

RPI-X@20 Emerging Thinking consultation document – Alternative ex ante and ex post regulatory frameworks

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Target audience: Consumers and their representatives, those with sustainable development interests, energy transmission and distribution companies, generators and offshore producers, suppliers, shippers, Government, investors, academics and other interested parties.

Overview:

RPI-X@20 is Ofgem's detailed review of energy network regulation. We are looking to the future on behalf of consumers by considering how best to regulate energy network companies to enable them to meet the challenges and opportunities of delivering a sustainable, low carbon energy sector whilst continuing to facilitate competition in energy supply. There is considerable uncertainty about how best to meet these challenges whilst maintaining value for money for existing and future consumers.

This supporting paper, published in parallel with our main Emerging Thinking consultation paper, provides an overview of the alternative regulatory frameworks we have considered. In particular, we identify different frameworks for setting ex ante price controls and distinguish these from forms of ex post regulation. Our main finding is that whilst there are lessons to be drawn from alternative frameworks, there is no alternative that we can pick up and apply in its entirety as a replacement for Ofgem's current regimes. The lessons have informed our thinking on a new regulatory framework for energy networks set out for consultation in our Emerging Thinking paper.

We welcome views on this supporting paper.

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Table of Contents

1. Summary	1
Overview of regulatory frameworks	1
Summary of findings	4
2. Ex ante price controls	6
Overview of alternative price control approaches	7
Comparison of alternative ex ante price control frameworks	12
Lessons for a new regulatory framework	14
3. Ex post regulation	18
Research commissioned on ex post regulation	18
Lessons for a new regulatory framework	22
Appendix 1 – Associated documents	23

1. Summary

1.1. Ofgem's approach to the regulation of energy network companies has evolved over time. We have identified the successes of this approach. But we have also identified some limitations and drawbacks, especially in the context of the challenges facing the energy industry.

1.2. The RPI-X@20 review has provided the opportunity for us to step back and consider the case for a fundamental change in the type of regulatory framework used to drive outcomes and constrain the prices, revenues and profits of energy network companies. As part of the review, we have considered whether there is a case for moving to other regulatory frameworks discussed in the academic and regulatory literature or used in other jurisdictions.

1.3. Our Emerging Thinking consultation paper attempts to provide an accessible overview of our emerging thinking and is aimed at a wide range of interested parties. Our ideas on 'embedding financeability in a new regulatory framework' are discussed in more detail in a parallel consultation paper. We will also shortly be publishing a related consultation paper on whether we should introduce a third-party right to challenge to our final price control decisions, as some participants in the review have advocated.

1.4. This is one of a series of technical supporting papers that provide further details on key aspects of the new framework. This supporting papers are aimed primarily at the network companies, investors and other stakeholders who require a more in depth understanding of our thinking and the rationale underpinning it in some or all areas. The references for this supporting paper can be found in Appendix 1.

1.5. Our main finding is that whilst there are lessons to be drawn from alternative frameworks, we do not think that there is an alternative that we can pick up and apply in its entirety as a replacement for Ofgem's current regimes. The lessons have informed our thinking on a potential new regulatory framework for energy network companies set out in our main Emerging Thinking consultation paper.

Overview of regulatory frameworks

1.6. We have examined regulatory approaches used in different sectors and different countries. We have also gone back to the drawing board, reviewing regulatory models discussed in the academic and regulatory literature. As part of the work we have:

- conducted our own research and published working papers;
- commissioned and published studies from consultants;
- invited contributions to our web forum; and
- held meetings and workshops with stakeholders.

1.7. Table 1 provides an overview of different regulatory approaches that we have considered as part of the RPI-X@20 review. It highlights the lessons we have drawn for the review and where we have picked up on these models in other supporting papers. We have organised the table into four categories:

- Models in which network companies are subject to "ex ante" price controls;
- The use of "ex post" regulation to regulate network companies' prices;
- The use of competitive processes to drive outcomes and constrain the prices of network companies; and
- Models involving user/stakeholder participation and negotiation.

1.8. Some models and approaches applied in practice cut across different categories.

1.9. Ofgem's current regulation of energy network companies is a form of ex ante price control regulation, in which a regulatory determination is made upfront, constraining the maximum prices or revenues that the regulated company is allowed. In contrast, ex post regulation covers a range of approaches in which no firm price control is specified upfront and reliance is placed instead on other rules or mechanisms to constrain the prices and behaviour of network companies, with regulatory intervention if there is a breach¹.

1.10. The first three categories above provide potential ways to drive outcomes and constrain the prices of the services provided by network companies. These categories are not outright alternatives. For instance, some regimes might involve price controls alongside elements of ex post regulation or combined with competitive processes in specific areas. The last category is more varied. Approaches within this category might be used directly to constrain network companies' prices, or they might form an input to a model under another category (e.g. an ex ante price control model).

1.11. This supporting paper focuses on the first two categories in Table 1: ex ante price controls and ex post regulation. We have already considered the other two categories — use of competitive processes and stakeholder engagement — as part of three RPI-X@20 working papers published between July and October 2009². We have subsequently developed and refined our thinking in these areas. We set out lessons we have drawn for our thinking on a potential new regulatory framework for energy network companies in separate supporting papers on a greater role for competition in delivery and enhanced engagement. We also consider the merits of regulatory frameworks focused on output delivery in our supporting paper on incentivising efficient longer-term delivery of desired outcomes.

¹ See LECG (2009a) in list of supporting papers set out at the start of this document.

² See the RPI-X@20 working papers on "Who decides what energy networks of the future look like?", "Consumer engagement in the regulatory process" and "Enhanced competitive pressures on regulated networks".

Table 1 – Alternative regulatory frameworks considered

Category	Ex ante price controls	Ex post regulation	Competitive process	Stakeholder participation models
Models	<p>Rate of return</p> <p>Pure price caps</p> <p>Yardstick regulation</p> <p>TFP-based price caps</p> <p>Sliding scale; profit-sharing</p> <p>Long-run average incremental cost</p>	<p>Ex ante rules about prices or profits</p> <p>Light-handed regulation</p> <p>Threshold regulation</p> <p>Obligation to negotiate</p> <p>Information disclosure</p> <p>Reliance on competition law</p>	<p>Competitive tenders</p> <p>Franchising</p> <p>Compulsory outsourcing</p> <p>"Utility bond / contracting out"</p> <p>Direct competition between networks</p>	<p>Guiding mind</p> <p>Constructive engagement</p> <p>Negotiated services</p> <p>Negotiated settlement</p> <p>Public contest method</p>
Examples	<p>Building-blocks approach to utility price controls in the UK</p> <p>Cost of service regulation for US utilities</p> <p>Performance based regulation for US utilities</p> <p>Yardstick regulation for Dutch electricity networks</p> <p>Sliding-scale scheme for GB energy system operators</p> <p>Long-run average incremental cost for UK mobile termination</p>	<p>Ex post price control with ex ante specification of approach to cost in Swedish and Finnish electricity distribution</p> <p>Ex ante non binding price and quality thresholds, in New Zealand electricity distribution</p> <p>The use of competition law alone in US telecommunications fibre access networks</p> <p>Light-handed regime for Australian airports</p>	<p>Competitive tenders for offshore electricity transmission</p> <p>London Underground public-private partnerships</p> <p>Utility concessions in France</p> <p>Franchises for buses and overground rail in the UK</p> <p>Independent energy networks (IGTs and IDNOs)</p>	<p>High-level output specification in regulation of Network Rail</p> <p>Quadripartite process in England and Wales water sector</p> <p>Negotiated settlement for US and Canada energy networks</p> <p>Negotiated services for electricity networks in Australia</p> <p>Constructive engagement in UK airport price control reviews</p> <p>Public contest for new investment in electricity transmission in Argentina</p>
Lessons for review	<p>Recognise that current regimes already a mix of elements from alternative price control models</p> <p>Not identified good case for wholesale switch to one of the alternative price control models</p> <p>Identified options for how current regimes could be developed (e.g. design of efficiency incentives, benefits of cost benchmarking)</p>	<p>Not identified a good case for replacing ex ante price controls with a form of ex post regulation</p> <p>Ex post models examined would give less confidence of the regime providing value for money</p>	<p>Potential for competitive tendering and compulsory outsourcing in specific areas</p> <p>Complete franchising of operation and maintenance of existing networks not a viable option for core regime</p> <p>Direct competition between networks outside scope of review of alternative regulatory frameworks</p> <p>Existing independent networks model does not remove need for price controls</p>	<p>In current context of GB energy networks, these models more relevant as potential add-ons to the process rather than an alternative</p> <p>Greater participation of consumers, government and users proposed as part of new regime to achieve a more informed regulatory settlement</p> <p>Some specific lessons drawn (e.g. need for engaging parties to have sufficient resources)</p>

Summary of findings

1.12. Overall, we have not identified a good case for moving away from an ex ante price control framework. In this framework we set, in advance, requirements on what network companies need to deliver, an associated constraint on the revenue they can collect, and incentives to encourage them to deliver and to reduce and restrain their costs over time. As emphasised in our Emerging Thinking consultation paper, we do see merit in changing how we determine the ex ante price control and associated output requirements.

1.13. We have not identified a case for moving towards ex post regulation. In reaching this view, we have drawn on the case studies and analysis presented in a report on ex post regulation we commissioned from LECG. We have also considered a paper by Stephen Littlechild on ex post regulation of Australian airports (Littlechild, 2009a).

1.14. Our review of alternative price control models emphasises that Ofgem's current regulatory frameworks reflect a mix of elements from different price control approaches. The current regimes are not pure "fixed-price" controls; they involve risk-sharing arrangements around some areas of costs which take them some way towards (but still short of) regulatory regimes that more or less remunerate network companies for the actual costs they incur. They use cost benchmarking analysis, allowing price controls to be set in light of comparative information across regulated network companies. They also involve elements found in rate of return regulation, in particular the use of ex post assessments of whether a network company's capital expenditure was efficient and useful.

1.15. This mixed approach allows the current regulatory frameworks for energy network companies to achieve some of the benefits of the alternative approaches whilst balancing their downsides.

1.16. We have identified from the review of alternative models some elements which could be taken on board in a new ex ante price control framework for energy network companies. In particular:

- Within a price control approach, the incentive arrangements can be designed to strike a balance between providing strong incentives for a network company to control its costs and addressing risks that the price control allows the network company too much or too little revenue in light of its actual expenditure.
- A competitive tender process can be used as an option for the delivery of specific energy network requirements, within a framework that is predominantly driven by the setting of price controls for monopoly network companies.
- Greater engagement with consumers, government, network users and other stakeholders could be built into the price control process.
- Cost benchmarking elements can play a role, within a price control, in providing longer term incentives on network companies to reduce and restrain their costs.

- Similarly, benchmarking network companies' performance in delivery might also have a role to play in encouraging companies to deliver our desired outcomes.
- Price controls can, and do, involve "ex post" elements, in which the revenue a network company is entitled to depends on its actions during the price control period as well as external events.

1.17. The remainder of this supporting paper highlights our findings on alternative ex ante price control frameworks and ex post regulation.

2. Ex ante price controls

2.1. We use the term "price control" to refer to a broad category of models in which limits are placed upfront on the prices that a regulated company can charge its customers. The limits may take a range of forms, for instance:

- the regulator may specify the maximum price for specific services that the company provides (e.g. the regulation of wholesale mobile termination by Ofcom);
- the regulator may specify the maximum level for a weighted average of the prices for different services that the company provides (e.g. this approach is used in Ofwat's regulation of the water and sewerage industries in England and Wales); and
- the regulator may specify the maximum revenue that the company can earn from customers, with the maximum potentially dependent on volume drivers such as the number of customers (e.g. this approach is currently used by Ofgem in its regulation of energy network companies).

2.2. These different forms of price control have different properties (see Regulatory Policy Institute, 2009). But we can take them together for the purposes of the high-level review in this paper.

2.3. Price control frameworks may include measures to encourage and ensure that the regulated company delivers the right services to customers, and meets quality standards. For instance, there may be penalties if its service quality falls short of levels specified by the regulator. Our supporting paper on incentivising efficient longer-term delivery discusses options for the regulation of network companies' performance in delivery, emphasising the merits of an outcomes-led framework. The outcomes-led framework could work with any of the alternative ex ante price control funding frameworks considered here.

2.4. In this paper we focus on arrangements for funding a regulated network company's activities through a price control — assuming it is delivering the outputs and service standards required. In particular, on how, in broad terms, the upfront price or revenue limits are determined and what they depend on. The design of these funding arrangements is likely to affect what the regulatory framework delivers:

- The funding arrangements play a large role in determining the value for money that consumers receive. For instance, they affect the incentives on a network company to control its costs and the levels of profit which the price control allows the network company to earn.
- The funding arrangements affect the risks that a network company is not able, without intervention by the regulator, to finance its activities (e.g. to provide the services it is required to deliver).
- The funding arrangements affect the risks that a network company does not deliver what the regulator and customers want it to deliver. A flipside of strong incentives on a network company to control its costs may be strong incentives for

it to cut back on delivery, especially for aspects of delivery that are not tightly regulated through a system of rewards or penalties.

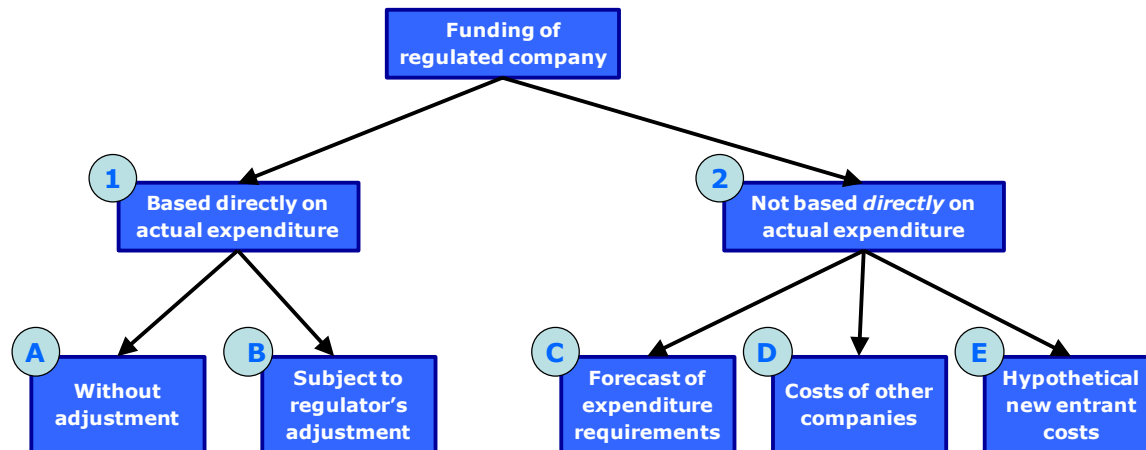
2.5. We take a step back from the current frameworks used by Ofgem. We identify a set of high-level alternative funding models and pick out their main features. The models we consider are simplified for the purposes of comparison. They overlook many of the nuances that characterise regimes used in practice, which would otherwise cloud the comparisons.

2.6. The aim of this exercise is twofold. First, to demonstrate that Ofgem's current frameworks already reflect a mix of elements from different regulatory models, rather than a pure application of a single model. Second, to identify, at a high level, ways in which alternative models may perform better than Ofgem's current frameworks and to draw lessons for our thinking on a potential new regulatory framework for energy networks.

Overview of alternative price control approaches

2.7. Figure 1 provides a high-level overview of the simplified models we have identified.

Figure 1 – Overview of alternative price control models



2.8. Regulatory regimes applied in practice often reflect a mix of elements from those indicated in Figure 1, as well as incorporating a host of additional features. Further below, we link the models in the figure to the terminology used in the regulatory literature.

2.9. The illustration recognises that an important difference between regulatory approaches is the extent to which the price control is based on the regulated company's actual expenditure. We distinguish between: (1) models based on actual expenditure and (2) models not based directly on actual expenditure.

2.10. Some approaches used in practice represent compromises between models under categories (1) and (2) above. For instance, a regulated company's allowed revenues may reflect both an upfront forecast of its expenditure requirements (C) and also its actual expenditure (A).

2.11. Our focus below is on how the funding the network company is entitled to earn is determined rather than the time profile over which it gets this funding (see the box below). This focus helps to clarify differences between the models.

Time profile of funding and the use of a regulatory asset value (RAV)

Energy network companies need to make long-term investments. It may be unfair to existing consumers for them to fund investment in full that will bring benefits over several decades.

Price controls can be designed so as to spread the funding that a regulated company receives for investment projects over a longer period of time than that in which the company incurs expenditure. The "regulatory asset value" (RAV) is a tool through which the regulator can commit to make payments to companies' investors in periods beyond that covered by the maximum prices or revenues under a price control. The use of this approach (or decisions on the proportion of expenditure that is funded as it is spent and the proportion that is funded through the RAV) is not specific to any single model for price controls, although the way that the regulatory asset value evolves over time will tend to vary between models.

Funding based on actual expenditure

2.12. At one extreme, it is possible to set a price control that remunerates, as far as practical, the actual expenditure of the regulated company (including a reasonable profit on its capital requirements). This can be referred to as full "pass-through" of the company's costs. It is represented as model (A) in the figure above.

2.13. This model, or approximations of it, can be implemented in different ways. For instance, one way would be to set the price control on the basis of short-term forecasts of what the company is expected to spend and then adjust its allowed revenues quickly to compensate for instances where actual expenditure was more or less than forecast.

2.14. A major problem with a model based on full remuneration of the company's actual expenditure is that this may provide the company with little motivation to restrain its costs — and, in turn, the prices that customers pay.

2.15. A variation on that model is to remunerate actual expenditure, subject to some kind of review by the regulator of that expenditure. This is represented as model (B) in the figure above. For instance, the regulator may examine the company's expenditure and find that some of its costs were inefficiently high, or

unnecessary for the provision of the services the company is required to provide, and not expose customers to the costs in full.

2.16. There are different ways in which the review and adjustment process could be carried out. The essential feature is that the actual expenditure of the regulated company is the starting point for what the company is allowed to earn, and adjustments are made to this where there are grounds to do so.

2.17. Regulatory models described as "rate of return", "cost plus" and "cost of service" fit within this category.

Funding divorced from actual expenditure

2.18. At the other extreme, it is possible to set a price control that is divorced, to varying degrees, from the regulated company's actual expenditure over the period in which the control applies. This is category (2) in the figure above.

2.19. One of the main theories of price cap regulation is that, by separating the prices that the regulated company can earn from the costs that it incurs, it will have the opportunity to profit from reducing its costs. This can benefit consumers over the longer term if, at some future point, the reduced levels of costs feed through to lower prices (e.g. at a price control review scheduled to take place every five years).

2.20. There is a range of different ways to set price controls that are not based directly on the regulated company's actual expenditure. A broad distinction can be drawn between the following models (cross-referenced against Figure 1 above):

- (C) Forecasts of expenditure requirements. For instance, a limit can be set on the total revenue that the company earn over a five-year period, based on an assessment by the regulator of the funding the company will need over that period if it is efficiently managed.
- (D) Costs of similar companies. For instance, analysis can be carried out to establish an average unit cost across a set of similar companies and used to set a price limit for each regulated company. Or price limits can be adjusted from one price control review to the next, based on measures of the change in costs experienced by similar companies over that period. Econometric analysis might be used to try to take account of differences between companies in their operating environment and the outputs they provide.
- (E) Costs of a hypothetical new entrant. Analysis can be carried out to assess the costs that would be incurred by a hypothetical efficient new entrant to provide the same services as the regulated company.

2.21. There are potential interactions between these three models. In particular, data on the actual expenditure of a regulated company in the past might be used as an input to a forecast of its expenditure requirements over a future period; similarly data on the historical costs of other companies (e.g. unit cost data for specific

network activities) may be used for such a forecast. Forecasts can draw on a range of evidence.

2.22. Regulatory models described as "pure price caps", "pure yardstick regulation" and "TFP-based" price caps fit within this category. Other approaches to price caps might fit within the category, but could also represent hybrids in which some element of the price control reflects the actual expenditure of the regulated company. This is highlighted further in the next two subsections.

Frameworks in the regulatory literature and other variations

2.23. The categories and models above do not fit perfectly with terminology used in the regulatory literature. We have found it useful to set out a simplified categorisation first by reference to the basis on which the funding for the regulated company is set (e.g. actual expenditure versus costs of other companies).

2.24. Nonetheless, it is helpful to set out the links with models described in the literature. A paper prepared by the Regulatory Policy Institute reviews regulatory literature on alternative price control frameworks (Regulatory Policy Institute, 2009). The models identified in that paper relate to the categorisation in Figure 1 approximately as follows:

- Rate of return (or cost of service) models fall under category (1) and, within that, may be closer to model (B) than (A).
- Price cap regulation, taken broadly, falls under category (2).
- Pure yardstick regulation (or yardstick competition) falls under (D); partial yardstick reporting or benchmarking approaches may be used as an input to a forecast of expenditure requirements (C).
- Some approaches to price controls based on long-run average incremental costs (LRAIC or LRIC) are based on calculations of hypothetical new entrant costs (E).
- Profit-sharing, error-correction mechanisms and sliding-scale approaches represent models that involve a mix of categories (1) and (2).

2.25. The regulatory literature also uses the term "building blocks approach" to describe the type of regulatory approach developed and used in the regulation of sectors such as water, energy and airports in the UK. This approach does not fit neatly into any of the models or categories above. It is perhaps closest to model (C) but with at least partial elements of other models (e.g. partial pass-through of actual costs to consumers). We explain in more detail in the next sub-section how Ofgem's regulation of energy networks reflects a mix of different regulatory models.

2.26. A potential further variation involves setting an initial price control on some basis, and then adjusting that price control periodically only according to some pre-specified and narrow rules. In particular, a price control might be set initially using a forecast of expenditure requirements, and then adjusted every five years only according to (i) measures of total factor productivity (TFP) growth over the five-year period across a sample of similar companies and (ii) changes over the five-year period to an index of input prices. Analysis of TFP growth across a sample of

companies is closely related to analysis of the costs of those companies. This model can be seen as a type of yardstick or benchmarking approach. For the high-level analysis in this supporting paper, we treat this model as falling within price control approaches based on the costs of other companies (D).

Ofgem's current regulatory frameworks

2.27. Ofgem's current regulatory frameworks reflect a mix of elements from the different models set out above. The detail of how "RPI-X" price controls are determined varies between the four energy network sectors (electricity distribution, gas distribution, electricity transmission and gas transmission) depending on each area's specific characteristics. The frameworks have also evolved over time, adapting at price control reviews. The high-level approaches are, however, similar.

2.28. In setting price controls for the main energy networks, Ofgem has historically used a different regulatory treatment for the funding of network companies' operating expenditure requirements than for the funding of companies' capital expenditure requirements.

2.29. The treatment of operating expenditure has tended to have been based on regulatory forecasts of efficient expenditure requirements (C) and, where possible, analysis of the operating costs of other companies (D).

2.30. The treatment of capital expenditure has generally had the effect of a risk-sharing approach, between network companies and consumers, around an upfront expenditure allowance. The upfront capital expenditure allowance has been based on forecasts of capital expenditure requirements (C), drawing where possible on analysis of other companies' costs (e.g. measures of unit costs) (D). The risk-sharing is such that consumers would bear some of the costs (or retain some of the savings) if the company's actual capital expenditure were more (or less) than envisaged at the price control review. The company's partial remuneration of its actual capital expenditure has also been potentially subject to a regulatory adjustment following a review of whether the expenditure was efficient (B).

2.31. The extent of risk-sharing for capital expenditure has varied over time and between sectors. For instance, the current price controls for electricity and gas transmission generally expose customers to 75 per cent of companies' actual capital expenditure (subject to an ex post efficiency assessment in this case); the corresponding figures under the current gas distribution and electricity distribution price controls are lower (these vary by company as they come from the use of Ofgem's information quality incentive (IQI) scheme).

2.32. The extent to which Ofgem's price controls represent a mix of different models outlined above can be illustrated by reference to Ofgem's final proposals for the recent electricity distribution price control review, DPCR5. In these proposals, Ofgem has sought to reduce differences between the treatment of operating and capital expenditure.

Mix of price controls models reflected in DPCR5: overview

Under DPCR5, the majority of "network expenditure" is subject to a risk-sharing approach in which a baseline expenditure allowance is set upfront and the revenue the network operator is ultimately entitled to is partially dependent on its actual expenditure (i.e. a mix between categories (1) and (2) in Figure 1 above).

The baseline allowance is determined by a regulatory assessment that includes forecasts of the network operator's expenditure requirements (model C in Figure 1) and draws, in part, on the historical costs of other network operators (D). The element based on actual expenditure (A) is such that for each additional £1 that a network operator spends (or saves) it is entitled to a fixed proportion (e.g. 50 pence per £1) of the additional cost (or saving).

The combined effect of these two elements is that if the network operator spends more than the upfront expenditure allowance, the additional cost will be shared between investors and consumers; if it spends less, the benefit of the saving will also be shared between investors and consumers.

Business support costs are not subject to risk-sharing: the network operator is entitled to a fixed allowance irrespective of the costs it incurs during the price control period. The determination of the fixed allowance draws on an analysis of the historical business support costs across distribution network operators (D).

Some elements of costs are subject to full pass-through (e.g. Ofgem licence fees) which is model (A).

Comparison of alternative ex ante price control frameworks

2.33. We set out in the table below a high-level comparison of the simplified models discussed above, and place Ofgem's current frameworks in this comparison³. Our main purpose is to show that Ofgem's current frameworks perform well overall against the simplified models, and also to identify areas where alternative models might perform better in specific areas.

2.34. We compare the models in terms of their implications for the risks that consumers do not receive value for money and the risks that network companies are not able to finance their activities under that model. We break the former down into risks to the (long-term) efficiency of network companies and risks that consumer

³ For the purposes of the comparison, we have assumed that in model (C) the forecast of expenditure requirements is set to cover a period spanning a number of years. If the forecast were set for a very short term, such as a single year, the properties of the model would tend towards that of (A) or (B). We leave out the model based on actual expenditure without scope for adjustments by the regulator (A). This is an extreme version of (B), which has insufficient protection for consumer to be plausible in the context of energy network regulation.

prices provide network companies with more money than they reasonably need (e.g. to give a fair return to existing investors and to finance new investment). We also consider risks that the regulated network company does not deliver what Ofgem and customers want it to deliver; as discussed above, a flipside of strong incentives to control costs may also be strong incentives to cut back on delivery, especially where delivery is not tightly regulated under a system of rewards or penalties.

2.35. A further criterion that could be used to compare models is the administrative burden. This includes the costs and time incurred on the regulatory process by the regulator, the regulated companies and other stakeholders. We do not make such comparisons in the table below. Each of the simplified models could be implemented in a way that has a relatively high or low administrative burden.

Table 2 – High-level comparison of alternative models

	B). Actual costs subject to regulator's adjustment	C). Forecast of expenditure requirements	D). Costs of other companies	E). Hypothetical new entrant costs	Ofgem's current regimes
1. Risks to delivery of outputs					
Risk that network company delivers fewest outputs/worst service it can get away with	Low	High	High	High	Medium
2. Risks to value for money for consumers					
i). Risks to company's efficiency from insufficient incentives to reduce and restrain costs	High	Medium	Low	Low	Medium
ii). Risk of company earning more revenue than it needs	Low	Medium	High	High	Low-medium
3). Risk network company cannot finance its activities					
Risk that network company's allowed revenue insufficient to meet its costs and provide fair return to investors	Low	Medium	High	Medium	Low-medium

2.36. In the table, the ranking of risks as low, medium or high is intended as a comparison between models, not a guide to risks in any absolute sense. The comparison is made only in the context of energy network regulation.

2.37. The rankings for Ofgem's current frameworks reflect our view that these are a compromise between (B), (C) and, to some extent, (D). In addition, we have taken account of other features of Ofgem's frameworks that mitigate the risks (e.g. the possibility of re-opening a price control to address financing risks).

2.38. The difference in rankings between models (B) and (C) reflects the idea that the latter provides stronger incentives for the network company to cut costs at the expense of a greater risk that allowed revenue is much higher or lower than the network company's requirements.

2.39. We have also taken the view, drawing on the regulatory literature, that a forecast of expenditure requirements (B) provides weaker incentives to reduce costs than models using the costs of other companies (D) or a hypothetical new entrant (E). A network company's actions today may affect forecasts of its future expenditure requirements (e.g. delaying investment today might increase the next forecast and lead to a higher price control at the next review) and this link can diminish its incentives to take action that restrains its costs over the longer term. There would tend to be less of a link between the network company's actions and the levels of future price controls if these are set using the costs of other companies or a hypothetical new entrant.

2.40. The rankings for the model based on costs of other companies (D) reflect the reality that any comparison between network companies will be imperfect. Some network companies will operate in a relatively favourable environment, allowing them to incur less cost than other companies. If price controls for each network company are based on the costs of other companies, price controls are likely to be overly generous to some companies and overly penalise others. Because of this, there are relatively high risks in this model that — regardless of how well companies are managed — some companies will collect more money from customers than they need whilst other companies will not have sufficient funding to finance their activities.

2.41. The rankings for the model based on the costs of a hypothetical new entrant reflect two additional things. First, any calculation of the costs of a hypothetical new entrant may overlook the detailed circumstances of the regulated company's situation. So there is a relatively moderate risk that the network company would not be able to finance its activities. Second, for energy network companies in Great Britain, the regulatory asset value, and hence the fair return required by investors, reflects the value of the assets sold at privatisation plus the value of net new investment since privatisation. This regulatory asset value may be substantially lower than the replacement value or "modern equivalent asset" value⁴. Setting revenue allowances for existing network companies on the basis of a hypothetical new entrant's costs could lead to revenues, and profits, far in excess of what is needed to provide a fair return to investors and to finance new investment. This could lead to higher consumer prices than under a model in which a forecast of the network company's expenditure requirements is made.

Lessons for a new regulatory framework

2.42. The high-level comparison above indicates that Ofgem's current regulatory frameworks perform well overall against alternative simplified ex ante price control models examined. In the proposed new regulatory framework set out in our main Emerging Thinking document we would retain an ex ante price control, focusing on retaining the benefits of what is in place but changing how the price control is determined to ensure our desired outcomes are delivered.

⁴ This is highlighted in our RPI-X@20 Finance Working Group Paper, page 8

2.43. The performance of Ofgem's current frameworks can be attributed to two factors. First, these frameworks already combine elements from different models to obtain a mix of benefits that would be unavailable from any one of the models in isolation (e.g. the risk-sharing between forecast and actual expenditure). Second, Ofgem's current frameworks include a range of additional mechanisms and processes that mitigate residual risks (e.g. the use of penalties and rewards around defined output measures to mitigate risks of non-delivery of desired outputs).

2.44. Even so, the comparisons above indicate that a change in the ex ante price control framework could help to reduce either of the following two risks: (i) risks that a network company delivers fewest outputs or the worst service it can get away with and (ii) risks of insufficient incentives for a network company to innovate and to reduce and restrain costs over the longer term. This first risk might be addressed through a move to rate of return regulation; the second by a greater use of cost benchmarking or by models based on hypothetical new entrant costs. We summarise below our findings on the case for such changes.

2.45. When considering how to design a new ex ante price control framework we consider these lessons and also assess other options for dealing with these and other risks. In particular, we focus on incentivising efficient delivery of outputs over the longer term, within the ex ante price control framework, as a means of delivering our outcomes.

Rate of return regulation

2.46. We have considered whether there is a case for moving towards a model that approximates remuneration of actual expenditure, subject to regulatory review of whether that expenditure was efficiently incurred. In other words, towards rate of return regulation. Such a move could reduce risks that regulated network companies do not deliver what Ofgem and customers want them to deliver.

2.47. We do not think there is a good case. This change could bring serious concerns about value for money to existing and future consumers.

2.48. A regulatory review of whether a company's expenditure was efficiently incurred (an ex post efficiency review) cannot compensate for a lack of incentives for the regulated company to reduce its costs. In some cases, it may be possible to tell, looking back, that some expenditure that the company incurred was wasted, particularly if comparisons between similar companies can be made. But this is not enough. Without the company being motivated to find ways of reducing and restraining its costs, innovative things that could have been done to reduce costs will never be discovered or revealed.

2.49. The use of ex post efficiency assessment by the regulator may discourage the network company from innovation and experimentation that could otherwise reduce the company's costs in the longer term. Expenditure on failed innovation and experimentation may be perceived as wasteful with the benefit of hindsight. The

prospect of ex post efficiency assessment seems likely to encourage the company to use tried and tested approaches — missing opportunities to improve practices over time and find better ways of doing things.

2.50. Furthermore, the more aggressive the regulator is in making downward adjustments on efficiency grounds when remunerating the expenditure of the network company, the riskier it will be for the company to make investments. The network may be better off spending the minimum it can get away with. This would tend to undermine the potential benefits of this model as a means to address risks that the company does not deliver what Ofgem and customers want.

2.51. Finally, there are other ways in which Ofgem's regimes could be developed to address these risks. For instance, a more extensive set of output measures could be developed against which a network company's performance can be assessed and held to account to. Our work in these areas suggests that it is not necessary to expose customers to the inefficiency that a move to rate of return regulation is likely to bring.

Use of cost benchmarking

2.52. As highlighted above, if price controls for each network company are based entirely on the historical costs of other network companies, price controls are likely to be overly generous to some companies and overly penalise others. Different companies will have different expenditure needs, over a given period, for a number of reasons:

- There are differences between network companies in terms of the scale and mix of outputs they need to provide.
- Some companies will operate in more favourable operating environments than others (e.g. reflecting the costs of network maintenance in different locations).
- Companies' capital investment requirements are not spread evenly over time and different companies will have different needs at different points in time.

2.53. These differences can be taken account of, to some degree, through econometric analysis in which data on costs, outputs and operating environment are modelled together and over longer time periods. However, we would not be confident that differences could be sufficiently taken into account to set price controls simply on the basis of such analysis alone. There could be large risks that some companies would be unable to finance their activities (which might then require intervention by Ofgem to increase the level of the price control) whilst others earn more revenue than they need.

2.54. Relying on historical comparative cost data to set future price controls seems particularly inappropriate in the current context of GB energy networks. The development of a sustainable energy sector means that the future requirements on energy network companies are likely to be quite different to what they were in the past.

2.55. Nonetheless, analysis of the historical (and forecast) costs of other network companies can play an important role as part of a wider assessment of a company's future expenditure needs. Rather than seeking to set the overall price control on the basis of analysis of the costs of other companies, benchmarking analysis can be carried out to provide a high level indication of the relative efficiency of different companies, and to inform the assessment for particular areas of network operations or for particular unit costs. We can also seek that companies make use of appropriate benchmarking analysis as part of the business plans they submit to us.

2.56. We will take this into account in considering the role of benchmarking analysis as part of the new framework. The discussion in this supporting paper highlights the contribution that setting part of price controls using the results of benchmarking analysis can make to longer term efficiency.

Hypothetical new entrants costs

2.57. As indicated in the comparisons above, models based on hypothetical new entrant costs might provide stronger incentives for companies to innovate and reduce costs over the longer term. But customers would not necessarily benefit from the cost reduction. Prices would be set by reference to hypothetical new entrant costs. Under this approach, there are concerns that the network company would collect more revenue from customers than is needed to allow a fair return to its investors and to finance new investment. This is because of the historic difference, from the way the opening value of regulatory asset value was set, between what investors paid and the modern equivalent value of energy network companies' assets. We do not consider this a viable alternative to the current price control framework.

3. Ex post regulation

3.1. Price control frameworks can include arrangements through which the maximum prices that the regulated company can charge are not strictly fixed upfront. These may depend on the company's actions as well as external events. For instance, adjustments might be made to maximum prices according to the company's performance in providing the services it is required to deliver or according to changes in elements of costs considered outside its control. But this does not detract from there being some form of maximum price or revenue set upfront, albeit subject to subsequent adjustments.

3.2. In contrast, ex post regulation covers a range of approaches in which no firm price control is specified upfront. Instead, reliance is placed on other mechanisms or rules to drive outcomes and constrain the prices and behaviour of the regulated company, with regulatory intervention if there is a breach.

3.3. We commissioned LECG to examine the case for "ex post" regulation of energy network companies (LECG 2009a), drawing on both the economic literature and case studies from network industries. We also commissioned Stephen Littlechild to provide a more detailed discussion of the regulatory regime for airports in Australia, which involves elements of ex post regulation (Littlechild 2009a, 2009b). We have drawn on these publications in assessing whether the objectives of the RPI-X@20 review would be served by switching from ex ante regulation towards an ex post approach.

Research commissioned on ex post regulation

LECG report on the case for ex post regulation

3.4. LECG found that ex post regulation does not have a single definition and identified a range of regulatory regimes lying on a spectrum between ex ante and ex post regulation. This is reproduced as Figure 2. The illustration indicates that ex ante price control regimes may include ex post elements (e.g. a price control in which the revenues a network company can earn are set to vary in response to factors deemed outside the company's control).

Figure 2 – LECG spectrum from ex ante to ex post regulation



Source LECG (2009a)

3.5. LECG (2009a) identifies a number of different approaches that could be taken as forms of ex post regulation. These include:

- A model in which the regulator specifies an approach or methodology for assessing whether the prices or profits of the regulated company would be acceptable. It is then for the regulated company to set its price, subject to the prospect of an intervention by the regulator against its stated approach.
- Threshold regulation, in which the regulator sets a price threshold which is not binding on the regulated company; but if the company sets prices above the threshold, its price may be subject to regulatory review and potentially to the establishment of an ex ante price control.
- A model in which the regulated company is obliged to disclose information to its customers and the regulator and to negotiate in good faith with them.
- Reliance on general competition law, without any more specific regulatory mechanisms applied to energy network companies.

3.6. LECG reviewed ex post models against a set of criteria:

- Preventing excessive pricing
- Promoting efficiency and timely investment and innovation
- Promoting operating efficiency
- Minimising the regulatory burden
- Providing a stable and predictable regulatory process

3.7. Overall, LECG concluded that for energy network companies "there do not appear to be significant benefits to consumers from moving from an ex ante form of control to an ex post form of control" (LECG, 2009a, page 11).

3.8. In reaching this conclusion, LECG emphasised the view that companies in all four energy network sectors (transmission and distribution in electricity and gas) have a high degree of market power — in other words that they do not face effective competition. LECG highlighted the weakness of ex post regulation in constraining excessive pricing, in the absence of competitive constraints, as a key finding for energy network companies (LECG, 2009a, page 6).

3.9. LECG (2009a, page 3) reports that where regulators have sought to use ex post regimes to regulate companies with significant market power, the ex post regime was typically introduced to a sector that did not have regulation, rather than being used to replace an ex ante regime. Furthermore, regulators have progressively refined ex post regimes with ex ante features; in some cases the regulator has simply moved to ex ante regulation.

Airport regulation in Australia

3.10. LECG (2009a) identifies the case of airport regulation in Australia as something of an exception amongst the case studies examined. In this case, there was a move from ex ante to ex post regulation in the absence of competition.

3.11. LECG (2009a) presents a short case study on airport regulation in Australia but does not explicitly evaluate this regime as part of the assessment of ex post regulation against ex ante regulation in the context of energy networks in Great Britain. The LECG comparison (2009a, page 5) focuses on threshold regulation and reliance on competition policy as models of ex post regulation.

3.12. Littlechild (2009a) provides a more detailed description of the regulatory regime for airports in Australia. This regime highlights that the Australian airport regime has elements of models described as ex post regulation and models involving negotiations between the regulated company and its customers (which we have categorised as stakeholder participation models in Table 1 above). Littlechild (2009a) identifies a number of features of the Australian airports regime, including:

- no (ex ante) price control;
- commercially negotiated outcomes;
- guidance on pricing principles that airports should follow;
- information disclosure obligations;
- monitoring of airports' prices, financial performance and quality of service; and
- threat of returning to a system of ex ante price controls.

3.13. Littlechild (2009b) reviews the Australian airports regime against the assessment criteria used by LECG and suggests that it would score more highly than ex ante price control regulation. Littlechild argues that the Australian airports model involves a lower regulatory burden than ex ante regulation and performs better in delivering efficient and timely investment and innovation. But it may perform worse against LECG's criterion of preventing excessive pricing.

3.14. Aside from the LECG criteria, Littlechild suggests that, compared to the centralised decision-making of Ofgem's ex ante price controls, the Australian airports model could improve the flow of information (e.g. about what customers want) and improve the relationships between the regulated companies and their users. Littlechild (2009a) concludes that the developing approach to Australian airport regulation deserves serious consideration in the context of UK utility regulation.

3.15. We recognise that, amongst the examples of ex post regulation, the Australian airports model seems relatively strong. We also recognise the links between this model and our proposals for enhanced consumer engagement as part of the regulatory process. However, we are not confident that, in the current context of energy networks in Great Britain, this model provides a suitable replacement for a framework based on ex ante price controls.

3.16. Our understanding is that the ability of airlines to negotiate effectively with airports is an important feature of this model. Different airlines will have different interests and priorities. There are questions about the extent to which airlines represent the interests of passengers and there are concerns about who represents the interests of potential new entrants (e.g. airlines not currently operating from that airport). These issues become even more significant when we consider applying the model to energy network companies:

- There is a wide range of different users of the networks, with very different needs and interests.
- Existing network users may not represent the interests of future network users and may even, depending on the extent to which they care about the future for their own commercial operations, have an interest in limiting current prices or service delivery at the expense of higher prices or quality of service in the future.
- Perhaps most importantly given our principal objective to protect the interests of existing and future consumers, there are questions about the extent to which the interests of end consumers are represented by network users (e.g. generators, shippers and suppliers)⁵. These are discussed in our working paper on consumer engagement in the regulatory process.

3.17. In any new regulatory framework, we think Ofgem should continue to make regulatory decisions, taking account of information from an enhanced engagement process. We think it is appropriate to stop short of the negotiated settlement model adopted in Australian airports. In the absence of the pressures imposed by the commercial airlines on the airports, we anticipate that the merits of this ex post regime would not be as significant.

3.18. If the Australian airports regime were applied to energy network companies in Great Britain, it is also not clear how network companies would be encouraged to innovate and find ways of restraining their costs, especially over the longer term. It is possible that network users could find ways of encouraging this behaviour from network companies (possibly through mechanisms similar to those found under price control regimes) but it is hard to be confident that adequate measures would emerge. For example, it is not clear whether existing network users would give sufficient priority to encouraging innovation by network companies that can contribute to a sustainable energy sector. In this respect, it is also relevant that network users such as suppliers and shippers may be less sensitive to the price of network services than airlines are to the charges of a specific airport.

3.19. Nonetheless, as set out in our supporting paper on enhanced engagement we are proposing greater participation of consumers and their representatives, network users, government and other stakeholders as part of the regulatory process. This would take the form of ongoing engagement between network companies and stakeholders, enhanced engagement during price control reviews, and potentially a right for third parties to challenge the merits of our final price control decisions. These measures would support efficient delivery of our desired outcomes within an ex ante price control framework.

⁵ A number of parties engaging in our review have suggested that these concerns become even more significant when we take account of the fact that a number of network users (generators and suppliers) are part of wider groups that include network businesses.

Lessons for a new regulatory framework

3.20. In light of the LECG report and the papers prepared by Stephen Littlechild, we have not identified a case for moving towards ex post regulation in the current context of the Great Britain energy sector. We have concerns that consumers would not be adequately protected from high prices. We are not confident that we can rely on negotiations between network companies and network users to protect the interests of existing and future consumers.

3.21. It may be appropriate to review the case for elements of ex post regulation if competition were to develop further between energy network companies. Or if conditions arose that were more conducive to network users, or other parties, negotiating effectively with network companies and placing pressure on them to help achieve our desired outcomes.

Appendix 1 - Associated documents

Consultation papers:

- Emerging Thinking
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/emerging%20thinking.pdf>
- Embedding financeability in a new regulatory framework
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20financeability.pdf>
- ***We will also shortly be publishing a separate consultation on 'Third party right to challenge our final price control decisions'.***

Supporting papers

- Longer-term price controls, Reckon LLP (2010)
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/reckon%20lt%20controls.pdf>
- Enhanced engagement
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20engagement.pdf>
- Incentivising efficient longer-term delivery of desired outcomes
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20long%20term.pdf>
- A specific innovation stimulus
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20innovation.pdf>
- Greater role for competition in delivery
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20competition.pdf>
- Simplicity of the framework: issues to consider
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20simplicity.pdf>
- Alternative ex ante and ex post regulatory frameworks
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20alternatives.pdf>
- Update on domestic and EU policy context
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/et%20policy.pdf>
- Glossary
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/glossary.pdf>

Previously published associated documents

Consultation papers

- Regulating energy networks for the future: RPI-X@20 Principles, Process and Issues
<http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=1&refer=Networks/rpix20/publications/CD>

RPI-X@20 working papers

- Regulating energy networks for the future: RPI-X@20, Delivering outcomes: Consumer engagement in the regulatory process
http://www.ofgem.gov.uk/Networks/rpix20/forum/rocag/Documents1/Role%20of%20consumers%20working%20paper_FINAL.pdf
- Regulating energy networks for the future: RPI-X@20, Delivering desired outcomes: Who decides what energy networks of the future look like?
<http://www.ofgem.gov.uk/Networks/rpix20/forum/rocag/Documents1/rpix20%20who%20decides%20what%20energy%20networks%20of%20the%20future%20look%20like%20FINAL.pdf>
- Regulating energy networks for the future: RPI-X@20, Innovation in energy networks: Is more needed and how can this be stimulated?
http://www.ofgem.gov.uk/Networks/rpix20/forum/innovation/Documents1/RPI-X20%20Innovation%20Working%20Paper_FINAL%20DRAFT.pdf
- Regulating energy networks for the future: RPI-X@20, Delivering a sustainable energy sector and value for money - A modified ex ante incentive framework
<http://www.ofgem.gov.uk/Networks/rpix20/forum/for/Documents1/Modified%20ex%20ante%20regulatory%20framework.pdf>
- Regulating energy networks for the future: RPI-X@20, Delivering outcomes: Ensuring the future regulatory framework is adaptable
<http://www.ofgem.gov.uk/Networks/rpix20/forum/do/Documents1/FINAL%20Adaptability%20paper.pdf>
- Regulating energy networks for the future: RPI-X@20, Delivering a sustainable energy sector and value for money - What do we mean by 'efficiency'?
http://www.ofgem.gov.uk/Networks/rpix20/forum/do/Documents1/what%20do%20we%20mean%20by%20efficiency_publish.pdf
- Regulating energy networks for the future: RPI-X@20, Delivering a sustainable energy sector and value for money: enhancing competitive pressures on regulated networks
<http://www.ofgem.gov.uk/Networks/rpix20/forum/cp/Documents1/RPI-X@20%20Working%20Paper%20-%20Enhancing%20competitive%20pressures%20-%20Final.pdf>
- Regulating energy networks for the future: RPI-X@20 - Working paper 1: What should a future regulatory framework for energy networks deliver?
<http://www.ofgem.gov.uk/Networks/rpix20/forum/do/Documents1/RPI-X20%20Working%20Paper%20->

[%20What%20should%20a%20future%20energy%20regulatory%20frame
work%20deliver%20-%20Final.pdf](#)

Consultant reports for RPI-X@20

- Peter Boait (2009) Energy Services Companies – their benefits and implications for regulation and the consumer
<http://www.ofgem.gov.uk/Networks/rpix20/forum/cp/Documents1/Ofgem%20RPI-X20%20ESCo%20paper%20final.pdf>
- CEPA (2009) A review of the rail and water regulatory models – lessons for energy
<http://www.ofgem.gov.uk/Networks/rpix20/forum/lfor/Documents1/Review%20of%20regulation%20in%20rail%20and%20water.pdf>
- CEPA (2009) New Zealand Gas Industry Regulation – lessons for energy
<http://www.ofgem.gov.uk/Networks/rpix20/forum/lfor/Documents1/NZ%20gas%20regulation.pdf>
- CEPA (2009) The use of RPI-X by other industry network regulators
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/CEPA%20Final%20Ofgem%20report%20270209.pdf>
- Frontier Economics (2009) The role of future energy networks
<http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=2&refer=Networks/rpix20/forum/for>
- KEMA (2009) RPI-X@20, Technological change in electricity and gas networks,
<http://www.ofgem.gov.uk/Networks/rpix20/forum/innovation/Documents1/KEMA%20Technology%20changes%20Final%20Report.pdf>
- LECG (2009a) The case for ex post regulation of energy networks
<http://www.ofgem.gov.uk/Networks/rpix20/forum/for/Documents1/Final%20report%20ex%20post%20regulation.pdf>
- LECG (2009b) Should energy consumers and energy network users have the right to appeal Ofgem price control decisions?
<http://www.ofgem.gov.uk/Networks/rpix20/forum/rocag/Documents1/Right%20of%20Appeal%20Final.pdf>
- Stephen Littlechild & Nigel Cornwall (2009) User participation in the GB energy regulatory framework
<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/User%20participation%20Ofgem%2028%20March%202009%20-%20final.pdf>
- Stephen Littlechild (2009a) Australian airport regulation
<http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=5&refer=Networks/RPIX20/FORUM/FOR>
- Stephen Littlechild (2009b) Consumer involvement, ex post regulation and customer appeal mechanisms
[http://www.ofgem.gov.uk/Networks/rpix20/forum/rocag/Documents1/Consumer%20involvement%20ex%20post%20%20consumer%20appeal%20029%20Nov%2009%20\(2\)%20\(2\).pdf](http://www.ofgem.gov.uk/Networks/rpix20/forum/rocag/Documents1/Consumer%20involvement%20ex%20post%20%20consumer%20appeal%20029%20Nov%2009%20(2)%20(2).pdf)
- Michael Pollitt (2009) Does Electricity (and Heat) Network Regulation have anything to learn from Fixed Line Telecoms Regulation?

- <http://www.ofgem.gov.uk/Networks/rpix20/forum/cp/Documents1/Telecoms%20Pollitt.pdf>
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<http://www.ofgem.gov.uk/Networks/rpix20/publications/CD/Documents1/CEPA%20Final%20Ofgem%20report%20270209.pdf>

RPI-X@20 industry working groups

- RPI-X@20 Consumer Working Group Paper
http://www.ofgem.gov.uk/Networks/rpix20/forum/rocag/Documents1/Consumer%20Working%20Group%20Paper_FINAL.pdf
- RPI-X@20 Working Group Report on Innovation in Energy Networks
<http://www.ofgem.gov.uk/Networks/rpix20/forum/innovation/Documents1/FINAL%20working%20group%20paper%20on%20innovation.pdf>
- RPI-X@20 Finance Working Group Paper
<http://www.ofgem.gov.uk/Networks/rpix20/forum/financing/Documents1/Finance%20WG%20-%20Final%20Final.pdf>
- RPI-X@20 Investment Working Group Paper
<http://www.ofgem.gov.uk/Networks/rpix20/forum/investment/Documents1/Working%20group%20on%20investment%20final%20paper%20public%20version.pdf>

Other sources for RPI-X@20 supporting material

- RPI-X@20 web forum – contains Ofgem, consultant, academic and stakeholder publications and responses to RPI-X@20 related issues.
<http://www.ofgem.gov.uk/Networks/rpix20/forum/Pages/forum.aspx>
- RPI-X@20 workshops
<http://www.ofgem.gov.uk/Networks/rpix20/publications/Presentations/Pages/Presentations.aspx>

Speeches by Alistair Buchanan on RPI-X@20

- Is RPI-X still fit for purpose after 20 years? October 2008
<http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=8&refer=Media/keyspeeches>
- Ofgem's 'RPI at 20' project, March 2008
<http://www.ofgem.gov.uk/Media/keyspeeches/Documents1/SBGI%20-%2006%20MARCH.pdf>