

Advisory Outlook

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Clarity from above

Drone technology creates new opportunities for power and utilities sector.



How is technology reshaping the power & utilities sector?

The power and utilities sector is on the verge of a digital revolution and faces numerous new challenges. Due to increasing social pressure to shift from fossil fuels to renewable energy sources, while simultaneously bringing energy prices down, the sector is trying to find new ways to maintain profitability.

Existing business models are being disrupted by the growth and decarbonized generation and the popularity of electric vehicles. Both trends are shaping how energy is produced, distributed and consumed, and are forcing industry players to reinvent their business models. Technology development is enabling already well-proven innovations such as drones and digital technologies to be harnessed in order to increase the reliability of producing, transmitting and distributing energy. At the same time it is helping to bolster cost efficiency and to streamline maintenance and management processes.

The only limitations lie firstly in choosing the most suitable technologies to meet companies' current and future needs, and secondly in applying them in a way that achieves the most desired outcome. The purpose of this article, therefore, is to offer some insight into the existing technological capabilities of drone applications relevant to the power and utilities sector.



Drone technology applications in the power & utilities sector

New technologies such as drones create a whole array of new opportunities for companies involved in both the energy production sector and the transmission or distribution sectors, as well as for companies involved in water industry. UAVs (Unmanned Aerial Vehicles) can be used in monitoring and maintenance of all types of power & utilities production facilities, and thanks to special sensors, they not only capture the current state, but also provide analysis of numerous factors influencing operation of the facility. PwC estimates the addressable market of drones powered solutions in the power & utilities market at USD 9.46 billion.³ Drones can live-stream high-definition or infrared video, as well as take detailed high-resolution images, which are later processed to photogrammetry products. For instance, a thermal camera may help identify overheating parts of infrastructure, or spots that require further action. Analysis can be performed on multiple types of infrastructure – e.g. energy towers (poles), water management infrastructure, wind farms and photovoltaic panels.

The potential of drones to assist in maintaining power & utilities networks is even greater. Maintenance of assets spread across a vast area, accessing hard-to-reach infrastructure and execution of dangerous inspection procedures normally performed by humans, or by expensive

helicopter or airplanes, can all be replaced by drones. UAVs beat other technologies by making inspections cheaper, faster and safer. They also allow greater precision and better access to hard-to-reach places. Predictive maintenance, focused on minimising network failures and damage, is also of great importance. Most importantly, drone-based inspections can be performed without having to halt the power supply. Such advantages are crucial, as more and more countries are implementing regulations awarding financial incentives to companies that improve reliability or imposing penalties on those that fail to meet targets. PwC has calculated the global value of incentives related to improving reliability of power supply systems at USD 609.3 million.

Undoubtedly, implementation of drone technologies in the power & utilities sector, especially in the maintenance process, can help make more of the incentives and savings attainable. However, the choice of a particular drone technology has to be adjusted to specific business needs, as there is a great variety of technologies on offer and their benefits vary. Regulations regarding drone use, as well as potential constraints created by a lack of drone-related regulations, or their limitations, must also be taken into account.

Drones can be applied in the following areas:

1. Pre-construction and investment monitoring

Worldwide demand for energy is growing rapidly, increasing the need for infrastructure. Large transmission and distribution networks require the implementation of new technologies for effective investment management. Emerging technologies such as drones may become a useful tool for monitoring both the pre-construction and the construction phases of investment projects.

2. Asset inventory & maintenance management

The power & utilities sector is highly capital-intensive due to the significant infrastructure it requires, which has to be maintained and upgraded to guarantee continuous supply of electricity. Unsurprisingly, one of the biggest costs for P&U companies is operating and maintaining infrastructure such as power plants, electrical substations and power lines. Despite incurring all these costs, every year the power & utilities sector loses USD 169 billion⁵ due to energy network failures and forced shutdowns. Innovative organizations might find that the ongoing digital transformation and emerging technologies such as drones offer dedicated solutions to address their maintenance and asset inventory issues.

3. Vegetation management

Tree branches or other vegetation making contact with power lines are the main cause of power outages. In most countries, vegetation management, defined as monitoring the forestry conditions and trimming trees, is the single biggest maintenance cost for power & utilities companies. By applying innovative technologies and redesigning vegetation management processes, industry leaders can improve the efficiency of trimming and repair services, as well as preventing future losses caused by falling trees and growing plants.

4. Enhancing water quality monitoring

Water quality monitoring is an important but challenging task, due to the time-consuming and labour-intensive methods of collecting and analysing water samples. Today, satellite images are being used to estimate some parameters (e.g. turbidity or cloudiness, chlorophyll content), making it more practical to analyse larger areas. However, the lower spatial resolution of these images often limits their applicability for monitoring smaller water sources (like streams), where conservation efforts are actually focused. Moreover, there are a number of additional challenges to remotely monitoring water quality by satellite: small streams are hard to see, there is limited control over when the

satellite collects data, and most importantly, turbidity tends to be highest shortly after rain, when it is often too cloudy to see streams from satellites. By applying UAVs with infrared cameras, scientists, employees of water services companies and government officials have the ability to monitor water areas remotely at a higher spatial resolution than ever before, at low cost and at any time. Drones might also be used for mapping and inspecting water supply infrastructure consisting of numerous as well as extensive: pipelines, sewage and drainage channels.

What are the opportunities for and challenges to drone powered solutions?

Opportunities

Regulations

Legal regulations sometimes constrain advances. Some countries have already started to develop a comprehensive regulatory framework to enable drone flights and deal with insurance of UAV pilots and aircraft, thus preventing certain problems in the implementation of solutions using drones. Changes in drone regulations, especially permission to perform BVLOS flights, will open up new opportunities for the Power & Utilities sector and others, and allow drones to perform increasing numbers of operations.

Technology Development

Drone producers are constantly innovating and improving performance and adding new functionalities. Battery life will be one of the major issues, as improvements in this area will allow for longer flights, processes to be accelerated while cutting costs even further. Although camera resolution and sensor parameters are already impressive, further developments will allow data to be gathered with a higher level of precision, opening up new opportunities and allowing for analysis of details that were not previously recognisable.

Automation

Automation will bring greater precision, better adjustment of flight parameters, reduced exposure to human error and decreased costs. It will also open up a new array of opportunities for the drone sector, and enable the development of an increasing number of innovative solutions and possible use cases in other sectors.

Challenges

Operational Safety

The use of drones brings not only benefits but also concerns about operational safety. The rising use of drone technology increases the number of aviation accidents and ground collisions. Human error, loss of signal between drone and pilot as well as technical errors can lead to incidents that pose a real danger to public safety. For power & utilities companies, a drone crashing into power lines could cause blackouts and serious damage to energy infrastructure. The risk associated with drone operations demands that safety systems be applied to ensure detection of risks and prevention of accidents.

Data & Security

As drones capture detailed data about power & utilities infrastructure, there is a growing risk that confidential information could be hacked. This concern requires the implementation of data security systems to ensure effective protection. Data gathered by drones are usually transmitted to the cloud via Wi-Fi or Bluetooth, which increases exposure to cyber-attacks. As a result, drones are extremely vulnerable to cyber threats. Hackers may make use of unsecure connections to gain control of a drone's interface and obtain sensitive data. To tackle this problem, security systems that control the safety of data and connections need to be developed.

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<https://www.pwc.pl/drones-for-power-sector>



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