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1. PURPOSE

1.1 To contract with a Supplier for the purposes of capturing an evidence based and up to date assessment of the relative benefits of deploying the following digital infrastructure options in the UK:

- Fibre to the home/premise (FTTH/P);
- G.fast (and subsequent copper based technological advancements);
- DOCSIS 3.1 (and subsequent cable based technological advancements);
- Fixed to the locale wireless.

2. BACKGROUND TO THE CONTRACTING AUTHORITY

2.1 The National Infrastructure Commission (the Authority) provides the government with impartial, expert advice on major long-term infrastructure challenges. It has been operating in interim form since October 2015 and was established permanently as an Executive Agency of HM Treasury on 24 January 2017.

2.2 The Authority's relationship with government is set out in a published [Charter](#). This explains that it must carry out its work in accordance with a remit (and terms of reference for specific studies) set by the government, but in all other respects it has complete discretion to determine independently its work programme, methodologies and recommendations, as well as the content of its reports and public statements. A mutually agreed [Framework Document](#) provides further details of the Authority's working relationship with government.

2.3 The Government has outlined the high-level objectives of the Authority as follows:

- (1) Support sustainable economic growth across all regions of the UK;
- (2) Improve competitiveness;
- (3) Improve quality of life.

2.4 Each Parliament, the Authority will deliver a study on the UK's long-term strategic infrastructure needs and produce recommendations to address those needs across the infrastructure sectors including transport, energy, digital communications, water and wastewater, solid waste, flood risk management as well as considering their interdependencies and their interaction with the built environment.

2.5 This study is the National Infrastructure Assessment (NIA). The delivery of the NIA will be overseen by the Authority's Commissioners, and able to commission research and call for evidence from public sector bodies and private sector experts.

2.6 The NIA will consist of two stages: Vision and Priorities, identifying the vision and long-term infrastructure needs, to be published in mid-2017 and the final National Infrastructure Assessment, a roadmap of recommendations including both on policy and infrastructure solutions, to be published in early 2018.

2.7 In 2016, the Authority launched a consultation in order to develop the process and methodology for the NIA. The responses to the consultation, as well as HM Treasury's

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response to its consultation on the Authority, can be found [here](#). There is currently an open call for evidence for the NIA, the details and questions can be found [here](#).

2.8 The Authority's remit also includes in-depth studies. Since the Authority's inception, it has produced a number of reports which include: Transport for a World City, Smart Power, Northern Powerhouse, an interim report on Oxford-Cambridge-Milton Keynes Growth Corridor and, most recently, 5G. The studies can be found on the Authority's website [here](#).

2.9 The Potential Provider must read both the Authority's consultation on the NIA, as well as HM Treasury's response to its consultation on Authority, in order to understand the broader context for this requirement and to inform their response. The Potential Provider must also read the 5G report and supporting papers which can be found [here](#), as they are particularly relevant to this piece of work.

3. BACKGROUND TO REQUIREMENT/OVERVIEW OF REQUIREMENT

3.1 The Authority is looking for accurate, independent and up to date information on the relative benefits of realistic, future digital infrastructure options. Due to the 30 year timeframe the Authority has been asked to consider and the need for up to date information in such a fast moving environment, the work is necessary for the Authority's ability to make objective and evidence based policy recommendations.

3.2 The Authority would like a benefit analysis which compares the relative benefits of the selected realistic, future digital infrastructure options. These include:

- Fibre to the home/premise (FTTH/P);
- G.fast (and subsequent copper based technological advancements);
- DOCSIS 3.1 (and subsequent cable based technological advancements);
- Fixed to the locale wireless.

3.3 The Authority seeks to understand the relative benefits of each digital infrastructure option that most influence the Authority's high level objectives.

3.4 The Authority is tasked with assessing the UK's infrastructure needs over the next 30 years. A long term perspective is, therefore, fundamental to its outlook. Taking into consideration the inherent uncertainty in forecasting, the Authority wishes to evaluate, as far as possible, the currently uncertain, yet reasonably foreseeable (i.e. use cases and enabled services) that each digital infrastructure option may enable over, or more effectively than, the other options. This must be informed by a view on which services and use-cases, both fixed and mobile, will best deliver the Authority's high level objectives. This piece of work should complement the work carried out for the Authority's 5G project – the final and supporting reports can be found [here](#).

3.5 The aim, therefore, is to deliver a piece of work that is at the forefront of research in this area and informs the debate surrounding the benefits of future, realistic digital infrastructure options in the UK.

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- 3.6 The Authority has procured a separate cost analysis for the same set of realistic, future digital infrastructure options. The initial findings of the two pieces of work will be used to inform the Vision and Priorities document, and the final conclusions to inform the recommendations to government in the final NIA. Compatible assumptions between both reports will, therefore, need to be agreed between suppliers and with the Authority.

4. DEFINITIONS

| Expression or Acronym | Definition |
|------------------------------|--|
| DOCSIS | Data Over Cable Service Interface Specification. It is a standard for the high speed transmission of data over cable networks. |
| FTTH/P | Fibre to the Home / Premises. A form of fibre optic communication delivery in which the optical signal reaches the consumer's home without relying on a copper access. |
| Fixed to the locale wireless | A broadband transmission using radio signals instead of physical cables to connect two fixed locations. Broadband access available in the surrounding area of the locale including through walls and inside the premise. |
| G.fast | A broadband transmission standard that further increases the access speeds possible on copper lines. |
| NIA | Means the National Infrastructure Assessment. |

5. SCOPE OF REQUIREMENT

- 5.1 The high level scope of the requirement is to outline, compare and contrast the associated benefits of deploying the following digital infrastructure options, over at least a 30 year period:
- Fibre to the home/premise (FTTH/P);
 - G.fast (and subsequent copper based technological advancements);
 - DOCSIS 3.1 (and subsequent cable based technological advancements);
 - Fixed to the locale wireless.
- 5.2 The Supplier must propose and agree upon with the Authority the appropriate specifications of the aforementioned infrastructure options. This will be tested and confirmed with other third parties of the Authority's choice. The Supplier must consider to what extent these options present alternatives and whether they should be considered in combination form or as alternatives. The Supplier, and the Supplier of the cost analysis, will be expected to propose possible combinations to the Authority. The Authority will work collaboratively with the Supplier of this benefit analysis, as well as the Supplier of the cost analysis, and agree upon which, if any, combinations are used. These combinations must be the same for both pieces of work and will be confirmed and agreed upon by the Authority.
- 5.3 This piece of work is threefold, seeking to:

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- 5.3.1 Firstly, present a historical analysis of how, why and by whom identified key technologies were taken up. This will inform the extent to which historical patterns can be applied to forecast unknown future benefits;
- 5.3.2 Outline and contrast the quantifiable and known benefits of the defined options;
- 5.3.3 Analyse the currently unknown, yet reasonably foreseeable, benefits (i.e. use cases and potentially enabled services) that a digital infrastructure option may enable over, or more effectively than, the other options.
- 5.4 *Present a historical analysis for the pattern of usage of key technologies in order to determine if common trends exist and the extent to which they could be applied today.*
- 5.4.1 There is inherent uncertainty and lack of foreseeability in forecasting future benefits, particularly in such a fast moving sector on a thirty year basis. As a result, the Authority requires a historical analysis for the pattern of usage, through the consideration of drivers and users of past key technologies over time. The purpose is to determine whether common trends exist and to consider the relevance of those trends when forecasting digital infrastructure today.
- 5.4.2 The historical analysis must include the following key technologies: (1) PC's in the office and the home; (2) mobile phones; and (3) broadband in the office and the home. The Supplier is able to suggest other adopted key technologies that may be of interest, which should be agreed upon with the Authority.
- 5.4.3 The analysis must determine the pattern of how the aforementioned key technologies were taken up. This includes the identification of the technologies and applications that drove usage, as well as the identification of the users. The analysis must consider both the drivers and the users of the technologies over time in order to capture and assess the pace of the pattern of usage.
- 5.4.4 Based on the findings of the historical analysis for each key technology, the Supplier should determine whether common trends exist and evaluate the main commonalities and notable areas of difference.
- 5.4.5 The conclusion of the historical analysis must determine whether any common patterns to usage can be applied to the situation today. This must acknowledge future benefits and evaluate the extent to which they can be reasonably foreseen. The Supplier should analyse the use cases that were forecasted as the aforementioned key technologies emerged. The Supplier should subsequently compare the forecasted use cases with those that were ultimately enabled once the key technologies were adopted.
- 5.5 *Outline the relative quantifiable and known benefits of the defined options:*



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- 5.5.1 The fundamental purpose of this requirement is to analyse the benefits each digital infrastructure option can provide relative to the others, when looking at least 30 years ahead.
- 5.5.2 The first part of the work will identify the private, social and external benefits of each digital infrastructure option that are known and quantifiable, relative to the others. These benefits must be assessed in view of the Authority's high level objectives as detailed in section 2 of this document. The Supplier must provide a long list of relative benefits, and then discuss with the Authority how they intend to quantify and rank them. Once agreed upon with the Authority, the most significant benefits will form the short list and will be discussed in detail.
- 5.5.3 The section must be supported by national or international use cases to illustrate the relative benefits derived when the digital infrastructure options are deployed in practice.
- 5.5.4 The Supplier must consider the timing of benefits and when they will be realised in addition to dynamic effects (cumulative causation). This must be in context of time to deploy and predicted life time of the asset. This may differ for different geographical areas of the country, and if so, it must address where those benefits are likely to be accrued in the UK – for example are the benefits specific to industrial settings, urban or rural settings.
- 5.5.5 The Supplier must also seek to briefly compare its findings with other work which has sought to quantify benefits, either nationally or internationally.
- 5.6 Outline the currently unknown, yet reasonably foreseeable, relative benefits (i.e. use cases and enabled services) that each digital infrastructure option may enable over, or more effectively than, the other options:
- 5.6.1 The fundamental purpose of this requirement is to capture the current unknown, yet reasonably foreseeable and therefore significant, benefits that a digital infrastructure option may enable, or enable more effectively, than the others. These benefits would materialise through newly enabled services and potential use cases. Ultimately, the Authority seeks to take a forward looking approach in order to understand the potential benefits each digital infrastructure option may enable over the others and how significant those benefits may be.
- 5.6.2 The Supplier should begin by determining the relative potential enabled services and use cases. The use cases should complement the work carried out for the Authority's 5G project – Connected Future – of which, the final and supporting reports can be found [here](#). It must be informed by a view on which services and use-cases, both fixed and mobile, will best deliver the Authority's high level objectives.
- 5.6.3 The Supplier must then work with the Authority to agree upon which use cases and enabled services to focus on. Once agreed, this will output a prioritised view of use-cases. Where possible, case study examples should
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be developed to illustrate the use-cases and the benefits they may offer. The Supplier must seek to quantify, as far as possible, the relative benefits for the agreed upon use cases and enabled services. The Supplier must provide a range of potential figures based on the findings from the historical analysis and existing forecasts.

- 5.6.4 Again, the Supplier must address where those benefits are likely to be accrued in the UK – for example are the benefits specific to industrial settings, urban or rural settings.
- 5.6.5 Where there is evidence, any international comparators should be highlighted. For example do developments in any other countries attach weight to particular use-cases and why.
- 5.6.6 The benefits derived from each digital infrastructure option will inevitably depend on demand. Despite the uncertainty, it is useful to consider and compare forecasted bandwidth demand with the digital infrastructure options' capabilities. The Supplier must address this area of uncertainty by providing a range of demand forecasts, looking at least 30 years ahead, based on the historical analysis of previous trends in demand as well as credible sources. Determination of a credible source must be agreed upon with the Authority. From the range of demand forecasts, over at least a 30 year period, the Supplier must map the capability of the various digital infrastructure options, as well as their forecasted future capabilities. The purpose, considering exogenous demand in isolation, is to allow the Authority to understand forecasted demand, and determine the estimated points in time that particular digital infrastructure options may be preferable.
- 5.6.7 The Supplier should also ensure to include the historical trends in data compression capabilities when forecasting future demand.
- 5.6.8 In addition, the Supplier must consider the extent to which a digital infrastructure option may stimulate demand i.e. how an increase in supply of bandwidth causes an increase in demand. This analysis must again be based upon the evidence gathered in the historical analysis as well as credible sources.
- 5.7 All assumptions made must be clearly stated and agreed upon with the Authority.
- 5.8 The scope of the requirement excludes analysis of current government or Ofcom strategy.
- 6. THE REQUIREMENT**
- 6.1 Outputs: The key outputs from this project will be a benefit analysis of the following digital infrastructure options:
- Fibre to the home/premise (FTTH/P);
 - G.fast (and subsequent copper based technological advancements);
 - DOCSIS 3.1 (and subsequent cable based technological advancements);



- Fixed to the locale wireless.

- 6.2 These products must be delivered by no later than 27th September 2017 to ensure that the findings of the report can be used to inform the NIA. Delivery will be staggered, with output being supplied to the Authority from the 10th May 2017, with 27th September 2017 an absolute deadline for all products. The Authority expect to be able to use the historical analysis to inform Vision and Priorities – due to be published at the beginning of June 2017. The Supplier must therefore ensure that, following feedback and comments by the Authority of the first draft on 10th May 2017, interim findings can be provided by 22nd May 2017. The Supplier must provide a draft final report by 4th September 2017, the Supplier should make changes following feedback by the Authority by 11th September 2017 which can be peer reviewed, with the final report due on 27th September 2017.
- 6.3 It is expected that the findings presented in the report are quality assured, including through peer review with relevant experts and that the report is finished to a publishable standard. All assumptions and caveats must be clearly highlighted and agreed upon with the Authority.
- 6.4 All materials (including research, calculations and models) used to generate the analysis must be made available to the Authority for future use.
- 6.5 At the start of the project we expect to hold an inception/scoping meeting with the successful supplier, and for a short inception report to then be provided which clarifies the approach to be taken, along with a plan setting out key milestones and dates for deliverables, risks and how these will be managed etc. – for agreement, before proceeding to carry out the analysis. The Authority expects the Supplier to work closely with the Authority, including through weekly meetings or phone calls and other communication.
- 6.6 The Authority has procured a cost analysis for the same future digital infrastructure options. The Authority expects that the assumptions used are compatible and that the Supplier works collaboratively with the Supplier of the cost analysis contracted by the Authority. That may include, but is not limited to sharing analysis and methodologies, and developing jointly agreed assumptions, assessments and conclusions to ensure that the overall findings of the individually commissioned pieces of research are compatible.
- 6.7 The Supplier must also be prepared to do a presentation of the report to technical and non-technical members of the Authority in a clear and concise fashion. The purpose would be to set out the key findings from the report, and the key assumptions, results, and caveats in a clear and concise fashion, to ensure these are fully understood by Commissioners.
- 6.8 The Supplier must submit a final report detailing analysis, findings and comments in a clear and concise fashion – this must reflect any inputs/requests made by the Authority during the production phase. The Authority intends to publish this report.

7. KEY MILESTONES

- 7.1 The Potential Provider should note the following project milestones that the Authority will measure the quality of delivery against:

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| Milestone | Description | Timeframe |
|-----------|---|---------------------------------|
| 1 | Project inception meeting with the Authority, to agree the milestones for the project and precise coverage of the report. | Within week 1 of Contract Award |
| 2 | An inception report to be provided, and agreed by the Authority, clarifying the approach to be taken, along with a plan setting out key milestones and dates for deliverables, risks and how these will be managed. | Within week 2 of Contract Award |
| 3 | Update meeting / phone call on the project including any findings or assumptions to agree upon. | Weekly |
| 4 | The Supplier must provide the Authority with the first draft of the historical analysis for use in Vision and Priorities | 10 th May 2017 |
| 5 | The Supplier must provide the Authority with the final version of the historical analysis for use in Vision and Priorities | 22 nd May 2017 |
| 6 | The Supplier must provide the Authority with a longlist of benefits and how they intend to quantify and rank them in significance. | 5 th June 2017 |
| 7 | First draft of the skeleton structure and interim findings to be shared with the Authority. | 12 th June 2017 |
| 8 | Second draft of the skeleton structure, following comments and feedback by the Authority, and interim findings to be shared. | 26 th June 2017 |
| 9 | First draft of final report to be shared with the Authority. | 4 th September 2017 |
| 10 | Second draft of final report to be shared with the Authority, who will send for peer review. | 11 th September 2017 |
| 11 | Final version of the report suitable for publication. | 27 th September 2017 |

8. AUTHORITY'S RESPONSIBILITIES

- 8.1 The Authority will share pertinent information received through relevant stakeholders and introduce the Supplier to relevant stakeholders, who can offer valuable advice on the requirement.



9. REPORTING

- 9.1 As referred to within the Key Milestones, section 7 of this Appendix B – Statement of Requirements.

10. VOLUMES

- 10.1 This is a substantial piece of work – the expectation is that the key outputs and related materials will be both extensive and of publishable standard.

11. CONTINUOUS IMPROVEMENT

- 11.1 The Supplier will be expected to give due consideration to how the way in which the required Services are to be delivered throughout the Contract duration can be continually improved.
- 11.2 The Supplier must present new ways of working to the Authority during weekly Contract review meetings or phone calls.
- 11.3 Changes to the way in which the Services are to be delivered must be brought to the Authority's attention and agreed prior to any changes being implemented.

12. SUSTAINABILITY

- 12.1 N/A

13. QUALITY

- 13.1 The recommendations to government in the National Infrastructure Assessment will be informed by this report. The Authority intends to incorporate the findings of the historical analysis into the Vision and Priorities document. The interim findings must first be presented to the Authority by 10th May 2017 for feedback, with the final interim findings provided by 22nd May 2017 as an absolute deadline. The absolute deadline for the final report is 27th September 2017. The report must therefore be to a publishable standard, with all assumptions and caveats clearly highlighted and referenced appropriately.
- 13.2 As part of the Authority's quality assurance process, the Authority can and will choose to have peer review of the output to be conducted by third parties and/or the Authority's expert advisory panels. The quality assurance process must be agreed with the Authority once the Potential Provider has been selected. It is required that the Supplier will need to work proactively and collaboratively with the Authority to consider any reasonable comments and to incorporate them into their work and output accordingly.

14. PRICE

- 14.1 Prices should be capped for the term of the contract, rates inclusive of expenses and exclusive of VAT.
- 14.2 Bids are expected to range between £70,000 and £100,000, prices above this maximum ceiling will not be considered.
- 14.3 It is the Authority's intention to adopt the following payment schedule:
- 14.3.1 [5]% of the total contract price for successful delivery of milestone [4];
- 14.3.2 [10]% of the total contract price for successful delivery of milestone [5];

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- 14.3.3 [5]% of the total contract price for successful delivery of milestone [6];
- 14.3.4 [5]% of the total contract price for successful delivery of milestone [7];
- 14.3.5 [10]% of the total contract price for successful delivery of milestone [8];
- 14.3.6 [20]% of the total contract price for successful delivery of milestone [9];
- 14.3.7 [10]% of the total contract price for successful delivery of milestone [10];
- 14.3.8 [35]% of the total contract value for successful delivery of milestone [11].

14.4 Prices are to be submitted via the e-Sourcing Suite using Appendix E excluding VAT.

15. STAFF AND CUSTOMER SERVICE

- 15.1 The Authority requires the Potential Provider to provide a sufficient level of resource throughout the duration of the Contract in order to consistently deliver a quality service to all Parties.
- 15.2 The Supplier’s staff assigned to the Contract shall have the relevant qualifications and experience to deliver the Contract.
- 15.3 The Supplier shall ensure that staff understand the Authority’s vision and objectives and will provide excellent customer service to the Authority throughout the duration of the Contract.

16. SERVICE LEVELS AND PERFORMANCE

16.1 The Authority will measure the quality of the Supplier’s delivery by:

16.1.1

| KPI/SLA | Service Area | KPI/SLA description | Target | Remedy |
|---------|---------------------------------|---|----------------------------------|--------------------|
| #1 | Agreed approach | An inception report to be provided, and agreed by the Authority, clarifying the approach to be taken, along with a plan setting out key milestones and dates for deliverables, risks and how these will be managed. | Within 2 weeks of contract award | N/A |
| #2 | Key outputs delivered in draft | A first draft of the historical analysis to be provided to the Authority for comment. | 10 th May 2017 | 5% penalty charge |
| #3 | Key outputs in publishable form | Interim findings from the historical analysis to be available for use in Vision and Priorities. | 22 nd May 2017 | 10% penalty charge |
| #4 | Key outputs | A first draft of skeleton structure and interim findings on: | 12 th June 2017 | 5% penalty charge |



| | | | | |
|----|--|---|---------------------------------|--------------------|
| | delivered in draft | <ul style="list-style-type: none"> Outline the relative quantifiable and known benefits of the defined digital infrastructure options; Outline the currently unknown, yet reasonably foreseeable, relative benefits (i.e. use cases and enabled services) that each digital infrastructure option may enable over, or more effectively than, the other options. | | |
| #3 | Key outputs delivered in draft | <p>A second draft of the skeleton structure and revised interim findings on:</p> <ul style="list-style-type: none"> The Authority's comments on the first draft Outline the relative quantifiable and known benefits of the defined digital infrastructure options; Outline the currently unknown, yet reasonably foreseeable, relative benefits (i.e. use cases and enabled services) that each digital infrastructure option may enable over, or more effectively than, the other options. | 26 th June 2017 | 20% penalty charge |
| #4 | Key outputs in final, publishable form | <p>A final report that presents</p> <ul style="list-style-type: none"> The Authority's comments on the previous drafts and interim findings; Outline the relative quantifiable and known benefits of the defined digital infrastructure options; Outline the currently unknown, yet reasonably foreseeable, relative benefits (i.e. use cases and enabled services) that each digital infrastructure option may | 27 th September 2017 | 60% Penalty Charge |

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| | | enable over, or more effectively than, the other options. | | |
|--|--|---|--|--|

17. SECURITY REQUIREMENTS

17.1 All data security requirements will align with the Terms and Conditions of the Crown Commercial Service’s Terms and Conditions within Appendix C.

18. INTELLECTUAL PROPERTY RIGHTS (IPR)

18.1 All analysis (including any calculations, models and draft reports) used to generate the outputs must be provided to the Authority for future use.

19. PAYMENT

19.1 Payment can only be made following satisfactory delivery of pre-agreed certified products and deliverables.

19.2 Before payment can be considered, each invoice must include a detailed elemental breakdown of work completed and the associated costs.

19.3 Invoices to be sent to:

HM Treasury
Finance Department
1 Horse Guards Road
London
SW1A 2HQ

20. ADDITIONAL INFORMATION

20.1 The supplier should demonstrate that they are open to working collaboratively with other suppliers, contracted by the Authority in order to deliver related pieces of analysis.

21. LOCATION

21.1 The location of the Services will be carried out at the offices of the supplier – however frequent meetings will need to take place with the Authority who are based in London.



ANNEX 1

HM Treasury Group – travel and expenses policy



HM Treasury Group –
travel and expenses p