

Policy Note

Enhancing governance of energy and water interdependencies



September 2015

The Energy Research Partnership (ERP), UK Water Research and Innovation Partnership (UKWRIP) and The Infrastructure Transition Research Consortium (ITRC) have been working together with practitioners in government, industry and academia to explore ways to manage the complex interdependencies between the energy and water sectors in infrastructure and service delivery within the UK and to enhance their governance.

This policy note presents the findings of a series of collaborative workshops, wherein a large number of interdependencies between the energy and water sectors were identified, categorised and implications analysed. Game Theory is suggested as one way of addressing multi-actor, multi-objective governance problems related to sector interdependencies.

Over 300 interdependencies between the water and energy sectors

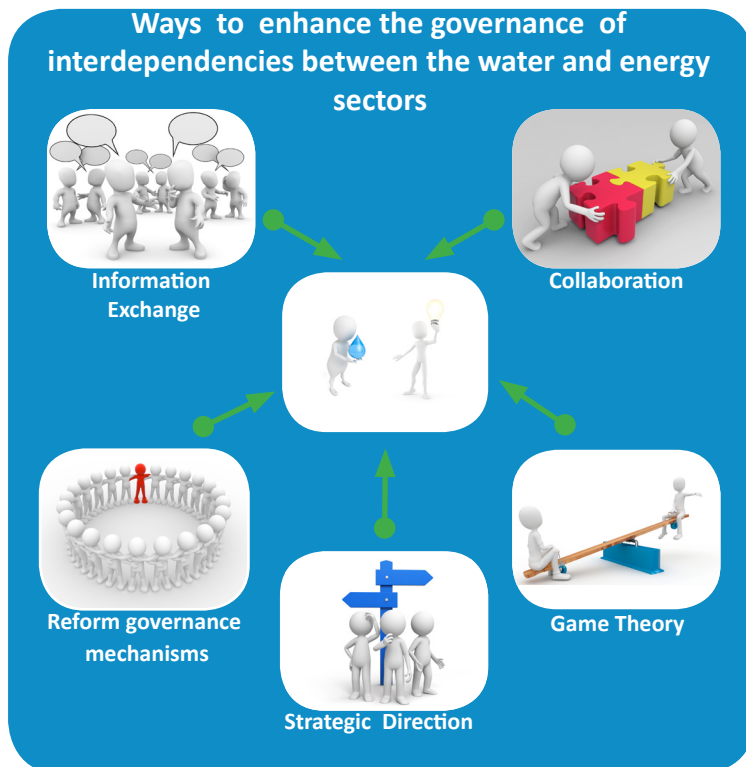
We have identified over 300 interdependencies between the energy and water sectors, which can be categorised as:

- Opportunities for co-location
- Risk and opportunities
- Existing policies

Yet, high fragmentation between multiple actors and initiatives in the UK makes finding the right forum for discussing infrastructure interdependency a challenge. The diffusion of efforts results in sub-optimal outputs and limited opportunities for productive engagement between industry and regulator stakeholders. For example, there are synergistic opportunities for demand reduction in the two sectors, which are neglected in single sector assessments.

Despite strong national and EU environmental policies to improve water quality and reduce emissions, investments by water companies that would help meet both of these goals have been hampered by competing policy priorities. Water companies have become increasingly interested in the use of renewable energy to meet rising energy demand whilst reducing emissions. However, the water regulator (Ofwat) and climate change regulations have significantly reduced the incentives for them to invest in renewables. This illustrates the need for a new approach to governance.

A new approach to governance



Information exchange

- An ongoing broad based information exchange between infrastructure sectors, academia and governance actors is required in order to develop a common understanding of different sectors, the degree of dependence that they have on each other, and their respective 'cultures'.

Collaboration

- Creation of a platform to identify synergies and enable knowledge exchange and action across sectors (beyond energy and water) would include:
 - Cross-sectoral exploration of the rationalisation of investment, risk limitation and robust infrastructure performance of interdependent services;
 - Assessment of the most effective governance mechanisms (see Figure 1) for the actors involved in UK energy-water governance;
 - Informing the implementation of effective policies at a government level; and
 - Development of an effective cross-sectoral brokerage system for shared understanding of respective sectorial needs, cultures, and visions of the future.

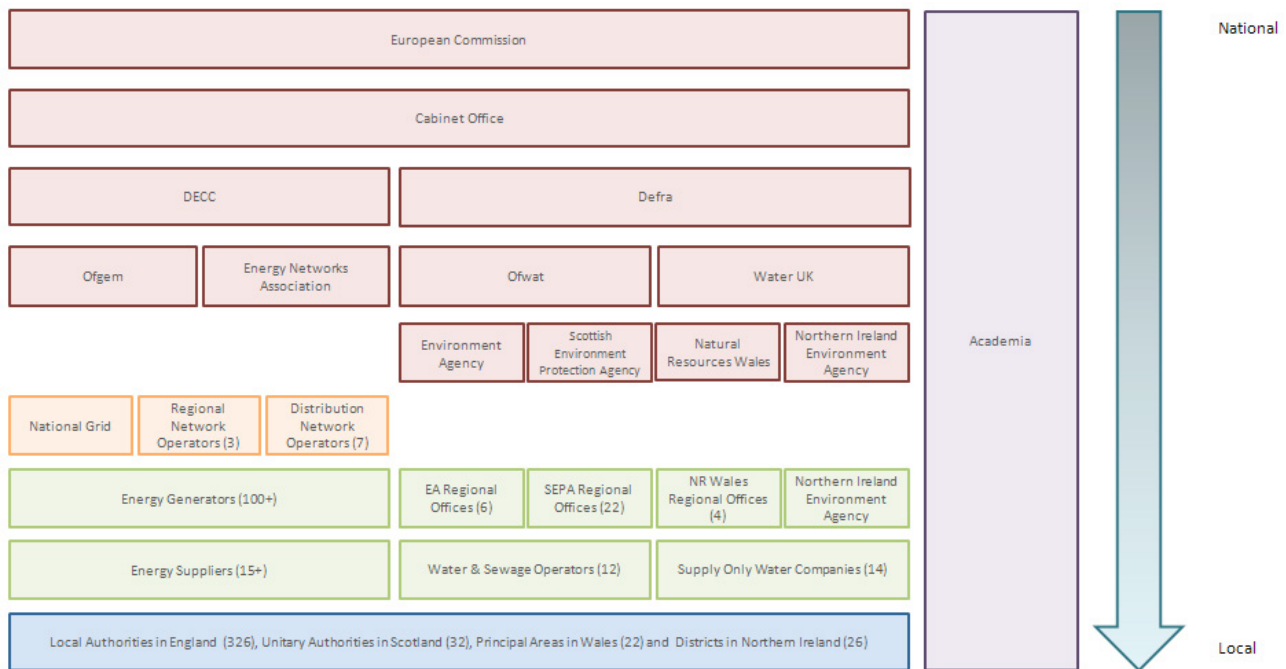


Figure 1: The hierarchical and highly complex system of energy-water related governance in the UK *.

Reform governance mechanisms

- Present infrastructure governance mechanisms should be reformed to include a wide range of actors (particularly local actors) to remove regulatory barriers, and to reconcile opportunities and risks from energy-water interdependencies.
- Local actors, authorities and communities are best placed to understand how different infrastructure systems interact to deliver economic, environmental and social benefits/trade-offs. However, market-based instruments, currently dominating infrastructure policy actively constrain local authorities and communities.
- There is a need to develop a strategic direction for interdependencies work and leadership to allow the coalescing of ideas from the two sectors to relevant actors.
- To promote openness and collaboration in the creation and operation of infrastructure requires a combined approach of: (1) stewardship by Government - in conjunction with (2) an 'Open Systems' approach to establish an interdependency planning and management process for the Her Majesty's Treasury Green Book; with (3) embedded learning and maturity modelling; and (4) innovative business models and practices.

Role of Game Theory in addressing multi-actor, multi-objective governance problems

- As shown above, there is increasing need to integrate multi-actor, multi-objective frameworks for infrastructure interdependency challenges across scales whilst accommodating uncertainty. Although multiple decision-making tools exist, their ability to replicate the capacity for compromise amongst stakeholders and objectives in real-world decision-making processes is limited.
- Game Theory can inform a decision-making approach by generating a set of near-optimal, feasible and 'stable' results, allowing the analysis of the various trade-offs involved, and of potential fall-back positions. The outputs from such an approach can be more practical in real-world situations when compared to the 'optimal', but often impracticable options, given by conventional multi-objective optimisation methods.
- Opportunities for addressing interdependencies using Game Theory include assessing policy risks; pricing methodologies for water trading; stability analysis for different long term water and energy (infrastructure) investment scenarios considering different regulatory changes; supporting negotiations processes.

- The relevance of Game Theory needs to be better explained to senior management and further activities are required to mainstream Game Theory as a tool for decision-makers addressing energy- water infrastructure issues in the UK.

Background information

This document represents a summary of the key messages within [The Energy & Water Infrastructure Sector Interdependencies Governance Workshop - Planning and Preparing for the Future - Full Report](#), and the [Grantham Institute Game Theory Policy Note](#).

Follow up activity

A workshop will be held to explore ways in which uncertainties and complexities in evidence can be factored into decisions; particularly exploring the tools and techniques available and the contexts in which they might be applied more effectively.

Date: 10-11 February 2016

Venue: Imperial College, London.

Further information on the workshop can be obtained from Dr Laila Read at the Grantham Institute

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Further information

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* From M. Alylott, 2014. UK Energy System Hazard Exposure, Research and Governance Mapping. Consultancy work undertaken for the Energy Research Partnership. Unpublished.

