



Disruption Bytes

Metaverse evolution, powering AI, and LEOs latest

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- ◆ **Metaverse:** A big tech launches its next gen smart glasses. Are transatlantic holographic business meetings the future?
- ◆ **Powering AI:** Can new nuclear tech power AI data centres?
- ◆ **LEOs:** With new entrants to the race, are they ready?

In this free to view update, we look at some recent developments within HSBC's Disruptive Technology theme and any potential implications investors should note.

Metaverse ... We highlight a big tech company that revealed its next generation Ray-Ban smart glasses. The smart glasses upgrade the company's cameras, microphones, speakers, and storage capacity. It includes a new voice assistant feature, so when the glasses are paired with a phone, the wearer can instruct their glasses to call contacts or send them a photo. An incremental stage of normalising wearing a computer on your face ...

Holographic business meetings could be the future. A number of telecommunications companies across Canada, the UK, and the US have come together to complete the first ever live transatlantic holographic meeting. The metaverse jigsaw expands ...

Powering AI ... We have previously highlighted the growing demand for data centres and the environmental concerns that emanate from this rising demand.

We highlight that a big tech cloud player could be exploring ways to meet demand via newer smaller nuclear technology. This is through a technology called SMR (small modular reactors), which could power data centres without emitting GHGs. However, we outline the challenges with SMR nuclear fission technology too.

LEOs ... The LEOs sector has a new European participant, following a merger. Meanwhile, a large tech retailer has just launched its first two test satellites as the company looks to begin rolling out its constellation in H1 2023.

The dominant player in the LEO sector is looking to take another leap forward by launching its fully reusable space launch system for the second time, but has the company addressed previous issues?

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The next generation metaverse

Next-generation smart glasses

Meta has launched its latest pair of smart glasses

On 27 September 2023, Meta, in partnership with EssilorLuxottica, announced improvements to their Ray-Ban smart glasses. The glasses now have a 12MP (megapixel) camera, up from 5MP previously, to take higher resolution photos and videos. And the glasses have an internal storage of 32GB (Gigabyte), which equates to about 500 photos or 100 thirty-second videos. Their new smart glasses were officially released on 17 October 2023 and will cost users USD299 per pair of smart glasses, with an option to upgrade to a pair with Transitions or Polarized lenses for an additional cost¹.

Smart glasses are packaged in a rechargeable case

Meta's new smart glasses weigh around 50 grams and are powered by the Qualcomm Snapdragon AR1 Gen 1 chipset – the same chipset that powered the Quest 2 headset. The glasses have a battery life of four hours and come with a charging case equipped with a USB-C port to provide the smart glasses with up to 32 hours of additional charge. The case takes one hour and 15 minutes to fully charge, but just 22 minutes to charge halfway².

The glasses come with a voice assistant that can be paired with the user's phone

The new glasses have an upgraded microphone system with a five-microphone setup to better capture immersive spatial audio. In addition, they also have upgraded the speakers ... 50% louder than the previous Ray-Ban Stories (Meta's first smart glasses) but with less audio leakage and better sound quality. Meta has also added a voice assistant feature whereby users can instruct the glasses to take a photo or video. The voice assistant can also be used to call one of the user's contacts or send a photo if the user has connected the smart glasses to their smartphone.

Holographic business meetings are here

The first ever live transatlantic holographic meeting has taken place

Vodafone, Verizon, Bell Canada, and Matsuko completed the first ever live transatlantic holographic meeting between attendees in Canada, the UK, and the US via 5G and MEC (multi-access edge computing)³. Unlike in the metaverse where most people are represented via CGI avatars, this meeting used holograms of the attendees. According to the Vodafone press release, the aim of the holographic experience is to increase the range of use cases (e.g. remote healthcare, collaboration, and education).

The users see photorealistic holograms through an extended reality headset

The Canadian attendees operated off of Bell Canada's 5G network, the New York attendees used Verizon's, and the UK attendees used Vodafone's. And the holograms were created via Matsuko's real-time software and a single camera, which streamed the attendees via spatial computing (an immersive technology combining VR and AR). The attendees wear an extended reality headset to observe the live stream of the holograms⁴.

¹ The Ray-Ban Stories 2 is here with a new design, new specs, AI, and a new name, *techradar*, 27 September 2023

² Hands on: Ray-Ban Meta Smart Glasses Collection review – the Ray-Ban Stories 2 in all but name, *techradar*, 27 September 2023

³ Vodafone, Verizon, Bell Canada and Matsuko Make First 5G Transatlantic Collaborative Meeting, Vodafone, 25 September 2023

⁴ Bell Canada, Verizon, Vodafone, and Matsuko conduct first 5G transatlantic holographic collaborative meeting, *Bloomberg*, 25 September 2023

Powering the AI revolution

Demand for data centres is high

More data and compute ... (means more data centres)

We have previously highlighted the water consumption issues from data centres in the United States, which was being compounded by widespread drought conditions. Data centres are comprised of thousands of servers and these servers generate a lot of heat as they process data. Therefore, data centres need to be kept cool, and this is accomplished by pumping water through pipes and heat exchangers. This is because water is a good conductor of heat, and the heat is absorbed and transferred out. Over the last year, AI and LLMs (large language models) have captured the technological zeitgeist and these types of digital applications will add to the growing question of how to power the data revolution in a sustainable way.

Data centres make up 2-3% of global GHG emissions

Data centres are responsible for 2-3% of global greenhouse gas (GHG) emissions, and this figure is rising, according to the IEA⁵. The total volume of worldwide data doubles every two years, and under the current technology stack, data centres required to store, compute, and process this information will naturally demand greater power and water. According to Villanova University, data centres can consume up to 100x more energy than a typical office building and are responsible for c2.8% of US energy consumption⁶.

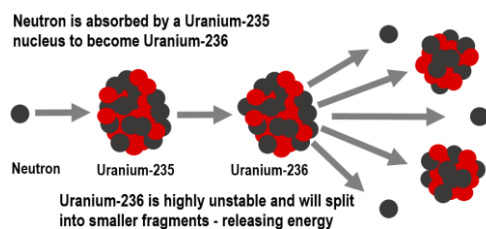
Is Microsoft exploring SMRs to power data centres?

Could nuclear power data centres?

In September 2023, *The Verge* reported that Microsoft is exploring how to use next-generation nuclear reactors to power its data centres and AI infrastructure. The company had listed a job for a Principal Program manager to lead Microsoft's nuclear energy strategy, specifically for someone who can deliver a number of small modular reactors (SMRs)⁷.

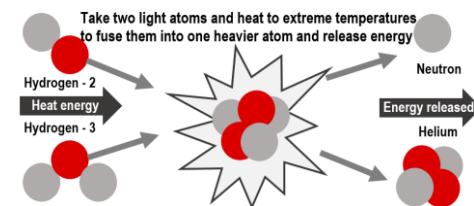
SMRs are nuclear fission (see chart below) reactors that are smaller than traditional nuclear reactors. They can be built in one location, then transferred and operated in another location. In nuclear reactors, a neutron is absorbed by a uranium nucleus (Uranium-235) causing the nucleus to become Uranium-236 – which is highly unstable. The nucleus splits into smaller fragments, energy is released, and neutrons go on to collide with other uranium nuclear (i.e. a chain reaction).

How does nuclear fission work?



Source: HSBC

How does nuclear fusion work?



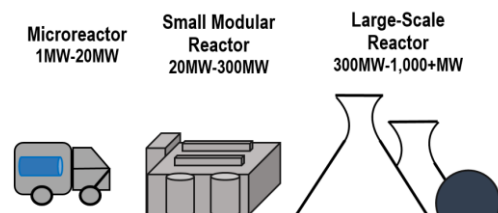
Source: HSBC

⁵ How to Make Generative AI Greener. *Harvard Business Review*, 20 July 2023

⁶ Proposing Solutions to Data Center Inefficiency, Villanova University

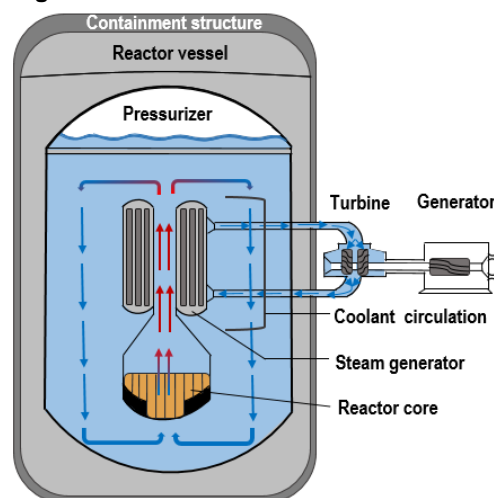
⁷ Microsoft is going nuclear to power its AI ambitions, *The Verge*, 26 September 2023

Nuclear: micro to large scale



Source: HSBC

Light water SMR



Source: HSBC

First regulatory certification in the US came in 2023

France wants SMRs by 2030

Eastern Europe is in the process of expanding nuclear capacity to replace coal

SMRs are expected to cost around GBP2bn each in the UK

China became the first country to connect an SMR to its energy grid

Canada, the UK, and the US also have national strategies to deliver SMRs

In January 2023, a public US-listed SMR company had its SMR design certified by the US Nuclear Regulatory Commission (NRC). The company's SMR power plant can host up to 12 power modules, each one third of the size of a large-scale reactor⁸. Each module is capable of generating 77MW of electricity, meaning the total output for the plant could reach 924MW of electricity⁹. France also has plans to invest in SMRs, allocating EUR1bn to develop SMRs by 2030¹⁰.

The United States appears to be encouraging eastern European countries to transition away from coal and towards SMRs. In 2022, at COP27, Project Phoenix was announced, which includes USD8m worth of grants available to 17 central and eastern European countries¹¹.

SMR cost and funding examples

To provide some context and magnitude of the costs involved in building SMRs, it is expected that the UK's government's investment into SMR's in the UK will cost approximately GBP2bn per SMR. This is compared to approximately GBP20bn for large nuclear power plants such as Hinkley Point and Sizewell. One of the SMR providers has said that its power stations would take up c10% of the space of a conventional nuclear plant and could generate 470MW of power¹².

Bloomberg reported in December 2021 that China had become the first country to connect an SMR to the power grid. This forms a part of China's wider energy strategy, which includes plans to inject USD440bn into new nuclear plants over the next decade and a half to become the worlds' largest generator of nuclear power¹³.

Other countries with SMR ambitions include Canada, the UK, and the US. Canada has released a 27-point SMR national action plan; the US and the UK have also provided funding and grants to various SMR companies.

The full note delves deeper into the rising costs of SMRs, a comparison between prices for different energy sources and balancing the risk/reward of SMRs. Please contact your HSBC representative for more details.

⁸ NRC Certifies First U.S. Small Modular Reactor Design, Office of Nuclear Energy, 20 January 2023

⁹ NuScale: Small Modular Reactor Fact Sheet

¹⁰ French small reactor plans under fire, DW, 22 October 2021

¹¹ US furthers overseas support for coal-to-SMR projects, *World Nuclear News*, 8 September 2023

¹² Rolls-Royce gets funding to develop mini nuclear reactors, *BBC News*, 9 November 2021

¹³ China is Home to World's First Small Modular Nuclear Reactor, *Bloomberg*, 21 December 2021

New competition in the LEOs sector

A new European participant has formed in the LEO market

A new European LEO competitor

In a previous report, we discussed the history behind the Eutelsat and OneWeb merger. In September 2023, the companies officially merged to become Eutelsat Group. Eutelsat Group is listed on the Euronext Paris Stock Exchange and has applied for a secondary listing on the London Stock Exchange. OneWeb will operate as a subsidiary and will be referred to as Eutelsat OneWeb and remain headquartered in London. In a prior edition of *Disruption Bytes*, we discussed OneWeb's deployment of its LEO constellation, which took place in March 2023, and it is set to offer services globally by end-2023¹⁴.

The new company will target enterprise customers

Eutelsat focuses on enterprise customers rather than consumers, using geostationary orbit (GEO) satellites. OneWeb also targets enterprise customers via its LEO (low earth orbit) satellites constellation. According to CNBC, the new Eutelsat Group will seek to create synergies between Eutelsat's existing network of density and high throughput GEOs and OneWeb's growing constellation of low latency connectivity LEOs¹⁵.

Amazon successfully launched two test satellites into LEO ...

Amazon's Kuiper constellation has lift off

In October 2023, Amazon launched its first two internet satellites into orbit, taking the first steps to building out its 3,000-plus Kuiper LEO constellation. The satellites were launched from Cape Canaveral, Florida on an Atlas V rocket operated by the United Launch Alliance (a joint venture of Boeing and Lockheed Martin). Amazon will use the satellites to collect real-world data from low earth orbit to build on its years of field testing.

... And plans to roll out the first of its constellation in H1 2024

The company must launch at least half of its 3,236 constellation by July 2026, as per its licence with the US Federal Communications Commission (FCC)¹⁶. Amazon has confirmed that the first production Kuiper satellites are set to launch in H1 2024, which will allow Amazon to begin beta testing of its network by end-2024¹⁷.

SpaceX is still the global leader in the LEO sector

SpaceX Starship could launch again in the next month

SpaceX remains the leader in the LEO sector, having nearly 5,000 satellites constellation in low earth orbit, with the company having already launched 70 times so far this year – an advantage of its redeployable Falcon 9 rockets. The Starlink constellation is operational in more than 60 countries with more than two million active customers¹⁸. Starlink added 500,000 customers between the beginning of May 2023 and the end of September 2023¹⁹.

The FAA concluded its investigation into the first Starship test launch

In a past edition of *Disruption Bytes*, we covered the first launch of SpaceX's Starship rocket. Despite having exploded mid-air, it was classified as a success by SpaceX because the mission proved the rocket could ignite and clear the launch pad's 500ft tower. Following the incident, the US Federal Aviation Administration (FAA) conducted an investigation (concluded on 8 September 2023) which identified "multiple root causes" and highlighted 63 corrective actions SpaceX must implement before a second launch can occur²⁰.

SpaceX has taken corrective actions and awaits a new FAA licence

On 10 September 2023, SpaceX had completed 57 of the 63 corrective actions and noted that six of the actions refer to flights at a later date²¹. On 13 September 2023, the FAA's acting administrator revealed that they were optimistic that the FAA could issue a licence for a new Starship launch sometime in October 2023²². SpaceX will also require approval from the US Fish and Wildlife Service before the next launch²³.

¹⁴ Eutelsat completes multi-orbit OneWeb merger after shareholder vote, SpaceNews, 28 September 2023

¹⁵ Eutelsat and OneWeb combine to create European satellite giant as Musk's Starlink pressures sector, CNBC, 28 September 2023

¹⁶ Amazon launches first internet satellites in bid to compete with Starlink, The Washington Post, 6 October 2023

¹⁷ Amazon launches first internet satellite prototypes, CNBC, 6 October 2023

¹⁸ Amazon launches first internet satellites in bid to compete with Starlink, The Washington Post, 6 October 2023

¹⁹ Starlink Surpasses 2 Million Subscribers, Satellite Today, 25 September 2023

²⁰ US could advance SpaceX license as soon as October after rocket exploded in April, Reuters, 13 September 2023

²¹ SpaceX completes required 'corrective actions' ahead of 2nd Starship flight, Elon Musk says, Space.com, 12 September 2023

²² US could advance SpaceX license as soon as October after rocket exploded in April, Reuters, 13 September 2023

²³ SpaceX could get license for 2nd Starship launch in October, FAA says, Space.com, 14 September 2023

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