CENTRE FOR SCIENCE & SECURITY STUDIES

KING'S College LONDON

Exploring the United Kingdom's Approach to Nuclear Security

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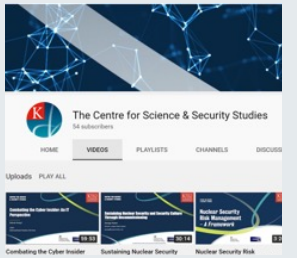
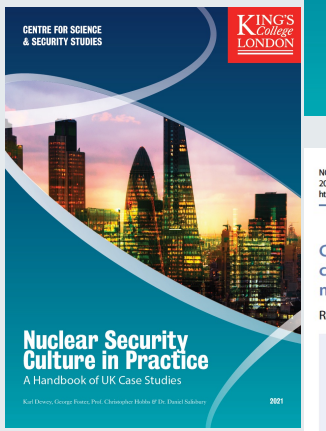
Outline

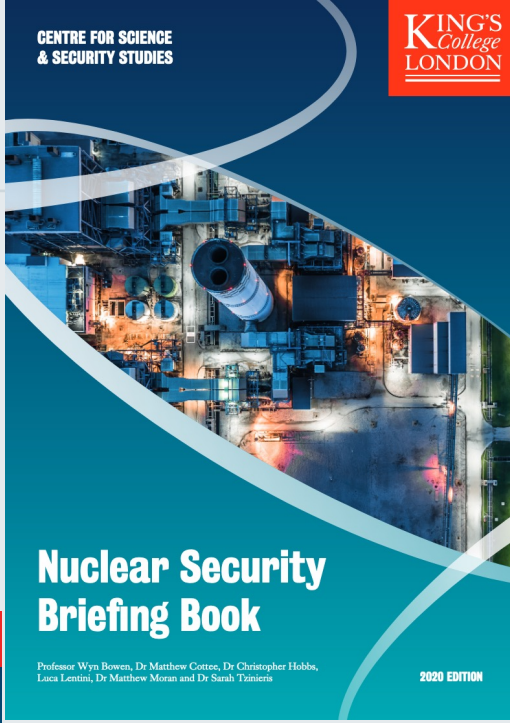
- Introduction:
  - KCL Nuclear Security activities
  - UK Nuclear Sector – Brief overview
- Exploring the UK's nuclear security regulatory transition:
  - Prescriptive => Outcome focused
- Nuclear security culture within UK industry:
  - Challenges and opportunities for when building programmes
- UK response to COVID-19:
  - Lessons learnt in implementing nuclear security
- Conclusions

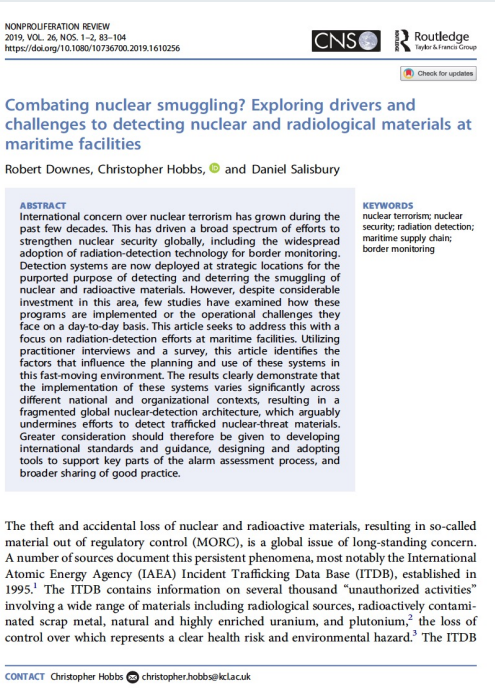
Introduction – KCL nuclear security activities

- Mix of academic research, policy analysis & practitioner engagement:
  - Examine different international approaches
  - Explore emergent areas/issues
  - Development of detailed case studies
- Interdisciplinary approach, bridging the gap between policy & practice, drawing lessons from other areas
- Implement the UK's international Nuclear Security Culture Programme (NSCP):
  - Share lessons from UK & other national experience

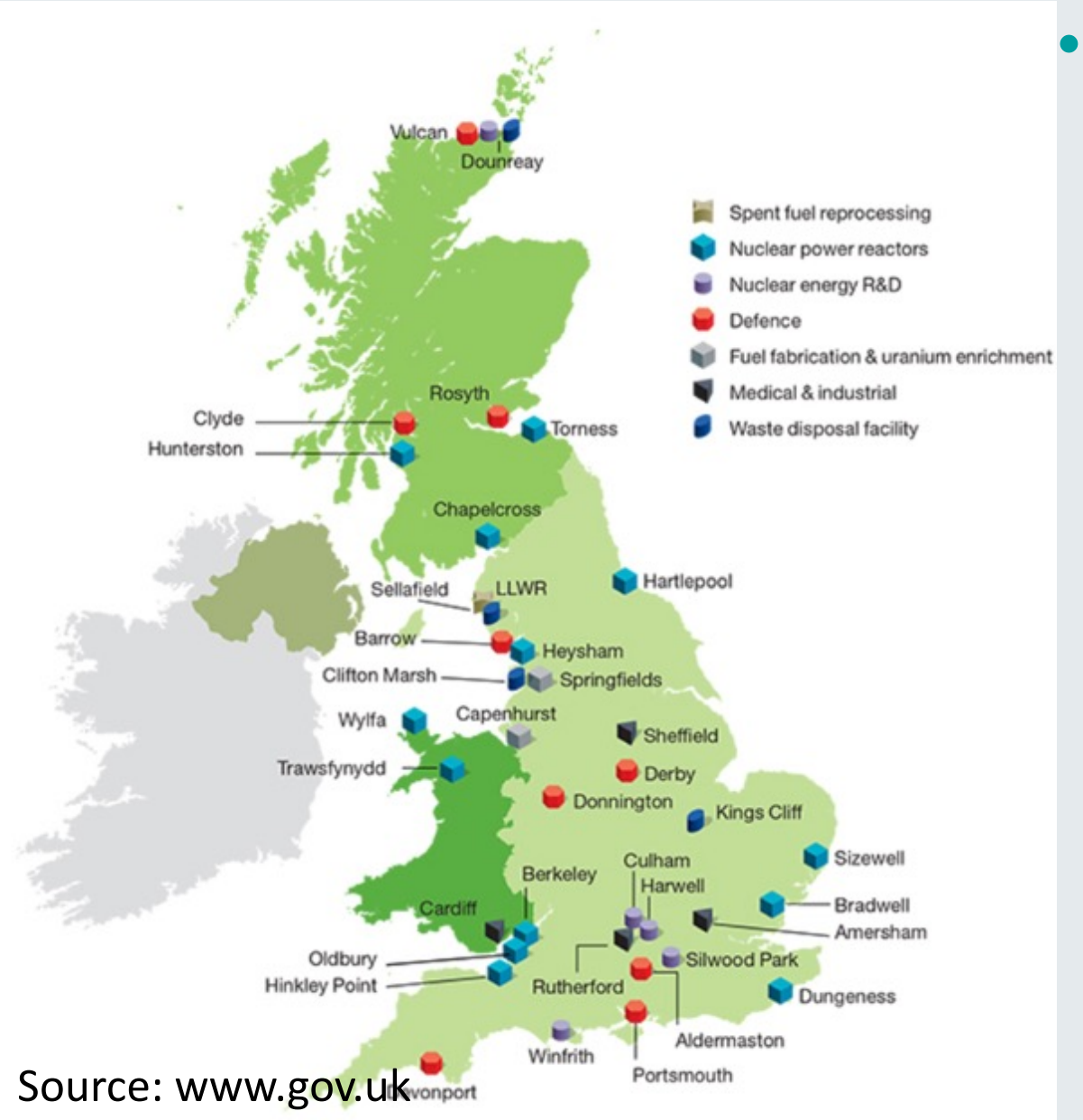








UK Nuclear Sector – Brief overview



Source: www.gov.uk

- Nuclear programme initiated in 1940s:
  - Defence and civil elements
  - Development of full nuclear fuel cycle
  - Word's first commercial nuclear power reactor (Calder Hall, 1956)
  - Cat I nuclear materials at multiple sites

UK Civil Nuclear Industry Today – At a Glance

- Currently 15 operating nuclear power reactors:
  - ~20% of electricity from nuclear
- Number of sites undergoing decommissioning
- New build nuclear power programme
- International transport of nuclear fuel
- Large and complex facilities
- Currently employs ~ 60,000 people

Nuclear Security – UK International Engagement

- Signatory to key international treaties and engagement in informal initiatives and forums:
  - CPPNM & its Amendment, ICSANT etc.
  - GCINT, Global Partnership, IAEA, IPPAS Missions, NSS process etc.

- Bi-lateral and multi-lateral engagement with countries on nuclear security issues:
  - UK's Global Nuclear Security Programme (GNSP)

Nuclear Security – UK Domestic Legislation & Regulation

- Timeline of key events:
  - 2001 – Establishment of Office for Civil Nuclear Security (OCNS)
  - 2003 – Nuclear Industries Security Regulations (NISR)
  - 2012 – Publication of National Objectives, Requirements and Model Standards (NORMS)
  - 2013 – Energy Act establishes Office for Nuclear Regulation (ONR)
  - 2017 – Publication of Security Assessment Principles (SyAPs)

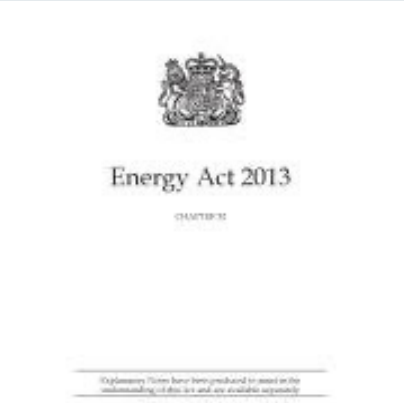

STATUTORY INSTRUMENTS

2003 No. 403

ATOMIC ENERGY AND RADIOACTIVE SUBSTANCES

The Nuclear Industries Security Regulations 2003

ARRANGEMENT OF REGULATIONS


Energy Act 2013

- Legislation and regulation consistent with international treaties. and guidance

Exploring the UK’s Nuclear Security Regulatory Transition

Regulatory regimes – Different approaches

- Many ways in which to regulate industries with respect to safety, security and other areas

- Two general approaches, with their own advantages & disadvantages:
  - Rules-based regulation (RBR)
  - Goal-based regulation (GBR)

- Mix of factors will influence choice regulatory system:
  - Broader UK shift over time to GBR

	RBR	GBR
Focus	Proscribed actions	Objectives
Demonstrate compliance	Adherence to proscribed actions	Achievement of results, assurance mechanisms
Rules & standards	Particularistic and detailed	Goal-orientated outcomes
Advantages	Precision, certainty, less discretion, regulator ultimately accountable	Flexible, regulatees more responsible, adaptable to changes
Disadvantages	Prescriptive, inflexible, stifle innovation	Imprecise, greater uncertainty for regulatees

Key drivers of regulatory change

- Growing UK interest in a nuclear new build programme from the mid-2000s
- Government push for more efficient regulation, with better integration of nuclear security with nuclear safety (already outcome focused)
- Promotion of potential efficiencies for industry, through development of more cost-effective security solutions:
  - Although many in industry comfortable with existing prescriptive regime

National Objectives, Requirements and Model Standards (NORMS)

- Replaced prescriptive Technical Requirements Document (TRD) as the basis for nuclear security assessment

- Intended to establish a flexible goal-setting framework:
  - Empower industry to develop innovative, effective & efficient solutions

- However, implementation suffered from a number of challenges:
  - Limited industry engagement in formulation of NORMS
  - Language still largely directive
  - Contained model standards, that could be closely followed
  - Culture of prescription within industry still deeply embedded

Security Assessment Principles (SyAPs)

- High-level principles, not a security manual
- Hierarchical document designed to be easy to navigate
- Freely available –> Improve openness and transparency
- Mapped with IAEA guidance
- Alignment with Safety Assessment Principles (SAPs)

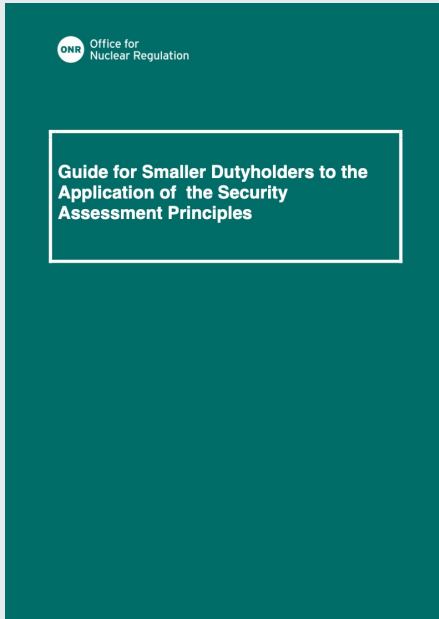
- Advantages over NORMS:
  - No model standards, with operators no option but to evaluate risk and devise appropriate security systems
  - Emphasis on high-level strategic issues => More digestible by management

Challenges encountered and lessons learned

- Process of sustained consultation with industry was seen as important as the creation of appropriate security principles and associated information

- Going from an ingrained prescriptive approach to security regulation to outcome focused takes time and sustained (10+ years):
  - NORMS perceived as an important step in this process

- May be challenging to apply at small sites => Development of additional guidance



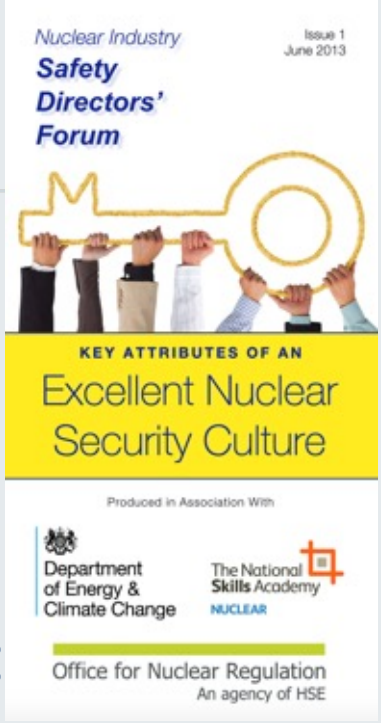
Challenges encountered and lessons learned

- Required the development of new capabilities both within the operator and regulator:
  - Training courses developed around assessment of SyAPs
- Deemed to have successfully transferred ownership of security to operators with corresponding improvements in security culture
- Particular benefits perceived in responding to rapidly changing threats and adoption of new technologies:
  - E.g. cyber security, development of SMR & AMR reactors

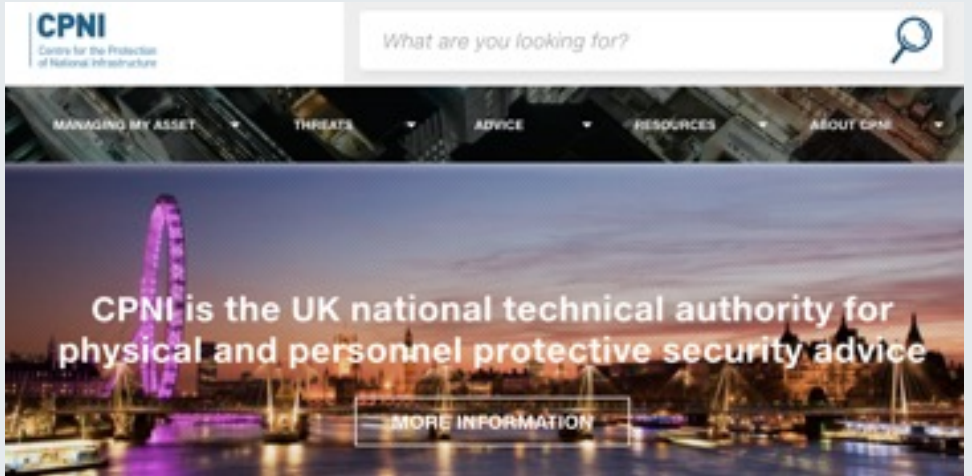
Nuclear security culture within UK industry

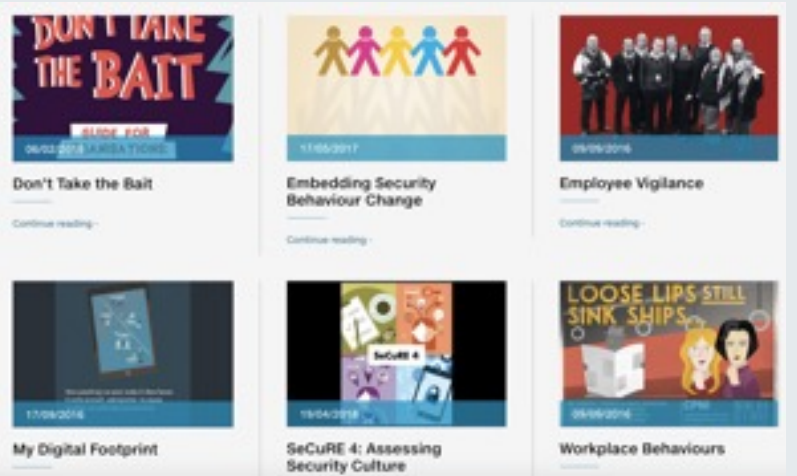
National security culture initiatives

- Importance of security culture promoted within UK critical national infrastructure sectors for well over a decade



- UK Centre for the Protection of National Infrastructure (CPNI):
  - Promote strong security practice
  - Developed & distributed SeCuRE

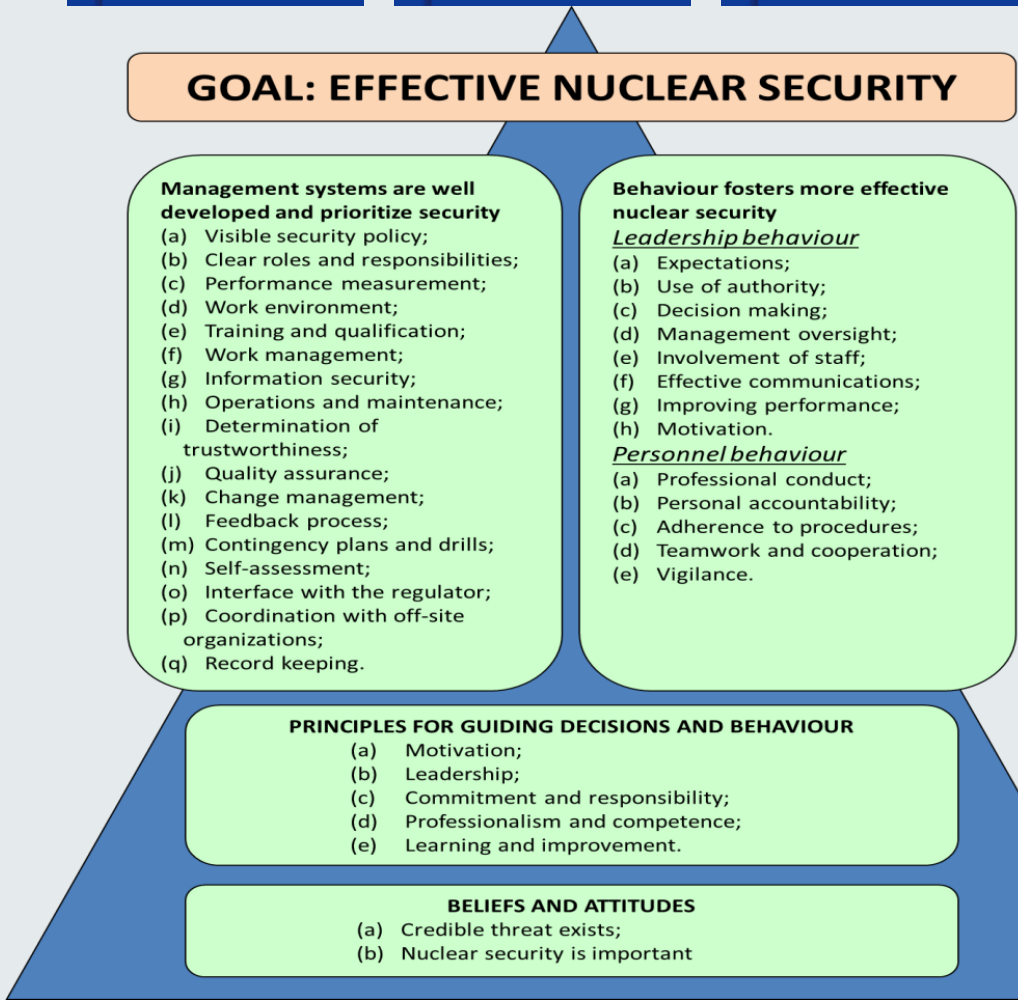




Nuclear security culture

- Detailed IAEA guidance on how to deconstruct, assess and strengthen nuclear security culture

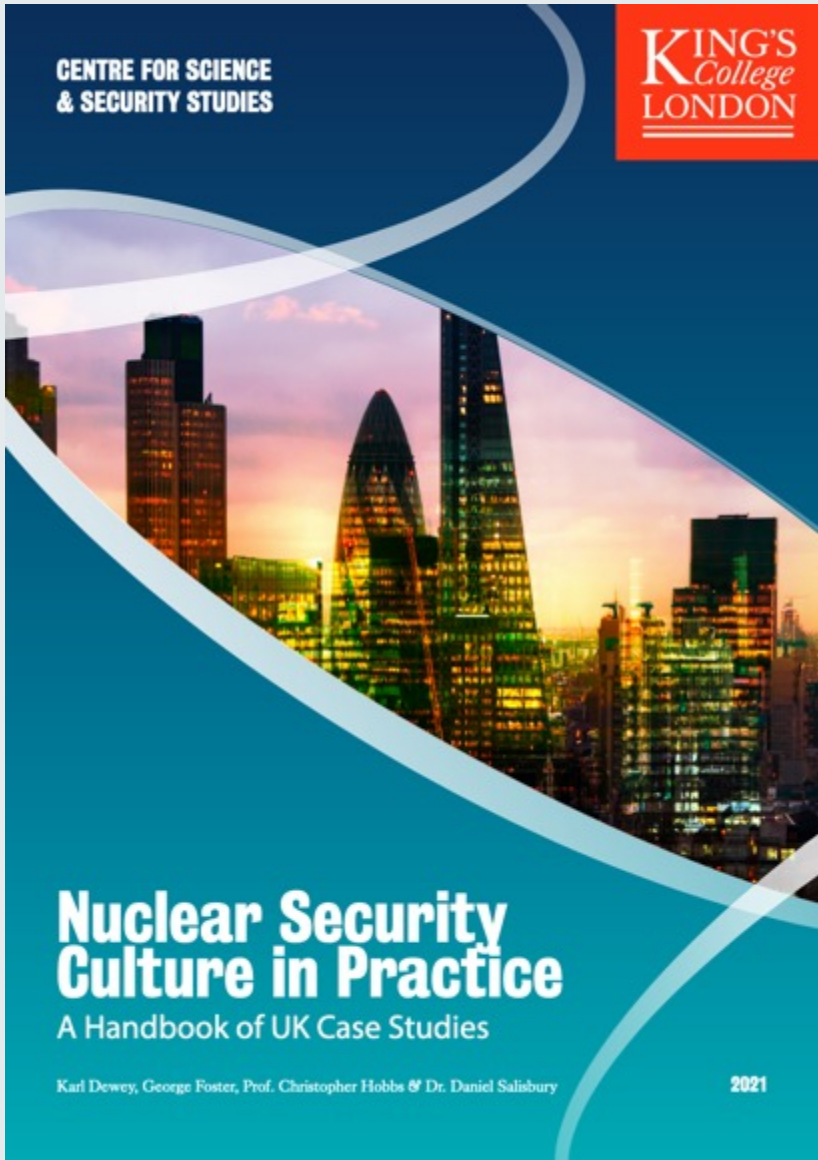
- However, the implementation of effective programmes in this area can be challenging:
  - Disconnects between threat perceptions and reality
  - Need to avoid complacency and encourage continuous improvement
  - Diversity of occupational groups and prior experiences
  - Requires sustained effort and buy-in



Exploring nuclear security culture in practice

- Interview based study aimed at identifying common challenges and essential elements that underpin successful programmes

- Four detailed UK case studies:
  - International Nuclear Services
  - Direct Rail Services
  - EDF Energy
  - Radioactive Waste Management



Challenges encountered and lessons learned

- High-level organisational buy-in and engagement on security issues at the Executive and Board levels is an essential step:
  - Corporate milestones for security performance
  - Frame security initiatives in terms of business requirements and risk management
  - In UK context, several organisations utilized the regulatory transition for overhauling their security approach

- Buy-in of middle management also key:
  - Support redrafting of security plan and policies
  - Able to relay and socialize new initiatives amongst their teams

Challenges encountered and lessons learned

- Value of security can be difficult to articulate:
  - Many organisations have yet to experience a serious security-related incident
  - May be perceived as an unnecessarily expense or an obstacle to conducting core business activities

- Important to make security relatable to different occupational groups:
  - Targeted training and engagement
  - Draw on real-life nuclear and non-nuclear incidents

- Common for security culture to trail safety culture:
  - Exploit common basis and approaches for promoting both
  - Joint activities and extension of existing safety programmes

Challenges encountered and lessons learned

- Beneficial to create an environment where two-way security dialogue is active, involving staff at all levels:
  - Encourage buy-in and compliance, develop innovative solutions

- Employ a mix of engagement strategies:
  - Large workshops => Smaller working groups

Challenges encountered and lessons learned

- For security awareness raising and training, important to have variety:
  - Refresh resources regularly, avoid jargon, promote lateral thinking

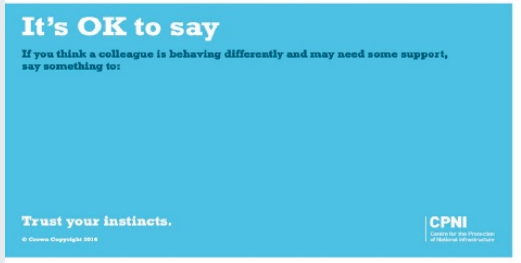
- Encouraging interaction was also deemed as particularly important:
  - Short quizzes, scenario-based discussion, table-top exercises and red-teaming

Challenges encountered and lessons learned

- Regular benchmarking of nuclear security culture is important:
  - Help ensure systems are robust against full range of threats
  - Inform development of new initiatives

- Wide range of security testing measures used to identify potential issues and improve compliance:
  - Ad-hoc challenges
  - Formal annual evaluations of security systems
  - Monthly cyber penetration testing exercises

- Promoting a ‘culture of positive challenge’

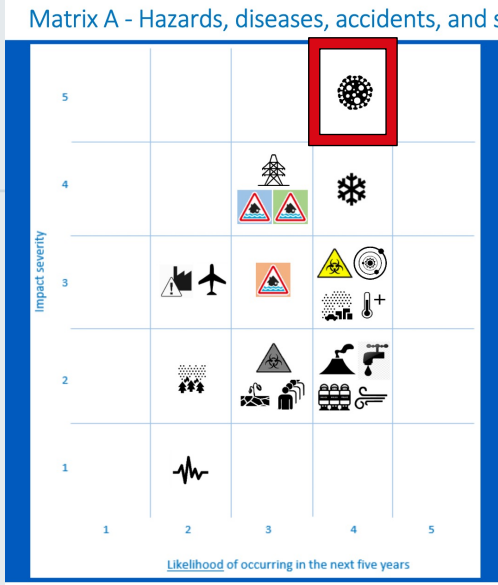


Response to COVID-19

UK nuclear response to COVID-19

- Pandemics featured in the 2017 UK national risk register:
  - But priority not necessarily reflected in UK nuclear organisational risk registers
  - Several of the organisations interviewed had pandemic plans, not regularly exercised or particularly detailed, but useful starting points

- UK's outcome focused regulatory framework meant no specific requirements for how nuclear security should be implemented during the pandemic:
  - Operators interviewed noted the useful flexibility this offered



UK National Risk Register (2017

Initial concerns

- Focus on vulnerabilities caused by absenteeism due to infections, for example within the Civil Nuclear Constabulary (CNC):
  - Initially daily data gathering around absenteeism for provision to government, subsequently reduced but retained

- UK nuclear sector has seen a peak absence of ~18-20% of staff as a result of the pandemic (ONR):
  - But sites have not needed to source security personnel from elsewhere

Other challenges

- How to share security-sensitive information
- Testing of PPS equipment by 3rd parties:
  - Security suppliers facing financial hardship
- Protecting sensitive information following move to home working:
  - Some large organisations rolling out 1,000 laptops a month
  - Reg 22 reports increased for some organisations before falling back to normal levels
- Meeting security-training requirements
- Remote monitoring of staff

Some lessons learnt

- Nuclear organisations are diverse, so tailor-made security solutions to crises developed by operators in consultation with government and the regulator:
  - Reinforced utility of outcome focused regulatory transition

- Communication between key stakeholders was vital, utilize existing structures for emergency and contingency planning

- Plans for an increased component of nuclear security regulatory assessment work to be conducted remotely post-COVID-19 & regular data collection will continue

Conclusions

- Considerable evolution in UK's approach to nuclear security over the past 10+ years:
  - Driven by regulatory transition, prescriptive => outcome focused

- Transition has taken considerable time and effort, but is now at a good level of maturity and widely perceived as beneficial within industry

Additional Information and Articles

- UK's Nuclear Security Culture Programme (NSCP) https://www.kcl.ac.uk/research/nuclear-security-culture-programme
- 'Nuclear security during the COVID-19 pandemic: Exploring Risks and Responses', *RUSI Journal* https://www.tandfonline.com/loi/rusi20 (June 2021)
- 'Nuclear Security Culture in Practice: A Handbook of UK Case Studies', *CSSS Occasional Paper* https://www.kcl.ac.uk/csss/assets/nuclear-security-culture-in-practice-2021.pdf (March 2021)
- 'Nuclear Security in Times of Crisis', *CSSS Occasional Paper* https://www.kcl.ac.uk/csss/assets/nuclear-security-in-times-of-crisis-handbook.pdf (June 2021)

Thank you

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