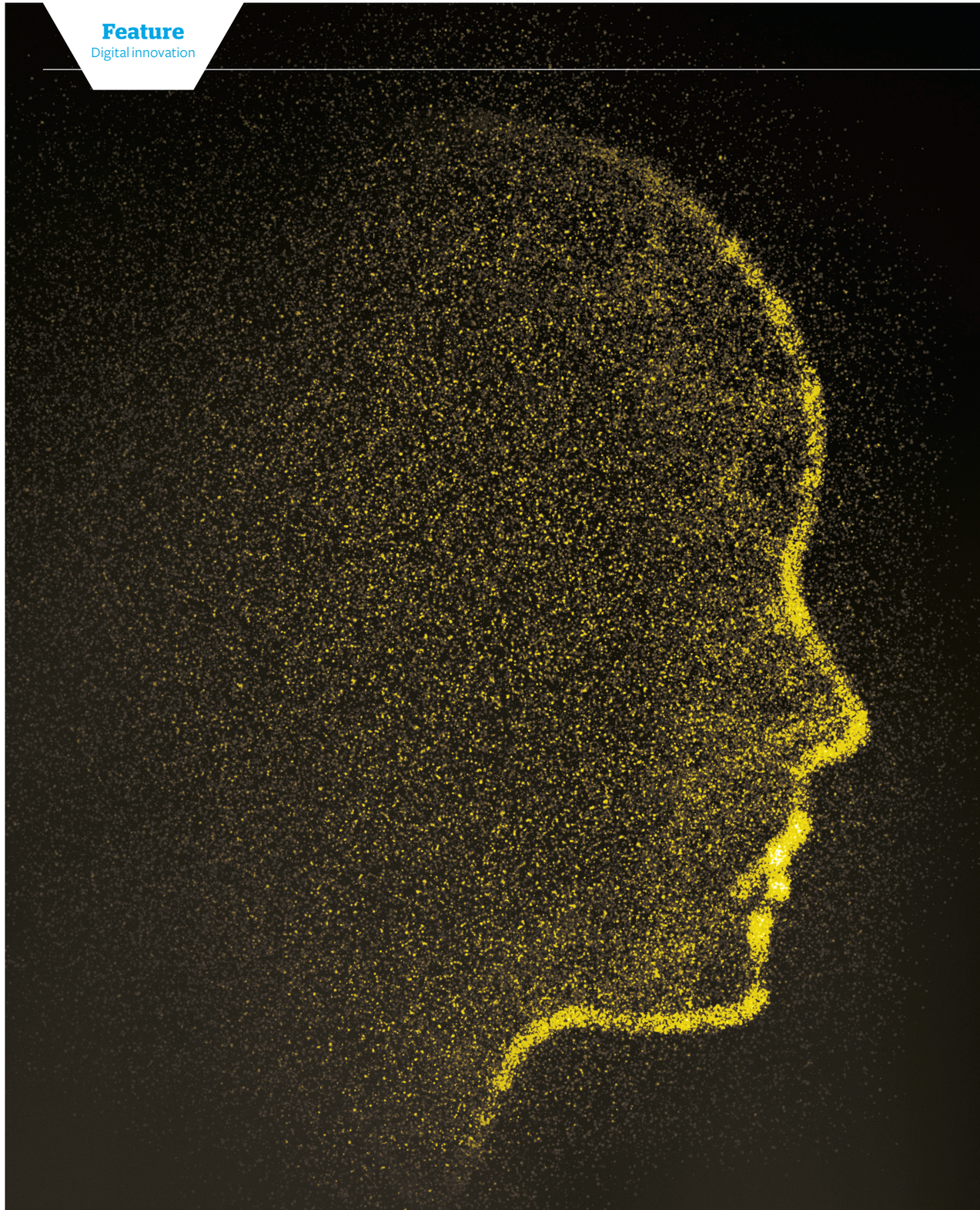


Artificial intelligence powers up

Lucy Woods looks at how artificial intelligence and other advanced digital technologies will reshape the energy sector

In 50 years' time, many energy sector jobs could be made quicker and more efficient thanks to upcoming technology.

By 2050, BP's Energy Outlook 2018 predicts that digital technology improvements – from holograms to self-healing machines – could reduce energy sector costs by 20–30%. The newest of these innovations include light fidelity (LiFi), optical computing, power over WiFi, and quantum sensors.

Light fidelity

LiFi is the ability to send data via LED light beams. Instead of using radio waves (which are used for WiFi), LiFi uses visible light waves to send data to a photo sensor, which then converts the information back into readable data.

In a few years, the energy industry could use LiFi as a more secure, faster alternative to sending data via WiFi.

Max Shtein, materials science and engineering professor at the University of Michigan, told Energy Focus that LiFi 'could produce decent bandwidth' and will most likely be seen in the near future being added to 'light infrastructure that's already been deployed' due to the low cost of integrating LiFi with existing LED devices.

IMAGES: Science Photo Library/iStock

Optical computing

Optical computing uses light to transfer data; computers today send information via electrical currents, which limits how fast information can be sent, read and understood.

> Optical computing could improve grid stability, making it easier to utilise less predictable forms of renewable energy, such as wind and solar

According to Shtein, using photons instead of electrons to send data could allow computer tasks to be completed thousands of times faster than they are today. This increase in computing speed could allow grid operations to react faster to disturbances or fluctuations, and to balance energy demand and supply – improving grid stability, and making it easier to utilise less predictable forms of renewable energy, such as wind and solar.

Power over WiFi

Routers leak energy when sending a WiFi signal. Researchers at the University of Washington asked: what if this power could be harvested instead? What if WiFi hotspots could double up as wireless charging spots?

While it will take decades of testing before it becomes widely available, and devices need to remain close to the router to recharge, power over WiFi (PoWiFi) could be used as a backup power supply for smaller

devices within a few short years. Small devices used in the energy industry, such as sensors, could be recharged using PoWiFi, explains Shtein.

Quantum sensors

Quantum sensors can detect tiny, distant waves given out by atoms and ions and then read those waves with incredible accuracy. Sensing quantum waves from deep underground is challenging for today's tech, but as quantum sensors are developed further for industry, this tech could greatly advance navigation and mapping, including the mapping of underground resources such as water and oil.

If sensors can be 'sufficiently miniaturised and deployed on various autonomous vehicles or drones, it could provide a lot of information about the distribution of minerals and the types of materials in the world', says Shtein.

Artificial intelligence in energy

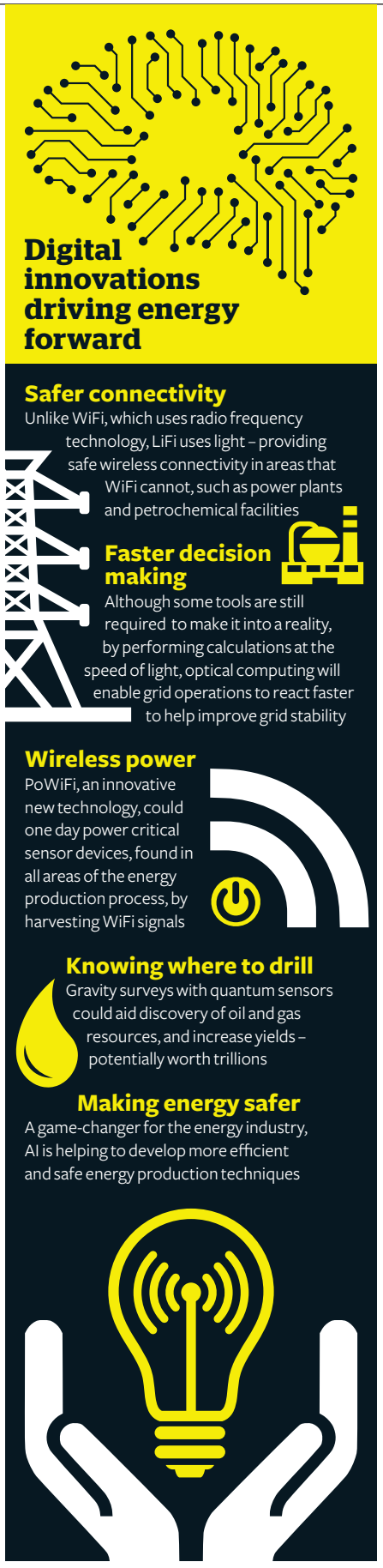
One other technology the BP report highlights as an area to watch is artificial intelligence (AI). Smart robots are already making labour safer and easier by completing tasks in hazardous environments such as offshore rigs and nuclear power plants.

Offshore rigs can be hostile places for humans – cold and wet, with exposure to chemicals, risk of explosions, and isolated work conditions. Getting staff there and back is expensive and difficult, requiring helicopters, boats and ferries.

International robotic solutions team ExRobotics has developed autonomous inspector robots that could lessen danger and save time, labour and money. The robot is fitted with caterpillar tracks; it measures temperature, vibrations and emissions and takes pictures and videos, analysing and identifying dangerous leaks or faults.

Similar robots may also assist with decommissioning plants and rigs in the next few years, says Dorian Scholz, AI Researcher for Energy Robotics (the team that creates the software for ExRobotics).

To safely decommission seven nuclear reactors in Germany by 2022, robot creators are competing at the European Robotics Hackathon, held in July this year at the Zwentendorf nuclear power plant in Austria. The primary aim of these robots is that in the next 50 years, 'humans do not need to be in unsafe areas anymore', says Scholz.



What if WiFi hotspots could double up as wireless charging-spots?

Limitations of artificial intelligence

AI is developing rapidly, but it is still in its infancy; it will take years of research before robots are commonplace. 'Most robots are still floored by carpets or steps,' says Bill Mitchell, Head of Policy at the British Computer Society. AI is firmly in the 'narrow' intelligence category: unable to complete multiple tasks similarly to, or better than, humans.

To advance the technology available to the energy industry, lots of people need to be adequately trained, says Scholz, and pathways for academics to enter the energy sector made attractive, says Mitchell. Funding and skills gaps 'make it tricky to maintain a consistent talent pipeline from academia to industry', adds Shtein.

One way the UK energy sector could fill the demand for tech talent is by encouraging more women and people from minority groups or less traditional education backgrounds. 'Diversity at the moment is poor,' says Mitchell. 'It's a massive problem.'

'There could be more women,' says Scholz. He describes energy tech as 'a boys club at the moment – but it does not need to be'.

Hopes for the future

There are misconceptions in the speed of development when thinking about the future of AI, says Scholz. Technology development 'over the years tends to be very disjointed', says Shtein, giving the example of the 'out of sync' development of solar cells, followed by battery technologies.

The take-up of new technologies 'will be slow', adds Scholz; it will take 'maybe 20 or 50 years until robots are doing everything'.

But the main question for increasing tech use in the energy sector is 'a social question', says Scholz: 'How do we work with more robots and less people so that humans will do less intense laborious work and more fulfilling, interesting and creative work that we like?'