Inquiry into low carbon network infrastructure Oct 2015

Future Energy Provision for the UK

Extract

Rarely has a select committee been given such an important task. The future importance of creating a successful electricity infrastructure policy is fundamental to the wellbeing of the UK. Unlike expert input and analysis, this submission asks the committee to take into consideration the longer-term requirements. This is about future technical change and why the future requirements maybe quite different from today's and unforeseeable. The committee is urged to consider this non-expert input with an open mind and tackle the difficult questions put forward for consideration. The author provides an example of the potential (unknown) impact of emerging technologies, (utilising fuel cells with hydrogen for both storage and fuel). The output from the committee shall hopefully inform the critical thinking and planning for a sustainable future for energy requirements for generations to come.

Summary of the Issues & Questions for the Committee

The main arguments are set out below to enable a quick overview of the issues the author would like the committee to consider. Some more detail follows in the appendix.

(Note - the author would like to apologies in advance for any issues the committee members consider trivial, they are provided in good faith and derive from a lifetime's experience of government planning and decision making).

Introduction

Electricity infrastructure cannot be considered in separation of other core issues, namely;

- electricity production (all sources)
- energy mechanisms for transportation
- future technical change (all sectors)
- changes to the social fabric of our society

In addition, any infrastructure project is by its nature long-term and core issues affecting the outcome include:

- A need to create ongoing planning and implementation process that takes account of **what we do NOT know & cannot know today**.
- Such a process needs to be flexible and transparent.
- Changes shall be required due to technical improvement, along with changing social demands.
- The effect on the UK's economy as a whole – how can the UK maximise economic benefits from proposed changes?

The timescales for this planning should be considered to be at least 25 to 50 years.

Note: Over my life-time (60+ years), in my view, no such long-term planning has ever been effectively carried out within the UK.

Question One - Future-Proofing

Humans are exceedingly poor at guessing the future. We are also poor at making good long-term decisions. Unless we accept these issues we shall not improve the process. My suggestion for the committee is therefore to consider the following:

- Making decisions – intuitive processes verses critical thinking (see appendix cf Thinking, fast & slow, Daniel Kahneman)
- Group shift affecting risk assessment
- How plans can be implemented that enable significant change - without the need to attribute failure
- How outcomes can be measured and made transparent to all stakeholders including the public
- How future technical change can be effectively incorporated within the change process

The author suggests that the above issues are just as important to the long-term future outcomes as the evidence and conclusions reached on the technical issues being considered.

Technical Change from unforeseen and emerging technology
We all understand that over the timescales involved with implementing an energy / infrastructure / transport 25 year plan, technology will change significantly. So I put this question to the committee:-

1) **How can the committee best influence the UK's ability to create future workable, flexible, long-term plan that take account of emerging and unforeseeable new technologies?**

This question is perhaps more important than finding a solution to the current known technologies.

Question Two - Enabling the UK's economy

To enable a really effective outcome for the UK's economy, it is necessary to consider the following:

- UK business infrastructure
- UK technical, engineering and core implementation businesses
- The export possibilities for UK companies
- The reduction of imports for different implementation strategies

For many years the author has lived through government and corporate-lead investment that has completely ignored the overall, longer-term economic well-being of the UK. The current high energy cost for industries such as the steel industry is mainly due to the lack of planning over the past 25 years.

The question of 'where does the money come from' (see appendix) misses the point entirely. By considering this question too intently, past decision makers have *not*

created the infrastructure we *now* require. The cost of *not* creating such investment, over the long-term, has created massively increased costs today. We are now paying for this indecision. The author urges the committee to consider the UK's overall resources rather than the inhibiting 'money' factor that blinds us to what is actually possible.

The question here for the committee is:-

2) **How can future energy plans be organised to maximise the benefit for the UK's economy?**

Question Three – Provision for the Whole

Future energy, transportation, economic processes and social requirements. These cannot be separated. The choice of future transportation has a direct effect on energy and its distribution methodology. Economic processes such as increasing automation and its knock-on effect to social and business structure seems inevitable. What **we do *not* know today** will change the outcomes and the speed of transition.

As an example, the author puts forward the move towards an energy & transport environment that is based on hydrogen (and its storage) as the main fuel. (This utilises fuel cells, now already shown to be a likely long-term solution by Toyota, Honda, Nissan & Hyundai, see appendix).

There is already a move away from carbon fuels for transport. New battery technology may provide a future path, but currently batteries are both expensive and unsuitable for longer journeys and larger vehicles. Fuel cell technology has already improved on both of these aspects and can be used for all ground based transportation.

A move to a hydrogen distribution and storage network would also impact the potential of solar and other renewable energy sources as it would enable large scale energy storage for off peak use. (See appendix).

It is therefore conceivable that a hydrogen distribution system may be implemented within the timescale of the energy infrastructure being considered. Such a move would change the whole potential for energy production and distribution. As such it would have a massive impact upon any plans put in place for energy infrastructure.

It would also massively impact the social and economic aspects across the UK including travel, jobs and residency.

To provide specific detailed requirements for energy infrastructure without a similar far reaching long-term review of sustainable energy production and transport is non-sensical. Sustainable energy production costs and transportation in turn impact on the long-term possibilities for the economy and social change.

The question here for the committee is:-

3) **How will the committee's findings be conveyed to *best* enable good decision making for long-term energy provision overall?**

Appendix

What will the UK's energy provision & transportation look like in 50 years?

We don't know, but it should be different from today. If we asked this question fifty years ago, it is likely we would have expected much more change - but today we have more of the same – old power stations, old train systems, inefficient road systems, still no complete fibre-optic network, no alternative fuel strategies and dependence on polluting oil and gas power stations. Marks out of ten?

This select committee has probably the most important job to do for the UK for many years. Energy affects all aspects of the economy and the society. Britain created world-wide changes for energy systems with coal, steam and nuclear. We could again show the world the way forward, and, in doing so, create new industries that could lead and compete world-wide for generations.

The main issues are of scale and timing (25 years plus). The reason the UK has done very poorly over my life time, is mainly due to the inability of 'parliament' to create sustainable long-term plans. While this select committee may ask all the right questions and indeed get some useful insight and potential ways forward, without a system enabling long-term planning, along with an effective, iterative review and change process, the committee's findings shall have little effect on long-term outcomes.

Background Facts

Let's look at some core things we think we know:

- The sun provides the earth with about ***20 thousand times more energy than the human race uses every day.***
- Since the industrial revolution, much of man's progress has been due to the ability to harness new energy sources.
- Technology is now moving ahead at an ever increasing pace, due to the increasing number of scientists and researchers across the world.
- If the UK reduced CO2 emissions to zero, the tipping points for global warming would be reduced by about six months. It is important to realise that these tipping points would still be reached and thus the UK can not affect the eventual outcome for global warming.
- Historically, the human race has consistently used more and more energy per person as time has elapsed. With the advent of increasing automation, humans are likely to require even more of an increase in energy per head as they are soon be *joined* by an increasing number of robotic systems.
- Energy is at the core of all major human endeavours and survival strategies; industry, communications, automation, food production, transport, material production, heating, cooling, clean water and sanitation.

Even a trivial review of the above tells us plainly that we shall need more and more energy in future and also there is ***not*** a lack of energy from renewable sources. The only real difficulty we have is to find a good way, (it does not have to be the best way), to provide more than enough energy for our children's future needs. We have missed this point for a whole generation, let's not miss it again.

Investment Strategy

This is simply misunderstood by both government and the public. We expect that the future will unfold without central planning and without direct public investment. Market forces are usually preferred to drive longer-term funding via business ROI. The current government is unlikely to change their fundamental view on such strategies. It has to be noted that the last government created £375Bn (via QE) and provided no structural change for this 'investment'. This QE is real, it effectively reduces the value of the pound and as such is a tax on every purse in the land. If the people of the UK understood the 'trick' that has been played on them, they would be amazed that the people whom govern them have the audacity to spend £375Bn of their money without any investment strategy.

Of course, such a strategy could be employed again. As the public exchequer has no 'savings' to pay future agreed pensions in many areas, it would not be unreasonable to create an investment fund for such long-term pensions. What better to invest in than the UK's future energy requirements? The government is already agreeing future energy value to business (& China) for their investment in energy production which means they are already giving away this money for future generations to pay.

Direct investment is the sort of thinking seen as ridiculous by many observers. They say markets and influencers would take a bad view of the UK and its economy if we were to invest directly on such a scale. This prevents the future people of the UK (the current younger generation), from benefiting from our current wealth and resources. Of course such investment would mean using some of our current wealth to create massively important new power generation and distribution systems. But the outcome for our young people would be very significant for generations to come. As an investment properly controlled, it would not cause economic difficulty as the money would flow back into the UK economy.

So, why not invest directly in energy by the people of the UK for the people of the UK, and along the way ensure that the UK has the major share of the innovation, engineering production and building processes?

This of course requires long-term planning and planning with joined up thinking. But this seems well beyond any government in the last 60 years.

The author suspects that governments simply will not take on such difficult decision making. It is much easier and less politically risky to hand it over to business to take the inevitable blame.

Is this too simplistic? If it is, then we need to ask what other strategies provide for the outcomes that we need and can directly control for a term of at least 50 years. To expect businesses that by definition have a short term view of ROI to tackle the most essential infrastructure for the UK for a term of 50 years seems absurd.

Large Scale Trials and Testing

Due to the difficulty of assessing implementation issues; technical, practical and unknowable, a workable solution would be to undertake large scale implementations and see where they lead. These test implementations can be organised so that they may be part of the ongoing infrastructure. Even though their outcomes may not be used in a wider context, there is no reason why they would not be an effective part of the overall long-term solution and act as an ongoing experiment.

Emergent Technologies

A review has already been undertaken in 2012 to assess low carbon technologies on the distribution network. Amazingly this does not include hydrogen technologies except to say that they are excluded!

https://www.ofgem.gov.uk/ofgem-publications/56824/ws3-ph2-report.pdf

The Hydrogen Plan

Current Fuel Cell Technologies

While the committee may be well informed of this subject, it seems from anecdotal evidence that the public is not. With Toyota's Mira 300 mile range vehicle taking the lead, hydrogen fuel cell technology seems a likely long-term solution for transport and other local energy provision. The author notes that Toyota has given free access to many of its patents for these new fuel cell and storage technologies to enable world-wide promotion.

Hydrogen for Energy Storage

Hydrogen is the most versatile means of energy storage – it can be produced and stored in all scales and used as a fuel, as a chemical material or as a natural gas substitute. It can be produced from a variety of feedstock – also electricity – and stored in many different ways: from a few grams in handheld cartridges to thousands of tons in an underground cavern. This gives hydrogen a unique potential to store renewable energy – both on small and very large scale. Especially for longer term storage (weeks to months), hydrogen is today the only viable alternative in sight.

Strengths of hydrogen

Hydrogen is an energy-rich gas. It supplies more energy than any other fuel, this is one of the reasons why it is used as a rocket fuel. And it's versatile to use: It can be converted back to power, but also be used as fuel for cars, a material for many industrial products (such as hardened fats) or even be converted to synthetic natural gas. Hydrogen makes all these markets accessible for sustainable power generation.

References

Thinking Fast & Slow Daniel Kahneman
The book's central thesis is a dichotomy between two modes of thought: "System 1" is fast, instinctive and emotional; "System 2" is slower, more deliberative, and more logical. The book delineates cognitive biases associated with each type of thinking, starting with Kahneman's own research on loss aversion. From framing choices to people's tendency to substitute an easy-to-answer question for one that is harder, the book highlights several decades of academic research to suggest that people place too much confidence in human judgment.0
https://en.wikipedia.org/wiki/Thinking,_Fast_and_Slow