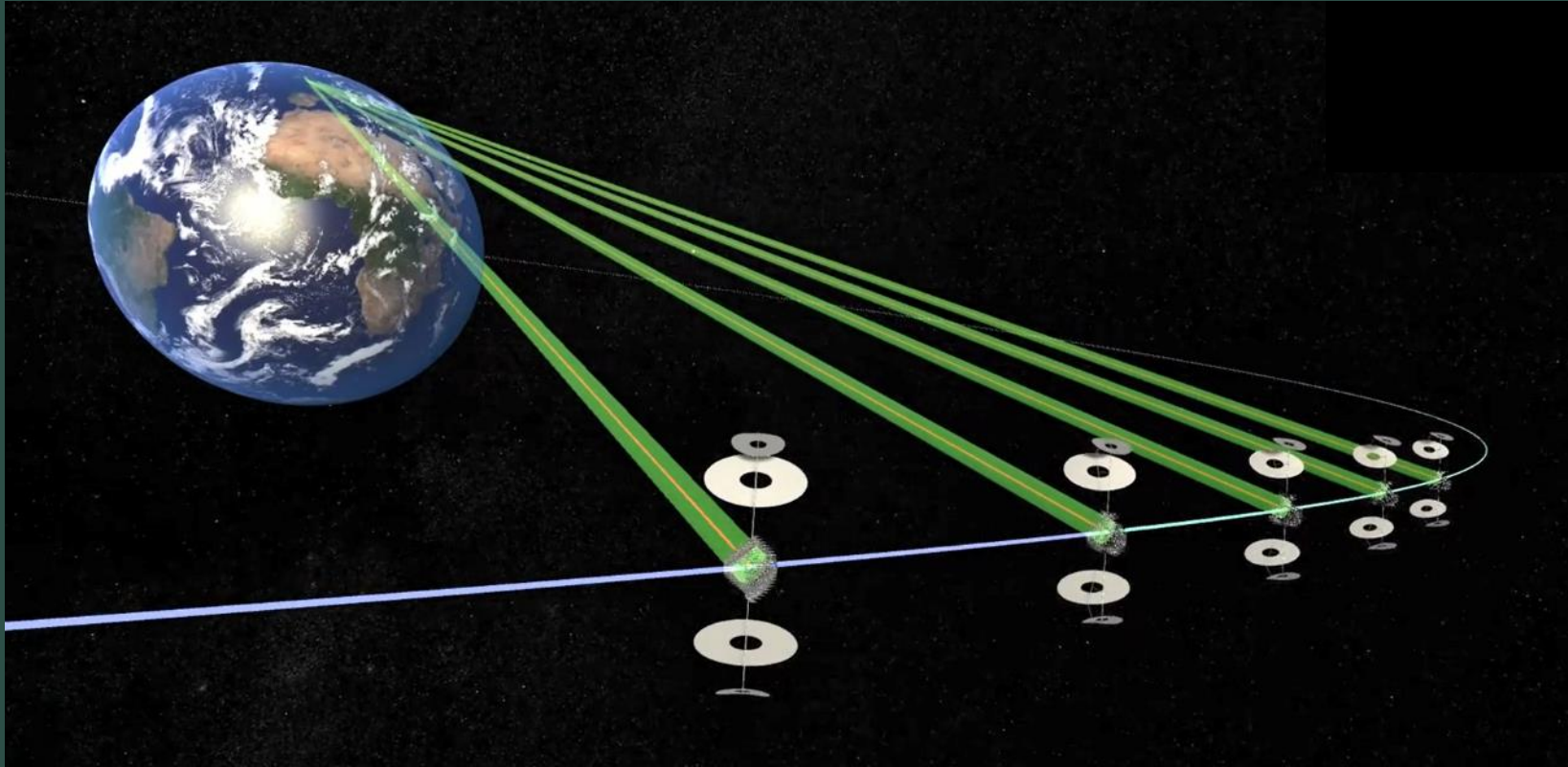


Space Energy Initiative

spaceenergyinitiative.org.uk



Conclusions



“The greatest danger in times of turbulence is
to act with yesterday’s logic.”

Peter Drucker