

REGULATED INFRASTRUCTURE INVESTMENT

INNOVATION AND OPPORTUNITY



A REPORT BY A FORUM WORKING GROUP



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The Infrastructure Forum's working group for this report comprised of members from across the infrastructure sector – within both the public and private sectors – and has been chaired by Michael Gerrard – Chair of INPP Limited, Senior Adviser to Agilia Infrastructure Partners and former Managing Director of the Thames Tideway Tunnel

CONTENTS

1. EXECUTIVE SUMMARY	1
2. INTRODUCTION	6
3. THE RII MODEL AND VALUE FOR MONEY	8
4. LEARNING FROM THE PAST	13
5. THE OPPORTUNITY	18
6. CRITICAL SUCCESS FACTORS.....	23
7. CANDIDATE SECTORS	25
8. CONCLUSIONS	28

ANNEXES

1. SOME CANDIDATE SECTORS

A. RAIL	29
B. TELECOMS	31
C. WATER – DIRECT PROCUREMENT FOR CUSTOMERS	32
D. CARBON CAPTURE USAGE AND STORAGE	33
E. ELECTRIC VEHICLE CHARGE POINTS	35
F. SOCIAL HOUSING	36
G. ENERGY STORAGE	37
H. TIDAL POWER	39

2. LESSONS FROM THE PAST

A. DARTFORD BRIDGE	40
B. HS1	41
C. LONDON UNDERGROUND PPP – PRICE RESET	42

1. EXECUTIVE SUMMARY

1. Each generation faces the challenge of maintaining a flow of investment into infrastructure that supports aspirational levels of national prosperity, quality of life and inter-generational legacy. This challenge requires the combined resources of the public and private sectors to be aligned and mobilised according to their complementary strengths.
2. The UK is fortunate to have two institutions whose mission is to help deliver on this challenge: first, the National Infrastructure Commission, which analyses and publishes investment plans, most crucially by viewing the national need through a long-term lens; and second, the Infrastructure and Projects Authority, which acts as an advocate and centre of expertise for the delivery of infrastructure investment.
3. With a desire to find better ways of delivering infrastructure, the UK has already led two world-wide infrastructure investment revolutions within the last fifty years - privatisation and public private partnerships (PPP).
4. In a modern economy, all organisations that are responsible for delivering public services must achieve continuous improvement in the quality of their offering against the backdrop of an ever-tightening affordability constraint. The infrastructure sector is no exception to this. Furthermore, the sector must achieve this whilst facing significant external challenges, such as climate change.
5. The foundation stone of the sector's response to these challenges and the reason to be confident that our national infrastructure can keep up with society's changing needs is innovation. The revolutions of privatisation and PPP are nothing if not demonstrations of the power of innovation.
6. This report aims to highlight the role that an innovative expansion of the Regulated Asset Base (RAB) model could play in delivering the UK's next generation of infrastructure investments. The new model is referred to in the report as Regulated Infrastructure Investment (RII).
7. The RII model provides a structure through which risks can be shared between the supply-side (including investors, contractors and the developer), consumers and the taxpayer to incentivise efficient delivery of investment at the best overall value for money. The nature of the structure, where parties have genuinely aligned interests, necessitates the fostering of an enterprise-based approach to the investment, rather than relying heavily on contractual obligations and an associated transactional approach to service delivery.
8. If suitably implemented, the RII model has the ability to help address the issue of social legitimacy related to the private financing of infrastructure assets. The structure can enable a low cost of capital to be achieved, which means that the premium over the Government's own cost of finance is more likely to be seen as acceptable and good value for money with respect to the services delivered, risks managed, incentives applied and resources mobilised.

9. A number of significant benefits of private sector involvement in infrastructure investment are highlighted in this report, including:
- Access to capability and capacity that are not available on sufficient scale within the UK public sector;
 - Increased contestability, including in the formation of delivery organisations;
 - Investments in which capital as well as future returns (e.g. profits) are at risk to customer service and asset performance, create powerful incentives for outputs to be successfully delivered and risks to be well managed;
 - Clear accountability for the reliable and value-for-money delivery of infrastructure can be achieved through the use of proven regulatory mechanisms; and
 - In circumstances where the supply chain lacks the necessary balance sheet strength, public sector procuring authorities will be directly exposed to the associated infrastructure delivery risks, unless they mobilise an inter-posing tier of private sector risk capital between the public sector and the supply chain.
10. A key benefit of an RII model is the role of an independent regulator, which has statutory duties to protect the interests of consumers, whilst balancing these with the interests of private sector investors. This approach enables key public sector resources to be concentrated within a regulator, as a centre of expertise, rather than spread across numerous procuring authorities, as happened in the case of contract management skills under Private Finance Initiative (PFI)¹ models.
11. The principal reason for renewed interest in building on the RAB model is the adoption, in 2015, of an RII model (as described in this report) for the delivery of the Thames Tideway Tunnel (TTT) project. TTT is not an isolated asset with a single interface to its related network, but rather an asset embedded within an operational network to which it will have live interfaces, the point being that TTT has demonstrated the flexibility and wide-scale potential applicability of the RII model to new asset formation.
12. The RII model thus provides a proven foundation for developing a wider infrastructure delivery solution that builds on past successes and, at the same time, overcomes identified short-comings in traditional private sector infrastructure delivery models – both regulated and PFI based – which are discussed in this report.
13. Until recently, it had been widely assumed that a TTT style RII model was only suitable for large and complex “one off” situations. However, this report surveys a range of infrastructure sectors and concludes that its potential role is far wider than this, as indeed current studies led by BEIS² in the nuclear power generation and carbon capture, usage and storage (CCUS) sectors already demonstrate. The sectors discussed in this report include energy, transport, telecoms, environment and accommodation. The examples given cover: programmes of investment; the

¹ A sub-set of PPP

² The Department of Business, Energy and Industrial Strategy

development of networks; straight-forward and highly repeatable lower-risk assets; as well as higher-risk “one off” investments.

14. The TTT model demonstrated the availability of deep markets of international equity and debt capital, that had developed on the back of utility privatisation and PPP programmes in the UK and abroad, which are able to support major stand-alone regulated construction projects. The potential scale of capital resources made available by this mechanism is immense – certainly of the order of multiple hundreds of billions of pounds – with a consequent potential for strong competition. In this sense, a third revolution in infrastructure investment is already under way.
15. The core objectives of the RII model are to:
 - (i) deliver assets in a manner that achieves continuous and demonstrable value for money over the long-term;
 - (ii) provide the flexibility to deal with changing needs and circumstances;
 - (iii) access customer funding streams;
 - (iv) mobilise low-cost capital; and,
 - (v) ideally, achieve additionality through private sector classification and accounting treatment.
16. The TTT model also pioneered a Government Support Package (GSP) solution³ to address a narrow class of low-probability high-impact construction period risks beyond the capacity of the private sector to manage, mitigate or price. The TTT GSP had several limbs, each specific to individually identified exceptional risks, and this approach to risk coverage proved to be both flexible and effective in terms of its relationship with the resulting TTT Weighted Average Cost of Capital (WACC). However, categories of exceptional risks do not necessarily apply to all investments and the GSP should be seen as a separate and distinct construct from the RII model, albeit in some instances mutually interdependent.
17. In circumstances where a GSP is required it does not erode the role of private sector investment capital, within the RII model, to manage and mitigate the limitations of supply chain balance sheets, through appropriate risk sharing mechanisms.
18. The RII model can accommodate mixed funding streams that derive both from consumers of the infrastructure services and capital (and/or revenue) contributions from the public sector, where issues of consumer affordability arise. Similarly, the model can deploy co-financings of private and public sector capital, where an optimum financing structure does not require 100% of private finance to be at risk for value for money to be achieved. (For example, the TTT GSP itself includes a contingent co-financing structure).
19. The scale of potential investment in infrastructure that could be supported by incremental increases in customer charges (for example in the energy or water sectors) is of the order of

³ As specifically applied to RII models

£1 billion for every one million customers paying an additional £1 per week⁴. Funding so raised from customers could be allocated across a range of qualifying RII investments, for example to address the causes and effects of climate change.

20. To maximise the value-for-money potential of a programme of infrastructure investment based upon the RII model, it is important to set the parameters of assessment for candidate sectors to be very broad, at least initially; and a range of case studies is included in the report to illustrate this potential. There are, of course, numerous constraints that may limit the eventual number of sectors within which viable RII investments can be realised. Nonetheless, as a starting point, the right question to ask is “why not”?
21. A key lesson from past infrastructure investment programmes is that they should be addressed as a programme from the outset, if their full value-for-money potential is to be realised. Accordingly, programmes need appropriate articulation, sponsorship and management in respect of issues like investment pipeline; market engagement; stakeholder engagement; capacity building; best practice and standardisation etc., not least to ensure that common issues are resolved only once. Another lesson from the past is to choose a programme name that the general public can understand and that, if possible, emphasises the central role of the customers for the infrastructure. Several suggestions for names are made in the report.
22. The need for substantial investment in the UK’s infrastructure is acknowledged by all political parties, stakeholders and commentators. At the same time, long-term interest rates continue to be at historically low levels, so offering the opportunity to mobilise affordable private finance that shares the cost of infrastructure investment equitably across the generations. There is also substantial untapped potential appetite for infrastructure investment within international financial markets. Past experience of large-scale investment in infrastructure has shown that the best value-for-money outcomes are achieved when the investment requirements are addressed as integral programmes. Programmes are based on delivery models and the RII model, discussed in this report, is innovative, proven and flexible enough so as to be usable across a wide range of infrastructure sectors. Moreover, the model avoids past shortcomings of both privatisations and PFIs. This report concludes that the RII approach is capable of delivering a third infrastructure investment revolution.

⁴ Assuming constant prices, a 50-year amortisation period, no provision for operational and maintenance expenditure and an illustrative WACC of 2.5% pa (real vanilla) for an RII structure with a similar investment risk profile to TTT

2. INTRODUCTION

23. Investment in infrastructure plays a unique role within society, which sets it apart from other areas of fixed-asset formation, including the fact that infrastructure is as much for the benefit of future generations as our own. Responding to this special status and the desire to find better ways of delivering infrastructure, the UK has already led two world wide infrastructure investment revolutions within the last fifty years – privatisation and public private partnerships⁵ (PPP).
24. The motivation for these revolutions was not simply a drive for improved investment economy and efficiency, important though these objectives were, but also included more overtly strategic objectives.
25. In the case of privatisation, the strategic driver was to shrink the role of the state, which in 1970s was the dominant player in the energy, telecoms, transport, water and wastewater management sectors in the UK. In the case of PFI, the strategic objectives were to introduce contestability within the delivery of public services (e.g. to create a “third way”), and to embed long-termism (i.e. recognition of whole-life-of-asset costings) within public sector asset design and maintenance.
26. Both revolutions also sought to create additionality of investment, by achieving private-sector classification for the businesses that were created to develop and manage these assets, and their associated finances.
27. Of the two revolutions, privatisation has been by far the larger for the UK. Today, the value of assets under the management of private sector businesses within previously state-owned infrastructure sectors, totals more than £500billion across the power generation, transmission and distribution, airports, telecoms, gas transmission and distribution, and water supply and wastewater treatment sectors. By contrast, the peak value of assets delivered under PFI contracts was around £90billion.
28. Each generation faces the challenge of maintaining a flow of investment into infrastructure that supports aspirational levels of national prosperity, quality of life and inter-generational legacy. This challenge requires the combined resources of the public and private sectors to be aligned and mobilised according to their complementary strengths.
29. The UK is fortunate to have two institutions whose mission is to help deliver on this challenge: first, the National Infrastructure Commission which analyses and publishes investment plans, most crucially by viewing the national need through a long-term lens; and second, the Infrastructure and Projects Authority (IPA) which acts as an advocate and centre of expertise for the delivery of infrastructure investment.

⁵ Including the Private Finance Initiative (PFI)

30. The UK also has the benefit of being a major international financial centre and leading innovator in the commercial markets for infrastructure finance.
31. In a modern economy, all organisations that are responsible for delivering public services must achieve continuous improvement in the quality of their offering against the backdrop of an ever-tightening affordability constraint. The infrastructure sector is no exception to this. Furthermore, the sector must achieve this whilst facing significant external challenges, such as climate change and the need to ensure carbon neutrality by 2050.
32. The foundation stone of the sector's response to these challenges and the reason to be confident that our national infrastructure can keep up with society's changing needs is innovation. The revolutions of privatisation and PPP are nothing if not demonstrations of the power of innovation. Within this context, it is the purpose of this report to consider the role that a particular form of Regulated Asset Base (RAB) model could play in delivering the next generation of infrastructure investments. This model is referred to in the report as Regulated Infrastructure Investment (RII).

3. THE RII MODEL AND VALUE FOR MONEY

33. The RAB model⁶ has been widely used within privatised infrastructure businesses since their inception. It is the means by which investors in these businesses are incentivised to create efficient assets that support delivery of public service obligations, in areas where the consumer pays for the service provided by the infrastructure asset, as specified in the licences awarded to these businesses by their respective regulators. These include businesses in water supply and wastewater treatment (Ofwat), airports (CAA), power and gas transmission and distribution (Ofgem). Accordingly, the RAB model is well proven and enjoys a high level of confidence across the financial and operational communities.
34. The basic characteristics of the generic RAB model are summarised in the box below:

THE GENERIC RAB MODEL

The RAB model was originally created to underpin the formation of regulated privatised utility companies, particularly where the company was operating as a monopoly, or within an environment of constrained competition. The RAB records the economic value of the company's assets upon which it is permitted to levy charges from its customers, where these values can depart from the carrying value of the same assets within the company's financial books. The charges levied on customers typically comprise a series of "building blocks" that include items such as: (RAB Value x Allowed Return⁷) + Operational & Maintenance Costs + Depreciation + Taxation.

The costs that are eligible for inclusion within a company's RAB are determined in accordance with its licence issued by and the periodic determinations made by its regulator – e.g. typically requiring the company to demonstrate that its costs have been incurred economically and efficiently. The license and periodic determinations include measures that incentivise the economic and efficient management of service-delivery risks, including the formation of new fixed assets. These measures typically include provisions for cost underspends and overruns to be shared between customers and investors in the company.

35. The principal reason for renewed interest in RAB models in general and the RII model in particular is its adoption, in 2015, for the delivery of the Thames Tideway Tunnel (TTT) project, a £4.2billion sewer currently in construction under London. Bazalgette Tunnel Limited (the company awarded a licence by Ofwat to deliver TTT) is the world's first single-asset, green-field construction regulated utility company. Moreover, TTT is not an isolated asset with a single interface to its related network (such as a water treatment plant, or power station might be), but rather an asset embedded within Thames Water's⁸ operational network with which it will have 24 live interfaces. TTT has thus demonstrated the flexibility and wide-scale potential applicability of the RAB model to new asset formation.

⁶ Sometimes referred to as the Regulated Capital Value (RCV) or Regulated Asset Value (RAV) model

⁷ The allowed return set by reference to the Weighted Average Cost of Capital (WACC)

⁸ Thames Water Utilities Limited

36. This complements the already proven use of the RAB model in the management and development of facilities, portfolios and networks within privatised (and often more diversified) regulated businesses⁹.
37. The RII model can accommodate mixed funding streams that derive both from consumers of the infrastructure services and capital (and/or revenue) contributions from the public sector, where issues of consumer affordability make this necessary. Similarly, the model can deploy co-financings of private and public sector capital, where an optimum financing structure does not require 100% of private finance to be at risk for value for money to be achieved¹⁰ (for example, the TTT GSP contains a contingent co-financing structure).
38. The defining characteristics of the RII model that underpin any comparison with alternative private-sector delivery options (such as PFI) are two-fold: first, funding for the investment is derived (principally) from customer groups who are actual (or potential) users of the services that the new asset supports; and second, the business appointed to deliver the service is formed, ab initio, as a fully functioning “business as usual” investment-grade utility company, so that funding can start to flow from the start of construction and the business is able to access deep pools of potential investors.
39. In this sense, the RII model can be seen as almost the antithesis of PFI (or similar constructs), whose defining characteristics are that funding is derived from a single¹¹ public authority and, typically, doesn’t flow to the infrastructure business until construction is complete and services are being delivered. However, despite these differences, the core value for money (VfM) drivers of all RAB/RII and PFI models are not that dissimilar¹².
40. A further point of difference to note is the use of target-cost construction contracts by TTT, in contrast to the almost ubiquitous use of fixed-price construction contracts within PFI structures, which difference emphasises the point made below that RAB models are more reliant on the incentivised management of risk rather than risk transfer per se.
41. Recently the Government has consulted on the desirability of an RII approach to financing new nuclear energy capacity and The Infrastructure Forum has contributed to this discussion¹³.
42. In infrastructure, as in so many other things, there is nothing totally new under the sun; and for one of the earliest privately-financed infrastructure projects in the UK (pre-dating the PFI programme by several years) a structure was developed not unlike that of the RII model in terms

⁹ For example, the construction of Terminal 5 at Heathrow airport.

¹⁰ Scottish Water is an example of a RAB that is publicly owned.

¹¹ Or, on occasion, multiple public authorities

¹² This report does not include a comprehensive appraisal of privatisation and PFI, drawing out all their respective strengths and weakness. Its purpose is to show how key lessons learned from their past implementation can be addressed by the RII model.

¹³The Infrastructure Forum, Response to the BEIS Consultation: RAB Model for New Nuclear, 2019

of generating revenues during the construction period and being predicated on a fixed cost of capital — the project was the Dartford Bridge (see Annex 2(A)).

43. A further example of an early privately-financed major infrastructure project, which shares resemblance with the RII model, is the High Speed 1 (HS1) railway that links London St Pancras with the Channel Tunnel in Folkstone (see Annex 2(B)).
44. The essential characteristics of the RII model used by TTT are summarised in the box below:

THE TTT RII MODEL

The characteristics of the TTT model that go beyond the generic RAB model (described in the box above), reflect an investment opportunity presented to the market that was, as closely as possible, a business-as-usual regulated utility, insofar as:

- there is a pre-agreed overall project cost and risk envelope, which is approved by the regulator
- consumers are funding asset formation prior to completion
- the debt issued by the project vehicle is capable of achieving an investment grade credit rating during construction
- equity capital is able to earn a running yield during construction
- there is no windfall refinancing gain opportunity for investors at the conclusion of construction
- there is confidence in a long-term regulatory regime that covers the entire project life
- RAB and revenue estimation methodology are both captured in the project's licence

The formation of an opportunity that was investable for third party debt and equity (i.e. unconnected to the projects sponsors), immediately prior to the start of main construction works, required a Government Support Package (GSP) for investors and lenders that was capable of addressing low probability but high impact risks.

The project's risk management regime was based upon incentives that share construction risks between investors and contractors, in the first instance; between investors and customers, in the second instance; and with the Government as the final resort. This tiered and calibrated approach to risk management and sharing is a key demonstration of the flexibility of the RII model.

Revenues for the project are collected by Thames Water Utilities Limited (the incumbent water and waste water treatment undertaking for London) and passed to the TTT licensee – Bazalgette Tunnel Limited.

45. The key value-for-money drivers of the procurement and delivery of infrastructure investments and their related services are: (i) competition¹⁴; (ii) single-point responsibility (for the management of supply-chains, internal resources and all related interfaces); (iii) incentivised risk-management (including the use of fixed¹⁵ prices and performance-related payments); (iv)

¹⁴ Including benchmarking where competition is not available

¹⁵ Or target price

innovation; (v) economies of scale and scope; (vi) long-termism (including whole-life-of-asset costings); and (vii) standardisation¹⁶.

46. All play a role within both the traditional RAB and PFI based delivery models. The most significant differences are in relation to: (a) the transactional focus of PFI which is quite different from the more evolutionary relationships between customers and service providers found in RAB-based models; and (b) competition, where for RAB-based monopolies (or near monopolies) the regulators use benchmarking and league table comparisons, to the extent that contract tendering (or other forms of competition) are not directly available.
47. In assessing the suitability of the RII model for wider use in infrastructure delivery, it is important to test whether the model can avoid the recognised limitations of PFI and the traditional RAB model, as deployed within the privatised utilities, to make sure that relevant lessons from past experiences of infrastructure investment are learned. Hitherto, the TTT structure has been seen mostly as a bespoke model best suited to special situations – that is, something of an exotic member of the infrastructure toolkit – rather than the basis of wider programme-level investment strategies. The reason for this characterisation is probably its association with a GSP that had to be developed for TTT to address a narrow class of low-probability high-impact construction period risks beyond the capacity of the private sector to manage, mitigate or price.
48. The question of a GSP is something we will return to later in this report. Suffice to say that deployment of an RII model does not necessarily imply that a GSP will be required.
49. The cost of finance is an input cost, like other input costs for infrastructure asset formation, such as materials, design or labour. Economy and efficiency are achieved by mobilising those inputs that deliver the overall best value-for-money infrastructure service outcome, not by necessarily mobilising the cheapest set of inputs, including finance. Accessing this optimum combination of inputs is a key responsibility of the investment-delivery organisation, whether public or private sector.
50. Key drivers underpinning expectations that the private sector will be able to deliver economy and efficiency include:
 - a) Access to capability and capacity that are not available on sufficient scale within the UK public sector
 - b) Increased contestability, including in the formation of delivery organisations
 - c) Investments in which capital as well as future returns (i.e. profits) are at risk to customer service and asset performance, create powerful incentives for outputs to be successfully delivered and risks to be well managed
 - d) Clear accountability for the reliable and value-for-money delivery of infrastructure can be achieved through the use of proven regulatory mechanisms
 - e) In circumstances where the supply chain lacks the necessary balance sheet strength, public sector procuring authorities will be directly exposed to the associated

¹⁶ Within a programme context, once the combination of other value-for-money drivers (especially innovation) have been optimised

infrastructure delivery risks, unless they mobilise an inter-posing tier of private-sector risk capital between the public sector and the supply chain

- f) The private sector has highly developed project-development, project-management and commercial skills gained over many decades of UK and overseas experience
- g) Innovation is often more easily fostered within an environment that accepts the risk of failure as part of business-as-usual
- h) The private sector undertakes extensive front-end due diligence, prior to committing to invest. This significantly increases the likelihood that a project will be delivered to budget and schedule, once an investment is underway
- i) Overall, once a contract has been signed, projects that are delivered with the support of private finance are more likely to be delivered on time and to budget
- j) Private-sector governance is unlikely to accept material changes to an investment's objectives or scope once it is underway, because of the risk that the control of costs and timetable will be lost. It can be much harder for public sector governance to resist requests for changes in publicly-procured projects, if derived from political considerations.

51. All of these drivers apply to the value for money available through the RII model.

52. The delivery of high-quality, safe, reliable and affordable services to customers over the life of an infrastructure asset requires a dynamic and evolutionary framework that can respond to changing needs, standards, environmental circumstances and technology. The design and calibration of incentive regimes that enable those who manage these delivery risks (or who innovate to achieve improved efficiencies) to share in the benefits of their successes, are the foundation stones of long-term value-for-money infrastructure. The characteristics of an evolutionary framework and of calibrated incentives are intrinsic to the RII model.

4. LEARNING FROM THE PAST

53. Four issues ultimately lie behind the often-cited criticisms of PFI as being overly complex, inflexible and poor VfM; and it is worth spelling these out in order to demonstrate why they should not apply to investment programmes based on the RII model. These are: (i) transparency; (ii) interest-rate risk management; (iii) VfM change control; and (iv) contract management. Taking each in turn:
54. **Transparency** – If PFI contracts had required a high degree of disclosure from its contractors, financiers and sub-contractors of profits made and losses incurred on a project-by-project basis, then over the last 30 years a database of several hundred projects would have been created that evidenced the losses from risks transferred that were not well managed, mitigated or priced by the private sector; and, conversely, the profits realised on risks that were well managed, mitigated or priced. Occasionally, information on profits and losses at the granular level of individual projects does leak into the public domain, but this is the exception. The overwhelming incentive for the private sector investors, lenders and contactors is not to disclose and, as a result, despite having commissioned a £90Billion programme and several hundred projects, the UK public sector still lacks the hard data by which it can validate whether VfM has been achieved.
55. **Interest-Rate Risk Management** – The twin drivers of delegated public sector budget accountability and private sector balance sheet treatment led to interest-rate risks (that arose under PFI contracts) being passed down to the level of individual public authorities, who generally had no choice other than to instruct their PFI contractor to use financial instruments that locked-in long-term fixed interest rates (notably, swaps and bonds). Had the interest-risk arising on the entire PFI programme (or sections of the programme) been seen as book(s) to be managed centrally by the public sector, it would have greatly improved the flexibility and affordability of individual projects, as viewed by their respective procuring authorities; and would have also led to improved VfM for the programme as whole. The point can also be noted that an RII financing structure can effectively preclude the kinds of windfall refinancing gains, at the conclusion of construction, which are characteristic of structures, like PFI, that exhibit a steep downward gradient in the cost of finance at the conclusion of construction.
56. **VfM Change Control** – To change service scope or specifications under PFI contracts, whilst maintaining value for money, has proven a difficult challenge for many public authorities and PFI contractors, for four reasons: (i) the difficulty of writing a long-term contract that adequately specifies all the potential outputs and behaviours that the procuring authority requires from its service provider over the life of the contract (including provisional or optional scope etc); (ii) the limitation of a change control procedure that is constrained by the terms of the original OJEU¹⁷ notice; (iii) the impracticality of running competitions for aspects of the overall service, that are inextricable to the delivered service solution; and (iv) a disputes resolution procedure that can end in deadlock. Of course, all sunk costs are inflexible (whether publicly or privately financed)

¹⁷ European Union public procurement regulations

and a least-cost contract will always be least-flexible. Nonetheless, it has often proven difficult to achieve change whilst maintaining value for money¹⁸.

57. **Contract Management** – Many public authorities that have entered into PFI contracts have found it hard to retain (or acquire) the skills needed to manage these contracts. They are lengthy agreements and lie towards the higher end of the spectrum of commercial contract complexity. Despite great efforts being invested (over many years) by HMT/IPA¹⁹ in standardising these contracts, publishing guidance notes on their usage and offering direct support to authorities, the fact is that too many authorities have struggled to manage these contracts in such a way as to realise their full value for money potential.
58. As regards the RAB model, as deployed within the privatised regulated utility sector, there are three areas of recognised weakness: (i) difficulty of market testing the cost of capital; (ii) lack of incentives for achieving least whole-life-of-asset costs through choice of suitable asset design and maintenance regime (aka capex bias); and (iii) material divergence between notional and actual capital structures. Again, taking each point in turn.
59. **Market Testing the Cost of Capital** – The privatised utilities typically have RABs reflecting large portfolios of assets that are heterogeneous as regards their function, age and condition. Having been built-up over several decades, the associated debt finance will itself also typically be heterogeneous in comprising debt instruments of different tenors, interest rates, security and other key characteristics, collectively managed as an optimised rolling corporate debt book that is bespoke to the business and to a particular point in time. Within this context, the terms of finance needed to support incremental asset formation is tied closely to the in situ corporate debt book (i.e. embedded debt) and not uniquely to the new asset itself. Moreover, associated incremental equity capital may be sourced from retained earnings and not from new issues. In consequence, market testing the cost of capital (a blend of equity and debt finance – i.e. WACC²⁰), relevant to new asset formation, can present challenges. While the market cost²¹ of debt may be readily benchmarked (e.g. by reference to suitable indices), more judgement is required to find suitable comparators for the cost of equity, which is why specific segregated structures that are competed on a WACC basis (e.g. TTT) provide such useful market tests.
60. **Whole-Life-of-Asset Costs** – The direct link between the RAB of a traditional regulated business and its revenue (which includes the revenue component “RAB x Allowed Return”) can incentivise asset design solutions that are “capex-heavy” and “opex-light” notwithstanding that associated operation and maintenance costs are themselves a separate building block within the overall revenue picture of the business. Regulatory controls that look at the combination of capex and opex (referred to as “totex”) within the relevant regulatory periods help mitigate a potential bias towards capex. However, this is not the same as a whole-life-of-asset NPV optimisation between capex and opex, such as typically underpins fixed unitary charges within PFI contracts.

¹⁸ The London Underground PPP provided a high-profile case of failure to achieve value for money under PPP. See Annex 2(C)

¹⁹ HM Treasury and the Infrastructure and Projects Authority

²⁰The Weighted Average Cost of Capital

²¹ Cf. UK Regulators Network, Cost of Capital – Annual Update Report, 2019

Furthermore, within the context of large and heterogeneous portfolios of assets (i.e. of diverse age and condition), the granularity of asset-specific cost information may not be available in a form that would allow the regulator to assess whole-life-of-asset costs.

61. **Divergence of Capital Structures** – The regulatory frameworks applied to the RABs of privatised businesses are typically predicated on a notional capital structure, particularly when it comes to determining an appropriate (industry-wide) WACC. It is then for individual businesses to decide whether and to what extent they should diverge from this notional structure, in search of the most efficient structure for their particular circumstances. Difficulties can arise when much higher levels of gearing are adopted (than are assumed within the notional structure) that, although efficient in the short term, prove unsustainable and inefficient in the longer-term and become an operational constraint on the ability of the business to respond to changing trading conditions and risks, as well as providing windfall gains to equity investors.
62. The capacity of the RII model to address these seven identified lessons from past PFI and privatised regulated utility markets is summarised in the following table:

ISSUE	THE REGULATED INFRASTRUCTURE INVESTMENT MODEL RESPONSE
Transparency	A new business undertaking greenfield asset formation provides a high degree of long-term cost, risk-management and performance transparency via regulatory reporting and project oversight by key stakeholders.
Interest-rate risk management	The model supports a more sophisticated and altogether better VfM approach to the management of interest-rate risk, including through the regulatory review process ²² .
VfM Change Control	Although the principle of single-point responsibility applies to both regulated and PFI businesses, the regulated model avoids the identified constraints on VfM change control inherent in PFI. That is, service standards, outcomes and incentives can evolve through the periodic review process of the RII model.
Contract Management	The RII model does not require the same level of contract-management skills and resources to be deployed by public-sector contracting authorities as PFI. Performance management and change commissioning skills can be concentrated within the regulator, as a centre of expertise (although see paragraph 64 below)
Market testing the cost of capital	The cost of capital can be associated directly with the formation and long-run management of an asset (or group of assets) and market tested accordingly.
Whole-life-of-asset costs	Depending on how the tender is run for the award of a licence (or contract in the case of Ofwat's DPC initiative ²³) it is possible to incentivise design solutions that offer long-term optimised trade-offs between capex and opex.
Divergence between notional and actual capital structures	As a general rule, businesses that are corporately financed (such as RII) adopt lower levels of gearing than those that are project financed, with consequentially greater flexibility and resilience. Capital structures that are locked-in at the time of license (or contract) award are less likely to later diverge if appropriately regulated.

63. Whilst the RII model avoids the need for appropriate contract-management skills to be spread across numerous procuring authorities, its wider application will necessarily require suitable resources to be expanded within existing regulators, or otherwise deployed within regulators newly formed for the purpose. The role of regulators as centres of expertise concerning the issues that arise in developing and delivering a new model will be a critical success factor to such an investment programme (see section 6).

²² For example under RII, whether or not a loan to a private sector infrastructure company is accounted for as Government debt, does not turn on the question of whether customers share the related interest-rate risk.

²³ Direct Procurement for Customers (DPC) based loosely upon the TTT model, which awards a contract rather than licence and supports the formation of a "shadow" RAB – see Annex 1(C)

5. THE OPPORTUNITY

64. The TTT model is simply the starting point for developing an infrastructure delivery solution that builds on the proven success of this and other regulated models and, at the same time, overcomes identified short-comings in traditional infrastructure delivery models – both regulated and PFI based (see section 4). The core objectives of the RII model are to: (i) achieve continuous and demonstrable value for money over the long-term; (ii) provide the flexibility to deal with changing needs and circumstances; (iii) access customer funding streams; (iv) mobilise low-cost capital; and, ideally, (v) achieve additionality through private sector classification and accounting treatment. At the heart of these objectives lies the principle of “incentivised and continuous cost and risk management” rather than “risk transfer” per se (embedded at the start of a contract) supported by appropriate and realistic risk sharing amongst funders (e.g. the customer base), investors and the company’s supply chain. These principles are also compatible with mixed funding streams (i.e. derived both from a customer base and a public authority²⁴).
65. The scale of potential investment in infrastructure that could be supported by incremental increases in customer charges (for example in the energy or water sectors) is of the order: £1 billion per one million customers paying an additional £1 per week. This assumes constant prices; a 50-year amortisation period; no provision for operational and maintenance expenditure; and an illustrative WACC of 2.5% pa (real vanilla) for an RII structure with a similar investment risk profile to TTT. Funding so raised from customers could be allocated across a range of qualifying RII investments, for example to address the causes and effects of climate change.
66. A key benefit of the RII model is the role of an independent regulator, who will have statutory duties to protect the interests of paying consumers, whilst balancing these with the interests of private sector investors – e.g. through the periodic review mechanism. As an independent body, the regulator will also be free from political interference in its decision-making process. This approach enables key public-sector resources to be concentrated within a regulator, as a centre of expertise, rather than spread across numerous procuring authorities, as happened in the case of contract management skills under PFI.
67. The TTT model demonstrated that the deep markets of international equity and debt investors, which had developed on the back of utility privatisation and PPP programmes in the UK and abroad, were able to support major stand-alone regulated construction projects. The potential scale of capital resources made available by this mechanism is immense, certainly of the order of multiple hundreds of billions of pounds – with a consequent potential for strong competition.
68. The TTT model also pioneered a GSP solution, specifically in the context of an RII project, to address a narrow class of low-probability high-impact risks beyond the capacity of the private sector to manage, mitigate or price. The TTT GSP had several limbs each specific to individually identified exceptional risks, and this approach to risk coverage proved to be both flexible and

²⁴ Similar in principle to authority capital contributions which could be included within PFI funding arrangements without disturbance to value for money

effective in terms of lowering the resulting TTT WACC. However, categories of exceptional risks do not necessarily apply to all investments and the GSP should be seen as a separate and distinct construct from an RII-based infrastructure delivery model, albeit in some instances mutually interdependent. In circumstances where a GSP is required, it does not erode the role of private sector investment capital, within the RII model, to manage and mitigate the limitations of supply chain balance sheets, through appropriate risk sharing mechanisms.

69. Although the TTT GSP was developed to address construction period risks, there is no reason why similarly bespoke public-sector support packages could not be included within future RII structures to address analogous risks (i.e. beyond the capacity of the private sector to manage, mitigate or price) arising within the operating period of an asset, and which would otherwise prevent the infrastructure business from achieving an investment grade credit rating (e.g. uninsurable events or extreme user demand risks) – see the mini case study on the HS1 project (Annex 2(B)). This principle could be especially relevant within the context of: (i) climate change; and (ii) up-scaling from pilot projects to full investment programme roll-out.
70. An approach used within the TTT model was to define a threshold amount (in respect of construction costs) as a limit beyond which the GSP would respond. By analogy, if a GSP were designed to address exceptional revenue generation risks, for example, then the appropriate threshold amount would be defined in these terms and not those of construction costs.
71. The RII model provides a structure through which risks can be shared between the supply-side (including investors, lenders, contractors and the developer), consumers and the taxpayer to incentivise efficient delivery of the investment at the best overall value for money. The nature of the structure, where parties have genuinely aligned interests, necessitates the fostering of an enterprise-based approach to the investment, rather than relying heavily on contractual obligations and an associated transactional approach to service delivery.
72. The lower cost to consumers available through the RII model derives primarily from its ability to create an investable proposition for which there is a deep pool of potential investors. Moreover, its risk structure means that a lower cost of finance can be achieved than would be possible through traditional private finance structures. Another key component of the RII model, as seen on TTT, is competing the WACC for the project, which resulted in a considerably lower cost of capital than might otherwise have been achieved.
73. Risk sharing with consumers per se is not a defining feature of an RII model. It is possible to have price-adjustment mechanisms under arrangements such as a Contract for Difference (CfD)²⁵, which was used for the Hinckley Point C project or, indeed, a PFI contract. However, the risk sharing arrangement used within the RII framework enables proven and familiar mechanisms to be used for balancing the interests of consumers and investors over an extended period during

²⁵ A Contracts for Difference (CfD) is typically used to create price certainty for a product (or service) being sold which would otherwise be sold at a prevailing (often volatile) market price. The "Difference" referred to in the title is between a pre-agreed "strike price" and the prevailing market price. In this respect, a CfD is not unlike an interest-rate hedging contract, which provides a borrower with a fixed rate of interest notwithstanding that market-based interest rates can be volatile.

which circumstances may change. This can help empower customers and help achieve a durable alignment with other stakeholders.

74. The RII model does not necessarily tie the period of funding (e.g. customer charging) for the infrastructure service to the life of the underlying assets being formed. The solution is essentially configurable. So, for example, at one extreme the costs of asset formation can be recovered inter-generationally during periods over and beyond the physical life of the assets; and, at the other extreme, a much shorter period of amortisation would be possible with mixed public and private-sector funding to address issues of consumer affordability. In this sense, the RII can be seen as a bridge between what the private sector is able to do today and what it will be capable of in the future.
75. One of the challenges for regulators in supporting the roll-out of new RAB-based models, is the benchmarking of costs that arise within what might otherwise be one-off projects. However, herein also lies an opportunity to adopt a programme-based approach to investment delivery that would allow the principles of standardisation to be adopted – a well proven driver of value for money.
76. A key lesson from past infrastructure investment programmes is that they should be addressed as a programme from the outset if their full value for money potential is to be realised. Accordingly, programmes need appropriate articulation, sponsorship and management in respect of issues like investment pipeline; market engagement; stakeholder engagement; capacity building; best practice and standardisation etc., not least to ensure that common issues are resolved only once. Within this context, the TTT project can offer-up value, beyond the project itself, as a pathfinder for a wider programme of similar RII delivery models.
77. Major new investment programmes need to be underpinned by wider strategic objectives, such as was the case with privatisation (i.e. shrinking the size of the state) and PPP/PFI (i.e. introducing contestability²⁶ and long-termism into the delivery of public services), if these programmes are to access the mobilising energy of an investment innovation.
78. One of the most significant investment market trends, at present, is the increasing emphasis being given to Environmental, Social and Governance (ESG) issues. Of course, in many ways, this is home turf for the infrastructure sector which has always had to: (i) submit detailed environmental impact statements as part of the planning process and meet on-going environmental license conditions in operation; (ii) operate within complex stakeholder environments and engage effectively with affected communities; and (iii) comply with applicable codes of conduct for governance etc. Nonetheless, despite ESG considerations being far from novel for the infrastructure sector, there is no doubt that society expects the sector to up its game in this area. Without this, questions of social legitimacy will continue to hang over the private infrastructure sector. Fortunately, the RII model plays well into this space in terms of its

²⁶ Referred to as a “third way”. The first way being through public ownership, the second – private ownership and the “third” being a partnership of public and private sectors – aka PPP.

high degree of transparency, its alignment of interests between customers and investors, and low cost of capital.

79. This then leaves the issue of customers paying (and returns on invested capital being earned) during the construction period and so in advance of an infrastructure asset entering operational service; and whether this can undermine the social legitimacy of the RII model. The charging of customers during periods of asset formation is a core and common feature of privatisation models and, during the 30+ year period since the creation of privatised infrastructure businesses in the UK, this feature has not been widely cited by critics of privatisation as being socially inequitable. Clearly, in the case of single asset formations (such as the TTT), the timing mismatch between revenue generation and operational commencement is much more visible. Nonetheless, this issue did not motivate a serious challenge to the social legitimacy of TTT and, insofar as the RII model is used to deliver programmes of investment and networks in the future, the mismatch will be even less visible.
80. Even the most ardent critics of privatisation and PPP begrudgingly admit the benefits of contestability – that is, of testing different delivery models not just to find the best but also to challenge, compare and contrast the performance of the status quo alternative, whether public or private sector owned. Furthermore, a plurality of delivery models provides choice and helps build capacity and capability within the supply chain and expertise within Government and the regulators. On the back of the 1980s and 1990s privatisation programmes, the RAB model of finance became one of the UK’s most valuable exports, having been replicated within utility sectors around the world.
81. The scale of investment programme that is suitable for delivery through the RII model is bounded at the lower end by considerations of economies of scale, in terms of the transaction and set-up costs of one-off bespoke models that weigh heavily below a capital value of, say, £100million (a threshold chosen by Ofwat for testing the applicability of its DPC model to individual projects – see Annex 1(C)). There is no upper limit to scale and the benefits of a programme approach to infrastructure investment arise more or less pro rata. The examples given in the Annex cover: programmes of investment; the development of networks; straight-forward and highly repeatable lower-risk assets; as well as higher-risk “one off” investments.

6. CRITICAL SUCCESS FACTORS

82. The Infrastructure Forum's response to the BEIS consultation (2019) on applying a new RII model (based on TTT) to a nuclear power generation programme²⁷, included some observations on key success factors that are generic to new RAB models and not exclusively tied to the nuclear sector. These are:

INVESTABILITY

- Pre-agreed framework for determining the RAB
- Revenue stream throughout the project lifecycle that derives from a credit worthy counterparty and that is both predictable and stable
- Understanding the nature of the infrastructure programme and so anticipating investor due-diligence requirements
- Using a trusted regulatory framework to ensure credibility, with clear duties for the regulator to support the success of the investment programme
- Having a clear tranche of risk capital in the utility / service provider, which has commercial incentives that can be aligned / influenced by the regulatory framework
- Careful balancing of consumer and investor interests by the regulator (for example, a duty to ensure that the project is financeable as well as a duty to ensure that customer bill impacts are affordable)
- Maintaining an initial fixed-period allowed return on capital (e.g. fixed WACC or such other relevant cost of finance parameters) through and beyond the initial construction period, and so for a much longer period of time than the usual regulatory review intervals of the infrastructure sector (albeit that the WACC etc may be subject to pre-agreed in-period adjustments)
- Regulatory determination of the allowed return on capital, after the initial fixed period, should be by reference to pre-agreed guidance that may also need to remain in place for longer periods than in other regulated industries

INCENTIVES, ECONOMY AND EFFICIENCY

- Clear, transparent and verifiable project cost and risk build-up, to provide confidence
- A clear regulatory link between expenditure and increase of the RAB
- Aligning incentives throughout the supply chain for successful delivery
- Balanced commercial relationships that support efficient expenditure and incentivise over-performance
- Resolving any potential asymmetry for risk transfer due to difficulties in getting the baseline cost right

²⁷ The Infrastructure Forum, Response to the BEIS Consultation: RAB Model for New Nuclear, 2019

- Treatment of non-WACC building blocks over the duration of the licence agreed ex ante to the extent possible (e.g. regulatory depreciation life, decommissioning, opex, tax etc) so that investors know what they are bidding against

SUPPORTING A SUSTAINABLE SUPPLY CHAIN

- The procurement process (whether of goods, services or finance) needs to be efficient in terms of cost, time and appropriate transparency
- The normal relationship applies between the incremental certainty gained through the due diligence process and the value-for-money offered by bids so informed
- Contracts and their sub-contracts, should be balanced and resilient as regards risk transfer and incentives, especially within the context of building a supply chain capable of supporting a programme of investment
- Government guarantee of large-scale remote risks that will not be value for money (or feasible) for the private sector to take-on (e.g. underpinning a threshold outturn construction cost for the project)²⁸.

83. The role that regulators play as centres of expertise in economic regulation (including performance monitoring, incentive setting and independent oversight) will be central to the successful roll-out of new investment programmes based on the RII model. This will require suitable resources to be expanded within existing regulators, or otherwise deployed within regulators newly formed for the purpose.

84. A key lesson from past infrastructure financing models is that they should have a name that helps stakeholders understand what they are fundamentally about, and that if possible, emphasises the central role of the customer for the infrastructure. The terms 'private finance initiative' and indeed 'privatisation' failed to capture any social purpose or set of values. Some examples of a title for a new RAB model – apart from RII – are: Regulated Social Value Investment (RSVI); Socially Assured Infrastructure Formation (SAIF); Community Infrastructure Framework (CIF); Long-Term Social Investment (LTSI); Assured Social Investment (ASI); Community Infrastructure Delivery Framework (CIDF); Asset Base Investment (ABI); and Customer Company Alliance (CCA). The choice of name can help create closer connections between (RII) infrastructure developers and the communities they serve.

²⁸ A GSP does not erode the role of private sector investment capital, within the RII model, to manage and mitigate the limitations of supply chain balance sheets, through appropriate risk sharing mechanisms. If a GSP were designed to address exceptional revenue generation risks, then the appropriate threshold would be defined in these terms and not those of outturn construction costs

7. CANDIDATE SECTORS

85. To maximise the value-for-money potential of a programme of infrastructure investment based upon the RII model, it is important to set the parameters of assessment for candidate sectors to be very broad, at least initially; and a range of case studies is included in the Annexes to the report to illustrate this potential. There are, of course, numerous constraints that may limit the eventual number of sectors within which viable investments can be realised – see below. Nonetheless, as a starting point, the right question to ask is “why not”?
86. Confidence can be found for setting the parameters wide, from the work already well advanced in demonstrating the suitability of sectors for the RII model (beyond sewer tunnels) as diverse as the new nuclear generation and Carbon Capture Usage and Storage (CCUS) programmes (see respective publications²⁹), given the potential for RII to deploy: (i) mixed funding streams (viz a combination of customer charges and public-sector capital and/or revenue contributions to ease affordability constraints); (ii) co-financings between private and public sector sources of capital; and (iii) GSPs that enable the public sector to contribute selective risk coverage in support of optimised value for money.
87. Accordingly, in principle, the RII model could be applied to novel situations across a broad range of traditional infrastructure sectors, viz: the energy, transport, telecoms, environmental and accommodation sectors. For example, new applications can be conceived within energy storage and distribution; road and rail; rural broadband; flood defence; tidal power and residential social care / social housing. Some of these are considered further below and in the Annexes to this report.
88. The constraints against which each potential application needs to be tested include: (i) availability of a customer base that can afford to make a long term, stable contribution towards the funding of the infrastructure; (ii) a sufficiently close connection between customer base and the service derived from the asset as to preclude the customer charges being classified as taxes; (iii) the availability of a credit worthy entity for gathering customer charges; (iv) accounting treatment that may deem the assets to be public sector notwithstanding that their associated (private sector) debt finance is well below a sovereign credit rating; (v) the availability of an independent regulator with the necessary duties and resources; (vi) the need for primary legislation for which sufficient Parliamentary time is available; (vii) to the extent that a GSP is deployed, that it does not lead to a public-sector classification for the infrastructure business; (ix) State Aid considerations; (x) other applicable EU regulations; (xi) market capacity; and, of course, (xii) overall value for money.
89. The scope for the RII model in the **rail** sector is wide and could cover single asset or system options – e.g. tunnels or stations, groups of assets such as a tunnel combined with track, or

²⁹ (i) The Infrastructure Forum, Response to the BEIS Consultation: RAB Model for New Nuclear, 2019; and (ii) CCUS Advisory Group, Investment Frameworks for the Development of CCUS in the UK, 2019.

complete railway infrastructure options and new railways. For the revenue stream, a regulated charge would be passed by Train Operating Companies (TOCs) through to rail passengers. For RII involving the sale of operational infrastructure, this would form part of the normal regulation of train fares. For RII involving entirely new rail infrastructure, it may be necessary to seek revenue from a wider pool of rail-users than the immediate consumers. In Annex 1(A), describes how the RII model could apply to the rail sector.

90. Whilst in roughly two thirds of the country Openreach and alternative providers may be able to build **full fibre** networks in a competitive environment, an RII approach could help in the remaining third by filling any funding gap and using regulated charges on legacy services operated by Openreach to recover the cost associated with deploying full fibre. Annex 1(B) shows how the model could apply in telecoms.
91. The success of the TTT procurement in delivering a major value for money investment for wastewater customers encouraged Ofwat to move forward with Direct Procurement for Customers (DPC). Annex 1(C) suggests that larger and more complex **water** projects will require the best aspects of RII and PPP if they are to optimize value for money. The risk-share arrangements that can exist in the RII model should be mirrored in plans for DPC in the sector. The wider significance of the DPC initiative is that it demonstrates how individual aspects of the RII model can be lifted and applied in new and evolutionary delivery models.
92. Annex 1(D) describes how the **carbon capture and storage (CCUS)** sector is key to the achievement of net-zero carbon by 2050. Transport and Storage (T&S) for the first CCUS projects could be, initially at least, a relatively high-risk activity until the store is well established and a network of interlinked capture and T&S assets has been created. The risks will then drop significantly. The RII model, if used for T&S, allows much of the early risk to be passed to a wider base of consumers that has greater capacity to absorb the risk. The CCUS Advisory Group has determined that the RII model is the best approach for T&S, principally because of its ability to accommodate risk, both from the perspective of the investor in the RAB and from the perspective of consumers.
93. Annex 1(E) examines how RII can help in the deployment of **Electric Vehicle (EV) Charge Points**. EV usage will be key to achieving climate change goals. At present consumers rank not having enough access to efficient charging stations as the third most serious barrier to EV purchase. To facilitate the transition to a net zero economy, there will need to be a rapid increase in the density of available charging points that mirrors and promotes the uptake of electric vehicles. EV charging points enable a user-pays principle to be applied at point of use, which provides an unambiguous basis for the revenue stream. The RII model allows controlled scalability across the investment portfolio, which could be accompanied by a policy and delivery framework for the roll-out of the charging infrastructure the country needs.
94. The corollary of growing EV usage is, of course, the prospective erosion of Government fuel duty revenues. One of the options for replacing these lost revenues is to introduce a road user

charging scheme that could support an RII approach to continued investment in the **road network**.

95. During the course of preparing this report, the RAB working group also considered the potential applicability of the RII model to three further sectors as described in ,respectively: Annex 1(F), (G) and (H) – namely: **social housing**, energy storage and tidal power.
96. Finally, whilst not covered by a case study within the Annexes, a specific mention can be made of the **flood defence** sector. The potential for this sector to be supported by RII is based, in part, on the extent to which relevant assets could be constructed and maintained within the licence obligations of the regulated water companies, or new companies formed and licensed to implement flood defences, and funded via existing customer charging arrangement – e.g. similar in concept to Bazalgette Tunnel Limited (formed and licensed to deliver TTT) which is funded through charges levied on Thames Water’s customer base³⁰.
97. The range of sectors described above and in the Annexes to the report illustrate well the potential versatility of the RII model.

³⁰ Thames Water Utilities Limited

8. CONCLUSIONS

98. The UK holds, arguably, the greatest repository of knowledge in the world in how to deliver successful infrastructure investment programmes at scale, both within the private sector and Government – the latter centred on the IPA. Moreover, this knowledge covers the crucial area of how the complementary resources of public and private sectors can best be brought to bear to achieve successful outcomes. It follows from this that the UK possesses a vast knowledge bank of what works and what doesn't, when it comes to infrastructure delivery that meets the tests of safety, value-for-money, affordability, sustainability and social legitimacy. Collectively, this intellectual property, although spread across numerous and diverse public and private sector organisations, is itself a national strategic asset. It has been the purpose of this report to show how the hidden value of this know-how can be unlocked to help meet the demographic and other key infrastructure challenges facing the UK, such as climate change and rebalancing the economy.
99. The need for substantial investment in the UK's infrastructure is acknowledged by all political parties, stakeholders and commentators. At the same time, long-term interest rates continue to be at historically low levels, so offering the opportunity to mobilise affordable private finance that shares the cost of infrastructure investment equitably across the generations. There is also substantial untapped potential appetite for infrastructure investment within international financial markets. Past experience of large-scale investment in infrastructure has shown that the best value-for-money outcomes are achieved when the investment requirements are addressed as integral programmes. Programmes are based on delivery models and the RII model, discussed in this report, is innovative, proven and sufficiently flexible so as to be usable across a wide range of infrastructure sectors. Moreover, the model avoids past shortcomings of both privatisations and PFIs. This report concludes that the RII approach is capable of delivering a third infrastructure investment revolution.

ANNEX 1 — SOME CANDIDATE SECTORS

100. The range of applications for an RII model is broad. Although, so far, only the TTT project is underway, the emerging conclusions of studies currently being led by BEIS in the nuclear power generation and CCUS sectors indicate the potential suitability of these sectors as well. Moreover, work is underway examining the potential of RII models in sectors as diverse as: rail, road, telecoms, water, energy storage, electric vehicle charging, accommodation, tidal power and flood defences. Several of these are considered in short case studies below.

A — RAIL

101. The scope for RAB funding models in the rail sector is potentially wide and could cover:

- **Single asset or system options**, e.g. tunnel, station, signalling, power systems;
- **Groups of assets and systems**, e.g. tunnels or a tunnel combined with tracks, power and signalling;
- **Complete railway infrastructure options**, e.g. major upgrades or enhancements to existing assets with new assets to increase overall rail capacity, or new railways; or
- **Vertically integrated railway options.**

102. RAB models may be applied to existing infrastructure through the sale of operational infrastructure with obligations to enhance, operate and maintain, or be extended to include construction and operation of entirely new infrastructure, either in conjunction with existing infrastructure and an existing consumer base, or potentially as a new standalone RAB project.

103. The model is likely to require a GSP. Looking at the GSP, rail does not generally have the same level of monopoly provision as found in other sectors. Demand for some rail services is more elastic than for certain other utilities. It is possible, therefore, that Government would need to offer a more extensive GSP than found in other sectors to attract investors.

104. Application of a regulatory charge under an Economic Regulatory Regime (ERR) is also potentially more complicated than in most other sectors due to the nature of the current UK rail model, which comprises:

- **Infrastructure Manager (IM)** – which owns the network assets;
- **Train Operating Companies (TOCs)** – which provide train services on the IM's network and pay the IM a track access charge;
- **Passengers** – who use TOC services and pay TOCs through ticket purchases;
- **Rolling Stock Companies (ROSCOs)** – which lease trains to TOCs.

105. The regulated charge could be recovered through track access charges paid by TOCs to the IM. But, for single or grouped assets, or part-network RABs, this approach has challenges.

These include determining how to ringfence the RAB asset from the rest of the network to identify the appropriate revenues; and where the regulated charge should be applied, given that multiple TOCs could be using the asset with varying passenger numbers. The proportion of the regulated charge to be applied to these TOCs could be complex to determine.

106. Turning to the need for a regulator, it is possible that the role of the Office for Rail and Road (ORR) could be extended to provide the regulation.
107. For the revenue stream, a regulated charge would be passed by TOCs through to rail passengers. For a RAB involving the sale of operational infrastructure, this would form part of the normal regulation of train fares. However, for RABs involving entirely new rail infrastructure, this may require further development. If regulated charges are to apply from commencement of construction, it may be necessary to seek revenue from a wider pool of rail-users than the immediate consumers of the new infrastructure. Here and elsewhere in the debate, the question arises whether customers who do not benefit directly from the project should contribute towards its cost through fares or charges.

B — TELECOMS

108. The UK's move to full-fibre networks will be transformational, and on a far larger scale than previous upgrades to the telecoms network. In about two thirds of the country there is a serious prospect for full-fibre networks to be built by Openreach or alternative providers. Competition is likely to be viable in these areas.
109. In the remaining third there is some prospect of a supported commercial build, but new competition is unlikely to be viable. A RAB approach could help in filling any funding gap in the build and rollout of new fibre networks, through enabling Openreach to invest by allowing it to recover costs associated with full-fibre investment across other regulated services.
110. A RAB based model could fund this residue and incentivise Openreach to build a new network more extensively than otherwise possible, through allowing Openreach's investment in full fibre in areas without competition to be spread across a wider group of customers.
111. In areas of the country that are less attractive to investment even with added incentive, it would take a relatively large price increase from other customers to fund it, whilst benefitting few people. This is where some public funding should come into play to reduce the number of people who are excluded from the benefits of full fibre.
112. The model could potentially be argued to put a burden onto regulators in terms of monitoring the effective roll-out of new networks; however, it is felt that this is manageable and would be similar to the approach in other regulated infrastructure sectors. Regulators would need to scrutinise business plans which had previously been left to the market.

C — WATER — DIRECT PROCUREMENT FOR CUSTOMERS

113. The objective of direct procurement for customers (DPC) in the water sector is to drive better value for money for customers and draws from the experience of both PPP and TTT. It gives licenced companies the option to choose the DPC route for delivery where it can deliver best value for customers.
114. The delivery of capex projects in the water sector has used the same approach to construction and remuneration as the electricity and gas transmission sectors. There was an obligation on the licensed operator to deliver the capex program for each review or control period in an economic and efficient manner. This obligation was at the program level and there was significant flexibility across individual projects and limited accountability for the outcomes at the project level. Assuming the capex was incurred in an economic and efficient manner, the costs were logged to the RAB/RCV and the utility charged customers as the costs built up. The licensed operator was receiving income across the construction period. Smaller projects tended to be procured from framework arrangements using design and build contracts that may or may not have been fixed price. Larger projects have increasingly used target price contracts such as NEC 3 that allow costs to vary based on agreed compensation events with customer charges being suitably calibrated to move in lockstep. In exceptional cases, TTT for example, this target price approach was enhanced with an overlay of risk sharing and incentives.
115. In the water sector, TTT was a landmark project which used much of the Heathrow Terminal 5 approach to RAB based financing with the difference being that the delivery company, Infrastructure Provider (IP), was a separately licensed entity. It was enabled by primary legislation, a modified regulatory framework and a GSP. The success of the TTT procurement in delivering improved VfM for customers encouraged Ofwat to move forward with DPC.
116. Guidance set-out by Ofwat seems to be moving away from the RAB model and towards a structure that is closer to PPP. A RAB for DPC currently therefore looks more like a quasi PPP with a consumer funding source. This is partly due to its having a contracting model rather than a licencing model. The provider does not have the licence to collect revenue from consumers, rather the incumbent utility company collects the revenue from the consumer base and passes it on.
117. This may not be a big issue for smaller projects, but larger and more complex projects will require the best aspects of RAB and PPP if they are to optimize value for money. The risk sharing arrangements between the licenced operator and the customer under the RAB model in particular should be mirrored into the DPC arrangements.

D — CARBON CAPTURE USAGE AND STORAGE

118. Carbon capture and storage (CCUS) will be rolled out across five different clusters of the UK, with the aim of decarbonising these clusters.
119. In terms of size and scale, the Committee on Climate Change suggest CCUS initiatives could achieve 175 MT per annum of carbon capture. Massive projects are being undertaken in each location and must be broken down into different models for different parts of the market. The cost challenge taskforce (CCTF) recommend that the transport and storage (T&S) assets for a cluster should be privately owned and financed, regulated through a RAB structure, and funded through T&S fees charged to their customers.
120. T&S for the first CCUS projects could be, initially at least, a relatively high-risk activity until the store is well established and a network of interlinked capture and T&S assets has been created. The risks will then drop significantly. Inherent in T&S operations are these low probability but high impact risks that might occur, which could lead to temporary or indefinite store closure. The T&S RAB structure allows much of the early risk to be passed to a wider base of consumers that has greater capacity to absorb the risk. This structure then allows Government to take the responsibility for addressing – often at no or low cost to the taxpayer – those irreducible risks that simply cannot be left with the private sector nor passed to consumers.
121. The RAB structure needs to recognise the possibility of those risks and have a suite of protections to address them. The primary protection is always to determine whether problems can be solved economically through expenditure, for which the regulator would allow additions to the RAB cost base at a cost of capital.
122. The CCUS industry would almost certainly need a GSP but are trying to minimise this. It is not looking for things like financial market liquidity support which was needed on TTT. If a plant were to fail, Low Carbon Contracts Company (LCCC) would continue paying. Whilst this may be politically difficult, it is needed to give CCUS a low risk RAB rather than a high risk RAB.
123. Under a RAB structure, many costs that might more traditionally fall on a project developer (e.g. the need to drill unexpected wells to maintain CO₂ store integrity) would be allowable costs. Should they occur, they are costs that would be passed through the RAB to end consumers. This will avoid oil and gas companies pricing in at the outset (in costs and costs of capital) low probability risks, unlikely to occur.
124. The drivers of using a RAB in T&S include the fact that it is big and long-term, so cost of capital would be an important factor. It is also a new industry with some uncertainty as stores and other assets will continually renew and expand its asset base. A fixed project finance structure doesn't seem to fit the risk share, as certain areas of the market can't be priced with certainty, and the company needs to be able to grow. Hydrogen roll out to industry users would be slow (e.g. 20 years) and the asset base would grow bit by bit.

125. In reviewing the alternatives for delivering T&S assets, the CCUS Advisory Group has determined that a RAB model is the best approach for T&S, for a variety of reasons. These include size and scale, the ability to become UK-wide, its proven precedents and attractiveness to a wide investor base and the likely consequent low cost of capital; but principally because of the ability to accommodate risk, both to the investors in RABs and to end consumers. It has been asserted that this model will be off the public sector balance sheet, but no detailed analysis has been made. The assumption is based on the fact that it's not dissimilar to TTT, it's slightly more like traditional RABs and would probably only be charging LCCC like any other utility.

E — ELECTRIC VEHICLE CHARGE POINTS

126. The UK has more than 38 million vehicles registered for use on the roads in Great Britain and thirty-three per cent of carbon dioxide emissions are from the transport sector. In comparison there are only around 15,000 EV charging points in the UK.
127. Consumers rank not having enough access to efficient charging stations as the third most serious barrier to EV purchase, behind price and driving range. To facilitate the transition to a Net Zero economy, there will need to be a rapid increase in the density of available charging points, which mirrors and promotes the uptake of electric vehicles, including in less densely populated areas. This must be accompanied by an increase in low-carbon electricity generation through renewables and nuclear sources.
128. EV charging points enable a user-pays principle at point of use, which provides an unambiguous basis for the revenue stream. The RAB model allows controlled scalability across the investment portfolio, which could be accompanied by a policy and delivery framework for the roll-out of the charging infrastructure the country needs.
129. It is anticipated that the social value provided by the charging infrastructure will significantly outweigh the project cost risk envelope. This is evidenced by the increasing maturity of the market, which is currently characterised by a number of established players accompanied by an increasing number of potential new entrants. This inherently lower risk profile provided through product maturity, coupled by strong due diligence undertaken by the investor community and regulatory oversight, will maximise the value to the consumer through the company-customer alliance enabled through the RAB model. Benefits to consumers, in the form of lower prices and more rapid rollout, means that the RAB can be a tool to promote competition and transparently sharing the costs accrued during construction.

F — SOCIAL HOUSING

130. The social housing sector has grown substantially over the years by virtue of its economically regulated environment and through the use of clearly defined asset valuation mechanisms. This can be seen as analogous to RAB based financing in infrastructure. There are a number of limitations to the valuation model however that mean that it is difficult to extend this model to new build social housing at scale and extending the offer to affordable/ first time buyer markets. The key to unlocking this potential is to recognise that social housing as an essential infrastructure asset, akin to say water treatment facilities, and to focus regulation of the cost to build, not on the open market value of the housing assets
131. The characteristics of social and affordable housing that may make it suitable for RAB financing include:
- There are areas of significant market failure and new build is constrained by lack of certainty of demand/returns
 - The scale of housing need is very large and individual projects can easily exceed £100m in value
 - Many developments require investments in supporting infrastructure and place-making that can be difficult to monetise through sales programme
 - The assets are long life and not subject to significant demand risk
 - Currently many developments require public subsidy leading to complex grant structures these may be rationalised by the application of RAB mechanisms
 - The existing benefit payment streams, which relate to housing, support a Regulated Social Landlord model that supports private market debt finance that is not classified to the public sector
 - There is a well-established and credible regulatory regime, which can be adapted without need to create a new regulator.
132. There are some potential challenges to the application of RAB mechanisms in housing. The most significant of these include:
- Sales of individual assets or building homes for sale introduce more variation in the asset base than is typically seen in RAB businesses
 - The setting of rents is a complex process and not currently structured on RAB terms. RAB may be seen as implementing rent controls which is not currently public policy
 - Care will be needed to ensure that RAB developments do not lead to crowding-out of more traditionally funded activities.

G — ENERGY STORAGE

133. The UK's achievement of Net Zero Greenhouse Gas Emissions by 2050 will be facilitated by significant increases in the amount of renewable electricity generation, the majority of which is intermittent in nature. Energy storage is vital in order to facilitate this clean energy transition and has a number of different roles to play:
- **Energy-supply regularisation** – the alignment of intermittent renewable generation with demand
 - **Frequency response and reserve** – to contain the frequency of the system within operational limits
 - **Network expansion deferral** – enabling Distribution System Operators to manage electricity demand at peak times without building excess network capacity
 - **Active network and constraint management** – generation and load within both distribution and transmission systems
134. There is a variety of different types of energy storage: Biological, Chemical, Electrical/electromagnetic, Electrochemical (Battery Energy Storage System - BESS), Fossil Fuel storage, Mechanical and Thermal. Each of these have their own particular characteristics and uses. Some are better suited to deal with short-term variations while others allow for longer-term storage.
135. The vast majority of energy storage that is currently in operation globally is mechanical pumped-storage hydroelectricity. The picture in the UK, mirrors that seen globally, with pumped storage at four sites (Cruachan, Dinorwig, Ffestiniog and Foyers) accounting for 2.8 GW, approximately 80% of the total energy storage currently deployed in the system. These four large energy storage sites were delivered by the publicly held; Central Electricity Generating Board of England and Wales and the North of Scotland Hydro-Electric Board, between the 1950s and 1970s.
136. Since 2015 we have seen approximately 0.7 GW of mostly utility-scale energy storage projects deployed into the UK's electricity system. This deployment of BESS has been financed by private investors. Steep declines in Lithium-ion battery cell costs, due to their increasing usage in consumer goods and hybrid and fully electric cars has enabled investors to seek to aggregate merchant revenues from various markets, in the attempt to achieve acceptable rates of return. The jury is currently out as to whether infrastructure investors can attain rates of return which are acceptable to them in exchange for the merchant risk profile of the investment they are making. It is this misalignment of risk profile and rate of returns which could stall the deployment of the efficient, high energy duration and scalable energy storage solutions that are needed to support the UK's clean energy transition.
137. There has been clarification in recent years that network operators can't own energy storage. Additionally, the Government has announced its intention to modify the Electricity Act 1989 to recognise energy storage as a distinct subset of the generation asset class.

138. The demand for energy regularisation, frequency response, network expansion deferral and active management and constraint management services, involve risks that are hard for infrastructure investors to assess, mitigate or price, potentially leading to poor value-for-money outcomes when viewed at a system level. An RII approach would help the energy storage system in the UK scale-up rapidly and affordably for consumers.

H — TIDAL POWER

139. Tidal power is the only renewable technology which draws energy from the gravitational and orbital characteristics of the Earth and Moon (and to a lesser extent in the Earth and Sun) rather than from the Sun's radiation. Tides occur in a routine manner due to the consistent pattern of this orbital motion.
140. Energy from Tidal power plants is very predictable (albeit cyclical over a 24-hour period) as opposed to energy derived from wind or solar radiation which can be less predictable.
141. The world's first large-scale tidal power plant was the 240 MW Rance Tidal Power Station in France, which became operational in 1966. It was the largest tidal power station in terms of output until the 254 MW Sihwa Lake Tidal Power Station opened in South Korea in August 2011. Both of these power stations are examples of Tidal Barrages.
142. The Hendry Review (independent review of tidal lagoons, led by Charles Hendry), published in January 2017, sets out the case for tidal lagoon technology to harness the UK's tidal range resource. The report identified seven potential tidal lagoon locations (Swansea, Wyre, Stepping Stones, Liverpool Bay, Sheerness, East Lincolnshire Coast, and West Cumbria (Solway Firth)) as having a suitable combination of low environmental impacts and good energy yields, collectively capable of delivering an installed generating capacity of 18 GW.
143. The Committee of Climate Change (CCC), in their Net Zero report, released in May 2019 stated that "Deployment of alternative renewable technologies such as wave and tidal power could reduce the variability of overall renewable generation, and reduce emissions further." The CCC has consistently recommended a portfolio approach to power sector decarbonisation.
144. During the Hendry Review, stakeholders noted that a RAB model would be well suited to tidal lagoons due to their operating characteristics and long operating lives. The necessary funding would be secured primarily through consumer electricity bills.

ANNEX 2 — LESSONS FROM THE PAST

A — DARTFORD BRIDGE

145. The construction and operation of the Queen Elizabeth II Bridge at Dartford was financed in the 1980's in the private sector on the basis of a real-toll 20-year concession. It has some of the features of a TTT style RAB model insofar as: (i) it received income during its four-year construction period; and (ii) it was financed with a fixed cost of capital.
146. The concession was awarded on the basis of a tender that focussed mostly on the level of tolls to be charged. In this sense, the bid prices reflected primarily a combination of construction cost and cost of capital. The early generation of revenues was achieved by the transfer (from DfT) of the pre-existing Dartford road tunnels to the concessionaire at financial close. The capital structure of the winning bidder comprised senior debt and two tiers of fixed interest subordinated debt. The ordinary shares in the concession company were not dividend bearing. If traffic volumes exceeded base case expectation during the concession, then surplus cash-flow was used to prepay the senior debt. If the traffic volumes were below expectations, then interest on the most junior tier of debt was deferred. As soon as all the debt (senior and subordinated) had been repaid, the concession could be terminated, and the bridge and tunnels transferred to DfT³¹. In fact, rather than terminate the concession early, it was extended for a short period to build up a maintenance reserve for the future.

³¹ Learning from the Dartford Bridge financing informed the design of the Non-Profit Distributing (NPD) delivery model adopted in Scotland

B — HIGH SPEED 1

147. HS1 was originally conceived as a PFI project, with the developer London and Continental Railways (LCR) awarded a contract to build the railway and run the UK arm of Eurostar. LCR was required to raise private finance against expected revenues from Eurostar and domestic high-speed passenger services, with the debt benefiting from a Government guarantee. In the event, lower than expected passenger numbers required the Government to step in and restructure the project, with the result that, on completion of the railway in 2007, it was wholly owned by the UK Government.
148. In order to recoup a proportion of the £6billion construction cost, the Government chose to sell a 30-year concession to operate the railway. Prior to the sale in 2010, a new revenue model was established to put the business on a stable footing and maximise sale value:
- Train operators (Eurostar and the domestic franchisee, currently South Eastern) pay track access charges to use the railway
 - Access charges have two main components: (1) an operation, maintenance and renewal charge (OMRC) and (2) an Investment Recovery Charge (IRC)
 - OMRC covers the cost of operating the railway, with no profit element. It is determined on a periodic (5 yearly) basis by the rail regulator, ORR, and apportioned between train services
 - IRC is levied on a £ per minute basis, with the £ amount subject to an indexed cap hard-wired into the HS1 Concession Agreement. IRC enables the owner of the railway to earn a return on its investment.
 - A Domestic Underpinning Agreement provided by the Government effectively guarantees use of the railway by domestic services at the volume operating at the date of the sale. As domestic services would bear the full OMRC in the event that international services cease to run, the agreement guarantees that the railway's costs will be met, together with a significant proportion (c.60%) of its IRC receipts
149. The revenue model for High Speed 1 differs from the RAB model in a number of ways. The level of the IRC was not determined by direct reference to the construction cost (or sale price) and is not subject to periodic review but is fixed for the 30-year concession period. Moreover, a significant proportion of IRC (e.g. that currently paid by Eurostar services) is exposed to volume risk. The Domestic Underpinning Agreement does however set a floor for the minimum level of IRC that will be earned, as well as ensure that the railways efficiently incurred operational costs are met.

C — LONDON UNDERGROUND PPP — PRICE RESET

150. The three London Underground PPPs (1998-2007) included a mechanism by which the scope and prices of delivered services were reassessed every 7.5 years by an “Arbiter” whose role was set out in the PPP contracts. These contracts were terminated early and important lessons were learned about the limitations of output-based contracts when applied to the refurbishment of complex legacy assets. The contractual processes administered by the Arbiter were much closer to a claims resolution procedure under a construction contract, than a periodic regulatory review. Lessons were also learnt about the difficulty of achieving value for money without competition in a supply chain; and the importance of private capital bearing risks which it can manage or mitigate, if contractual incentives for good performance and value for money are to be effective.