



Office for
Nuclear Regulation

Regulatory challenges (and opportunities) associated with implementation of innovative technologies

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Outline

- Approach to regulating innovation in the UK nuclear industry
- Examples of applications of innovation in the UK
- Lessons learned
- Work ahead

Who are we?

- Office for Nuclear regulation (ONR)
 - UK's independent nuclear regulator for safety, security and safeguards
 - 35 licensed nuclear sites in Great Britain
 - Mission to protect society by securing safe nuclear operations
- Recognising opportunities offered by innovation to deliver ONR mission

What do we mean by innovation?

“Innovation is the implementation of new ideas that generate value”*

Innovation – Not just invention. It includes responding to stakeholder needs.

New – Very little is truly new. Often innovation builds on previous work, “steal with pride” from other sectors.

Ideas – Its not just about products. It also includes ways of working, new service, etc...

Generate value – Innovation has to return a value to stakeholders. Otherwise – what’s the point.

*Independent report from the Taskforce on Innovation, Growth and Regulatory Reform 2021

ONR's approach to innovation

ONR's Strategy 2020-25

Innovation Hub - Internal



Embrace innovation, new approaches and technologies in how and what we regulate, sharing best practice case studies and encouraging dialogue

- Horizon scanning
- Knowledge management
- Inspector development
- Communications

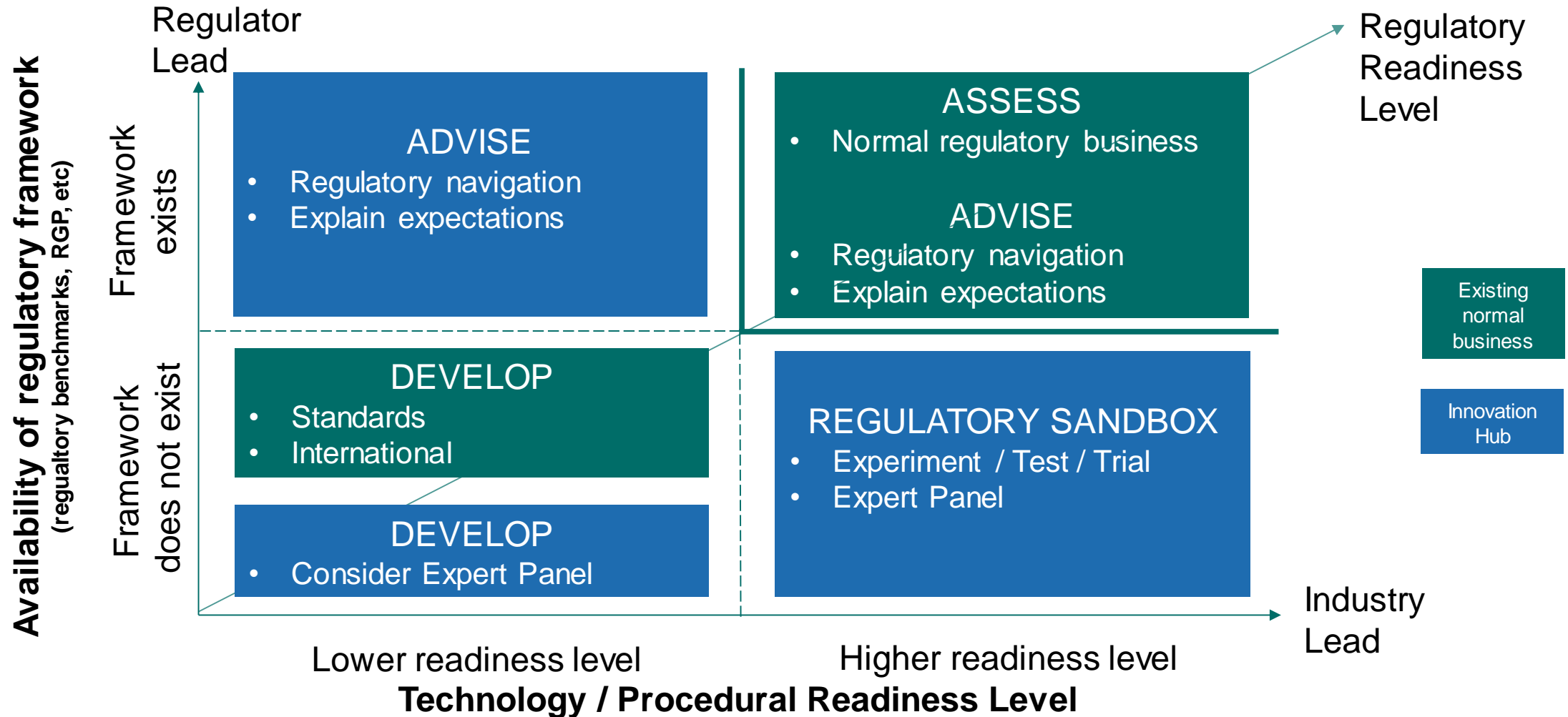
Approach to regulating innovation (2020)

Innovation Hub - External

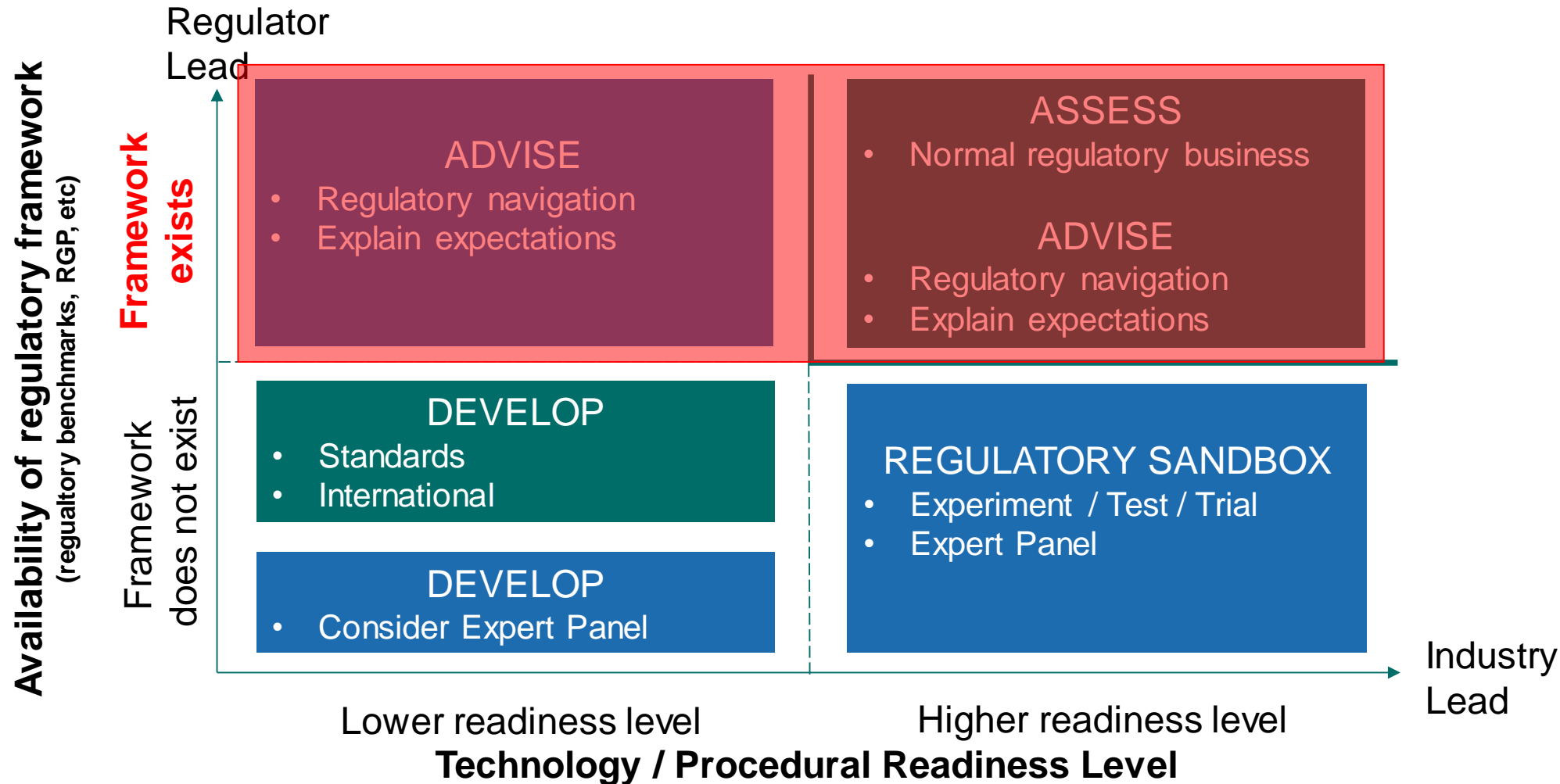
Supporting the adoption of innovative solutions by the nuclear industry and its supply chain where it is in the interest of society and is consistent with safety and security expectations .



Delivery of “ONR’s approach to regulating innovation” (2020)



Examples of applications where regulatory framework existing



Examples of applications where regulatory framework existing

- Innovation in the nuclear fuel back end and decommissioning
 - Robotics and autonomous systems
 - Either at trial or permissioning stages
 - Additional complexity or lack of clarity in expectation

Examples of applications of robotics (1)

- Application of robotics for 3m³ box lid bolting
 - Opportunity to remove operators from hazard (teleoperation)
 - Limited safety claim on the robot / tool
 - Complexity of substantiation of I&C
 - Focus on failure modes of the robotic solution
 - Compensation by independent means (e.g. visual, tool re-calibration)

Examples of applications of robotics (2)

- Use of drones
 - Opportunity for more frequent or more efficient inspections
 - Inspection of civil structures / pipework (both indoor and outdoor)
 - Outdoor need authorisation from the UK Civil Aviation Authority
 - Risk assessment for drone flight
 - Consideration of impact on safety case

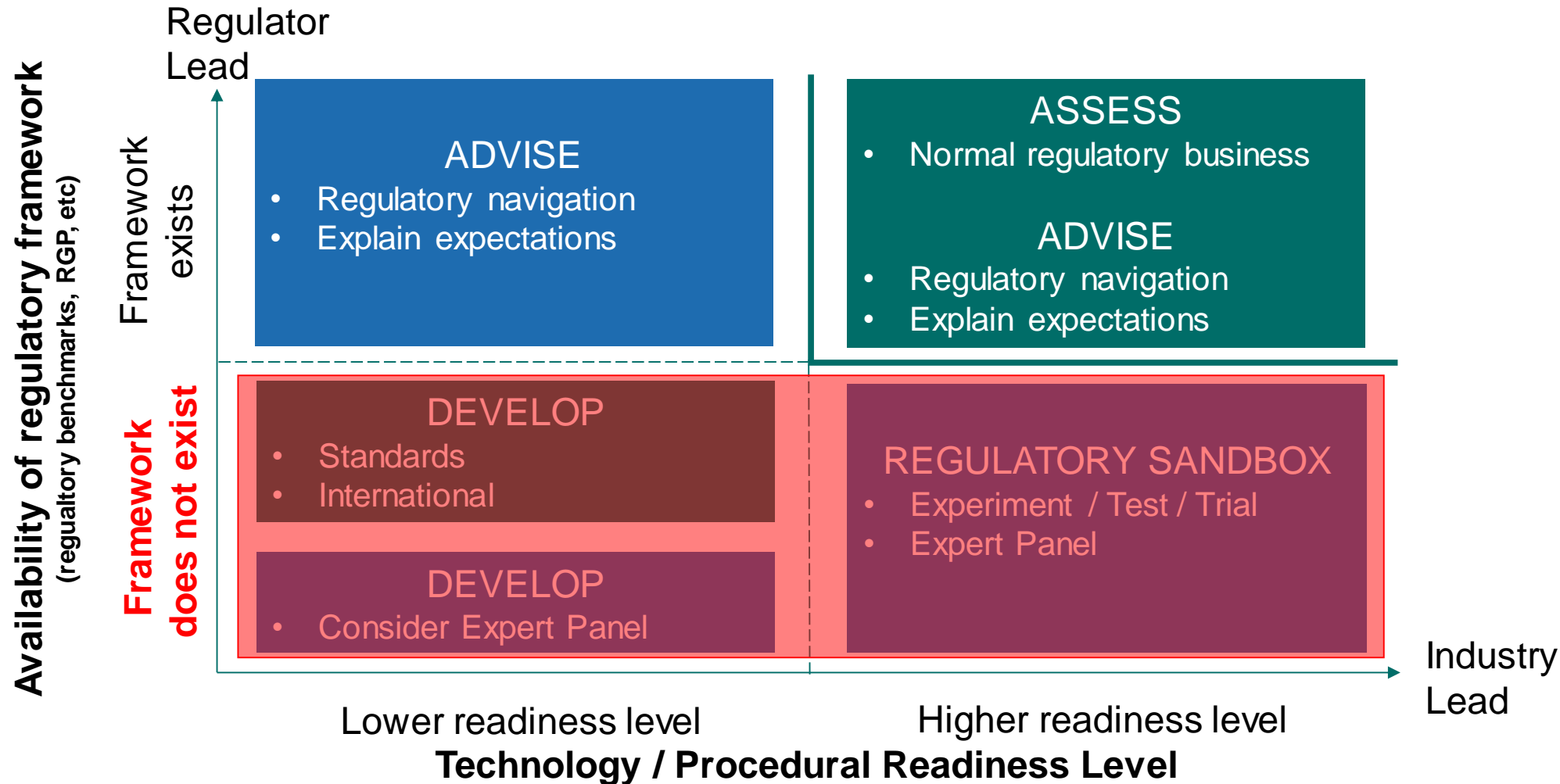
Examples of applications of robotics (3)

- Laser cutting of skips / gloveboxes
 - Opportunity to remove the risk from operator by teleoperation of a robot / laser
 - Robot in a separate cell
 - Risk for the laser to damage containment
 - Active walls and secondary containment

Examples of applications of robotics (4)

- Quadruped robot
 - Initial trials and tests
 - Potential for reducing significantly the time and cost for decommissioning
 - Challenges associated with substantiation of AI element
 - Ongoing research

Example of applications where regulatory framework not yet existing



Example of applications where regulatory framework not yet existing

- Horizon scanning
- Requires very early engagement
 - Time to understand applications
 - Time to develop a regulatory position
 - Targeted research?
 - New standards?
 - Consultation with other regulators (non-nuclear, overseas)?

Example of applications where regulatory framework not yet existing

- Artificial intelligence
 - 2 expert panels on regulation of AI
 - 2 examples in regulatory sandboxing
- Blockchain
 - Engagement with licensee to clarify the regulatory expectations

Lessons learned

- Great potential offered by innovative solution (value for money, time reduction of risk remediation)
- Perceived blockers vs real regulatory blockers
- Need for early engagement (especially where no regulatory framework)
- Importance to maintain regulatory independence

Work ahead

- Research on artificial intelligence (UK)
- Continuation of Expert Panel and Sandboxing 2 applications of AI in the Innovation Hub (UK)
- Research on engineering substantiation for robotics as part of a UK I&C research consortium
- Work with Health and Safety Executive (non-nuclear UK regulator)
- Work with other regulators in the Expert Group on Robotics and Remote System (EGRRS) in nuclear fuel back-end
 - Workstreams on 1) regulation, 2) benchmarking, 3) cost benefit
 - ** Open invitation to join the discussions **