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# Yorkshire Green Energy Enablement (GREEN) Project

**Volume 5**

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Options Appraisal, National Grid**

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National Grid's job is to connect people to the energy they use to warm and light their homes, to connect factories and offices to the power that keeps them going and to provide the infrastructure essential to maintain our modern lifestyle.

Our approach to Options Appraisal  
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We own and manage the grid to which many different energy sources are connected. In Britain we run systems that deliver gas and electricity across the entire country, holding a vital position at the centre of the energy system.

That puts us at the heart of one of the greatest challenges facing our society: the creation of new sustainable energy solutions and the development of an energy system that can underpin our economic prosperity in the 21st century.

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# Options Appraisal

As part of National Grid's development of new gas and electricity infrastructure, we carry out Options Appraisal on our projects. Options Appraisal has been developed primarily for major infrastructure projects under the Planning Act 2008, though we may apply the process to other National Grid projects. There are often a number of different ways that we could satisfy the need for a new connection, perhaps involving different locations, technologies or designs. Each time a new connection is needed, we have to make judgements about the best way to achieve it. Options Appraisal provides information to help inform those judgements.

Stage 01 – **Strategic Options**

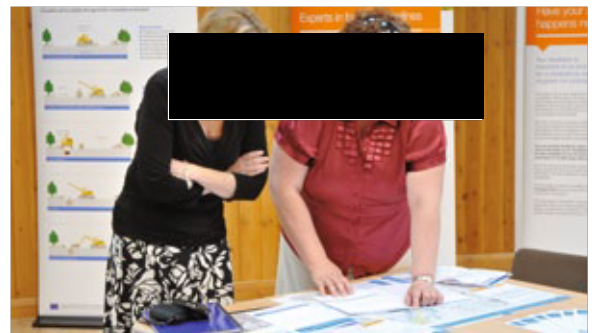
Stage 02 – **Outline Routeing and Siting**

Stage 03 – **Detailed Routeing and Siting**

Stage 04 – **The Proposed Application**

Stage 05 – **Application for Development Consent**

Stage 06 – **Consideration and Hearing**



### What is Options Appraisal?

Options Appraisal is a robust and transparent process we use to compare options and to assess the positive and negative effects they may have across a wide range of criteria including environmental, socio-economic, technical and cost factors.

Options Appraisal is one part of our project development process. The different planning stages of our project development are shown in the diagram opposite. This diagram shows the development of our projects from the earliest stage of identifying high-level (strategic) options right through to the submission of detailed proposals. We begin by looking at all of the technically feasible options, which may cover a very wide geographical area and a number of different technologies, such as gas pipelines or compressors. We then narrow down the options through a process of careful analysis and consultation. Having established which of the potential options we think best meet society's needs, we focus in on broad corridor locations for any new infrastructure by consulting local communities and others. Finally we concentrate on exactly where a new connection might run to minimise any impacts on local people and the environment.

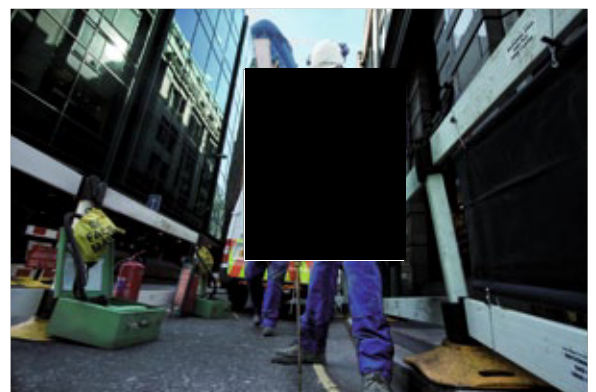
The process, which is described fully in this document, is intended as guidance for our project teams and for all stakeholders with an interest in our projects. All projects are different and where we need to deviate from this process, we will explain the reasons and ensure that we satisfy all of our obligations. For example, in the case of some smaller projects such as the replacement of a short section of gas pipeline or overhead line, we may combine some or all of stages 1, 2 and 3 to identify a preferred choice.

At each stage of the process we gain more detailed information about the constraints and issues that might affect a particular option. As we learn more, we back-check at each stage to see if any new information has come to light which affects any conclusions previously made as regards technology or options.

### Why do we do Options Appraisal?

We carry out Options Appraisal because it provides a framework which allows us to identify and balance technical, socio-economic, environmental and cost considerations in selecting project options. It also enables us to document in a transparent manner the information on which we have based our judgements.

The information we collect as part of Options Appraisal goes on to inform discussions with stakeholders including the public. Alongside community and stakeholder consultation, Options Appraisal is a key tool in helping us develop, and make decisions on projects.



## When do we use Options Appraisal?

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Options Appraisal can be applied at different stages of project development, but mainly in the early stages of strategic options and outline routing and siting. The table opposite shows how we use Options Appraisal at different stages.



Project Stage	Options Appraisal normally required?	Purpose of OA work at this stage
<b>Stage 1</b> Strategic Options Looking at the range of possible ways that a connection can be achieved	Yes	(i) Comparing technically feasible strategic options to inform the selection of a preferred strategic option(s).
<b>Stage 2</b> Outline Routeing / Siting Looking at broad corridors for linear infrastructure or general locations for other structures	Yes  As appropriate	(i) Comparing route corridors / sites to inform the selection of a preferred route corridor / site.  (ii) Back-checking and review of the performance of the preferred route corridor or site against the anticipated performance of the preferred strategic option if there have been material changes.
<b>Stage 3</b> Detailed Routeing / Siting Looking at the precise alignment or precise location for infrastructure	As appropriate  As appropriate	(i) Comparing alignment options to inform the selection of a proposed alignment (if required), In some cases, only a single alignment will be developed.  (ii) Back-checking and review of the performance of the preferred alignment against the anticipated performance of the preferred route corridor if there have been material changes.
<b>Stage 4</b> Proposed Application Consulting and preparing an application for development consent	As appropriate  As appropriate	(i) Appraisal of the performance of any further technically feasible options that have not previously been considered and which have been identified through formal pre-application consultations.  (ii) Back-checking and review of the performance of the proposed scheme in the light of any new information arising through consultation.
<b>Stage 5</b> Application for Development Consent	N/A	
<b>Stage 6</b> Consideration and Hearing	N/A	



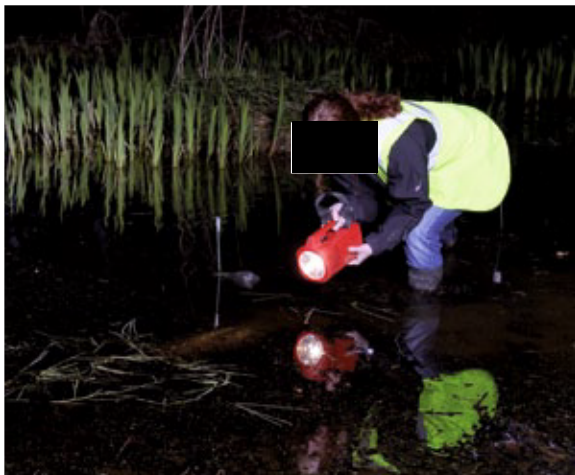
# How we use Options Appraisal to inform decisions

Options Appraisal ensures that we have considered all the relevant factors when selecting a preferred option.

Options Appraisal is underpinned by a set of overarching principles which reflect our statutory duties, which assist us in our decision-making and which help achieve an appropriate balance between competing interests that must be taken into account in Options Appraisal.

**We will generally consider options to have an advantage if:**

- we can use or adapt existing infrastructure, or where we can negotiate different commercial arrangements with our customers to achieve a need, rather than building new infrastructure;
- they are shorter, compared with longer routes;
- they are financially less expensive compared to other more expensive options;
- they avoid or mitigate environmental or socio-economic impacts.



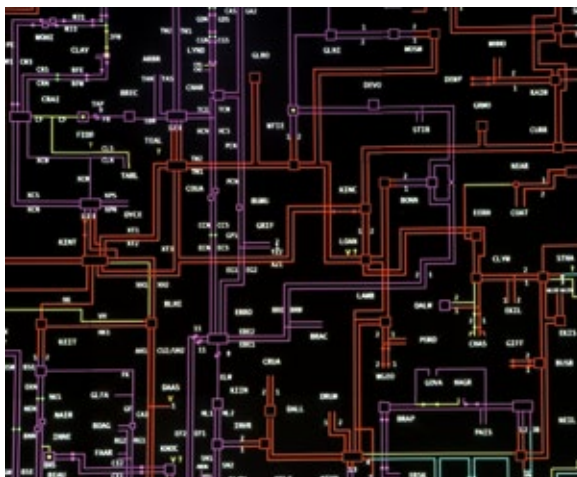
Taking into account the views of our stakeholders National Grid will make a judgement on the option which best balances all of our duties and obligations.

Together with the feedback we receive during the consultation process, Options Appraisal informs our decision-making at various points of the project. It helps us to make comparisons between the options available, by taking into account the information we have collected for each individual topic and sub-topic for each option.

In most cases a single preferred option will be identified. However, where it is not possible or appropriate to narrow down the selection to one preferred option, then more than one option may be taken forward.

One option may perform better on technical and environmental grounds than another, but at much higher cost. In those cases, we need to make a judgement as to whether the additional benefits of the more expensive option justify the additional cost. In doing this we will take into account consultation feedback we have received.

Further information on Appraisal sub-topics can be found on pages (10–15).



# Outputs of Options Appraisal

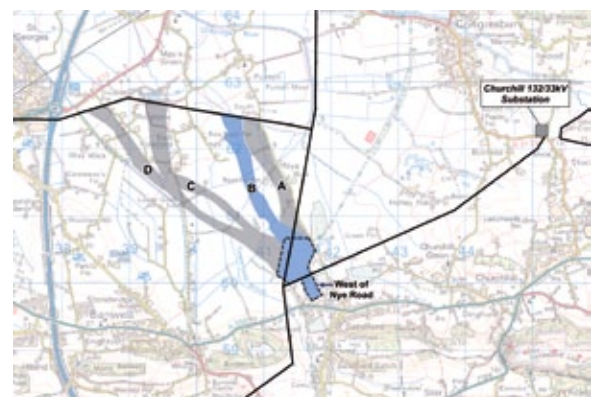
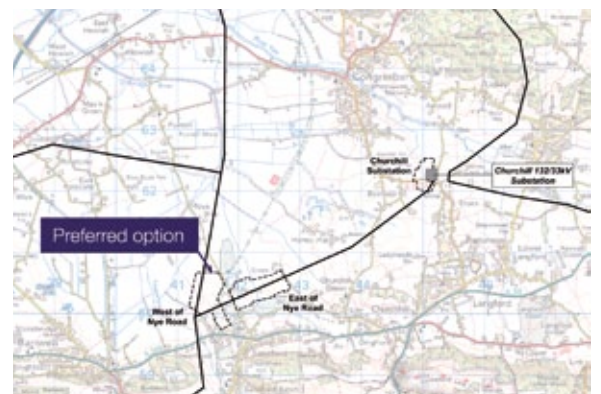
The results of Options Appraisal are normally reported at each stage of the project evaluation and will inform the project consultation.

**For Stage 1** where we compare strategic options, results are reported in our Strategic Options Report.

**At Stage 2** where we look at broad corridors or general locations, the findings will be presented in the Route Corridor or Siting Study Report.

**At Stage 3** where we consider the precise alignment or location of any infrastructure, then any Options Appraisal carried out will be included in the consideration of alternatives section in the Environmental Statement.

**At Stage 4** where we consult on and prepare our application for development consent, any Options Appraisal carried out will be included in the application documents.



# Appraisal Topics

There are four main topics we consider during our assessments of potential options. These can be broken down further into sub-topics, which are shown in the table below.

Options Appraisal is designed to be as useful as possible, both to us in making a decision, and to the public in understanding what information we have used to help us reach our decision. For this reason, we carefully consider all sub-topics and only include in our Options Appraisal those which could have a bearing on the choice of option. For example, if there are no features of historic importance, this topic will not be considered within our appraisal.

We will not include sub-topics if all of the options we are considering would have similar effects. For example, if all of our options would have similar effects on air quality or noise levels, then we will scope those sub-topics out of our Options Appraisals (though we will still consider any likely effects in our Environmental Statement). Once we have decided which of the sub-topics are most relevant to each option, we discuss this scope with our stakeholders and consult them on which sub-topics they consider to be particularly important given their knowledge of the local area.

Technical	Environmental	Socio-economic	Cost
Technical complexity	Landscape and Visual	Local economic impact	Capital cost
Construction/project delivery issues (incl resource and waste issues)	Ecology	Aviation and Defence	Lifetime cost
Suitability of technology	Historic environment	Traffic and Transport	
Network capacity	Water		
Network efficiencies/ benefits (incl energy efficiency)	Local air quality		
	Noise and Vibration		
	Soils and Geology		

# Technical Considerations

Before we start Options Appraisal, we review the technical feasibility of potential options to ensure that the options we are considering are all achievable.

The technical sub-topics we use in Options Appraisal are listed below.

## Technical complexity

Options that are more complex may increase the overall complexity of the transmission system. This in turn can make it more difficult for us to switch off parts of the system (e.g. for maintenance) and may make the system less able to cope with some faults. We generally consider those options which are less complex as more advantageous.

## Construction/project delivery (including resource and waste issues)

Options that involve a greater quantity of construction, require us to switch off parts of the system for long periods of time to allow for construction and/or which require untried or untested or difficult construction techniques, may all present a delivery and cost risk to the project. We consider the volumes of materials used in constructing different infrastructure options and the volumes of waste that will be generated, to identify the least 'resource-hungry' options.

## Suitability of technology

In some situations, a new or emerging technology may appear to be suitable, but it may not be proven to work in the precise situation required. This can present a technology risk that could increase costs, delay the delivery of the project and/or reduce the resilience of the network to some faults. We will generally therefore consider options which use proven technologies to be an advantage where we are unable to mitigate the risks associated with alternatives.

## Network capacity

Options which provide the gas or electricity transmission system with additional capacity, over and above the minimum required for that project may reduce the requirement for or cost of further reinforcement in the future. We will therefore consider such options to have an advantage if we believe there will be a need for increased capacity in the future.

## Network efficiencies/benefits

Some options will have additional benefits beyond what they are designed to do. Options which improve the overall efficiency of the transmission network (for example, by reducing transmission system losses), and/or which deliver any other system benefits, will generally be considered to have an advantage over those which do not.

Where appropriate we can also compare the implications on climate change for each of the options under consideration by comparing their energy use. For example, for gas infrastructure projects we can compare the energy efficiency of using pipelines compared with compressors.

Operating our networks safely is a fundamental prerequisite and a vital requirement underpinning our licensed network operator responsibilities. Only options that would be safe to build and operate will be taken forward for further consideration.



# Environmental Considerations

We consider a wide range of environmental sub-topics throughout the different stages of the Options Appraisal process. Generally, the environmental sub-topics that we use in Options Appraisal are set out below.

## Landscape and Visual

The effects of our infrastructure on the character of the landscape or on people's views are important issues that we need to consider. Even infrastructure which is largely underground can affect the landscape and can require some above-ground structures. For each option, we assess the likely effects on important areas such as National Parks or Areas of Outstanding Natural Beauty (AONB), and the effect on views from settlements or other features. We recognise however, that not all sites that are valued by and important for the wellbeing of local communities are included in designated areas. In general, options will be of benefit if they avoid or minimise effects on the landscape or on views.

## Ecology

Wherever possible we seek to avoid negative effects on nature conservation. We assess the likely effects of each option on important areas including Special Areas for Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and other features of nature conservation value. When comparing between options, those which avoid or mitigate impacts on sites of importance for ecology or biodiversity will be considered advantageous.

## Historic Environment

Wherever possible we seek to avoid negative effects on important historic features. In carrying out Options Appraisal, we compare the likely effects of different options on features such as World Heritage Sites, Scheduled Monuments and Listed Buildings. Most "point" sites can relatively easily be avoided by National Grid infrastructure, but there may be impacts on the setting or context of such features. Those options which can avoid or mitigate impacts on features of cultural heritage will generally be advantageous compared with those which do not.



### Local air quality

Although there may be some temporary impacts on local air quality due to dust and emissions caused during construction, most National Grid infrastructure does not have significant impacts on local air quality. However under certain circumstances, such as if there is an Air Quality Management Area, or where different technology options with very different effects on local air quality are being considered, this will be included in Options Appraisal. Options which have less effect on air quality will be advantageous.

### Noise and Vibration

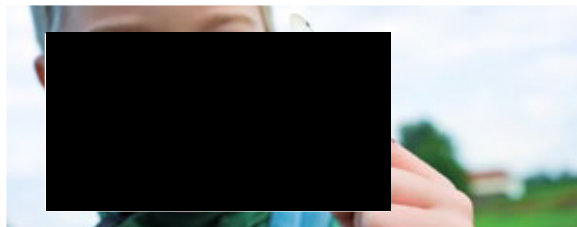
During the Options Appraisal we consider any effects of noise or vibration on people and the local environment. While noise and vibration issues are considered at the Environmental Assessment stage of any potential project, they are not always relevant during Options Appraisal. However, if there are sensitive receptors in the area, and if there is an obvious difference in the noise performance of options under consideration, then it can be differentiated from other options at this early stage. Options which have less noise effects will be advantageous compared with those with more.

### Water

We consider all effects on the water environment including water quality and flood risk. This is particularly relevant for infrastructure with a large footprint or which is located underground. Options which have less effects on the quality of water or the risk of flooding will be advantageous.

### Soils and Geology

These are important resources both economically, for agriculture, and biologically. Where possible we therefore seek to minimise effects on the soil resource. We identify areas of value such as Geo-parks, geological SSSIs and large areas of valuable farmland and assess the potential effects of each option. Those options which can avoid or effectively mitigate any such impacts will be advantageous.





# Socio-economic Considerations

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The potential effects of our projects on people, communities and the economy are important considerations in our appraisals of options. The socio-economic sub-topics which we consider are set out below.

## Local Economic Activity

Economic activity is included in our Options Appraisal process to make sure that we consider any benefits or disadvantages our infrastructure might have on the local economies where they are located. We do not take into account the wider national economic benefits of our projects, as these would normally be the same for each option considered and hence would not help in deciding between options.

Ultimately, when considering whether particular proposals should be granted consent, the decision-making body must, as set out in the Overarching Energy National Policy Statement EN-1, consider whether any adverse impacts arising from the proposed development outweigh its benefits. To that end, broader national, regional and local economic benefits arising from the connection of secure, reliable, affordable and low carbon sources of energy will be taken into account by decision-makers.

At Stages 1 and 2, we appraise our options with regard to key receptors including, significant areas of economic activity such as major businesses, tourist attractions and large areas of land zoned for industrial or employment use which could potentially be affected by the option. Where Options Appraisal is considered appropriate at Stage 3, we would carry out a more detailed analysis of the impact of different options on the local economy. We will generally consider as advantageous options which benefit or do not have an adverse impact on local economies.

## Traffic and Transport

We assess the potential effects of our projects on traffic and transport infrastructure and the users of it, including road, rail, ports, waterways, public rights of way and, where appropriate, public transport. At Stage 1 this may include a very high-level assessment to identify any potentially significant transportation issues, such as inadequate road networks to transport large materials or equipment. At later stages, we carry out a more detailed assessment of the potential effects on local road users. We generally consider as advantageous options that cause the least disruption to local users or roads and rights of way.

## Aviation and Defence

Aviation and defence areas may also have an influence over the selection of options. Examples may include airports, airfields, radar sites and military training areas. Some of these may be absolute constraints on location, or may have safeguarding limitations that we would need to comply with, for example by the use of low height pylons or undergrounding. We may therefore discount an option if we are unable to find an acceptable means of avoiding or mitigating such constraints.

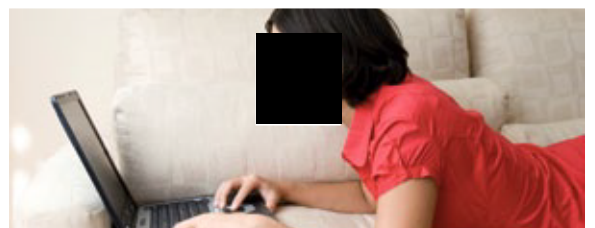
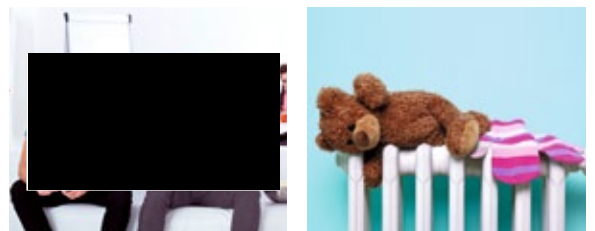
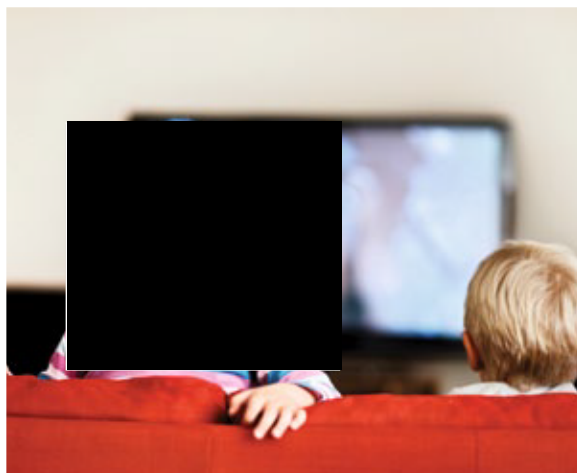
## Cost Considerations

National Grid has a statutory duty to develop and maintain a safe, efficient coordinated and economical network. The financial impact of a project is therefore a fundamental part of the appraisal process. The differences in cost between options can often be extremely large, especially when different technologies are being considered (e.g. overhead lines versus underground cables, or gas pipelines versus compressors), as well as the length of the connection. It is therefore important to factor this in to any decision we make about which option we choose.

We prepare a cost estimate for each option, based on broad assumptions regarding the technology to be used and the likely length or scale of the scheme. We explain how we have done this and which unit cost estimates we have used in the relevant report for that Stage of the process, for example; Strategic Options Report, Route Corridor Study etc..

The cost estimates we produce for new infrastructure include not only the total cost of construction/installation, but also the lifetime operation and maintenance costs. We take account of relevant recent information on costs and use a net present value (NPV) discount rate consistent with our lifetime cost calculations.

As set out in the guiding principles, options with lower capital and lifetime costs will generally be advantageous compared with those with higher costs.



## Further Information

The following reports  
are available at



Our approach to the design  
and routing of new electricity  
transmission lines

Our approach to Consultation

Our approach to Socio-economics





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