16 Robertson Street
Glasgow G2 8DS
Tel: 0141 248 3721
secretary@iesis.org www.iesis.org
www.iesisenergy.org

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# Actions that need to be taken by the UK Secretary of State for Energy and Climate Change appointed after the May 2015 General Election

## 1. Introduction

The Secretary of State for Energy and Climate Change who will be appointed after the May 2015 General Election will have a difficult task but will also have an excellent opportunity. The task will be difficult because the development of national policy for energy involves complex uncertainty. The opportunity lies in the potential to apply management processes and technology that are known to deliver satisfactory outcomes in such contexts.

The provision of a secure and affordable electricity system is at the highest level of national importance and we recommend that this is the area that should be given priority in energy planning. This document discusses only features of the Electricity System. The approach to policy development outlined here should be applied to all energy issues.

The complexity of planning for an electricity system is strongly affected by requirements that have become increasingly difficult to balance: security of supply, affordability, emissions reduction, safety, effect on landscape, etc. These issues need to be addressed using the most advanced methods that are available.

## 1. Message from IESIS to all UK political parties

IESIS is promoting the principle that it is imperative that the Secretary of State for Energy and Climate Change who will be appointed following the UK General Election in May 2015 must:

1. Adopt 'third axis thinking' where balanced judgement rather than intuition is used in making decisions. For more about third axis thinking see Appendix 1.
2. Ensure that reliable information is used in making judgements.
3. Arrange that the gathering of information to support judgements will be under the control of an independent expert commission.

This document focuses on policy for the GB Electricity System but the above actions are relevant to all government planning for energy

For intended interpretations of the words used above see Appendix 4

**Why is a government body needed?**

It is not realistic to expect that those who are involved with organisations that depend on the Electricity System to fund their activities will be able to avoid bias in their approach to information gathering. Gathering information under the control of an independent expert commission can minimise the risk of such bias. As an example, the 1926 Electricity Act required that the Energy Commissioners would not hold shares in electricity generation companies - see Appendix 3.

The logic of why an electricity system needs a government body to control risk is explained in Appendix 2 and evidence that such a body can be effective is given in Appendix 3.

**Why are these actions imperative?**

The GB Electricity System is not only complex and deeply technical, but is also of considerable financial significance at about £28 billion p.a., and of societal importance with regard to security of supply. It is, therefore, imperative that great consideration is given to achieving optimal overall cost required to achieve a robust and defined level of reliability, and to the level of risk to security of supply it is endeavouring to achieve. The structure of the decision-making process should reflect the needs of society as a whole, and also be based on the soundest governance.

**How might a national commission be constituted?**

An option analysis should be carried out to consider a range of ways of establishing a commission. In the first instance a group of people could be appointed on an *ad hoc* basis to start the process of technical assessment based on third axis thinking.

Consideration should be given to the arrangement established by the 1926 Electricity Act that required the appointment of Electricity Commissioners reporting to Parliament.

**What arrangements for optimising the Electricity System should be considered?**

Again, an option analysis is needed to investigate ways of providing long-term planning for the secure operation of the Electricity System. For an example, see:
http://www.iesisenergy.org/CG-paper.pdf

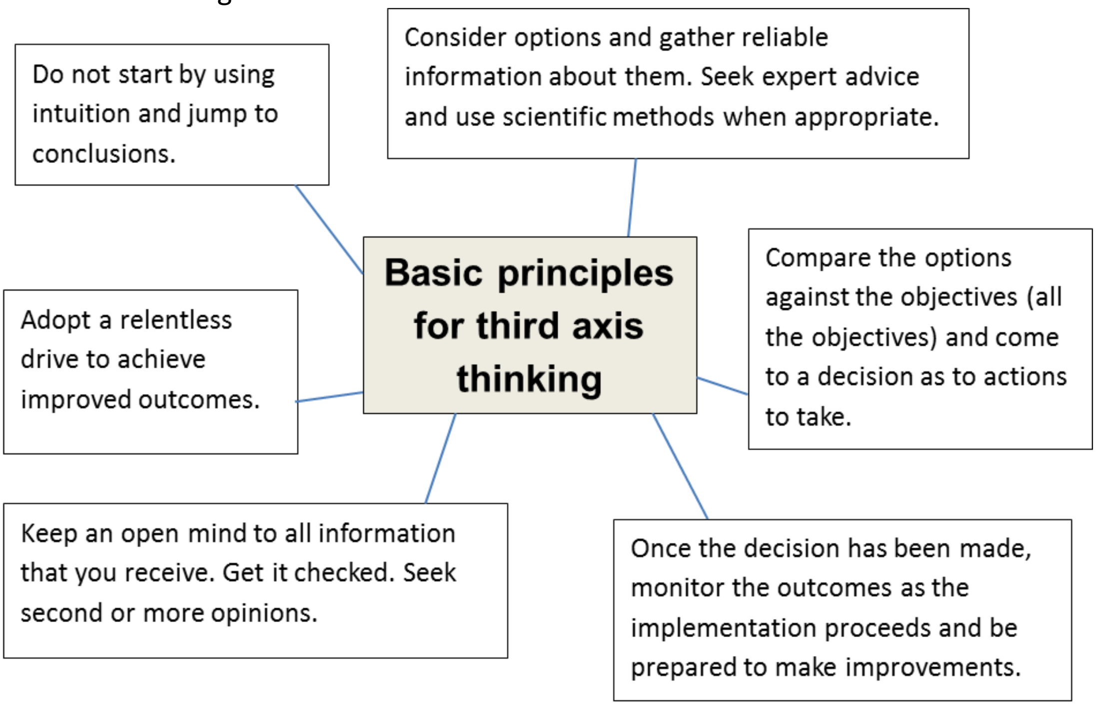
## Appendix 1  Third axis thinking

**Background**

Mark Henderson, former Science Editor of "The Times" wrote:

"Politics has a third axis too. It measures rationalism, scepticism and scientific thinking – the willingness to base opinions on evidence and to keep them under review as better evidence comes along."(*The Geek Manifesto* – Why Science Matters)

We seek to define the 'third axis' concept as the use of a set of guiding principles that also go beyond, but include politics and go beyond, but include scientific thinking.  The principles are used where people seek to achieve successful outcomes in complex situations as outlined in the figure below:

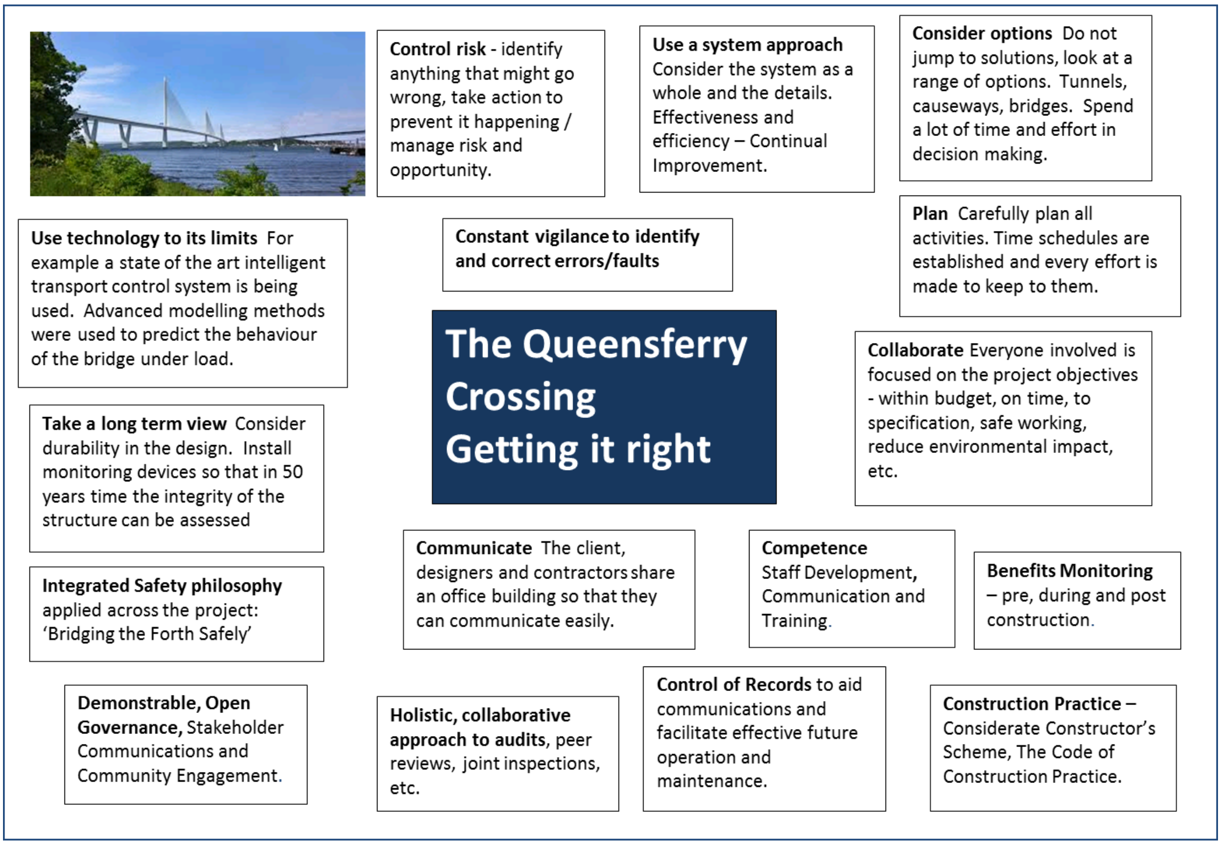



For more about third axis thinking see http://www.iesis.org/thirdaxis

***Case Study Third axis thinking for the Queensferry Crossing presently (2015) under construction over the River Forth in Scotland***

The diagram below is a map of a range of guiding principles that represents third axis thinking in the procurement of a large infrastructure project.  The wide range of principles shown illustrates the complexity involved in achieving success in such large projects.

For this project a client team was formed from staff from the Major Projects Division of Transport Scotland, a Department of the Scottish Government and two consulting engineering firms. The Transport Scotland staff are highly competent and specialist expertise is provided by the consulting firms. This 'competent client' team did option assessments and produced the  basic design.  It now works closely with the contractors and all other stakeholders to seek to achieve the fundamental project goals of: on time; within budget; and to specification.



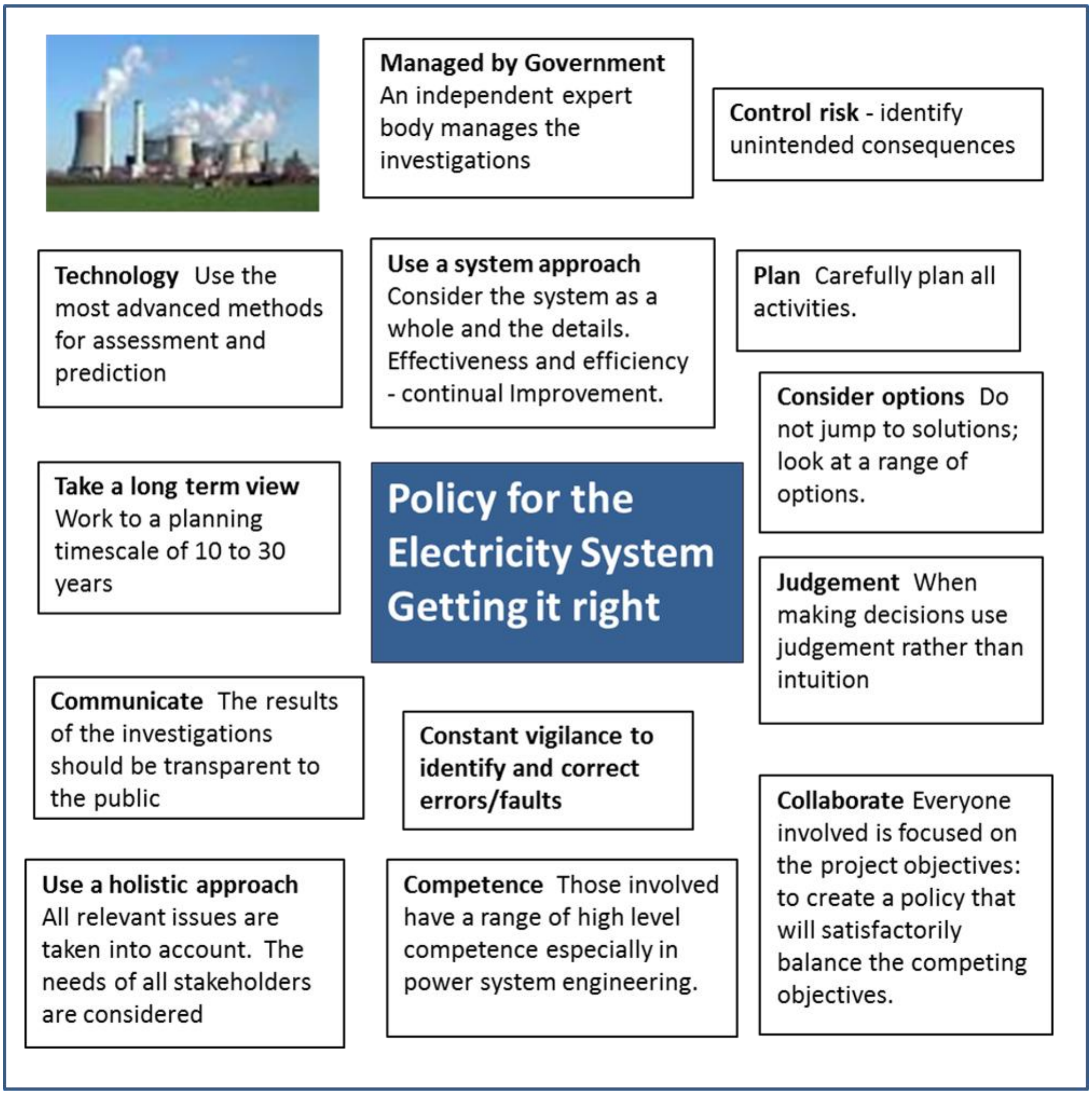

Such an approach to project control is normal for large infrastructure projects in the UK. For example the 2012 London Olympic Delivery Authority, a non-departmental government body, was highly successful . The Crossrail Project that involves the highly complex work of providing new rail infrastructure for London mainly by driving new tunnels, is being very successfully managed.

**Guiding principles for the Electricity System**

Below is a similar map for developing policy for the Electricity System.

While an electricity system is different from a long span bridge, there are important lessons to be learned:

- A government body can be very effective in the management of a complex engineering project.
- A public/private partnership for a competent client team can work well.
- The central role of government staff, in seeking to ensure that the client's interests are being served, is critical.




## Appendix 2. Risk of unsatisfactory outcomes for the Electricity System

### Risk to Security of Supply

A failure in security of supply resulting in a 'black condition' would not only be of considerable inconvenience at a domestic level, but would also result in a massive loss of production, possible civil unrest, and even death. The cost will be well beyond that normally attributed to Value of Lost Load. It is, therefore, a 'public good' issue, and the involved methodology and calculations should be open to the widest scrutiny. This raises the question, therefore, whether the standard adopted for the level of risk should be fixed on an enduring basis, and not subject to Cost Benefit Analysis as is presently being used.

***Case Study: Longannet coal fired power station***
Scottish Power is proposing to close Longannet Power Station because they consider that it is no longer economically viable. This situation is influenced by:

- Wind energy generation being given preference in dispatch over thermal generation. This reduces the load factor for the thermal generators and hence increases the cost of operating them.
- Coal generation attracts the highest rates for carbon tax.
- Longannet needs expensive upgrades to meet EU emissions standards.

Risks if Longannet were to close include:
- Scotland would be dependent on generation from England and Wales to meet demand in Scotland. However, since (a) only a small proportion of wind generation capacity can be allowed for in calculations for security of supply and (b) generation capacity in England and Wales is declining, the likelihood that there would be spare capacity to export to Scotland is low. Therefore without Longannet there is a high risk that Scottish demand for electrical power would not be met, leading to blackouts in Scotland.
- Without Longannet to provide reactive power to control the system voltage, Scotland would be vulnerable to voltage control problems that could cause blackouts.
- In the event of a major blackout in Scotland, re-starting the system (the black start condition) could take over a day if power from Longannet was not available. Experience from North America shows that long blackouts can lead to looting, fire raising and civil disturbance.

The situation with Longannet clearly illustrates the conflict between the commercial requirements of a company that generates electricity and the needs of the public. Electricity is not like other commodities where companies that operate in the market can be allowed to make independent decisions about closure of a service. The risk that demand for electricity will not exceed generation has to be maintained at an acceptable level. Only an energy commission as described in this document can address this issue in a way that takes account of all issues.

Longannet needs to be treated as a national infrastructure asset as if, for example, it was part of a water supply system. We could not contemplate the situation that a private company would close part of the water supply because it was not commercially viable.

## Risk of high levels of cost of electricity

***Monitoring and estimating costs***
Since new sources of renewable energy, such as from wind, need to be subsidised, they are more expensive than by conventional generation sources. The question is 'How much more?' We do not have generally accepted answers to this question. Wind generation causes 'integration costs' for backup, balancing and extra transmission that are incurred by the customers but are not by the generators. We know of only one attempt to estimate these costs – see: http://www.iesisenergy.org/lcost.html This indicates that with 28GW of wind power in the GB system, onshore wind energy could be three times the cost of thermal generation and offshore wind energy four times. The calculation for these estimates was

based on the Levelised Cost method which is not the most advanced method. The Total System Cost Method would give more accurate predictions.

***Keeping the costs to a minimum***

It seems that meeting targets for reduction in $CO_2$ emissions are being sought on the basis that whatever the cost, it has to be done. Whether or not this is an acceptable strategy, the public have a right to know what the extra costs of such reduction are and will be. Proceeding to implement government policy in the absence of reliable information about cost does not represent good governance.

Whilst the recent Capacity Auctions show recognition of the need for a degree of central planning for power capacity and for its delivery through competitive tenders, it does not give overall optimization of cost for both power capacity and energy. The financial magnitude of the industry warrants the effort of overall optimization. This could be achieved by extending competitive tendering to both capacity and energy, since both are delivered by the same physical plant. The assessment of tenders would use Total System Cost Analysis. For more information on this see: http://www.iesisenergy.org/CG-paper.pdf

### Risk that the level of reduction in emissions will be less than expected

When there is a significant proportion of intermittent wind power generation in the system, thermal generators need to operate in an inefficient balancing mode. This results in extra $CO_2$ emissions. Producing reliable estimates of this effect is complex but feasible. Estimates for other electricity systems indicate that it could be important. We are not aware of any such estimates for the GB system. Pressing on with a policy in the absence of assessment of unintended consequences does not represent good governance.

## Appendix 3 History of the GB Electricity System

The chronology for the GB Electricity System listed below and summarised in Table 1 provides evidence that:

- A free market system for electricity supply can be unsatisfactory.
- A national commission can successfully work with private generation companies to provide an electricity system that is fit for purpose.
- A nationalised electricity system can be planned by a commission that operates successfully in the interests of customers.

Table 1 Ownership and Management of the GB Electricity System

| Period | Ownership of plant | Management | Effectiveness |
|---|---|---|---|
| **1882-1898** | Municipal | Local | Urban only |
| **1898-1926** | Private and municipal | Local | Low[a] |
| **1926-47** | Private and municipal | National | High |
| **1947-1990** | National | National | High |
| **1990 to present** | Private | Market regulation | Low[b] |

- a Prices were too high
- b Now prices are high and increasing and security of supply problems are looming

**Chronology for the GB Electricity System**

**1882** Generation only in urban areas by municipalities who tried to keep the public electricity system in their own area out of private hands because their experience with private water and gas companies had been dire. The county councils were not interested in providing a public electricity supply in their area.

**1898** Private companies were allowed to supply electricity to landward areas, which included some large enterprises as potential customers.

**1919** The Williamson Report advised Parliament that:

- The cost of electricity in GB was twice that in USA because:
- The size of the generating units in terms of power output was too small and
- A national grid was needed.

The report recommended that a national body be formed to increase the size of the generators and create a national grid

Amendments to the 1919 Electricity Act did not provide sufficient authority for the needed changes to be made.

**1926** The Weir Report advised Parliament that the recommendations of the Williamson report had to be implemented

Under the 1926 Electricity Act, Electricity Commissioners were appointed to recommend what actions should be taken and an Electricity Council implemented the recommendations. The Act required that the Commissioners could not hold shares in electricity generation companies. The Council was responsible to Parliament.

The Grid was largely complete by 1935.

By 1938 the sizes of the generators had been significantly increased and the cost of electricity had been reduced by 24% from pre-1926 levels.

**1947** The System was nationalised

It was managed by the Central Electricity Generating Board (CEGB) in England and Wales and the South of Scotland Electricity Board (SSEB) and the North of Scotland Hydro Electric Board (NOSHEB) in Scotland.

These bodies used advanced methods to optimise cost of generation and to maintain the risk to security of supply at a satisfactory level.

**1990** The System was privatised

Regulation of prices was sought via Ofgem but regulation for security of supply was abandoned. It was assumed that the market would provide a suitable quantity and mix of generation types.

That prices did come down in the 1990s is hailed as a triumph of market economics but a main reason for the decrease was the lifting of a Government ban on the use of gas for electricity generation. This resulted in the 'dash for gas'. It is likely prices would have decreased in a nationalised system.

We now have an electricity system for which:

- Priority in dispatch is given to the most expensive type of generation i.e. wind power, rather than to the cheapest.
- Renewable energy is subsidised, new nuclear has price guarantees and coal and gas generation is becoming increasingly unattractive to investors. Therefore opportunities for an electricity market to be effective are low and declining. The system that we now have is not suitable for the intended type of market competition.
- There is no expert independent technical overview of policies.
- The method being used to control security of supply does not appear to be able to produce optimum outcomes and does not appear to be auditable.
- There is no evidence that reliable assessments are being made for cost or for emissions reduction.

## Appendix 4 Intended interpretation of words used in in this document.

*Judgement* - the evaluation of evidence to make a decision
*Intuition* - the ability to understand something instinctively, without the need for conscious reasoning
*Balanced* - that all relevant issues are taken into account based on their relevance and importance.
*Reliable* - that uncertainties about the information have been reduced to as low a level as is reasonably practical.
*Independent* - that those involved are not subject to commercial or other constraints that would limit their potential to support the production of reliable information, i.e. they need to be disinterested in specific outcomes.
*Expert* - that those involved in the work will have a range of high level competence particularly in relation to technical issues.

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