



**THE
STATE
OF THE
NATION**

**DEFENDING
CRITICAL
INFRASTRUCTURE**



TABLE OF CONTENTS

EXECUTIVE SUMMARY	04
WHAT IS CRITICAL INFRASTRUCTURE?	05
THE CONSEQUENCES OF FAILURE	05
MAIN THREATS	06
System failure	07
Climate change	07
Terrorism	07
CURRENT SITUATION	08
Interdependency	08
The need for an overview	08
Asset knowledge	09
Maintenance funding	10
Planning	11
Inadequate regulatory remit	12
Lack of specific delivery bodies for all threats	13
ICE RECOMMENDATIONS	14

ABOUT ICE

The Institution of Civil Engineers (ICE) is a global membership organisation that promotes and advances civil engineering around the world.

ICE is a leading source of professional expertise in transport, water supply and treatment, flood management, waste and energy. Established in 1818, it has over 80,000 members throughout the world, including over 60,000 in the UK.

ICE's vision is to place civil engineers at the heart of society, delivering sustainable development through knowledge, skills and professional expertise.

ABOUT THIS REPORT

State of the Nation reports have been compiled each year since 2000 by panels of experts drawn from the various fields of expertise across ICE's membership.

Their aim is to stimulate debate and to highlight the actions that we believe are needed to improve the state of the nation's infrastructure and associated services.

This report has been compiled through a process similar to that of a select committee inquiry, with a wide range of stakeholders providing evidence based on their views and knowledge of UK's infrastructure networks, and the threats to those networks.

The report is issued to a wide range of stakeholders, including politicians, civil servants, local authorities, trade, regulatory and consumer bodies, as well as the media.

ICE has published several State of the Nation reports each focused on a specific issue which will affect the delivery of effective infrastructure for the UK. In 2008 ICE published reports focused on transport and on capacity and skills. These are available at ice.org.uk/stateofthenation

For more information on the background to this report, please contact ICE Public Affairs:

t +44 (0)20 7665 2150

e stateofthenation@ice.org.uk
ice.org.uk/stateofthenation

ACKNOWLEDGEMENTS

Steering Group

Alan Stilwell (Chair)
Merseytravel

Roger Allport
Consultant

Tim Chapman
Arup

Amrit Ghose
AECOM

David Hirst
Drax

Nigel Mattravers
Grant Thornton

David Nickols
MWH

Chris Veale
CPNI

Graeme Monteith
Babcock Rail

Keith Jones
ICE Wales Cymru

ICE Staff Team

Andrew Crudgington
Beth Bear
Graham Sibley
Joanna Shardlow
Ingunn Goodman

WELCOME TO THE STATE OF THE NATION REPORT ON DEFENDING CRITICAL INFRASTRUCTURE

Critical infrastructure is essential to modern life. It provides us with clean water, with electricity and heating for our homes, with roads, railways, airports and more. It is the heart of what makes our society function. However it is currently under threat from an increasing range of factors. This report examines how we deal with these challenges and how we can prevent major events bringing the country to a halt.



Recent years have seen a growing number of threats facing our critical infrastructure network. Many of the biggest news stories over the past few years have concerned critical infrastructure in some way – the terrorist attack on the London transport system in 2005, the effects of the floods of summer 2007, and the heavy snow in early 2009.

These stories highlight just some of the threats to UK infrastructure. There are

other more hidden, but equally damaging issues: lack of day-to-day maintenance, lack of spare capacity, and a failure to plan for long-term delivery all have the potential to greatly affect our infrastructure networks.

It is vital we address the challenges facing our critical infrastructure. We need to organise our approach to its defence before an event causing severe damage to the UK, or worse, serious loss of life occurs.

I urge the government to act on the recommendations contained in this report, recommendations which come not only

from expert civil engineers, but also from many of the UK's chief infrastructure asset owners, operators and agencies. We must move forward together to defend our critical infrastructure network and protect our nation.

Jean Venables OBE FEng
President,
Institution of Civil Engineers



EXECUTIVE SUMMARY

The Institution of Civil Engineers (ICE) has conducted an inquiry into the defence of the UK's critical infrastructure. During the course of our investigation we gathered oral and written evidence from numerous major UK infrastructure asset owners, operators, agencies, service providers and civil engineering consultants and contractors.

The evidence submitted to ICE by these key industry players has allowed us to produce an independent in-depth assessment of how effectively the UK ensures the resilience of its critical infrastructure.

This report addresses the main threats to our infrastructure: system failure, climate change and terrorism. It explains the current situation and sets out a list of major recommendations to improve the security of our critical infrastructure networks.

Infrastructure is the backbone of the nation. It is our energy, transport, waste and water systems. Infrastructure assets are interdependent, with increasing numbers of individual assets critical to the functioning of wider national networks. Infrastructure provides everything from power and clean water to airports and motorways. Without infrastructure our daily lives would be unrecognisable.

The UK government has taken some steps towards reducing the risk to our infrastructure, such as the creation of a body to defend against terrorism, and the recent creation of another for natural hazards, but work remains piecemeal. In order to increase the resilience of our infrastructure, the network must be treated as an interdependent whole, with the functionality of one asset recognised as reliant on others. At present there are too many gaps in our infrastructure defence system, increasing the nation's vulnerability to crisis.

Well defended critical infrastructure is central to the security and stability of the nation. A more resilient critical infrastructure network will ensure the UK has improved protection against future crises. It will mean peace of mind and the knowledge that our most vital systems are unlikely to fail us. The UK must work now to fortify critical infrastructure, or pay the economic, social and environmental price in the future.

ICE'S MAIN RECOMMENDATIONS

1

We recommend that the government creates a single point of authority for infrastructure resilience to coordinate the work of the agencies responsible for dealing with individual sectors and threats and recognise interdependency. This would provide the fundamental overview that is lacking, consider how to fill in the gaps and address the areas of infrastructure defence which are currently ignored.

2

With climate change identified as the biggest threat currently facing the UK's infrastructure, government must ensure that the newly created Natural Hazards Team is effective. Government should invest the Natural Hazards Team with the power to provide strong leadership to asset owners and ensure legislation is properly enforced.

3

Government must give clearer guidance to sector regulators such as Ofgem and Ofwat. At present these regulators' remit is largely the short-term prices paid by end users. In order to deliver the improvements to resilience identified as necessary by government and the overview function for infrastructure resilience, regulators must have the capacity to address asset resilience as well as broader and longer term consumer interests. Regulators require the ability to ensure asset owners build in reserve capacity to critical infrastructure and that they are fully prepared for any emergency scenario.

4

The circuitous UK planning system has long delayed the delivery of many crucial pieces of infrastructure. Government must ensure that the Planning Act 2008 and the Infrastructure Planning Commission (IPC) effectively reform the planning system for major infrastructure. Without reform the UK is in danger of not having the infrastructure it needs to operate.



WHAT IS CRITICAL INFRASTRUCTURE?

The Centre for the Protection of National Infrastructure (CPNI) defines critical infrastructure as specific assets which if destroyed or seriously disrupted would cause major disruption to the service being provided.

These assets form crucial components of our water, energy, waste and transport systems. ICE also acknowledges that the communications network is vital to the functionality of critical infrastructure, but recognises that this falls outside of the Institution's main area of expertise.

For the purposes of this report, the goal of defending critical infrastructure will be assuring the continuation of our way of life and of the nation itself.

THE CONSEQUENCES OF FAILURE

Infrastructure plays a vital role in supporting society; we rely on it to provide the most basic essentials of life. If major infrastructure assets were to fail, the effects would be catastrophic. Failure of our water, energy, waste and transport systems would cause damage to the environment, huge cost to the economy, and without doubt loss of life.

Recently we have come perilously close to witnessing the destruction that infrastructure failure has the potential to cause. For example, in 2007 the Atomic Weapons Establishment site at Burghfield in Berkshire was flooded and all radiation detection alarms were disabled.

If the flood water had penetrated only a little further it could have led to the spread of radioactive material, forcing the evacuation of thousands of people and leaving the area near the factory uninhabitable for centuries.

To make matters even more difficult, preparatory measures begun in 1999 against potential flooding had not been completed in 2007.¹

It was little more than luck which prevented a radioactive leak at Burghfield. This event and other recent narrow escapes highlight the risks of infrastructure failure and the importance of ensuring our networks are adequately defended.

¹ AWE nearly inundated by 2007 floods. (15 October 2008). Retrieved on 27 October 2008 from http://www.publicservice.co.uk/news_story.asp?id=7352

MAIN THREATS

Ongoing maintenance work to reduce the risk of system failure is essential. Failure to adequately maintain and protect our critical infrastructure, or to build in any reserve capacity, will leave us potentially as vulnerable to critical infrastructure failure as acts of terrorism or natural disasters.

Currently very little is being done to ensure service continuity and security of supply and no agency has overall responsibility for defence against system failure. In addition to this, the UK's regulatory systems are not driving delivery of sufficient new or upgraded critical infrastructure; not all infrastructure is governed by a regulator; maintenance funding is rarely ringfenced; the planning application process is highly protracted; and there are few incentives in place to support increased private investment in reserve network capacity.

The impacts of climate change - flooding, rising temperatures, wind, drought, rising sea level and heat waves - are a serious threat to critical infrastructure, with flooding identified as the greatest threat to the UK².

“ By far the greatest institutional threat to the resilience of the infrastructure, for which our members are responsible, comes from inadequate investment in maintenance and in the lack of strategic improvement in capacity by central government. There is a real need for both capital and revenue resources to be redirected into the local highway network if it is to regain the resilience demanded of it by society today.
COUNTY SURVEYORS' SOCIETY

These assertions are supported by the predicted increase in frequency and intensity of extreme weather events³. The 2007 report from the Intergovernmental Panel on Climate Change (IPCC) said that average temperatures could rise by 6°C this century if greenhouse gas emissions continue to rise at current rates⁴. Indeed climate change is already happening; greenhouse gas emissions have caused an increase in global temperatures of 0.7°C over the last 100 years⁵.

Clearly much work needs to be done in order to deal with the increasing threat of extreme natural events to UK infrastructure. The creation of the new Natural Hazards Team, charged with coordinating efforts to identify and counter relevant risks to critical infrastructure, represents a good start but it cannot succeed alone.

“ CIWEM considers the risks posed by climate change (through extreme weather events) represent arguably the greatest long term threat in the context of critical infrastructure, (although we recognise that terrorism remains a significant risk).
CHARTERED INSTITUTE OF WATER & ENVIRONMENTAL MANAGEMENT

Government has taken action to reduce the risk to the nation from terrorist attacks. In 2007 it set up the Centre for the Protection of National Infrastructure (CPNI) to protect the UK's critical infrastructure against acts of terrorism. The CPNI works to address the threat of terrorism to the UK and our interests overseas. The current threat level in the UK is assessed as 'severe' which means an attack is highly likely⁶.

“ Whilst reducing emissions through international agreements is critical to mitigate the worst impacts of climate change, it is clear that adaptation will also be required to ensure our infrastructure is able to cope with increased temperatures, extreme weather and sea level rise.
MET OFFICE



1

SYSTEM FAILURE

In May 2008 hundreds of thousands of people were hit by electricity blackouts in areas of London, Cheshire, Merseyside and East Anglia. These blackouts were caused when the Sizewell B nuclear reactor in Suffolk and Longannet coal-fired power station in Fife unexpectedly stopped working within two minutes of one another⁷. This was followed by the failure of several other generating units throughout the day. The resulting power cuts left businesses and homes without power. Traffic lights failed and fire engines were sent out on false alarms⁸.

Power stations must of course occasionally be shut down for routine maintenance and unexpected faults. And it must also be said that, during the blackouts, the National Grid actively managed the electricity shortfall, minimising disruption as far as possible. But the changing electricity generation mix is leading to a potential erosion of systems flexibility, exposing UK electricity supply to the risk of blackouts. For this risk to be managed requires operational and physical resilience to be addressed within the incremental changes currently being made to energy transmission and distribution networks.

2

CLIMATE CHANGE

The Mythe water treatment works in Gloucestershire flooded in 2007, cutting off the water supply to 350,000 people in the area for 17 days. It showed how the failure of a single piece of infrastructure can have huge repercussions across a whole region.

A total of five water treatment works and 322 sewage treatment works were put out of action by the 2007 floods. Many electricity transmission and distribution assets were also affected, with 40,000 people in Gloucestershire left without power for up to 24 hours and 9,000 customers spending several days on rota disconnection in south Yorkshire and Humberside⁹.

As damaging as these failures were, it was the potentially disastrous near-misses which really exposed the dangerous weaknesses in our critical infrastructure network. Walham substation, serving 500,000 in south Wales and Gloucestershire, and a number of Sheffield substations serving 750,000 people, came close to failure – events which would no doubt have endangered lives¹⁰. Another alarming near-miss was Ulley Reservoir, near Rotherham. This large dam was in danger of breaching, which would have caused loss of life and also damaged the M1 motorway, a major electricity substation, and the gas network connection to Sheffield.

3

TERRORISM

On 7 July 2005 London's public transport system came under attack during the morning rush hour.

At about 8.50am bombs exploded on three Underground trains within minutes of each other and a fourth went off an hour later on a bus in Tavistock Square. The bombings killed 52 commuters, the four suicide bombers, and injured a further 700 people¹¹. The bombings caused widespread disruption to London's transport system and formed the deadliest and most damaging terrorist attack on the transport system in the city's history.

² Climate Change: Adapting to the Inevitable. A report by the Institution of Mechanical Engineers.

³ Henstra, D. et al. (September 2008). Background paper on Disaster Resilient Cities. A report prepared by Infrastructure Canada. Retrieved from 12 February 2009 from <http://www.inf.gc.ca/altformats/pdf/rs-rr-2004-03-eng.pdf>

⁴ IPCC Fourth Assessment Report. Climate Change 2007 Synthesis Report. 17 November 2007.

⁵ <http://www.metoffice.gov.uk/corporate/pressoffice/myths/1.html>

⁶ Centre for the Protection of National Infrastructure. Retrieved from <http://www.cpn.gov.uk>

⁷ Fortson, D. (28 May 2008) Blackouts sweep the country in electricity shutdown. The Independent. Retrieved from <http://www.independent.co.uk/news/business/news/blackouts-sweep-the-country-in-electricity-shutdown-835315.html>

⁸ Ahmed, M & Hawkes, S. (28 May 2008) Blackouts hit thousands as generators fail. The Times. Retrieved from <http://www.timesonline.co.uk/tol/news/uk/article4016552.ece>

⁹ Pitt, M. (June 2008). Learning lessons from the 2007 floods: An independent review by Sir Michael Pitt. A review commissioned by the UK Secretaries of State.

¹⁰ Pitt, M. (June 2008). Learning lessons from the 2007 floods: An independent review by Sir Michael Pitt. A review commissioned by the UK Secretaries of State.

¹¹ Report of the Official Account of the Bombings in London on 7th July 2005 (11 May 2006). House of Commons. London: The Stationery Office. Retrieved from <http://www.official-documents.gov.uk/document/hc0506/hc10/1087/1087.pdf>



LONG-TERM POLICY SHOULD ADDRESS THE VULNERABILITY OF THE UK NETWORKS AND BUILD RESERVE CAPACITY SHELTERED FROM THREATS

ICE ENERGY PANEL

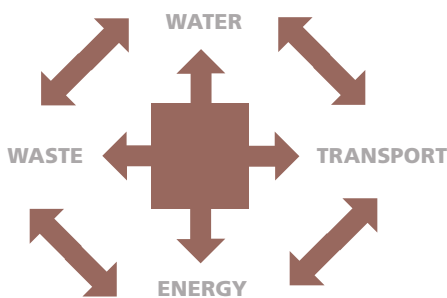
CURRENT SITUATION

The current approach to increasing infrastructure resilience is disjointed and piecemeal. There is a lack of overview, a lack of coordination, there are issues with funding, regulation and planning and an overall failure to recognise interdependency. The following key areas need to be addressed:

INTERDEPENDENCY

The UK's infrastructure assets form an interdependent network. A single failure can cascade across the network of critical infrastructure, rendering otherwise unaffected sectors inoperable¹². This means that one asset requires another in order to function properly; for example, a water treatment plant cannot function without electricity and an electricity production plant will not work without a water supply.

The UK's current infrastructure defence system fails to recognise this vital interdependency. At present work is carried out on individual assets by individual agencies, or separate bodies work independently to address different threats, without any real overview of how each is linked to the others.



☞ The inter-dependencies between different infrastructure systems are sometimes overlooked. In common with most businesses, companies that provide infrastructure services themselves rely on energy, telecommunications, transport and water. A failure in one area can cascade into an event with a wider socio-economic impact.

BURO HAPPOLD/CIC

THE NEED FOR AN OVERVIEW

The government has taken some steps to increase the resilience of our critical infrastructure. Recent initiatives include:

- CPNI working with asset owners to combat terrorism
- The Natural Hazards Team within the Cabinet Office Civil Contingencies Secretariat
- The new flood forecasting centre created by the Met Office and the Environment Agency set up in direct response to the Pitt Review recommendation that the two bodies work more closely together¹³.

While it is valuable, the above work focuses on individual aspects of resilience and operates within different departments. In addition, on a day-to-day basis, agencies, local authorities, regulators, asset owners, and the emergency services all work separately in their individual regions and sectors, with little scope for sharing information or joint forward-planning.

Worrying gaps are therefore present in our approach to critical infrastructure defence. Terrorism is addressed in isolation by the CPNI, emergency planning is dealt with separately by the Civil Contingencies Secretariat, a new team has only just been set up to tackle the effects of climate change, long-term system failure is ignored, and no one is overseeing the resilience of the whole infrastructure network.

A single point of authority to defend critical infrastructure is desperately needed to provide a vital overview and counter silo thinking.

ICE recommends that these issues could be addressed through the creation of an overview role, such as that given

☞ It is vital to the future economy of the UK that costly adaptation decisions are based on robust scientific evidence: to minimise costs, as well as risks to infrastructure and life.

MET OFFICE

to the Environment Agency for flood defence, designed to assist government in addressing the political short-termism that is so detrimental to protecting critical infrastructure. This would help to broker long-term cross-party consensus on essential work. It is vital that risk management assessment, not political point scoring, be used to determine the funding of the defence of critical infrastructure.

The single point of authority would:

- Work with CPNI, and the Civil Contingencies Secretariat and lead government departments, plus the sector based regulators to ensure that they are working together and adequately protecting infrastructure
- Communicate with government, local authorities, the emergency services and the public and support them in implementing resilience guidelines
- Address the gaps in the areas of infrastructure defence currently being overlooked
- Provide the vital overview of critical infrastructure which the UK lacks and work to achieve resilience and add reserve capacity

The authority would also liaise regularly with the key engineering institutions and ensure that sufficient technical ability and engineering expertise exists throughout Whitehall to inform government decisions on infrastructure resilience as called for in the recent Innovation, Universities, Science and Skills Committee report¹⁴. The present lack of technical understanding on the part of policy-makers and politicians compromises decisions and affects government's ability to act as an intelligent client.

☞ New national rules and unifying legislation need to be developed to allow consistent application of duties and powers, so that threats to infrastructure are managed in the same way across various boundaries (eg between landowners and local authorities). Without this consistent national framework, local considerations will overshadow efforts to deliver a joined up, consistent approach.

NETWORK RAIL

ASSET KNOWLEDGE

One of the largest risks is the limited knowledge we have of much of our infrastructure, in terms of location, nature, condition, and impact of failure. The disparate datasets for assets, in particular networks, makes the understanding of total risk difficult to assess.

ARUP

Evidence from all sectors suggests that there is a lack of knowledge of infrastructure assets. If we are to protect our infrastructure we must first know what and where it is. It is likely that this lack of knowledge is one of the causes of inadequate funding for infrastructure maintenance.

Despite this incomplete knowledge of infrastructure networks, CPNI have taken steps to identify and protect the most vital critical infrastructure assets by creating a national asset database, an excellent step towards protecting critical infrastructure. The United States has taken similar measures to protect its critical infrastructure, including creating a list of high priority sites¹⁵. This CPNI database can and should be used as a starting point for protecting and mapping infrastructure.

Once our assets are mapped the government must improve its accounting system to adequately recognise the cost and value of critical infrastructure. The single point of authority must ensure that the government carries out necessary cost benefit analysis of critical infrastructure – the cost of building and maintaining a piece of infrastructure compared to the cost to society, the environment and the economy were it to fail.

ONE OF THE LARGEST RISKS IS THE LIMITED KNOWLEDGE WE HAVE OF MUCH OF OUR INFRASTRUCTURE, IN TERMS OF LOCATION, NATURE, CONDITION, AND IMPACT OF FAILURE



¹² Edwards, C. (April 2009). Resilient Nation. A report by Demos.

¹³ Pitt, M. (June 2008). Learning lessons from the 2007 floods: An independent review by Sir Michael Pitt. A review commissioned by the UK Secretaries of State.

¹⁴ Engineering: turning ideas into reality (27 March 2009). House of Commons Innovation, Universities, Science and Skills Committee. Published by authority of the House of Commons London: The Stationery Office Limited.

¹⁵ Moteff, J. (10 October 2008). Critical Infrastructures: Background, Policy, and Implementation. CRS Report for Congress prepared for Members and Committees of Congress. pp 28.

MAINTENANCE FUNDING

« Much more emphasis needs to be placed upon routine maintenance of existing assets across all sectors.

NETWORK RAIL

Infrastructure accounts for much of the nation's investments¹⁶. Past governments and the private sector have invested considerable sums in our built environment. The total value of existing civil engineering works in the UK is £799.4 billion¹⁷. If infrastructure is such a large part of the UK's assets,

should we not protect our investment?

The need for maintenance is not just due to our ageing infrastructure - maintenance of infrastructure should be a perpetual, ongoing commitment. Routine maintenance of existing critical infrastructure assets reduces the risk of failure.

Maintenance is currently funded by revenue budgets rather than capital budgets. Revenue budgets are often under more pressure than capital budgets because they are ongoing, rather than one-off expenditures. Furthermore, revenue based maintenance budgets are often the first to be cut in difficult financial times¹⁸.

The government and regulators must ensure that maintenance funding is ringfenced. This will ensure that even if budgets are tight, money intended for ongoing maintenance will not end up spent elsewhere.

The format of the national accounts should be reviewed to ensure that the ongoing costs of maintaining infrastructure are much clearer, and to ensure politicians suffer as much criticism for a decline in the value of our fixed assets as they do for a drop in GDP.



COMPETITIVE MARKETS MAY NOT ASCRIBE SUFFICIENT VALUE ON RESILIENCE

ICE ENERGY PANEL

PLANNING

Acquiring the necessary planning and regulatory consents has proven to be a major constraint in the timely and efficient delivery of large infrastructure projects.

BURO HAPPOLD/CIC

The government has recently taken steps to address the long-standing problems with the UK's circuitous planning process. In 2008, the Planning Act was passed to provide a more efficient planning system for nationally significant infrastructure projects. The legislation replaces eight consent regimes with one for major projects such as railways, ports, roads, airports, water and waste infrastructure¹⁹.

The Act also provides for the establishment of a new independent Infrastructure Planning Commission (IPC) to determine the detailed and technical merits of individual applications. However, as yet, no projects have been through the new system, so it remains to be seen if this new Planning Act will be effective in delivering much needed infrastructure more efficiently.

The government must ensure the Planning Act and the IPC are as effective and straightforward to navigate as possible. If this legislation fails to achieve reform due to political decisions or workability issues, further reform will be urgently needed.

Planning Policy Statement 25: Development and Flood Risk

The onus is on English local planning authorities to apply Planning Policy Statement 25: Development and Flood Risk (PPS25), introduced in 2006 and intended to reduce the risk of flooding to new developments.

The Environment Agency provides some guidance to local authorities on the implementation of PPS25 in England, and the equivalent policies in the devolved administrations. The relevant bodies do this by auditing large planning applications, but only in a very small number of cases. This system means that flood risk management policy often conflicts with, and loses out to, local authority targets for the economic development of their region.

ICE believes there is a lack of appropriate engineering expertise within many local authorities. This leaves development control and planning departments without the skills to fully implement the recommendations of PPS25 or other devolved administration equivalents. This sometimes results in development that is unnecessarily at risk from flooding, and/or insufficiently resilient.

The Natural Hazards Team should work with the Department for Communities and Local Government and the Environment Agency to ensure local authorities and infrastructure operators consider resilience in the implementation of PPS25 (or equivalent). The team should provide national guidance, if necessary, to enable local authorities to develop the right engineering capabilities to put PPS25 or equivalent policies into practice.

In terms of regulation, there are a number of limitations in the existing structure which potentially undermine long-term infrastructure resilience. The current framework for economic regulation of the water industry can encourage short-term efficiency savings at the potential cost of ensuring that vital infrastructure is maintained and improved to meet future requirements.

SEVERN TRENT WATER

It is known that there is still a significant amount of critical infrastructure being located in areas at risk of flooding.

BURO HAPPOLD/CIC

¹⁶ Boshier, L. (2009) Addressing the challenges and impediments to building national, regional and local resilience: A built environment perspective. Presented at the '4th International Conference on Integrated Disaster Management', 1st -2nd March 2009. Tehran, Iran.

¹⁷ Spending Review. HM Treasury. Retrieved on 18 April 2009 from http://www.hm-treasury.gov.uk/spend_index.htm

¹⁸ Goodman, S. & Hastak, M. (2006) Infrastructure Planning Handbook: Planning, Engineering, and Economics. London: McGraw Hill.

¹⁹ Infrastructure Planning Commission implementation: Route map. (January 2009) A report by Communities and Local Government.

INADEQUATE REGULATORY REMIT

ICE believes that the current regulatory system does not adequately address the long-term stewardship of infrastructure and in particular the protection of our national assets. While there are currently regulatory bodies for some sectors, such as Ofgem for the energy sector and Ofwat for the water industry, some major areas – such as waste and roads – have no over-arching regulator whatsoever. Among the sectors where regulators do exist there is a lack of joined up working, each is only concerned with their own sector.

The focus of regulators and asset owners is consumer price, service level and the bottom line, rather than increasing resilience and funding reserve capacity. At present the government takes no responsibility for the provision of reserve capacity and leaves its delivery to the market. Therefore regulators have neither the remit nor the ability to

incentivise asset owners to build reserve capacity into critical infrastructure assets. The regulatory system does not recognise interdependency or approach the critical infrastructure network as a whole.

As well as reserve capacity, it is also difficult for regulators to ensure full precautions are taken against emergency situations. Specific man-made and environmental threats are not always addressed as a matter of course – only in certain instances and not always successfully. For example, several years ago Ofwat had to seek specific advice and support from CPNI to ensure that it could justify water companies' investment against terrorist threats, due to the narrow definition of its remit.

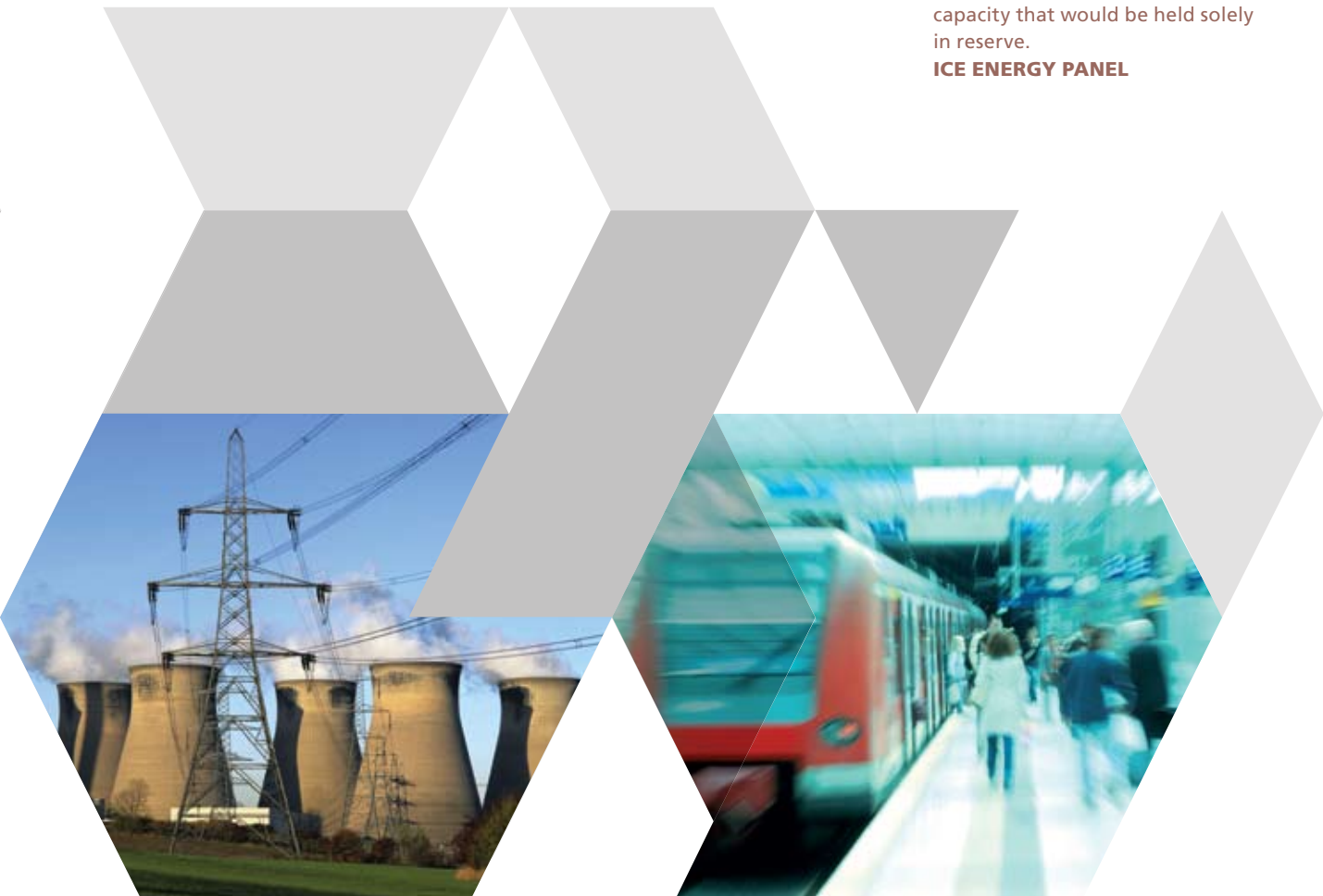
The government must therefore expand the remit of the regulators to address asset stewardship as well as consumer interests. The regulators must be able to offer private asset owners some incentives to build reserve capacity into their infrastructure

and should also be given the power to ensure that contingency planning which accounts for an interdependent system of infrastructure is carried out by asset owners.

Regulators must ensure critical infrastructure receives adequate funding to ensure necessary protection – an action which is particularly important given the current economic situation. Regulators should work with CPNI and the new Natural Hazards Team to ensure that additional spending on infrastructure protection is appropriate and proportional. Spending should be carried out under the supervision of the new single point of authority for infrastructure resilience. This point of authority would also play a key role in identifying the gaps which exist in the regulatory system and suggesting solutions to resolve them.

Current electricity market arrangements are based on rewarding energy sales, but there is no incentive to install new generating capacity that would be held solely in reserve.

ICE ENERGY PANEL





LACK OF SPECIFIC DELIVERY BODIES FOR ALL THREATS

The government has recently rectified the failure to address the impacts of climate change on critical infrastructure by creating the Natural Hazards Team within the Civil Contingencies Secretariat of the Cabinet Office.

This new initiative is to be welcomed but we must now ensure that the Natural Hazards Team has the same amount of power as the CPNI and is capable of providing much-needed leadership to asset owners and regulators. Previous government efforts, such as the National Risk Register encourage, but do not insist, that individuals and organisations think about their own preparedness²⁰. The Natural Hazards Team should provide a 'challenge function' to asset owners (through regulators where they are available), actively ensuring that their recommendations are carried out and that infrastructure is resilient.

The Natural Hazards Team must also work closely with the Met Office to ensure asset owners make the best use of climate change data. One of the Natural Hazard Team's first jobs should be to prioritise cross-referencing the Environment Agency's flood maps with the CPNI list of critical assets as a first step to identifying and protecting critical infrastructure at risk of flooding.

The government has acted in some way to address both climate change and terrorism, but the third main threat to critical infrastructure – system failure – remains largely ignored.

System failure can be caused by a lack of proper day-to-day maintenance, or failure to recognise long-term delivery issues. For example, in the next 10 years, eight nuclear power stations will come to the end of their functioning life. A further 8GW will be lost when six coal fired power stations close under the Large Combustion Plant Directive by 2015 at the latest²¹. Without new

energy generation or significant demand management there will be a shortfall, which will affect not only the energy sector but the entire infrastructure network.

ICE recommends that the overview authority for infrastructure resilience acts to address system failure. With an overview of the infrastructure network and open communication channels with regulators, asset owners, local authorities and agencies this function will be well placed to ensure issues of long-term maintenance and delivery across all sectors are effectively dealt with. The role can also add extra weight to the efforts of the Department of Energy and Climate Change to create new capacity to meet the energy deficit.

²⁰ Cabinet Office. National Risk Register. Retrieved on 12 February 2009 from http://www.cabinetoffice.gov.uk/reports/national_risk_register.aspx.

²¹ Bird, J. (August 2007) Energy Security in the UK: An ippr fact file. Institute for Public Policy Research.

While some sectors, notably water and parts of the power network have well developed resilience policies and procedures to address risks, the development in other areas is not as mature. An opportunity exists to roll out the experience gained in creating resilience in the more traditional sectors to the newer ones, and the current structure of CPNI does, we believe, support this.

CARILLION

ICE RECOMMENDATIONS

Well defended critical infrastructure is central to the security and stability of the nation. The UK must take action now to improve the resilience of our critical infrastructure, or pay the economic, social and environmental price in the future.

From the evidence submitted to ICE, the following recommendations are made to government:

1. ESTABLISH A NEW SINGLE POINT OF AUTHORITY FOR INFRASTRUCTURE RESILIENCE TO:

- Ensure coordination and communication between threat-based resilience bodies as well as sector-based regulators
- Pick up the resilience issues currently overlooked
 - i. electricity supply and demand
 - ii. system failure
 - iii. multiple sector/failure approach
 - iv. interdependency
- Support CPNI, Natural Hazards Team and sector based regulators in their work to increase infrastructure resilience
- Provide overview for resilience of infrastructure
- Achieve resilience by encouraging reserve capacity and connectivity
- Support local authorities to implement resilience guidelines
- Ensure planning is in place so that in emergency situations, contingency measures are communicated to the public (eg loss of public transport)
- Ensure there is sufficient technical engineering expertise in government to enable the defence of critical infrastructure
- Liaise with elected officials to ensure an apolitical approach is taken to resilience
- Improve government accounting to effectively manage critical infrastructure liabilities, and increase the cost of political failure
- Improve cooperation and information sharing between national, regional and local authorities and improve coordination with the emergency services
- Ensure that adequate contingency planning is carried out by critical infrastructure asset owners
- Encourage the Treasury and the Office of National Statistics to enable and increase a better understanding of the value and cost of critical infrastructure maintenance
- Carry out necessary modeling to enable proper cost benefit analysis for the protection of critical infrastructure

2. ENSURE THAT THE NEW NATURAL HAZARDS TEAM WILL:

- Challenge private asset owners (through regulators where necessary) to ensure they are accounting for infrastructure resilience
- Cross-reference the CPNI critical infrastructure list with EA flood maps
- Work closely with the Met Office to ensure that climate change data is correctly interpreted into defensive measures by critical asset owners

3. ENABLE REGULATORS TO:

- Drive infrastructure resilience through regulation
- Ensure that regulated utilities' investment, maintenance and charging plans reflect the need to protect critical infrastructure
- Enable appropriate funding mechanisms for infrastructure development
- Guard against the dangers of interdependency of critical infrastructure
- Increase resilience through reserve capacity and connectivity between assets
- Incentivise private critical asset owners to build in resilience and redundancy

4. ENSURE FULL IMPLEMENTATION OF THE PLANNING ACT 2008 TO:

- Ensure the new Planning Act is workable and effective
- Support local authorities in the implementation of relevant planning guidelines including PPS25: Development and Flood Risk and its equivalents

WE WOULD LIKE TO THANK THE FOLLOWING CONTRIBUTORS:

Alan Carter
Arup
Barry Rydz
BERR
Brian Collins, Chief Scientific Advisor, Dept. for Transport
Buro Happold
Carillion PLC
Centre for the Protection of National Infrastructure
Centrica
Construction Industry Council
CIRIA
Civil Contingencies Secretariat
Chartered Institution of Water and Environmental Management
Chartered Institution of Wastes Management
Consumer Focus
Council for Science and Technology
County Surveyors Society
David Evans
Defra
Demos
Denis Stephens
Doug Brown

Dr. Lee Boshier, Loughborough University
Environmental Agency
Environmental Services Association
Ewan Laracombe
Geoff French, ICE Vice-President
Highways Agency
Ian Jenkinson
ICE Energy Panel
ICE Health and Safety Panel
ICE Learned Society
ICE Municipal Panel
ICE Transport Panel
ICE Waste Panel
Institution of Civil Engineering Surveyors
Jim W. Barrack
John Forrest
Keith Nicholls
KPMG
Leicestershire County Council
Local Government Association
Location and Timing Knowledge Transfer Network
London Chamber of Commerce and Industry
London TravelWatch

Mark Ferri
Met Office
Municipal Engineer Journal
National Grid
Network Rail
Michael Hayward
OMEGA Centre, University College London
Oprisk
Ordnance Survey
Paul Jowitt, ICE Vice-President
Peter Jones
Peter Styles
RAC Foundation
Reg Harman
Royal United Services Institute
Seams Ltd
Severn Trent Water
Stephen Wearne
Suffolk County Council
Tony Bolden
Transport for London
Water UK



One Great George Street
Westminster
London SW1P 3AA
t +44 (0)20 7222 7722
f +44 (0)20 7222 7500
e stateofthenation@ice.org.uk
ice.org.uk



Published June 2009

Registered charity number 210252
Charity registered in Scotland number SC038629
This paper is made from elemental chlorine-free pulp from sustainable forests