Resilience policy and regulation

Tom Hughes
Assistant Director – Energy

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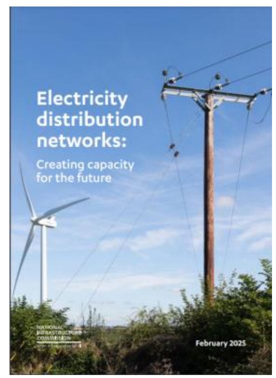
NIC's role: an impartial and expert voice

- Expert advice to government on long term infrastructure challenges – focused on next thirty years
- Energy, transport, water and wastewater, waste, flooding and digital communications

The National Infrastructure Assessment

Studies on specific issues



Annual Monitoring Report

From 1st April we will merge with the IPA to become NISTA

National Infrastructure
& Service Transformation
Authority

NIC view on resilience

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The imperative for better infrastructure resilience

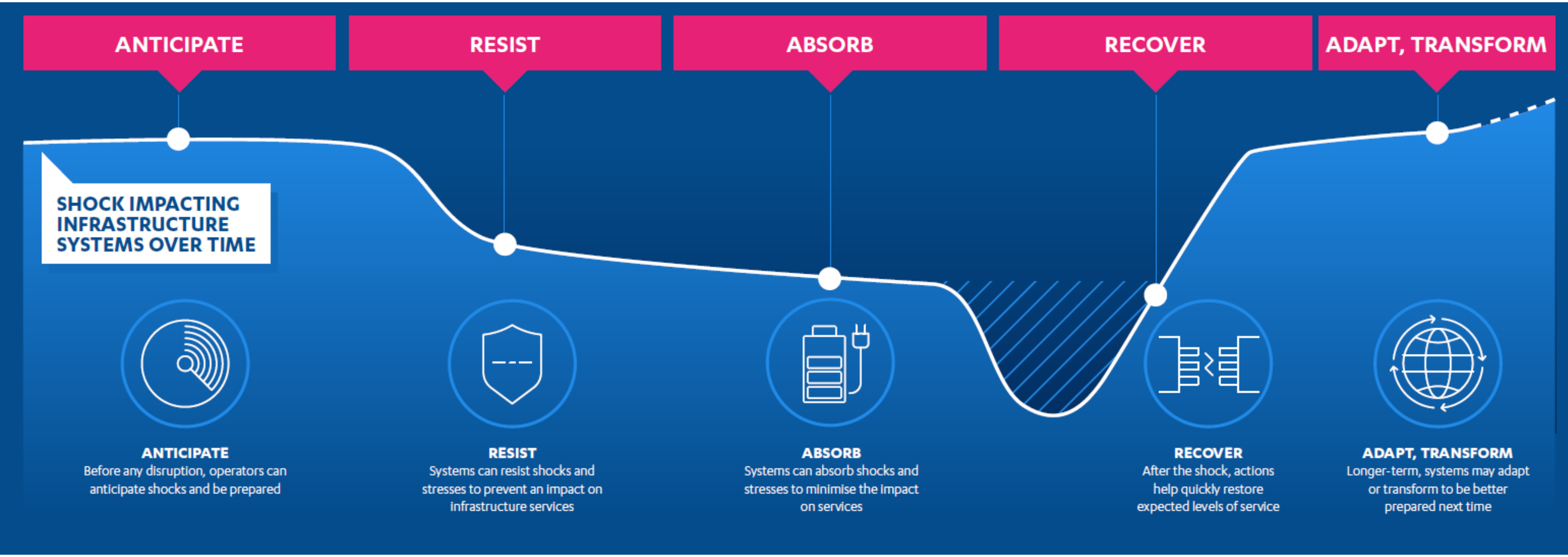
Continuing changes to infrastructure systems impact resilience

- Increasing electrification and digitalisation result in widespread inter-dependencies between systems
- Focus on minimising costs / maximising 'everyday' performance and short-term planning combine with aging and deterioration for some assets to limit ability to cope with shocks and stresses
- End users increasingly rely on services but resilience is difficult to communicate and people are reluctant to pay extra for it

Transformational changes provide both challenges and opportunities

- 'Re-engineering' infrastructure, e.g. to meet 'net zero' and benefit from new technologies, could allow resilience improvements but also presents risks
- Infrastructure systems will need to be able to cope with a range of uncertain future across different economic population and climate scenarios
- Increasing urban populations mean sustained infrastructure failures in cities are potentially catastrophic, but 'invisibility' can lead to complacency

The NIC's resilience framework



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We often approach policy through standards …

1. **Customer outcome standards:** the quality of service received by customers

2. **System performance standards:** how the system is expected to perform in certain circumstances

3. **Technical asset standards:** tolerance to different risks / events

4. **Recovery standards:** what is expected in the event of a service failure, both restoration of service and support services

… because expectations of resilience are key

Helps inform he strategic case

- ✓ **Transparency**: scrutiny and expectation management
- ✓ **Reducing coordination costs**: single planning assumption
- ✓ **Supporting testing**: to identify where action is needed
- ✓ **Accountability**: meeting and paying for
- ✓ **Incentivising upgrades**: show where improvements are needed

Needs a strong role for policy and regulation to set overall direction

- Big social and political choices with trade offs – can't be resilient to everything
- Risks are too high for the private sector alone and spread beyond infrastructure sectors
- Resilience is not properly valued in the market
- Markets focus on those who can pay

Energy resilience: where are we today?

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Starting in a largely positive place

Resilience is a high priority for users

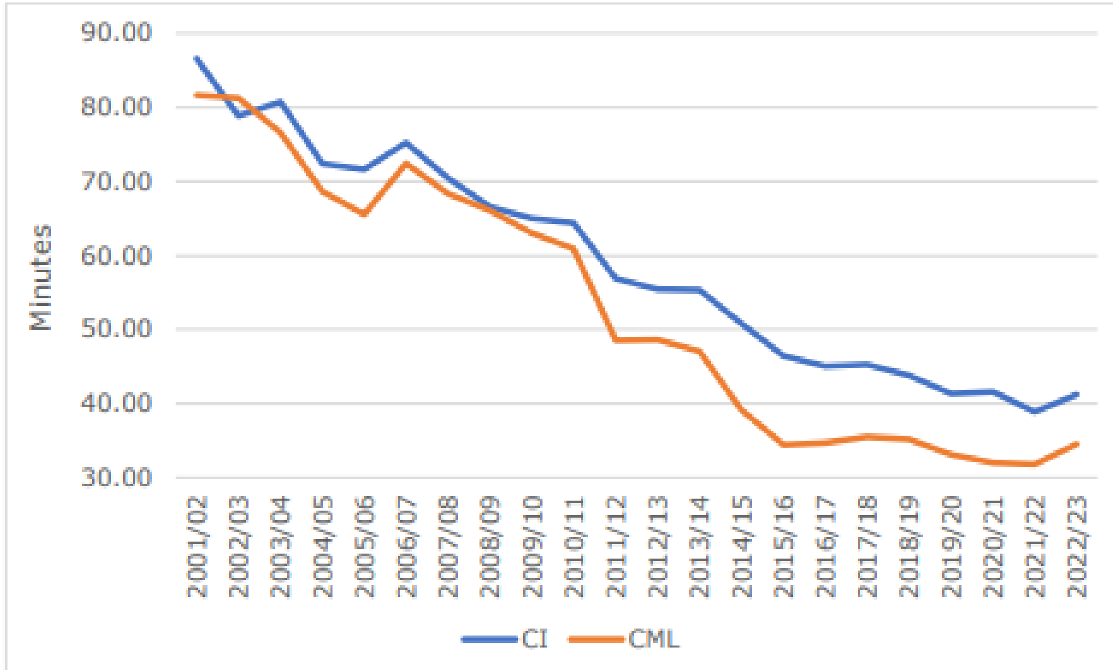
Social research puts energy and water top of infrastructure sectors

Our energy system is generally pretty resilient

And energy compares quite well to other sectors:

- general performance
- coverage of standards and policy

GB customer interruptions and customer minutes lost weighted average performance from 2001/02 to 2022/23



Source: Ofgem: [ED3 framework consultation]

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But the landscape is quite complicated …

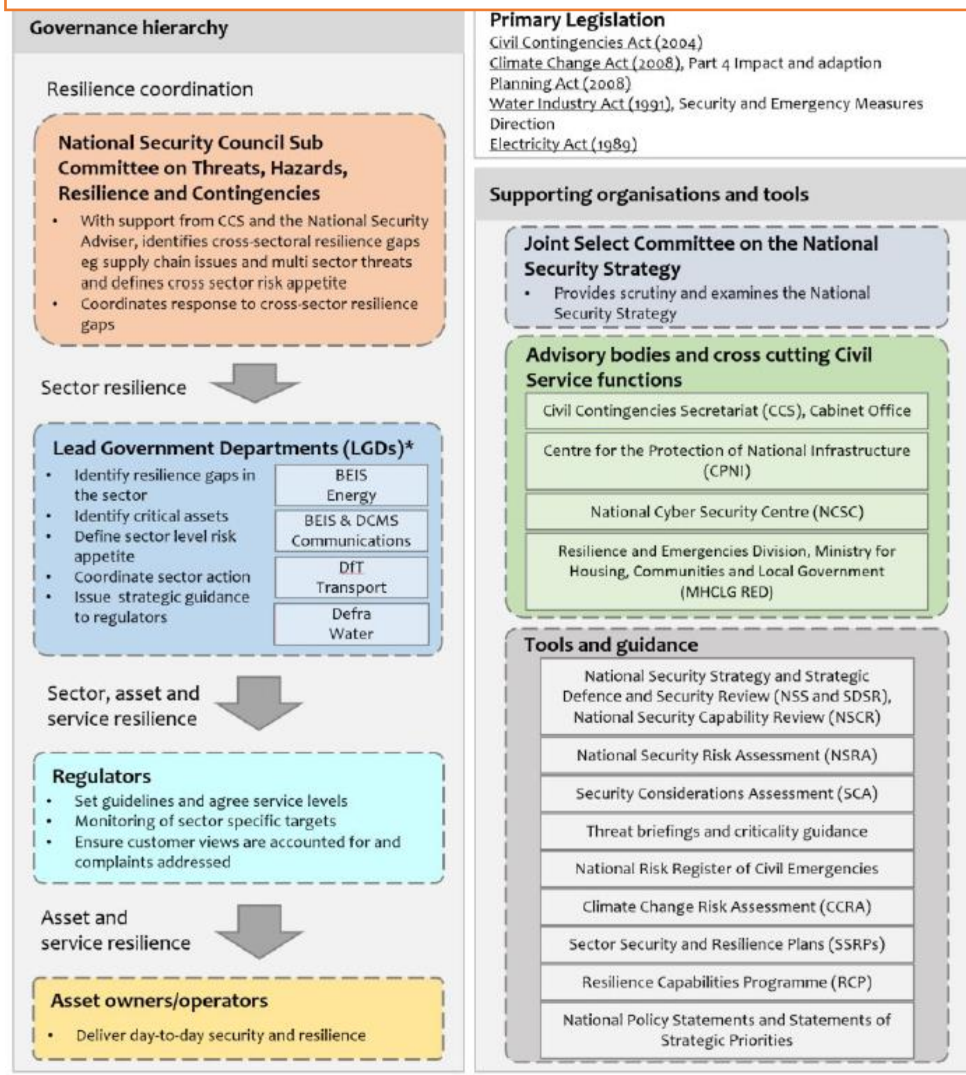
A lot of different standards and approaches – legislation, codes, licence conditions, standards …

… so roles and responsibilities for resilience are complicated too

Two examples of this:

- **Gas vs electricity** – no equivalent to 1 in 20 peak demand day for electricity
- **Transmission vs distribution** – less willing to tolerate disruption in former, so expect more redundancy

Some of the details are now out of date, but the general picture remains the same



* Some responsibilities lie with the devolved administrations. This complexity is not represented.

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… and long term needs are changing

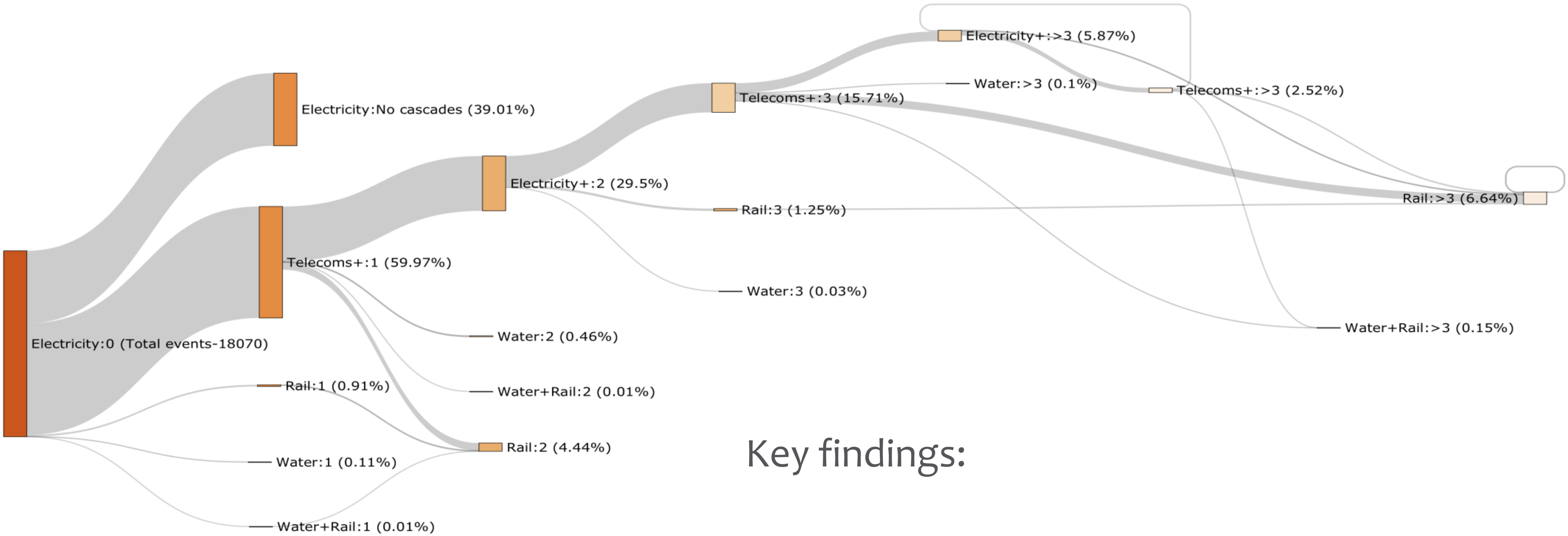
- **Vectors** – increased reliance on electricity
- **Generation technologies** – different characteristics and deployment of new technologies
- **Decentralisation** – more, smaller elements of the system that interact – with much more ‘local’ participation
- **Digitalisation** – operational changes, but also an increasing need to manage cyber security
- **Climate change** – need to adapt to a changing climate

Need to deal with these trends together

Opportunities as well as risks for resilience

Energy is also a big cascade challenge

Pilot modelling from Resilience Study



Key findings:

- A large proportion of failures in electricity networks lead to failures in other sectors
- A small but not insignificant number of failures cascades go to 4th order and above

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Pace is the key challenge for policymakers

“pace not perfection”

CB6 means that by 2035:

- fossil fuel use in land transport and heat must fall by 50-60%
- fossil fuel use in industry must fall by 60-70%

Govt policy doesn’t add up to scale of change at this pace

Major infrastructure for CB6 needs to be in train in mid-2020s

That means a higher risk appetite – ‘acceptable regrets’

Also more consideration of wider economic opportunity

What does this mean for resilience policy?

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What do we want from system change?

- What level of resilience do we want?
- Who is going to pay for it? And how?
- How do we maintain resilience during *and* following the transition?

Need coordination, strategic direction and balancing of trade-offs

Part of the challenge is to focus on what is *actually* changing

Three examples …

1. Changing system composition: generation mix

Move to renewable generation changes how the system works and what we need to do to maintain security of supply

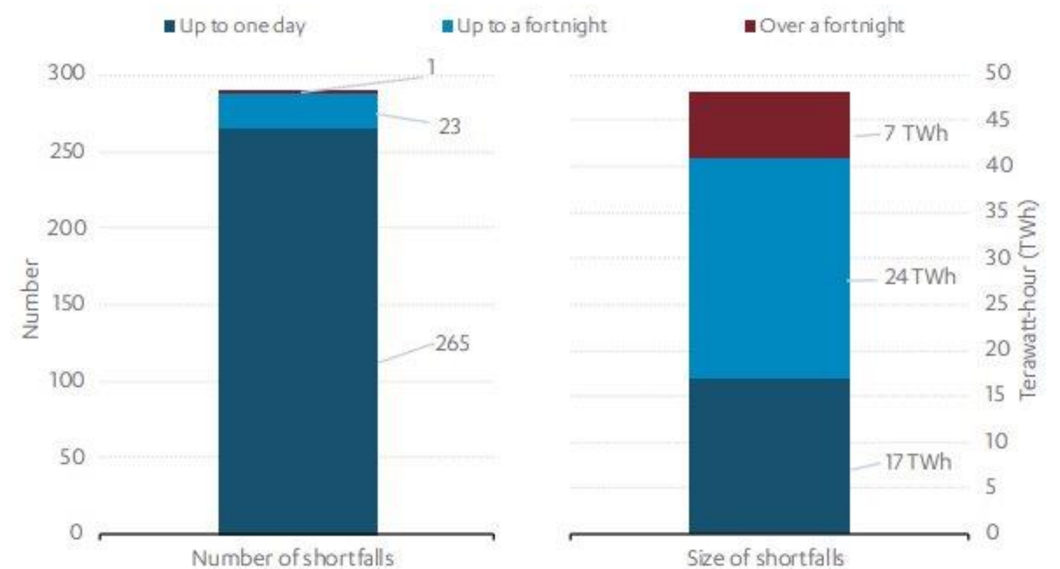
More than just supply
Generation technology mix, but also the enabling infrastructure required

How does this get paid for? Opex-heavy system to a capex-heavy system

Communicating uncertainty
Doing this effectively is key

Figure 2.1: Longer shortfalls occur less frequently but require much more energy

Number and size of shortfalls in an illustrative 2035 scenario



Source: Commission analysis of Aurora Energy Research (2023), The role of system flexibility in achieving net zero (A)

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2. Future demand: distribution security of supply

Not just about what future demand networks need to meet but how what but how they do it

Load is going to increase – planning as we do now could be expensive and the benefits won’t be evenly spread

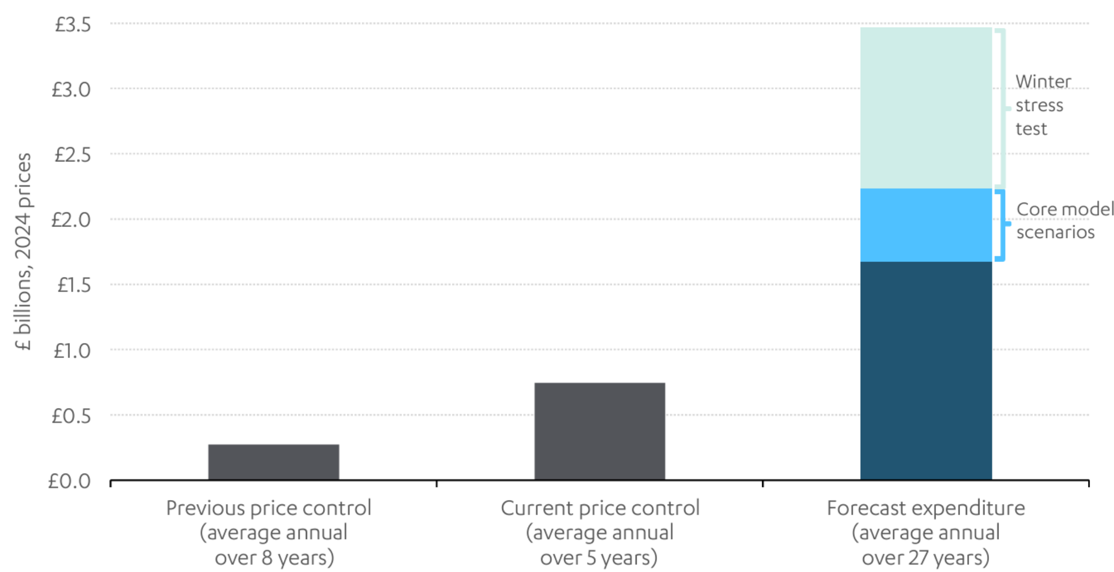
A **changing system could help:**

- better monitoring
- greater digital network capability and automation
- smart device integration

Incorporating these could lead to significant savings …

… **but how confident do we need to be** vs traditional approach?

Average annual load related expenditure from 2015 to 2050



Sources: Commission analysis using Regen and EA Technology’s modelling and data from Department for Energy Security and Net Zero and Ofgem.

Note: This excludes non-load related expenditure. Forecasts have been uplifted for 132 kV load related expenditure using Department for Energy Security and Net Zero forecasts and for low voltage service cables load related expenditure using Ofgem data.

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3. Multiple challenges: incorporating adaptation

Tackling climate risks in some places – e.g. ETR138 on substation flooding – but it's piecemeal

Limited understanding of cost of adaptation across all infrastructure sectors

Need adaptation risk incorporating into general asset risk – e.g. into NARM

How do we factor in interdependencies?

Energy sector risk assessment

Risk or opportunity	England	Northern Ireland	Scotland	Wales
Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures **(I1)**	🔴	🔴	🔴	🔴
Risks to infrastructure services from river, surface water and groundwater flooding **(I2)**	🔴	🔴	🔴	🔴
Risks to infrastructure services from coastal flooding and erosion **(I3)**	🟠	🟠	🟠	🟠
Risks to bridges and pipelines from flooding and erosion **(I4)**	🟠	🟠	🟠	🟠
Risks to hydroelectric generation from low or high river flows **(I6)**	🟠	🟢	🟠	🟠
Risks to subterranean and surface infrastructure from subsidence **(I7)**	🟠	🟠	🟠	🟠
Risks to energy generation from reduced water availability **(I9)**	🟠	🟢	🟢	🟢
Risks to energy from high and low temperatures, high winds, lightning **(I10)**	🟠	🟠	🟠	🟠
Risks to offshore infrastructure from storms and high waves **(I11)**	🔵	🔵	🔵	🔵
Risks and opportunities from summer and winter household energy demand **(H6)**	🔴	🔴	🔴	🔴

Source: [CCRA energy brief]

More action needed

Further investigation

Sustain current action

Maintain a watching brief

What do these examples tell us?

Not exhaustive, but what might we want to think about?

- Implications for lots of different types of standards
- Need to think differently not just ask: ‘how do we keep things the same?’
- Decisions interact
- Communication really matters
- There are opportunities here too
- Not just who pays but also when

Dealing with interdependencies

Systems thinking – a willingness to think widely and holistically

Data – collecting more and better data and making it available

Collaboration – across disciplines, organisations and sectors

Responsibility and accountability – somebody needs to make decisions

Thank you!

Any questions?

tom.hughes@nic.gov.uk

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