

Peter Forman

What does it mean to Flex?

I really enjoyed the broad definitions of flexibility that you developed in the workshop. I wish I could have made it and joined you! I think the two notions of flexibility, one a goal or imperative orientated one, and the other as a form of adaptability to shocks are both really productive in different ways. I got caught up on the notion of flex here though, and what it means to flex. In your metaphor of the spring (and in most notions of resilience) there is this sense that the flexible system is one that returns back (or bounces back) to more or less its previous shape. I'm not sure this is necessarily the case though. I have often thought of a resilient system as being more like a spider's web, where certain supportive threads can break, but where the web still supports the spider. The spider might also work overtime to create new threads that help to maintain its suspension. In this kind of flexibility, the whole may almost entirely transform, but something still needs to stay the same – the spider still needs to be suspended. In this sense, there is a goal/objective/imperative that is being maintained (as in the first definition), but this still involves the loss of many threads, and potentially the broad transformation of whole systems. This is quite an abstract/tangential way of looking at things, I know but I guess what I am saying here is that we need to pay attention to the cost of flexibility; to look for who or what's imperatives are valued and maintained, and at who or what is affected by the snapping of threads as these systems flex.

Is Flexibility Always a Good Thing?

On this theme, and following on from the comments in the workshop that flexible systems often stand in contrast to those that are efficient or 'lean', flexibility might also be associated with negative terms such as volatility. The capacity for a complex system to dramatically transform suddenly, rapidly and unpredictably is in itself productive of a variety of risks. We should therefore be cautious about promoting flexibility exclusively as a positive quality, and we should reflect upon the consequences of designing systems to be more or less flexible.

On Capacities to Change and Speed of Change

Speed of change seems to be an important factor in flexible systems. What seems to be important is not just the capacity to change and to what extent a given entity can flex or distort, but the rate at which such changes can be achieved, and whether these components and their different speeds of change can be made to 'link up' in different ways to form functional circuits that maintain the networked imperative. Within and across energy systems there are a vast plurality of objects, bodies and practices and each of these elements (and the relations between them), will sit at different points upon a spectrum of flexibility/obstinacy that is measurable both in terms of the extent of their capacities to change, and the speed at which these changes can be achieved. As such, flexibility nicely brings together concepts of possibility, potentiality, risk and capacities. There is also an interesting question here about the optimization of flexibility. Whilst certain components may have the capacity to radically distort or shift in appearance and function, a component with less but quicker flex may be preferable in certain instances. Studying flexibility will therefore require an appreciation of the capacities of different elements to flex to different degrees and at different speeds. It will also require us to appreciate how a plurality of rhythmic variations can come to be harmonized (or perhaps cannot) across these systems. It will thus involve mapping the complex layering of capacities across these networks, understanding what is changing/is

susceptible to change, and correspondingly, what may have to change in order to respond to changes in other parts of these systems.

On Complexity

Returning to the notion that flexible supply chains that have redundancy built in are often inefficient and complex, whilst I agree with this claim in some instances, there are many cases where this is not the case. My first thought was the example of new technologies such as networked microgrids. Here, the system is technically becoming far more complex, but simultaneously far more flexible. There is also, I think, a need to reflect on how complexity may present problems for flexibility. I.e. to what extent does complexity present challenges for transitioning/shifting from one form to another? In the case of Brexit, for example, how does its complexity present a form of friction or 'stickiness' that makes transitioning away from European integration difficult?

Constructing a Typology of Flexibility?

Looking through the summaries of your workshop discussions, I get a sense that there are different manifestations of flexibility, and that we will eventually need to consider how they join up/relate to one another. For instance, we have material (often infrastructural) flexibility, which is really significant, but this seems totally different to the flexibility of social practices, to political flexibility, or to economic/market flexibility. We therefore need to reflect on how to understand the different (in)flexibilities that exist within and across these systems, and how they interact with one another. We also need to consider what kinds of possibility they make possible, and what possibilities they inhibit.

This fits in nicely with a story that came to mind in relation to Stan's comment about the extent to which flexibility is a concept that is already operationalised in decision-making processes within energy systems. I've included a couple of extracts from an interview I conducted with an emergency operations manager for National Grid below. Previously, this guy had been involved in the modelling and design of the national gas transmission system (NTS), and in this interview he was reflecting on the way that flexibility and contingency was factored into the design of gas networks. He described how, with the privatization of the UK's national energy infrastructure, a fundamental philosophical shift had taken place, in which the operator of the gas network went from over-engineering, or 'gold plating', the network to physically 'build-in' forms of operational flexibility, to a new reliance on market flexibility and the plurality of responses of distributed market forces. These two different deployments of flexibility had radically different implications for the kinds of opportunities and challenges that could arise across the gas network, and they have necessitated totally different systems of emergency measures and contingency plans. As such, we can not only see flexibility being operationalised as a concept here (often in terms of risk and volatility), but we can see it taking two very different forms; one broadly based upon a principle of infrastructural flexibility, and the other on a kind of economic flexibility. Whilst I'm cautious about suggesting a firm and discrete typology here, there do seem to be very different kinds of flexibility at play, and each seem to involve quite different techniques and possible consequences.

This also hints at a need to more closely look at the techniques and technologies that are employed to facilitate flexibility, and the reasons that necessitate these measures. For instance, storage might be understood as one of many different techniques of flexibility, and

this may have certain benefits and drawbacks for the flexibility of the larger system. For instance, storage can simultaneously facilitate some forms of supply flexibility, but the investment in physical infrastructure it involves may create forms of inflexibility and friction in other contexts. As such, we need to recognise the plurality of an entities' capacities for flexibility. Moreover, we also need to look at the history of this technology – why was this technique chosen over others? What necessitated its development? Finally, the example below seems to suggest that there are layers of strategies – market flexibility has its limits, and at which point other strategies are deployed to try and flex/transform the system so that supply is maintained.

Interview XX, Friday 8th July, 2014

“There is a load of history to all of this. Back in British Gas days, it was all about a central buyer, British Gas, bringing the gas in off the sea...and it was all controlled where it went into the network. And they owned all of the distribution networks as well, and there was very little gas fired generation and this kind of thing... so it was very much "we need the gas here, OK, we will put more gas here". So it was all controlled from one end to the other, essentially. Through regulation and privatisation...British Gas split up, erm, British Gas eventually had to sell its distribution networks on, that was about ten years ago...we moved away from a sort of command and control approach of gas flows to a purely market-based model whereby the concept of the shipper was brought in, so E-ON, or Total, or BP, or whatever, they have customers they want to deliver their gas to in the UK...they can to bring that gas in wherever they want in the country and they want to take it out wherever they want. As long as they are balanced, then the system should operate ...well. Now obviously that isn't always the case, we can't always balance things out. Offshore problems or sudden trips at plants and all sorts of other factors. So penalties and layers of incentives are set up around that now.”

“It could be very...very close to real time. So, er, yeah. And that's good for markets. If they can just flow their gas then they don't have to worry about being restricted by entry conditions on the grid or anything like that. And that's good. It keeps costs down, it means people aren't second guessing that they can take out...with contracts to cover for this and they will be able to flow that gas...so it's open, it's free, which OFGEM regulators-cause its good for competition, and it's good for consumer bills. So that's...we've come from that command and control scenario right the way through now to this free open market with volatility that we can't control. And over the last ten years we have just seen that volatility grow.”

“It's getting more complex, but at the same time it is always about keeping the gas flowing and the freedom to do that. And National Grid have a place right in the middle of that to sort of balance and juggle it all. Make sure it all...yeah... My job is...*was*, as soon as you move away from free-flowing, you start having to do something called enter the market ...to trade, or move prices or create the incentive to change flows right the way up to spending money to tell people to come off the grid if we need to do constraint management.”

“So far we have never had a full-blown emergency and we want to keep it that way, obviously (laughs), but there's a whole load of processes there for controlling the grid, and they are all underpinned by HSE, so it's quite a serious stuff. Once we take that approach, all bets are off, we close the market and we tell people what we are doing.”

“We have a two-way interconnector to Holland and we have a one-way connection to Belgium. The one from Belgium to the UK flows in that direction, so that could shut down to offset...to bring more supply into Belgium. Belgium's very interconnected, very much a transit country. Holland has a two-way interconnector into Bacton on our east coast and we could very easily...we would expect market prices to rise in the UK, if it were flowing into the UK, if market prices were to rise in Europe, it would flow that way.”

“So we did a lot of modelling, simulation, around that to try and understand the risks of different flows. And that built up and up to looking at risks on a daily basis as well, so okay, it's all well and good trying to invest for this, but you don't want to go and invest for every scenario because that's not efficient. But where do you draw the line?”

“And that, that grew because we changed the way that gas is off taken from the system. We sold our DN's (Distribution Networks) on and created a universal firm service, so everybody's firm. Which creates a lot of problems because everybody wants firm capacity, they don't expect to be turned off at a moment, it means we need to be better at managing that exit risk, which is just ...the same issue then is the supply risk. What's the range of scenarios, which are those that are going to cause us grief, or problems, so the role kept growing because there's more and more risk, commercial risk. And in that space then OFGEM put a load of incentives on us so that we, we don't enter the market and stop it...then we'll made a load of money. So there is a big incentive on us not to do it, and if we do, we start taking money out of that pot essentially, and eventually it will cost us quite a bit of money if we carry it on. So, that was the sort of space...it wasn't necessarily looking at the safety risks, but you try and avoid that safety risk, and ultimately, if you do head into that risk, then that's an emergency.”

“I mean, every pipeline has a finite capability. You can only put so much gas through a pipeline because you will get a pressure drop down that pipe. So, you might need to build a bigger pipe, or another pipe, or a compressor, or whatever it needs to be, but what you are not going to do is build for every possible scenario. So, it is a case of okay, well, Millford Haven is coming online, so okay, we're going to build a pipe to deliver the gas that needs to be delivered there, and that's fine, it can deliver that under the majority of scenarios, but there would be certain scenarios when you would have too much gas that is coming off to a certain area of the network, and you know that are outside the realms of what you would expect and there is potential for that to happen on a very, very, like, small number of occasions, and it was a case of you know, in that scenario, the capability of the grid isn't good enough to allow that gas to come in. So, in that one percent chance, are you going to spend another 100 million pounds to cover that off? Or are we going to risk it out and go, OK well now we need a plan to manage that if it happens. It might be a contract, it might be a way of managing it through demand-side response, it might be something we will just manage on the day, by pushing the market...or you know, trying to create that sort of market in that sort of area, in terms of locational energy ...so there is loads of things that we can do, but what we won't do is waste the UK's money. You know we won't through money out the window trying to gold-plate the system as OFGEM puts it.”

On Narratives

The notion of flexibility being integral to narratives concerning the ongoing battle between people and 'nature' is interesting and I am looking forward to reflecting on this further. The connected narrative of modernity seems to be key here, flexibility and openness to change being characteristic of the 'modern' and 'post-modern'.

In terms of Stan's comment about the articulation of flexibility as a concept within different narratives, this will be fascinating to explore - particularly in relation to the narratives articulated around future energy transitions and energy policy. Yet, as we can see from the extract above, an interpretive approach may be necessary here – flexibility is operationalised through a whole series of related terms, but flexibility itself is never mentioned. As such, it might be useful to compile a glossary of related terms (e.g. volatility, responsiveness, control, freedom, resilience), and also the terms used to describe its inverse (e.g. inflexibility, constraints, friction).