



# Incentive Regulation: Expectations, Surprises, and the Road Forward

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## Abstract

Forty years have passed since an inflation-adjusted price cap, widely called RPI-X, was proposed as a way of controlling prices in the UK's newly privatised monopoly telecommunications company by a form of incentive regulation. The paper traces developments since then in several jurisdictions, within the context of a wider field of changing regulatory governance involving legislatures and governments as well as regulatory agencies. The focus is on, first, the experience of increasing complexity of the incentive schemes adopted, and second on the growing political salience of regulatory decisions which adds goals such as net zero, with more direct quantitative targets, to maximising consumer welfare. The implications of these changes for regulatory interventions are considered.

**Keywords** Incentive regulation · Network price caps · Competition in networks

**JEL code** L51

## 1 Introduction

It is hard to see how, absent total satiety or universal benevolence, any multi-person economic system can survive without incentives. Thus, the expression “incentive regulation” in the title of this paper is a term of art, which is used to capture one particular way of incentivising, in this case, network firms. Its use is also largely confined to a relatively few countries - according to Driver (2023, p. 122), the UK, USA, Australia, New Zealand, Belgium, France, Honduras, Ireland, Italy, Japan, Mexico, Panama, and the Netherlands – countries accounting for a fairly small proportion of

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global GNP. It is also the case that the heaviest users – the first four countries - belong to what is sometimes called the Anglosphere.

The goal of this paper is to trace two trends in the development of incentive regulation over the past 40 years. The first is the growing complexity of economic incentives, from a very parsimonious early period to a much more granular approach more recently. The second is the increased complexity of the interactions at the regulatory governance level among the wider organisations involved – typically a legislature, government and regulatory agency – as regulatory issues acquire more political salience.

Although there were some precursors in its use, the origins of incentive regulation are often associated with the UK<sup>1</sup>, where its importance lay in being part of a new *zeitgeist* of economic policy that was adopted for a period of years beginning in 1979. The UK has - possibly on the basis of the ‘invented here principle’ - been particularly assiduous in developing new approaches to using incentive regulation in a variety of network sectors under both private and (to a lesser extent) public ownership models.

Rather than conducting an international comparison, much of this paper is focussed on developments in the UK, and in particular on the relationship between the development of network price controls and the wider governance and changing objectives of the network regulatory regime in that country, which has been copied by and also copied from other jurisdictions.

Since much ground is necessarily covered in a small compass, it may be helpful to set out here the flow of the argument in the following Sects. 2 to 6.

Section 2 sets out the contents of Stephen Littlechild’s path-breaking espousal of incentive regulation in 1983 in the form of a price cap (known as RPI-X) for the ‘soon-to-be-privatised’ UK telecommunications firm – BT - together with an account of some aspects of the critical reaction to it by the economics profession.

Section 3 discusses a development of price cap regulation which is known in some jurisdictions as ‘performance-based regulation.’ There is no agreed-upon common definition of this term. In North America it is sometimes widely used as a synonym for incentive regulation (but see NREL, 2018). In some other jurisdictions it is used to connote a movement away from the simplicity of the original price controls into a system with more disaggregation and complexity but retaining overall clear elements of incentive regulation. This latter is the interpretation used here.

Section 4. In 1983, Littlechild expressed the hope that price caps were a temporary intervention that would be put in place to ‘hold the fort’ until competition would arrive to control the behaviour of the dominant telecommunications firm. However, in the UK and elsewhere, success in the duplication of other physical networks than telecommunications has been limited, which has left a continuing role for incentive regulation.

Section 5 notes developments in what I call ‘regulatory governance’ - the manner in which the three elements in the ‘food chain’ of regulatory policy- the legislature (at the top), the government, and the regulator (at the bottom) - have interacted. Devel-

<sup>1</sup> The United Kingdom comprises four countries - England, Northern Ireland, Scotland and Wales. Most (but not all) network regulation is done on a Great Britain basis, excluding Northern Ireland, which has a separate multi-sectoral regulator.

opments in recent years show the wider importance of network industries in affecting household living conditions, and in meeting decarbonisation targets and sector-specific goals. The focus of regulatory decisions is moving away from primary use of the price mechanism towards use of additional quantitative targets.

Section 6 discusses how regulators can, within the framework of incentive regulation, react to the two forms of mounting complexity described in Sects. 3 and 5 above. There is some evidence that the increased regulatory complexity of performance-based regulation introduces broader controls over firm performance variables, but over-complication and the use of inadequate data may lead to regulatory errors. At the same time, the introduction of new goals may create tension between the elements in the multi-level regulatory process.

## 2 The Origins and Basic Economics of ‘price-cap Regulation’<sup>2</sup>

### 2.1 Where it began.

In the beginning was Mrs Thatcher. Her government, on winning the UK election of 1979, embarked upon a new market-based approach to economic policy in many fields, including what was by then referred to almost universally as ‘the nationalised industries.’ The most prominent of these were the industries with local and/or national physical distribution networks - including energy, telecommunications, transport, and water. In the first half of the 20th century the relevant firms, initially in private hands, largely passed (in keeping with the common ‘European’ utilities model) into public ownership as their coverage grew and their services came to be seen as essential.

The chosen mode of regulation in public ownership came to be widely criticised on grounds of inefficiency, low productivity, and neglect of consumers’ interests - even to a form of capture by organised labour. And this provoked greater interest in the alternative ‘American’ model- then a century or so old - of regulated private ownership. But that too (known as ‘rate of return’ regulation) was widely criticised as being too monopolistic, stifling innovation and subject to capture by regulated firms. The British network regulatory policy examination question thus became: how to devise a regime which embodied regulation of a private enterprise with the avoidance of the perceived defects in the US system.

A highly influential answer to the above examination question was provided by Littlechild (1983) in an inventive, comprehensive and eloquent report to the Thatcher Government on the regulation of the telecommunications sector, the first of the major British network industries to be slated for privatisation.

The report was required to demonstrate a regime to control the profitability of the telecoms monopolist (British Telecommunications or BT), while achieving a balance among the objectives of protection against monopoly, the achievement of efficiency and innovation, limiting the burden of regulation, promoting competition, and enhancing the proceeds from privatisation and prospects for BT. Littlechild’s report

<sup>2</sup> the Early History of these Matters is Discussed much more Fully (and Authoritatively) in Stephen Littlechild’s Contribution to this Symposium (Littlechild, 2024)

introduced the essential elements widely considered to be emblematic of the original British model.

Underpinning this regime was the creation of an independent regulator, vested with powers and duties by Parliament, subject to guidance by the Government, its decisions also appealable to the courts or other superordinate regulators. The nature of the duties has been subject to considerable debate and change over time, as is discussed below.

Independence is intended amongst other things to protect the regulatory regime from destabilising political intervention, thus offering greater security to investors in highly capital-intensive sectors. But the question of how the regulatory regime should take proper account of government policy has also been widely discussed, as will be shown below in Sect. 5.

At extreme risk of caricature, the simplest way of expressing the conceptual difference between incentive regulation of networks and its fore-runner – so-called cost-plus or rate-of-return regulation – is that under the latter the network shows its bills for labour, materials and capital to the regulator after the fact (*ex post*) and is remunerated for them, including an allowed rate of return on capital. Whereas, under incentive regulation, a maximum network price is set before the fact (*ex ante*) on some disclosed basis, and if the firm can deliver an average cost below the established price, it keeps the surplus as profit.

While rate-of-return regulation was developed in practice over many decades in the USA, by state and federal legislatures, the Courts and regulatory bodies (Driver, 2023, pp 121–138), the emergence of price cap regulation, occurring in an age when regulation attracted increasing interest among economists, quickly elicited contributions which elucidated various versions of it. These include design alternatives: such as the duration of the price cap; the treatment of inflation (see Baumol, 1982); the method of determining the rate at which the firm's inflation-adjusted prices must decline over time (the 'X' factor); whether tightening the cap enhances efficiency; institutional issues; and reliance on either an accounting approach to deriving the cap, or an engineering cost (LRIC) model. It also generated useful surveys of various aspects (see, for example, Crew and Kleindorfer (1996), Sappington (2002); Erbetta and Cave (2007); Sappington and Weisman (2010); Stern (2014), and Driver (2023, pp. 122–141). And such work continues to this day.

Economists quickly identified shortcomings in the simple approach. A partial set of such shortcomings includes that of collecting the data required to produce a value of X in the formula without under- or over-rewarding investors – a task that overlaps with that required of rate of return regulation. Moreover, in world in which a succession of, say, five-year caps are expected, firms are likely to conjecture that the observation of low cost or high profits towards the end of a current price cap will influence the regulator's value of X in the succeeding period – to the firm's disadvantage: this will cause them reduce effort – via a so-called ratchet effect. Thus, while it has often been said that incentive (alternatively, price cap) regulation is the most important

development in regulation over the past 40 years, it was quickly recognised that it did not avoid all the shortcomings of its predecessor (Joskow, 2006).

## 2.1 Interpretations of Consumer Welfare

Littlechild was writing at a time shortly after a new and influential approach to competition law had been developed at the University of Chicago (Bork, 1978). It took as its goal the maximisation of ‘consumer welfare.’ This was essentially defined to be a synonym for the ‘wealth of the nation’, implying that it includes not just the gap between the benefit over cost of production that consumers derive from purchase, but also producer profits. In matters such as merger control, the standard may focus attention on the merger’s impact on prices. One way of interpreting a price cap in network industries in the period before competition develops, is to say that incentive regulation targets the same variable directly.

As time went on, many regulators were additionally charged with protecting the interests of certain groups of disadvantaged consumers. This imposed a duty to have regard to (non-exclusionary) specified groups of vulnerable customers. In GB historically they include individuals who are disabled or chronically sick, of pensionable age, with low incomes, or residing in rural areas (and this does not exclude other potential beneficiaries).

This takes the regulator into the area of cross-subsidy of consumers (see Posner, 1971). And UK government rules for assessing the costs and benefits of public policy interventions expressly allow for “equity weights”, based on the elasticity of marginal utility of money, to be taken into account in cost-benefit analysis of regulatory and other interventions. This has led to a situation where greater weight is attached to the same monetary gain accruing to poor than to rich households, and some regulators are beginning to apply this approach in limited circumstances (HM Treasury Green Book, 2022, pp. 100–103; Ofgem 2020). One UK network regulator, Ofwat, has been authorised by legislation to introduce a system of social pricing, whereby regulated firms consult all their customers on their preferred degree of cross-subsidy of less well-off by better-off households (Consumer Council for Water, 2020).

These developments may reflect a trend which some commentators have identified as making regulation more responsive to shifts in public and political opinion on such issues. We return to this more fully in Sect. 5 below.

## 3 Performance-Based Regulation

### 3.1 Performance-Based Incentive Approaches

Littlechild’s model of incentive network price control discussed above is pretty much one-dimensional – its goal is to elicit production of a single output or simple set of outputs in an efficient manner over a specified period. In doing so it may take little account of quality or input choice problems; interactions between controls in successive periods; of the quality of information flows from the regulated firms to the regulator; and of information flows between the regulated firm and its customers.

Accordingly, the price control could be communicated in a very few pages of text. Thus, the first price control issued by the regulator for electricity transmission in GB was only six pages long and contained two numbers – the value of X in the RPI-X<sup>3</sup> price control formula, which was three, and the duration of the control, which was four years, from 1993 to 7 (Offer 1992).

This is obviously very partial. The electricity that a distribution company delivers to its customers may be as close to homogeneous as can be imagined, but the reliability of the supply, the speed with which any outages and safety issues are addressed, the ability of the company to meet demands for connection of EVs, the treatment of vulnerable customers, the company's effect on the environment (and so on) are also matters of great importance to end users – current and future.

In the context of the long list of such factors, it is not surprising that when the price control for electricity transmission for the period 2021-6 was published, covering three transmission companies, it required hundreds of highly detailed pages to set it out (Ofgem, 2021).

The term 'performance-based regulation' is used here to capture the goal of widening the range of what is desired from a network regulation regime: see NREL (2018) for an international survey, and an interchange between Kaufmann (2018) and Makholm (2019) on developments in the USA. A useful definition of a parallel but more limited concept – output regulation – provided by Rioux and Rossetto (2018):

Output regulation can apply to a variety of specific activities. Basically, any output can be identified, monitored, subjected to targets, and rewarded or penalised. For instance, outputs can encompass environmental policy goals (minimising power losses...) or social policy objectives (...rewarding actions by distribution licensees to help vulnerable customers on affordability).

Performance regulation is used here to include - as well as measures to promote efficient current production - activities involving the gathering of information about the needs and wants of various possibly diverse groups of customers; the process by which the regulated entity takes them into account in formulating its business plan; steps that are taken to adapt that plan to uncertainties which arise in the course of its implementation; and longer-term issues relating to asset growth and the maintenance of asset health which straddle both the current regulatory period and its successors.

The continuity with the earlier simpler approach is the presence of an action plan for a period of, say, five years and the use of carrots and sticks to ensure its fulfilment. At the end of the chosen period the process is repeated. In a faster changing world, this fixity may have to be loosened by provisions to change targets within the course of the period, using what are sometimes called 'uncertainty' mechanisms.

It is also noteworthy that the various network sectors differ in their degree of closeness to the customer, and the granularity of customer involvement in the investment planning process. This is illustrated in the electricity sector. The task of conveying electricity at high voltage from its place of generation to where it can be delivered at

<sup>3</sup> In 1983, the rate of inflation in the UK was measured by an official Retail Price Index or RPI. This was later replaced by a differently-weighted Consumer Price Index or CPI.

lower voltage by an electricity distribution company is typically entrusted to a wide-area (even national) transmission company. The latter, in conjunction with the electricity systems operator, is charged with working out, usually guided by government policy, a plan that reaches more than a decade ahead for an on-shore transmission network, and increasingly for an off-shore network to deal with a growing number of marine wind farms and interconnectors.

From an environmental and aesthetic perspective, the routes of the transmission lines and the issue of whether they should be over-ground or under-ground, are often fought over very vigorously, and generators' profits depend heavily on the speed with which they are realised. But the scope for highly localised and detailed debate about need may be more limited.

Now consider an electricity distribution company or a water and sewerage company that makes a variety of plans with predominantly local impact. They might involve strengthening the network in a particular location to accommodate growth in demand from electric vehicles, or a project by a water and sewerage company to limit discharges of dirty water into a river. Or the water company may want to poll its customers on the strength of their willingness to finance bill reductions for poorer households. In these cases, it is probably necessary to impose on the relevant company an obligation to conduct research among local consumers and residents and their political representatives to establish priorities.

Care must be taken to calibrate rewards for service quality properly (Sappington, 2005). If the reward for a particular attribute of performance is set at a level that exceeds end users' valuations of the relevant improvement, it will very likely be over-provided – to the detriment of those customers. Regulated firms are adept at identifying and profiting from any regulatory error of this kind – and end users pay for the mistake. There is little systematic evidence on this question, but anecdotal observation and first principles suggest that, absent reliable cost and benefit information, the proliferation of such rewards may carry dangers.

These embellishments have made price controls in some jurisdictions very complex and time consuming. It is not unusual for the construction of a five-year network or wider price control to take fully five years, with numerous intermediate consultations and decisions. This long process does create space which the regulator can use to mobilise consumer and customer groups to subject the plans, and implicitly the priorities, of the regulated firms to serious scrutiny, which expands the challenge capability of the regulator itself. Time must also be set aside to accommodate a process by which the regulated firm or others with an interest in the decision – notably end users themselves – can appeal the regulator's decision.

An illustration of a thorough-going attempt at wide-ranging performance-based regulation is provided by the energy price controls prepared by the GB energy regulator Ofgem. It grew out of a very lengthy research project known as RPI-X@20. The chosen outcome, RIIO1 (standing for *Revenue = Incentives + Innovation + Outputs*), first came into use for an eight-year price control period in 2013. The subsequent version, RIIO2, applied to electricity transmission and gas transmission and distribution from 2021 to 2026 and to electricity distribution from 2023 to 2028.

Regulatory engagement for RIIO2 took at least five years. It included, amongst many other things (see Ofgem, 2021):

- a requirement to conduct detailed investigation of customers views, and those of relevant local authorities and non-governmental organisations;
- the preparation of draft and final five-year business plans;
- targets and incentive mechanisms for about 50 different input and output (opex and capex) and customer service variables – with non-linear rewards for over-fulfilment and (not necessarily symmetrical) penalties for under-fulfilment;
- a floor and a ceiling for total returns;
- benchmarking that set productivity targets for like firms in the same sector, with higher targets for those with weaker starting positions.

As noted above, regulated firms are adept at identifying and profiting from any regulatory error - and end users pay for the mistake. Care must be taken to calibrate rewards properly. RIIO1 contained some dysfunctional incentives which were capable of exploitation by some network companies. For example, there was a significant incentive and reward for firms to defer investment in RIIO1, but then reinstate it in the following period. This was fairly easily rectified by reducing the power of the incentive.

More fundamentally, the proliferation of regulatory interventions does not necessarily resolve the problem of informational asymmetry, which (as was noted earlier in this section) also gives a firm subject to a succession of price controls the opportunity and incentive to maintain a safety margin in its current performance in order to avoid too large an increase in its targets in the next control period. Solving this problem has attracted a number of possible solutions, notably an attempt by two distinguished French economists, Jean-Jacques Laffont and Jean Tirole (1993), to devise a network regulation process that elicits rational and honest disclosure of private company information about its production potential, which as we have seen is often concealed.

The simplest Laffont-Tirole model assumes that there are two types of company (high-cost and low-cost). Suppose that the regulator offers them a choice between two contracts: a fixed-price one which allows a low-cost type to make a profit but imposes a loss on a high-cost one (i.e., a scheme with a high-powered incentive); and a cost-based contract that allows the company to make less effort but allows no profit (a low-powered scheme). Low-cost companies are better off opting for the high-powered scheme (and providing the optimal level of effort), while high-cost companies are attracted by the low-powered scheme (providing less effort). In essence, firms are offered a choice, and their responses both reveal their capabilities and subject them to the right form of regulation. There was a flurry of use of information revelation devices of this type by UK network regulators, but it has largely been abandoned. One problem is that some investors and network firm senior managers regard it as over-complex or even wonkish.

### 3.2 The Performance of Performance-Based Regulation

During and after its first completed variants (with networks split between the eight-year periods covering 2011–2019 or 2013–2021) RIIO1 was subject to intensive criticism. This was focused on the excessive rates of profits made by the network companies, due in part to failure on the part of regulators to understand the effects



and interactions of some of the many individual measures adopted: (see NAO, 2020). This is a risk to which more complex regulation is subject, since there are so many possible dimensions and degrees of error, which may present regulated companies with opportunities.

We can illustrate this possibility by reference to the need for an estimate of cost of capital for just about all network regulatees. Given the capital intensity of some of the regulated sectors, this is area where costly regulatory mistakes may be made. Accordingly, cost of capital disputes are often first subjected to extensive debate between regulator and regulatee, followed by final determination by an appellate body, which might be a court or a special administrative body.

In practice, the underlying theory in financial economics used by regulators to set allowed rates of return which is almost invariably required to set a price cap is the capital asset pricing model, which is simple, relying on a single measure of risk.

In many jurisdictions, network monopolies have often earned returns which exceed their cost of capital. To a degree, this is a sign of incentive regulation working, but when such returns are not confined to selected performers, but pervasive, and when network companies regularly change hands at valuations which considerably exceed their regulatory asset basis, it begins to look more like regulatory failure.

More generally some critics have claimed that this effect is aggravated by use by sometimes numerous network companies of their superior financial resources to ‘tie up’ regulators with many thousands of pages of repetitive, lengthy and time-consuming evidence on the cost of capital, as a means of ‘winning the argument’ either with the regulator or with the body which hears appeals. Valletti (2020), formerly chief competition economist at the European Commission, points out that: ‘There is even a term for this: “agnotology,”<sup>4</sup> which is the study of how ignorance is deliberately fostered by corporate funding’. If successful, this tactic can systematically have the effect of increasing expected returns. It can be stopped by limiting the scale of submissions, but it may be difficult to separate such tactics from attempts to improve and refine regulatory practice.

And, of course, regulators are quite capable of making their own mistakes (Baldwin & Cave, 2020, Ch.8). They can be captured; they can be intimidated by a barrage of criticism generated by the firms which they regulate, which forces them to regress to what has been christened ‘minimal squawk behaviour’- the fear of antagonising those whom they regulate. Or they can exhibit the same cognitive failings as other actors in the economy, including firms and households. But for the reasons given above, systematic regulatory failure in the network space can be very expensive for customers.

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<sup>4</sup> Agnotology is a late 20th century coinage from Greek words meaning ‘the examination of the opposite of (or concealment of) knowledge.’

## 4 Who Needs Network Price Regulation Anyway? the role of Network Competition

This aspect featured prominently but briefly in the 1983 Littlechild report on regulating British Telecommunications. The UK government had already allowed a network rival to BT to be created in 1981 and licensed it in 1982. In 1984, as Mercury Communications, it came into operation as a full public telecommunications operator, and competed with BT, initially offering international and long-distance communications. Lacking a local network, it relied on interconnection with BT to originate and complete its customers' calls. (These wholesale costs also had to be set by the regulator - see below.)

Littlechild (1983, para. 4.11) stated his support for competition in network industries as follows: "Regulation is essentially a means of preventing the worst excesses of monopoly; it is not a substitute for competition. It is a means of 'holding the fort until competition arrives'."

This feature was consistently maintained in UK regulation by the British model throughout the period, if with different degrees of intensity in different sectors, using a combination of firm-to-firm competition in the market and competitive tendering for new investment projects.

### 4.1 Competition in the Market

The Littlechild report on the regulation of BT omitted any detailed discussion of the regulatory regime that would follow the government-set price control for the years 1984-89. This may have reflected optimism over the whether it would be needed at the end of that period, but the relatively small inroads made by Mercury made such deregulation impractical, and throughout the 1990s further price controls were applied to BT, accompanied by the start of measures to make BT lease its local distribution infrastructure to competitors and the promotion of infrastructure competition based on the spread of cable companies, newly capable of providing telecommunications as well as broadcasting services.

Overall, the approach to competition in energy, telecommunications and water can be characterised as involving deconstructing the value chain in each into:

- i) the abstraction and processing of a product or service to be delivered (generation of electricity, extraction of gas, content in (tele)communications, collecting and treating raw water);
- ii) a major national or regional delivery network;
- iii) a local distribution network, delivering the service to end users;
- iv) the retailing of the product – mostly comprising marketing, billing and financial help to households in difficulties.

More recently, in relation to ii) and iii) above, the main opportunity for network competition lay in telecommunications - not surprisingly given its growth in demand, continuous reduction in costs, innovation, and relatively low capital intensity. In 2003, the telecommunications sector in the UK and elsewhere in the EU was subject

to new EU legislation, which expressly looked forward to a major and general extension of competition.

In order to facilitate the resulting reduction of regulation, it adopted from the start an approach to defining markets and identifying market power that was congruent with that adopted in EU competition law, and regulations imposed in any Member State were subject to a sunset rule after 3–4 years, unless expressly renewed or replaced. Over the same period, a major technological change was taking place, the progressive transition from a partially copper to a fully fibre-based infrastructure. (No such network technological change occurred applied in land-based distribution and transmission in the energy sector, for example.)

Over the following two decades, the application of these rules by active and creative regulation successfully shrank the need for it: intrusive pro-competitive regulation did successfully hold the fort, and more, and made itself redundant. What had been a monopoly was replaced in many Member States, and in GB, by a market which lacked any participant with dominance or significant market power (Cave, 2023a).

In the GB energy sector by contrast, a somewhat more fluctuating approach was applied. As in other network industries, the regulator had a duty to ‘further the interests of consumers in relevant markets, where relevant by promoting competition.’ In the energy sector, this was changed in 2010 by the addition of an obligation on the regulator to consider and adopt the alternative approach which – regardless of whether it would promote competition - would confer more benefit on consumers – see Fig. 1.

It is worth noting that the forms of competition envisaged over the period under review have generally been like-for-like competition within a single component of the value chain. Digitalisation is, however, extending the range of possibilities. By way of illustration, in communications, the traditional switching function is now being sub-contacted by some mobile operators for performance by a cloud supplier; where that market is well functioning, the scope of competition will expand. Equally,

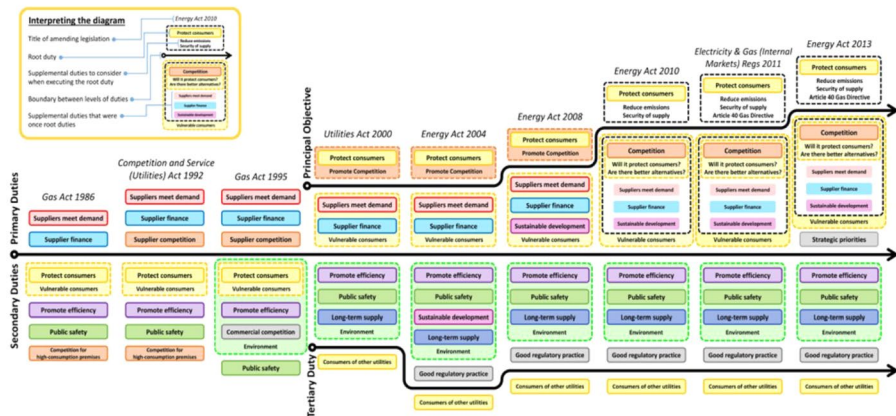


Fig. 1 Ofgem’s Statutory Duties for gas 1986-2018. (Source: David Deller and Catherine Waddams Price, *Fairness in Retail Energy Markets? Evidence from the UK* (2018), p.35)

energy retailers offering more complex time-of-day retail tariffs can reduce peak-hour demand and ‘compete’ with investment in energy transmission and distribution. Much of this involves what is essentially a process of replacing expensive hardware with cheaper software solutions. The scope of this process in the network industries will become increasingly apparent as digitalisation proceeds, but is inevitably limited.

## 4.2 Competition for the Market

When a ‘natural monopoly’ asset is to be installed in a network industry, by definition there is no scope for efficient duplication. The firm equipped with the asset will not be in head-to-head competition, or ‘competition in the market’. However, there may be scope for ‘competition for the market’: i.e. rivalry among firms for the right to install and operate the asset. This process is often called making the activity or asset contestable.

Proposals have been made in the UK for introducing a very high degree of contestability in the energy sector (Helm, 2017, pp. 196-9). This would have the effect in the limit of replacing the current process in which an incumbent network operator is charged with owning and operating the bulk of the assets within the framework of a periodic price control. Thus, suppose that all network projects were allocated to individual contractors on a competitive tendering basis for periods roughly equal to the lifetimes of the assets. Then over time, network regulation would switch to a process of writing, enforcing and renewing these temporally and geographically overlapping contracts.

However, the requirement on the public sector body orchestrating the process would be very substantial. Moreover, a system of this kind would require people employed and assets owned by separate firms to co-operate instantly and fully in the event of large-scale environmental challenges which global warming is likely to make more frequent: storms, flooding, and fires.

Reviewing its approach 2010, the GB energy regulator concluded that contestability is only likely to be appropriate for new, large and discrete projects, where significant benefits can be expected to outweigh the high costs of administering the process, and where time is not of the essence. (Ofgem, 2010) Ofgem has had success in competitive tendering for offshore transmission facilities which bring electricity to land from a growing number of individual offshore wind farms. But this is getting increasingly complicated as their numbers proliferate, and it gets cheaper to build a fully interlocking offshore network rather than a series of discrete arrangements for individual wind farms. At first sight, it seems that the need quickly to grow onshore electricity transmission to meet the needs of net zero described below will often satisfy the three conditions described above. However, the much higher premium now placed on speed of execution, and the fact that running any competitive process inevitably adds more time to the construction process, are disadvantages.

Thus, in the aspects of network regulation considered in the two preceding sections, the British model of economic regulation has developed since 1983 along a path which for its first 25–30 years largely retained the most important original features. Moreover, the model has been applied to networks in both private and public

ownership. Thus, the rail network has been subject to similar independent regulation both before and after its switch from private to government ownership in 2002, and the same is true in the case of the mail delivery service (the Royal Mail), which switched in the opposite direction in 2014. In the past 10–15 years that has changed, not only in the direction of greater technical complexity, as captured in the earlier section on performance, but also in respect of regulatory governance, to which we now turn.

## 5 How Changes in Regulatory Governance Impact Incentive Regulation

### 5.1 Changes in Regulatory Governance

As noted above, the governance structure for regulation in the UK as elsewhere is complicated and multi-level: in the UK, Parliament passes (or amends) an Act that creates a regulator and imposes or changes its duties. The government sets out an overall policy and strategy for the sector, and with Parliament, makes tax and benefit policy. In the light of both the above, the regulator exercises the powers it is separately granted. When the first two components of this process change, then it is likely regulation does as well – including incentive regulation. Regulatory independence is thus qualified: note the two examples at the end of this section. Other jurisdictions, of course, have different institutional structures designed to fulfil broadly the same functions (see Baldwin et al. 2012, Ch 18).

This does, of course, leave room for changes in regulatory governance introduced at each level, taking place in individual jurisdictions or more widely. Coincident with the start of our account of incentive regulation in the 1980s, a broader development was occurring in advanced capitalist nations. This drew the name of the ‘regulatory state’ (Majone, 1994) and is often contrasted with the ‘welfare state’ in which the role of the state included macro-economic planning and the provision of welfare, and often entailed public ownership. Reduction in these requirements often led to a role for independent regulatory agencies and a change to policy instruments which are now applied to companies owned by investors. They no longer rely upon the brute force of commands to firms in public ownership - direct centralisation, but must now adopt the techniques of indirect centralisation, via the use of rules and standards. Decisions are also increasingly subject to appeal bodies.

It has further been argued that in this early period the emphasis was on an ‘economic’ analysis in pursuit of efficiency rather than on distributional or other goals. This has been described as a ‘responsible regulatory state’ by Koop and Lodge (2022), who propose that the social and economic stresses imposed by the global financial crisis and, in some countries, by the austerity policies pursued thereafter, changed popular perceptions. The decline in living standards, or in their rate of improvement, led to a degree of disbelief in light-touch regulation and the operation of markets. This generated what is sometimes called a ‘responsive regulatory state,’ in which the scope of regulation is wider, accountability is extended, and a focus on redistribution rules the roost. A similar transition is conveyed by the alternative frequently-used phrase: the

politicisation of the British model of regulation. We look in turn at what has happened at the levels of the legislature, the government and the regulatory agency.

### 5.2 Parliament Determines Network Industry Regulators’ Duties

Regulators’ statutory duties had been a feature of the British model of regulatory governance from the start. Typically, a change of duties was often associated in a larger piece of sectoral re-regulation. As a result, the collection of duties now comprises an accumulation of sedimentary layers of amendments, imposed on a now 30–40 year-old original statute. (This does not make them compelling reading.)

At privatisation, the duties were few and simple. This can be seen in Figs. 1 and 2, which show at the left the initial duties (both primary and secondary) of the GB gas regulator and of the England and Wales water regulator at privatisation in the 1980s, and also how they grew over the periods specified. In relation to gas regulation, this began with two primary duties – security of supply and supplier finance. Supplier competition was added as a third in 1992. In 2000, a multi-sectoral Utilities Act identified a category of primary objectives which elevated protecting consumers (formerly only a secondary duty) to a third objective. Vulnerable consumers’ interests were upgraded at the same time.

Sustainable development features from 2008. In 2010, a qualification to the ‘promoting competition’ objective in gas was introduced requiring the regulator to use the most effective ways of achieving its objectives. In crude numerical terms, in Fig. 1 seven ‘boxes’ of duties in 1986 had doubled to 15 in 2013. This growth is mirrored in the England and Wales water regulator, as shown in Fig. 2. There is obviously the risk in imposing duties that, the more are imposed, the more complex the trade-offs among them become. In the limit, if everything is a priority, nothing is.

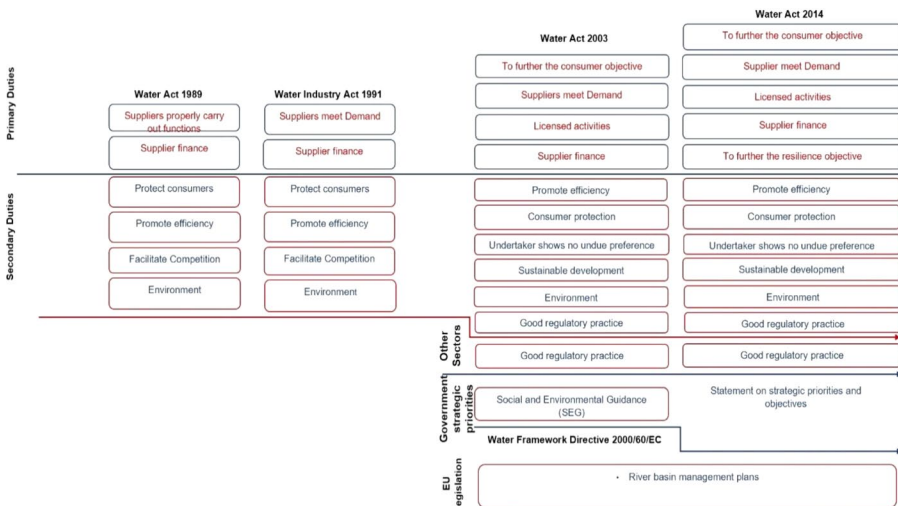


Fig. 2 Ofwat’s Statutory Duties for water and sewerage (1989–2022). (Source BEIS, *Economic Regulation Policy Paper*, 2022, p. 10)

A recent issue in debate has been whether it is desirable to include an express duty on the regulators of network industries, almost all of which are heavily energy-intensive, to act in strong support of the UK Parliament's acceptance of an obligation to achieve a net zero position in the emission of carbon and other harmful gases by 2050. This obligation applies to all regulators, including the GB energy regulator Ofgem. In 2023, it was imposed as a duty on Ofgem (Duma et al. 2024). In 2024, an enhanced duty was imposed on Ofcom, Ofgem and Ofwat to promote economic growth, in the light of the UK's poor record in this respect (DBT, 2023). Both of these issues were the subject of high levels of political debate. It is not therefore easy to establish the incremental effect of imposing a duty.

### 5.3 Changes in how Government Communicates its Strategy and Policy

In 2011, the incoming coalition (Conservative and Liberal) government conducted a review of network industry regulation which set out Principles of Regulation (BEIS, 2011) which are broadly similar to their predecessors. At the same time, the government committed to put in place for each regulated sector a strategy and policy statement (SPS) directed to the relevant regulator designed to provide context and guidance about priorities and desired outcomes. It was envisaged that the shelf life of the document would correspond to the (maximum) life of any parliament of five years.

Relatively few SPSs have been issued: three for the water sector (DEFRA, 2013, 2017, 2022), and one for the telecommunications sector (DCMS, 2019). No statement for the energy sector has gone beyond a draft. Unsurprisingly, what emerges from the statements is that the government's strategic priorities for the regulator are broad and multiple: for Ofwat in 2022 they are: to protect and enhance the environment, to deliver a resilient water sector, to serve and protect customers, and to use markets to deliver for customers. Each of these categories is disaggregated. None is objectionable or trivial. Ordering of priorities is generally absent.

Where the government does not make the trade-off, it is up to the regulator to do so – for example taking such decisions as on how much expenditure on environmental protection, with resulting price increases, it will allow in a five-year network price control. We now turn to this process, and in particular on how it may have changed over the 40-year life of the British model.

### 5.4 Changes in the Formulation of Regulators' Plans

This leaves considerable discretion to the regulator in devising its plans. And the way in which this is exercised appears to have changed. This is illustrated by the experience of telecommunications regulation by Ofcom in the UK, as shown by the regulator's Annual Plans twenty years apart (Cave & Crocioni, 2023).

The Ofcom 2004-05 Plan starts by making very clear what its role was: "*Ofcom exists to further the interests of citizen-consumers through a regulatory regime which, where appropriate, encourages competition.*" It identified three main market challenges: (1) helping to drive forward digital switchover and broadband roll-out, (2) promoting competition and (3) safeguarding the interests of citizen-consumers.



Ofcom's core projects and programs were designed to address its mission which was summarized in four points:

1. Encourage the evolution of electronic media and communications networks;
2. Support the need for innovators, creators, and investors to flourish via promoting competition;
3. Foster plurality, inform and protect citizen-consumers and promote cultural diversity; and.
4. Serve interests of citizen-consumers.

Under 1 and 2 in particular, almost all objectives were about encouraging competition and promoting efficiency.

Comparing this to the Ofcom 2022-23 plan helps to understand the substantial change and evolution in Ofcom's role and focus. Although, its range of activities were extended further to cover postal and internet services, the main difference lies elsewhere. Ofcom's main duty remains unchanged (though it does no longer appear as prominently as it did in 2004-05), but it acquired several additional duties which shifted its focus, and new legislations were added (e.g., the Telecom Security Act on reliable networks and the then draft Online Safety Act whose aim is to protect consumers from online harm).

Critically though, in the more traditional areas of intervention, Ofcom's focus is no longer on "*furthering the interests of consumers*" through the promotion of competition, but on setting direct "*output*" targets (e.g., increased take-up, more investment in fixed and mobile networks, more reliable and resilient high-quality networks, safety and trust in content, promotion of public service broadcasting (PSB), ensuring representation of every part of society in programs - to cite the most important ones listed in its 2022-23 annual plan).

Competition is no longer prominent as a means to an end, instead the aim is directly to state what consumers want and achieve it by regulatory intervention. This does not necessarily imply that competition was not successful or cannot be relied upon; customers continue blithely seek to get the best deals and switch among providers. Instead, it identifies additional goals in the sector, often with 'public' or shared aspects of the benefits they bring. In telecoms (fixed and mobile), Ofcom's focus was now firmly fixed not on setting prices but on choosing quantities of specified variables: on directly increasing investment, take-up, resilience, security, reliability; "*supporting the delivery of high-quality mobile connections and innovation;*" "*supporting investment in gigabit networks;*" and "*safeguarding telecoms customers' interests, including those who are vulnerable.*"

As it happens, the European Union was independently engaged in reconfiguring its communications regulation at the same time, in the context of making the 2020s a 'digital decade' (Cave, 2023b). That too led it into targets such as a gigabit connection for each household and 5G connectivity in the whole of each Member State's inhabited area.

Going with the grain of these developments, but largely independent of them, there occurred from 2015 onwards in particular a strong movement in investors' propensity to favour companies or sectors that, in order to extend the benefits of com-



panies' operation to a wider group of stakeholders than shareholders alone, pursue ESG (environmental, social and governance) goals. In practice such proponents are driven by a broad church of motives ranging from altruism to the belief that such investments would be directed to more dynamic and far-sighted firms, which would earn higher returns.

In a similar vein, one UK regulator, Ofwat, went so far as to direct all boards of licensed England and Wales water and sewerage companies to adopt a binding principle of Board Leadership and Governance which requires it to set a purpose for the company that recognises the needs of its wider stakeholders as well as of its shareholders (Cave & Wright, 2021).

## 5.5 How Regulators make trade-offs

When regulators publish decisions over how they will act, they will likely share the reluctance of governments to combine an enumeration of the beneficiaries with an equivalent enumeration of those who might have benefitted but haven't. One way of investigating this aspect is to conduct anonymised interviews with regulators and ask them why and how (they believe) the regulator came to its decisions. Note that the outcome of this procedure may depend on some inevitable randomness in the choice of interviewees. I now describe two published exercises of this kind covering UK regulators.

The first, by Reader and Harper (2018), reported the results of asking 13 past or current regulators or commentators about regulatory duties and fairness in retail energy in GB. As noted above, the regulator's principal objective is 'to protect the interests of current and future consumers' – which is a model of clarity, and not surprisingly described by one respondent as 'at the heart of decision-making'. While current regulator respondents emphasised the role of the statute in determining decisions, former regulators considered the wider political context to be a significant factor.

On the question of the regulator's role in supporting fairness and justice in energy markets, the majority view seemed to favour leaving that role to government, while a minority acknowledged a growing joint role for the regulator in the protection of vulnerable customers.

The second group of interviewees, in 2019, comprised 13 senior officials with many years of cross-sectoral regulator experience (Koop & Lodge, 2022). Careful analysis of this set of responses led to a variety of conclusions, including that:

- politicisation was particularly felt in regulatory sectors where prices had increased;
- this had increased government attention to regulators, and in respect of both scrutiny and intervention;
- the mid-2010s had seen the balance of regulatory decision-making switch from investors and companies to consumers, with the protection of vulnerable consumers being particularly important;
- regulators had learned the limitations of competition and the implications of under-enforcement and under-regulation;

- regulators were increasingly uncomfortable about ignoring the distributional consequences of their decisions, but still reluctant to use fully redistributive ones like cross-subsidisation via social pricing among consumers.

Both studies appear to suggest that changes were in progress at the time.

## 5.6 Two Recent GB Episodes of Overlapping Regulatory Governance

It is instructive to compare two fairly recent episodes. One concerned retail energy prices for households. This became a matter of controversy in the light of increasing margins made by a small group of large retailers. The energy regulator referred the matter for market investigation to a fellow-regulator, the Competition and Markets Authority, which found a substantial consumer detriment and proposed a form of direct price control on retail margins for about 15% of households and other lighter-touch methods for the remainder (CMA, 2016). This approach was endorsed by the energy regulator.

In the face of a public outcry, and with a general election imminent, the government proposed legislation to Parliament which required the energy regulator to set a price-controlled tariff available to all households. This passed with an over-whelming all-party majority, and such a tariff came into effect in January 2019.

A less controversial but still major issue arose in the telecommunications sector. The UK had fallen behind much of Europe in installing so-called ‘gigabit’ fibre-to-the-home connections. Rectifying the situation at pace required some hard choices relating to end-user broadband charges, not only to fund the large investments required, but also to encourage the replacement of slower broadband services with gigabit services. Following simultaneous consultations by government and regulator on the future of the UK communications infrastructure, one driven largely by industrial policy and one driven by its regulatory duties, collaboration was achieved, with its expected significant pricing-raising consequences. Regulatory implementation included a novel approach to calculating the cost of capital and a commitment to abstain until 2031 from regulating the wholesale prices of slower broadband services, in order to allow network firms in the meantime to charge higher prices on slower products, thus encouraging faster full fibre take-up (Ofcom, 2020).

In the former case the legislature over-ruled the competition and energy regulators. In the latter telecoms case, despite some minor disagreements, the two parties behaved in a complementary fashion to implement the Government’s policy.

## 6 Summary and Conclusions

Sections 3 and 5 above have identified two separate sources of increasing complexity in the application of incentive regulation to networks – the replacement of the initial simple price caps by a much more complex regulatory regime, often called performance-based regulation; and the expansion of the goals of regulation through the interaction of the three types of organization involved in regulatory governance.

Most of the examples that are noted here are based on GB practice. There is reason to believe that a ‘technical’ switch to some form of performance-based regulation is in place or under consideration more widely. Changes in goals obviously depend upon the constellation of the forces governing the political economy in the jurisdiction in question, so that generalisation is more difficult. But in both instances we can begin tentatively to formulate questions about the effects of the two above-noted changes on regulatory performance and outcomes.

## 6.1 Performance-based Complexity

Sections 2 and 3 above have discussed three regulatory regimes: (i) rate of return, (ii) RPI-X, and (iii) the more complex ‘performance-based’ regulation. It is natural to ask questions about their comparative performance in pursuit of the same or similar regulatory goals.

To compare the first two, we require data on performance by a sufficiently large number of firms operating in the same sector and general market circumstances, but subject to different forms of regulation, probably but not necessarily imposed by different regulators.

Driver (2023, pp. 140-1) has identified nearly 40 studies, comparing rate of return and price cap regulation with respect to prices, costs, quality of service, earnings and investment. In the author’s assessment, the evidence is mixed, except in two categories: earnings grow faster under price caps, and network modernisation and investment are higher with price caps in the telecommunications and energy sectors.

The comparison of RPI-X and ‘performance-based’ regulation is harder to accomplish, in the light of the judgements that are required of the level and effectiveness of complexity. I am not aware of any attempt at a full cost-benefit analysis of such a switch, but fragmentary evidence is available from a consultancy study prepared for the GB energy regulator of the early years of operation of the appreciably more complex RIIO-1 price control (CEPA, 2018, pp.3–5). This notes that the RIIO framework was designed to be high-powered, so carrying execution risk. A major risk which crystallised was the high level of company returns, associated with quite granular cost allowances, based on targets derived from outdated data.

In the consultants’ view, ‘the upside potential for network companies is likely to exceed the downside risk because the companies have an information advantage over Ofgem.’ This was partly addressed in the following price control (RIIO-2) by imposing a separate ceiling on overall returns. Compensating benefits from additional more complex procedures were also identified.

The fundamental question here is the shape of the curve that links the level of regulatory complexity, measured for example by the number of separate bonus - or penalty – determining indicators, and, for example, the welfare of consumers in the sector in question (assumed to be unaffected by a change in goals). There is an ‘in principle’ argument that the availability of a larger number of instruments permits the attainment of a larger number of distinct (and hence more granular) objectives, in the form, for example, of cost reduction and greater efficiency.

However, an unsettled question is whether the regulator can get hold of enough of the necessary detailed knowledge that is held within the regulated firm to make

choices of detailed incentives and targets which increase consumer welfare. If the regulator cannot obtain such information, then the firm may be able to distort its plans to maximise its bonuses rather than to enhance broader social objectives. As noted in Sect. 3 above, there is some anecdotal evidence of such problems from the operation of RIIO-1 in GB.

The problem of asymmetric information between regulator and regulatee goes wider than this, especially when combined with the ‘ratchet effect’ associated with repeating a price control over time. The difficulty is that, just as a rate of return regulated network can supposedly achieve Hicks’ famous monopoly profit in the form of quiet life by lowering effort, and still more than break even, so a more or less complex price-capped regulated network can choose to reveal less than its true productive capacity by holding back its potential; this may enhance the present value of its super-normal profits.

Despite their disadvantages, ratchets are found everywhere – both in the private sector (for example, in setting sequences of targets for sales organisations), and under public ownership. Thus, one of the causes of the ultimate collapse of the Soviet economy was the persistent use, when setting the next year’s bonus- and penalty-determining annual enterprise plans, of the practice of adding standard percentage points to the current year’s expected outputs (Berliner, 1956). This persistent and apparently insoluble problem does not of course entail any abandonment of incentive regulation; that depends on what else is available.

Finally, it is apposite to note Guthrie’s (2006, p. 966) view that ‘the most appropriate regulatory scheme for a given situation will depend on the characteristics of the firm and industry being regulated, as well as the institutional environment’. This has been analysed extensively since the 1990s (see Levy and Spiller, 1996). This has led to suggestions that the long tradition of administrative law in the USA, extending going back a century or more, with respect to judicial precedents concerning fair rates of return, may predispose regulators to adhere to rate of return regulation. (See Weisman, 2019). These forces may be stronger than those present in the licence-based regime in the UK.

## 6.2 Responding to Complex Goal Changes

It may help to divide goal changes into two main components. One - greater focus on distributional goals - has been in place for several decades, affecting principally the retail or downstream component of the value chain. Regulators have responded variously, in some cases by setting social prices, and more widely in requiring special protections for certain disadvantaged groups. Some schemes of this kind have been imposed by the UK Government, rather than the regulator, the costs being defrayed from public spending. It appears that this can be accommodated without too much difficulty, unless its scale gets too large.

However, wider economic objectives such as net zero, other broad-brush environmental goals or the pursuit of growth, present other problems, which penetrate the whole of regulated activity in a sector and have wider consequences on the operation of (incentive) regulation.

For example, in the case of net zero, demand for electricity is expected to grow very fast, and to require a very large increase in on-shore and off-shore transmission capacity. This has provoked the introduction of uncertainty mechanisms within the energy price caps which allow in-period variations in investment plans, and even the development of new processes which incorporate strengthened incentives for timeliness of completion. Simultaneously, measures are required both to reduce overall demand (for example by improving building insulation), and to use the price mechanism to shift demand away from peak times to reduce the need for additional network investment.

As in the case of telecommunications as described in Sect. 5 above, this may require the introduction of quantitative targets to be achieved by regulation within an inherited framework of regulation, which relies on price signals. We have noted use of the wholesale price mechanism to encourage the spread of fibre in the UK. In the EU, in 2023 the European Commission mooted but has since apparently resiled from the possibility of direct actions such as requiring redistribution within the internet value chain from over-the-top (OTT) platforms such as social media or search engines to defray some of the costs to fixed or wireless networks of achieving universal gigabit connectivity (Cave, 2023b).

A less novel way forward which has attracted recent attention is to seek to combine different pre-existing regulatory mechanisms within the same sector (say, electricity) or even sub-sector (say, electricity transmission), using different degrees of incentive regulation. For example, the costs of running existing capacity on a ‘business as usual’ basis, for which past cost data – subject to the flaws noted above – are available, might be accomplished by a simplified version of incentive regulation, while the regulation of urgently needed new capacity might be subject to something akin to a form of rate of return regulation. This thus represents an implicit response to changes in both sources of complexity. It remains to be seen how this works out.

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**Data Availability** No datasets were generated or analysed during the current study.

## Declarations

**Competing Interests** The author was employed part-time as chair of the GB Gas and Electricity Markets Authority from 2018 to 2023. The present work was done in his academic capacity.

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