



Essex County
Fire & Rescue Service

Strategic Assessment of Risk

Technological Risk

About

Digital transformation and changes to communication methods have accelerated due to the COVID-19 pandemic. These have provided opportunities, whilst also challenging how we deliver core services, and considering how vulnerable we are to cyber-attacks.

IT systems and digital technologies offer the opportunity to deliver better outcomes for our staff and communities. Digitisation can provide smarter, more effective ways for us to operate. This can be through streamlined management systems that enable effective, efficient communication, document management and creation and tools that securely record data. IT systems are now also enhancing operational capability at incidents with many emergency technologies that have been developed to improved firefighter safety and reduce the risk to members of the public.

Within this chapter of the Strategic Assessment of Risk, the following areas will be considered:

- Cyber
- Emerging Technologies
- Communications

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CYBER

CYBER SECURITY

The Service is aligned with the National Cyber Security Centre’s Cyber Essentials in conjunction with guidance from the National Fire Chief’s Council which is conducting an assessment of all fire and rescue services against the National Cyber Security Centre’s Cyber Assessment Framework.

The Service is subject to multiple malicious outsider attacks on a daily basis, to date, none of these malicious attacks have been successful in breaching the control measures in place. These controls are a network topology which includes firewalls, restrictions, malicious software identification and malware detections. Whilst these are the highest risk to the Service’s ICT network, for them to be successful individual users would need to assist by clicking on malicious links.

Top Attack Vectors 2021 vs 2020

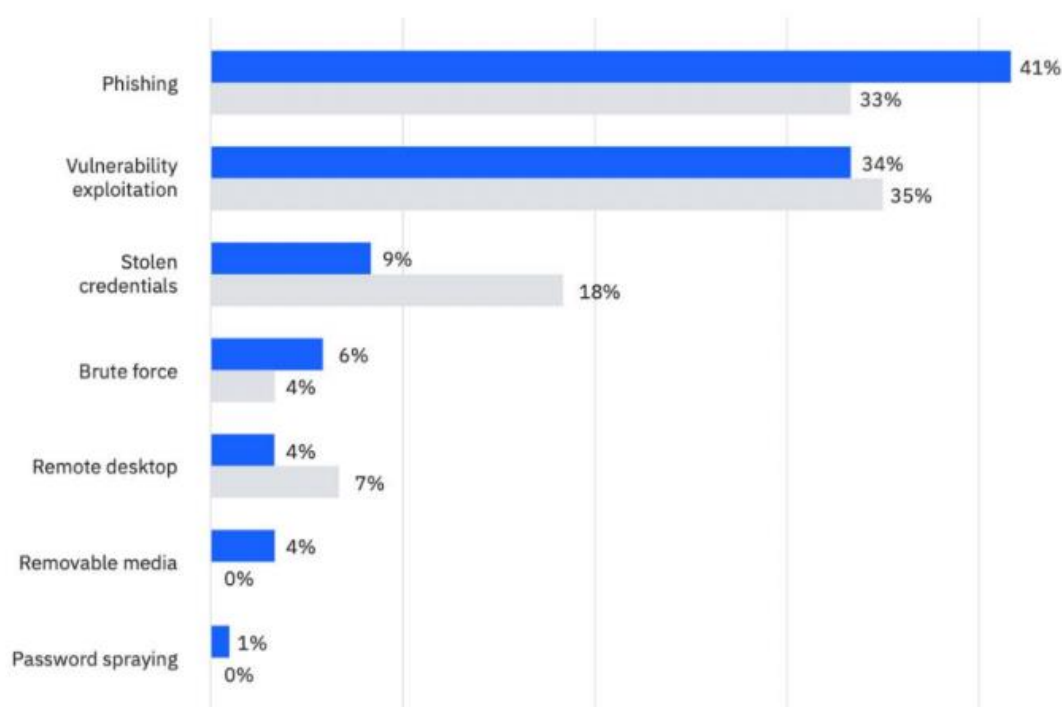


Figure 1: Source IBM Security X-Force 2023

As shown in Figure 1, IBM’s Security X-Force assessment for 2023 shows the top attack vectors over a two year period. Malicious outsider attacks are only successful if both the Service user clicks on a suspect link such as a phishing or spear phishing email and the Service security patches are out of date.

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The Service's ICT Department works to ensure that attacks as perpetrated towards users to enable system access are mitigated through training, education and support. Whilst the threat of a malicious insider attack is mitigated through the restriction of administrator access this is currently not implemented as effectively as it could be and steps to improve this and reduce the threat could be considered by the ICT Management Team.

Where the Service invests in new technology there will always be risk as end users become more proficient in the software ahead of ICT staff. The increasing pace at which technology is evolving in conjunction with the Service need to change provision to maintain an effective service delivery leaves staff with a continual requirement for training and support both as end users and ICT staff.

Additionally, staff utilise non-ICT managed consumer technologies such as WhatsApp for daily processes and procedures. Whilst these may be viewed as the simplest solution to the issue faced, consideration must be taken of the inability of the ICT Department to support these technologies, provide any backup or restore facilities, or control access to the data held or shared through them.

DATA SECURITY

As the Service continues to develop its use of the applications available through Microsoft Office 365, the potential for malicious or accidental exposure of data is an increasing risk. This is due to the nature of Microsoft and its ability to give individual users greater control and flexibility in what they are able to achieve. The governance for these applications is now an area which requires further discussion between the ICT and Information Governance Departments to determine best practice going forward.

Data control and governance therefore must now be owned by individual users who may have little to no ICT or Data Security knowledge. One example of this is the diverse use of Microsoft Planner to capture, record and provide auditable evidence for action driven tasks. This platform has no backup or restore ability, and the Service model has shifted so that data owners rather than ICT must take responsibility for this potential failure or consult with ICT prior to engaging a piece of work to determine the best solution available.

As part of the new model for users to be data owners, there needs to be greater engagement between data owners and ICT to ensure a full awareness of the risks associated with each new application.

EMERGING TECHNOLOGIES

ALTERNATIVE FUEL FLEET VEHICLES

The UK Governments strategy intends to end the sale of new petrol and diesel vehicles by 2030 and for all new cars and vans to be fully zero emission at the tailpipe by 2035. The Service must constantly monitor and adapt its fleet purchases to ensure a compliant, yet effective fleet is maintained within budget allocations.

As part of the Fleet Strategy (2021) the commitment to not purchase diesel vehicles where possible has provided the opportunity for the Service to review and consider alternatively powered vehicles for its purposes.

Under review by the Fleet Management Team is the newly emerging use of hydrogen fuelled vehicles, with JCB developing a 7.5 tonne vehicle using hydrogen fuel. The application of this technology could be beneficial to future fire appliance models. Currently in production are a hybrid diesel and electric appliance by Rosenbauer, a fully electric appliance by Emergency One being trialled by London Fire Brigade and a hydrogen powered appliance by ULEMCo Ltd being trialled by Oxfordshire County Fire & Rescue Service. Consideration will need to be taken to the cost of the new appliances (approximately £1M for an alternative fuel versus £300k for a diesel fuel) and the lifespan of ordering in new fleet vehicles (6 years replacement scheme for cars and vans, and 15 years replacement scheme for appliances).

In addition, the Fleet Management Team are reviewing the equipment and training required for working on alternatively fuelled vehicles. The current fleet team are trained to Level 2 but will need to be trained at Level 3 with the appropriate tools and equipment to match in order to maintain an alternatively fuelled fleet. A user needs assessment should be undertaken to ensure the makeup of fleet vehicles is efficient and effective, ensuring the fuel type, range and capacity of each vehicle is suitably matched to the job it is required for.

The Service has recently ordered 20 Plug-In Hybrid vehicles for use by Officers and to be used under Blue Light driving conditions, these are due for roll out by the end of May 2023. However, the Service does not yet have sufficient electric vehicle charging points situated across its estate to support these fleet vehicles. Consideration should also be taken in regard to the potential risks associated with introducing electric vehicle charging points to the Service infrastructure and its electricity supply.

It is also noted that the current Blue Light Driving training and qualification is done through a manually operated vehicle, whereas all alternatively powered vehicles are

automatics. This alternative transmission system leads to a change in driving style which could pose a risk when driving at high speeds.

Where the Service has a requirement under the National Emergency Fuel Plan to be self sufficient with fuel supplies for up to 10 days in a national shortage, consideration will need to be taken in relation to storing and providing appropriate alternative fuels. Both electrical and hydrogen based vehicles require electricity to maintain the fuel supply. Hydrogen would be required to be stored under pressure or produced locally. The current diesel bunkers would not be suitable for storing either alternative fuel source.

ELECTRIC VEHICLES

SMMT provide monthly and annual data sets on vehicle ownership within the UK. The tables below provide visual representations of the changing landscape of vehicle ownership in relation to fuel type. The tables include reference to:

- MHEV – Multi Hybrid Electric Vehicles
- BEV – Battery Electric Vehicles
- PHEV – Plug-In Hybrid Electric Vehicles
- HEV – Hybrid Electric Vehicles

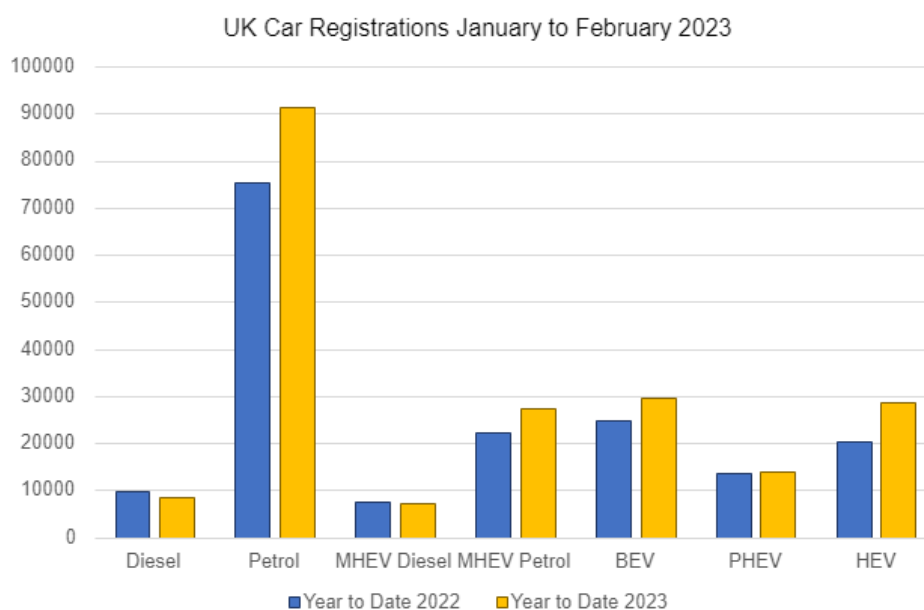


Figure 2 Source: [UK new car registration data, UK car market - SMMT](#)

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There is evidence that new car ownership is transferring from traditional fuel types of diesel and petrol to alternative, electrically powered vehicles. There are known risks related to electrical vehicle fires, including:

- Requiring considerably more water to extinguish an electric vehicle fire than a traditional fuel vehicle fire.
- The release of toxic and flammable gases when water is applied to the Lithium-Ion battery cell.
- The Lithium-Ion salts within the battery cell release toxic gases as their temperature increases.
- The batteries are sealed units with firefighters unable to view the internal combustion process, potentially leading to pockets of undetected pressure.
- High pressure, flammable jets are known to piece through the battery shell.
- Water used to extinguish the battery fire will become contaminated with toxins and cannot re-enter the natural water table.
- Batteries need to be submerged and monitored for up to 72 hours following extinguishing the primary fire to prevent reignition. Although reignition has been recorded 5 days after the initial fire.

Reviewing the tables below, with data supplied by SMMT, there is evidence that the choice of vehicle fuel is continuing to change and develop into a predominantly alternative fuel based economy. The projections for 2023 and 2024 highlight the decreasing use of diesel vehicles compared with electric based models.

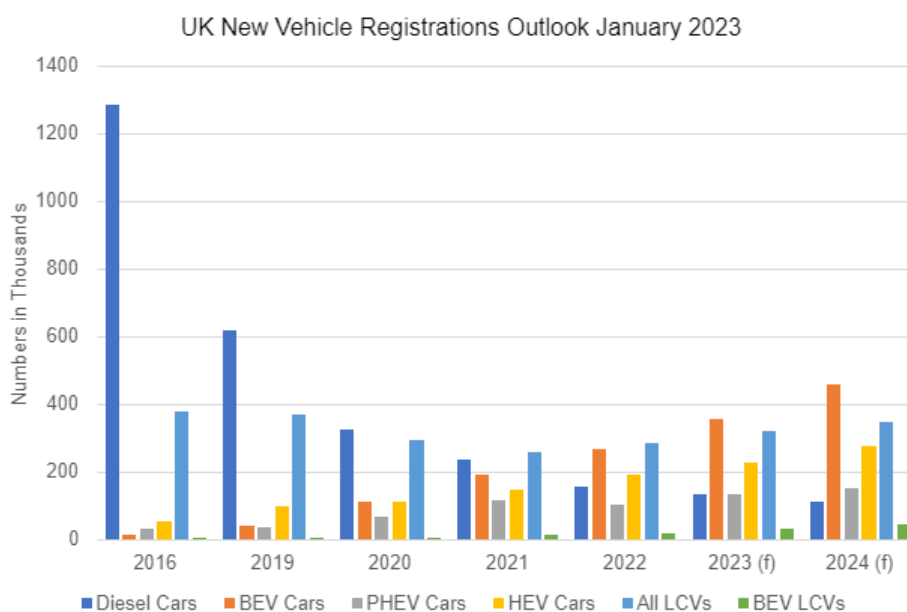


Figure 3

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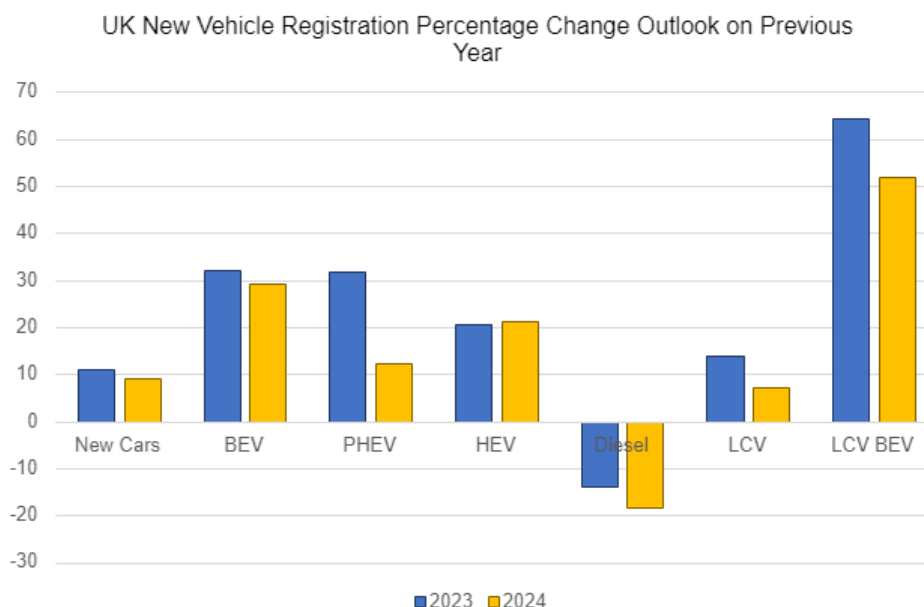


Figure 4 Source: [Guidelines \(smt.co.uk\)](https://www.smm.co.uk/guidelines)

The Service is proactively engaging with vehicle manufacturers to understand the technological advances and the risks inherent with them. Technical advice and guidance are being sought in relation to size and scale of alternatively powered vehicles when firefighting or responding to a road traffic collision.

The Service is also considering other forms of alternatively powered vehicles such as e-scooters and e-bicycles which are more likely to be charged in the home without specialist charging facilities creating a risk to households.

GREEN INFRASTRUCTURE

The Service established an Environmental Hub in 2007 to discuss environmental issues and technological changes. The Environmental Hub is a collaboration between Property Services, Fleet Services, Technical Services, Essex Police and external consultants. It remains an open forum for all employees who have an interest in Environmental Issues.

The Environmental Hubs objectives are to identify likely technologies to enable the Service to reduce its environmental impact, decide upon suitable sites to trial, evaluate performance after installation and make recommendations. Not all recommendations are technological advancements, the Environmental Hub has also

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recommended and implemented a wild meadow environment at Service Headquarters.

The Environmental Hub utilises an evaluation process which focuses on the key sustainable development goals which are balanced against criteria relating to value for money, carbon savings and Service delivery, they are:

- Clean water and sanitation
- Affordable and clean energy
- Industry, innovation, and infrastructure
- Waste
- Climate action
- Life below water
- Life on land

Successful projects which have been delivered by the Environmental Hub are:

- Solar Panels.
- Ground Water Exchange.
- Fire Station Cavity Wall Installation.

Current projects under consideration by the Environmental Hub are:

- Electric Vehicle Charging Points.
- Sustainable Heating and Hot Water Provision.

Clean energy is the key focus of discussions with technological advancements from other emergency services shared through the engagement with the Emergency Services Environment & Sustainability Group and the National Fire Chief's Council Environment & Sustainability Group meetings.

The Environmental Hub discusses government incentives and grants to support the retrofitting of existing estate with green infrastructure as there are many challenges with adapting old buildings to new technologies. However, the Service has implemented the introduction of LED lighting coupled with movement control and daylight savings which is now incorporated into the Service building design guide for use in all new projects. As well as introducing a Cloud based Building Management System across 28 of the Service sites which provides the Property Services team with greater control of heating and hot water systems.

COMMUNICATIONS

EMERGENCY SERVICES NETWORK

The Home Office has taken the lead in delivering the Emergency Services Network which is being designed to replace the current Airwave service which all Category One Responders use to communicate during incidents.

The Emergency Services Network is advertised to deliver:

- Secure and resilient mission critical communications the emergency services and other first responder communities can trust to keep them safe.
- A modern voice and data platform which will enable the emergency services to improve front-line operations.
- A common platform to enable emergency services to work more closely together for data sharing in emergencies.

The Airwave network utilises terrestrial trunked radio networks whereas the Emergency Services Network will use 4G and 5G capabilities along with air to ground contact.

Whilst the move to the Emergency Services Network has been seen as positive, there has been significant delay in the successful roll out and implementation of the project. The Home Office has secured an extension to the provision of Airwave radio communication until 2026, however they have put a tender out for delivery of the Emergency Services Network and have no clear indication that this will be achieved within the required timescale. Therefore, the Service faces the risk of uncertainty in the longevity of its current communication methods, and the understanding of what future communication methods will be available for emergency service personnel.

TELECOMMUNICATION UPGRADES

The UK is in the process of upgrading its core telecommunication network from a copper based analogue system to a fibre based digital system. The move from the public switched telephone network (PSTN) is due to complete in 2025 and the Service is upgrading its telecommunication lines to align with this government requirement. Once the Control System upgrade has been completed the only remaining copper lines in the Service network will be those connected to the Red Phones at stations and the Control non-emergency integrated services digital network (ISDN), however there is potential that other departments currently use devices requiring a PSTN connection.

Copper lines provide up to 5 days resilience and connectivity following a power outage where the handset is not dependent upon an additional power source to operate. Fibre lines will provide up to 1 hour resilience and connectivity following a power outage which creates a significant risk to how the public will be able to contact the Service in an emergency coinciding with a power outage, as well as a risk to how the Service will communicate with and mobilise key assets during a power outage.

The Red Phone copper line replacement has two identified alternatives, to replace the current device with a standard phone which is connected via Teams to make calls via the 8x8 software, or with a mobile phone which is connected via 4G to make calls. Both options present new issues for consideration such as battery life, signal availability, signal dependency and user engagement with device design and functionality.

CONTROL SYSTEMS & MOBILISATION

The Service is currently undergoing a large-scale Control system upgrade project which will improve the capabilities and resilience of the current technology. However, whilst this is in progress the Service has no back up provision to support a move from Primary Control to Secondary Control from other Fire and Rescue Services.

Currently, should there be a need to relocate the Control Operators from the Primary Control Room to the Secondary Control Room, they will need to use a single mobile phone to receive emergency calls from BT and use a radio to mobilise and communicate with crews whilst travelling. If the nature of the incident allows, this could be mitigated by two Control Operators remaining at Primary Control until the travelling Control Operators have arrived and successfully logged into the systems at Secondary Control.

This will continue to be a risk for consideration following the final upgrade as the new Control System does not allow third party access, meaning that no other Fire and Rescue Service will be able to access our Control System should we require support during a location move from Primary to Secondary Control. Additionally, the system will only be accessible through the Control Operator Terminals, with 10 positions available in Primary Control and 5 positions available in Secondary Control.

The new Control System has built in redundancy at both sites, with data travelling through two separate wires into the Control Room infrastructure. This is supported by dual resilience built into each stage of the communication process. Should there be an inability for data to travel through the primary route at any stage it will automatically divert to the secondary route.

REFERENCES

[Emergency Services Network: overview - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

[Guidelines \(smmmt.co.uk\)](https://www.smmmt.co.uk)

[UK new car registration data, UK car market - SMMT](https://www.smmmt.co.uk)