NGN 2014/15 Network Innovation Competition

Optimising the Transportation of Shale and Other Unconventional Gases in the UK
ISP Questions – May 9th 2014

1. What is the key challenge/problem that this project is looking to address?

NGN has been following the growing debate surrounding the potential large scale development of shale gas in the UK over a number of years. It has become apparent through this time that there has to date been little discussion or consideration of the issues surrounding the efficient development of the transportation infrastructure required to facilitate this production capacity. The scale of the investment required to deliver this infrastructure could be at a level not seen in the UK gas industry since the conversion of the UK to North Sea Gas more than 30 years ago.

There are a number of key issues that the lack of consideration of the issues relating to infrastructure development raises including:

- Will the current framework deliver efficient production capacity and location decisions?
- Will the scale of infrastructure investment required deliver an optimal solution?
- Does the current framework consider the full range of costs and benefits of large scale infrastructure development to deliver an optimal solution for the UK economy?

These specific issues have already arisen in a number of smaller scale projects that NGN have been presented with recently. An example includes the development of a large onshore gas field within NGN's area that was attempting to evaluate the options for connection to the gas network and in particular the trade off between connecting to the gas distribution network or the gas transmission network.

Consideration of a set of potential distribution connection options highlighted a number of issues which indicated that including these within the analysis could provide a wider range of investment options, with a different cost profile but additionally the delivery of wider and longer term benefits when compared to current arrangements. Current arrangements do not consider a wider range of issues that could inform investment decisions and deliver these additional benefits including:

- Socio-economic issues such as fuel poverty
- Economic/Customer Value benefits of extending access to wider energy market for off-gas energy users
- Carbon impact of investment options including carbon footprint of network investments and operations, the potential to facilitate greater connection of low carbon sources of gas, reduction in carbon footprint of gas customers who switch to using gas from higher carbon sources of energy.
- Sustainability of energy supplies
- Operational impacts of alternative options

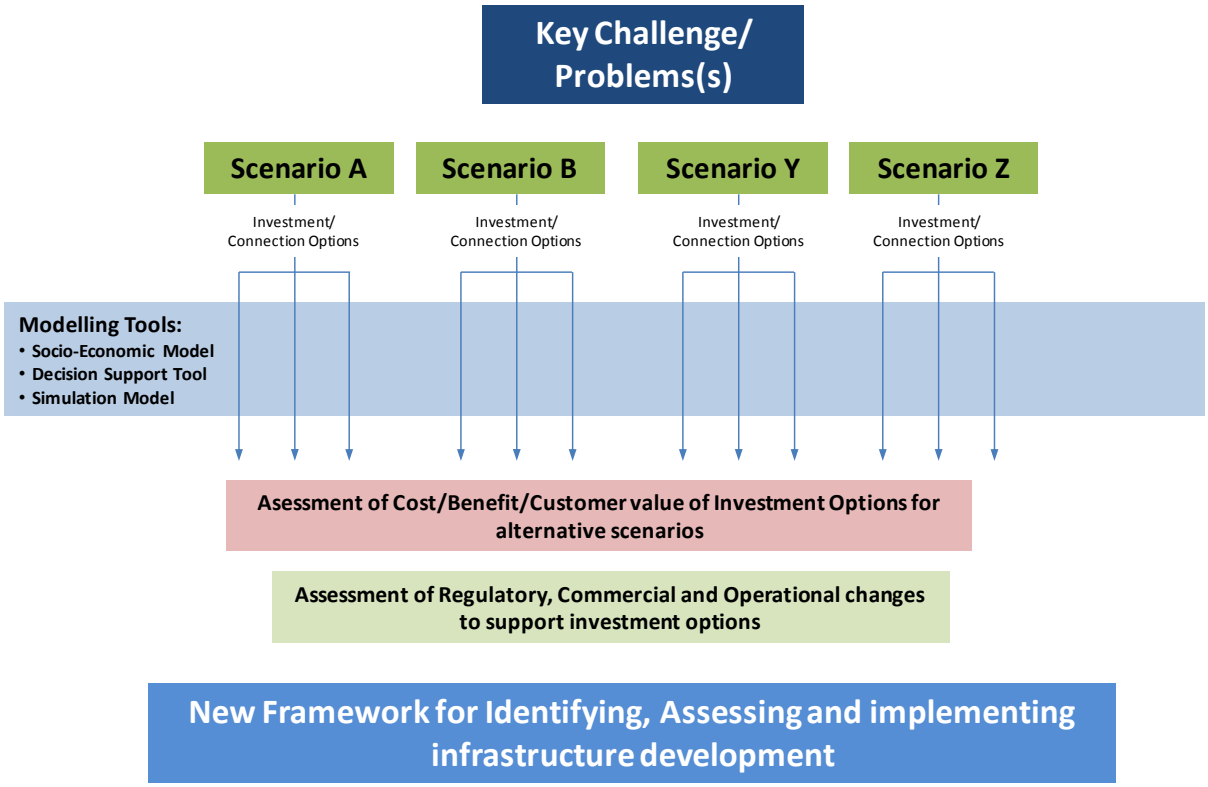
Any consideration of these additional factors within the investment optimisation process must also consider whether any changes to the regulatory and commercial framework need to be made to facilitate the delivery of the wider benefits that may be identified.

The development of the wider business case for the production of shale gas will be impacted by the costs of development of the associated transportation infrastructure. It is therefore imperative that the framework surrounding the development of the infrastructure is place to allow this to be considered as part of and potentially impact directly upon the development of the production capacity being considered. Additionally, the long lead times on the development of both production and infrastructure projects means that these issues must be considered in advance of firm decisions being made on both production and transportation infrastructure investment decisions.

2. What is the method(s) that you would use as part of this project?

The project be focussed on generating and testing solutions to the problem of optimising the transportation of shale gas against a range of factors financial, economic, social and environmental. The project will consequently be based on activities focussed on generating and testing Solutions to the Problem and therefore classed as Development (TRL 4-6) under the categorisation set out within the NIC guidance document.

The key methods that will be incorporated form the basis of the project can usefully be explained using the diagram below that presents a simplified project summary:



The project method will incorporate the following elements and phases:

- The development of a wide range of representative scenarios that simulate the investment/connection options that will be faced across a range of potential production capacities and geographical dispersion and will include:
    - Connection direct to the NTS
    - Connection direct to the GDN
    - Connection via an offtake
    - Via a new connection
    - Creation of new 'stand-alone networks'.
    - Extending associated connection infrastructure to facilitate connection of off-gas areas
    - Extending associated connection infrastructure to facilitate connection of off-gas areas and fuel poverty
    - Extending associated connection infrastructure to facilitate connection of other alternative/non-conventional sources of gas
    - A combination of the above

  Each of these options has implications for the distance the gas is transported, the compression it requires and the new infrastructure that needs to be built. All options will be influenced by the pressure and volume of shale gas available from the well head.

- The project will develop a system comprising three key elements:
    - An economic model - will determine the best financial comparison between direct connection to the NTS and the connection options to the GDN. The carbon footprint associated with various options and scenarios for connection will be factored into this model.
    - A decision-tool - will analyse the existing physical gas network by reviewing the existing physical parameters of the network, to ascertain the most efficient distribution of shale gas inputs.
    - A simulation model - will be a mathematical model of the network inputs from unconventional gas and GIS mapped real-time demand outputs. Therefore the network can be balanced and operated to maximum efficiency.

  This will provide a means by which an objective assessment can be carried out of the relevant cost and benefits of any scenario and the associated alternative investment options to facilitate the development of optimal gas transportation infrastructure.

- The costs and benefits will incorporate key factors that are not considered within the current framework including:
    - Socio-economic factors (Fuel Poverty)
    - Carbon Impact
    - Sustainability
    - Network Capacity trade-offs
    - Network Operation

- The project will model each of the scenarios and investment options using this system and present and assess the results of the associated cost benefit analysis to determine both the general and specific implications implied by these results. The project can then identify those individual or group of investment options that present the strongest business case for consideration.

- The project will also consider and propose the necessary regulatory and commercial framework changes that may be required to facilitate the successful delivery and implementation of any of the identified alternative investment options that present the business case for development.

Following this approach and these methods, the project is focussed on delivering a new framework for identifying, assessing and implementing efficient infrastructure that maximises the net benefit associated with the development of shale gas production.

3. What is the outcome, or product, that this project would deliver?

The successful delivery of this project will provide a number of key outputs:

- The analysis and assessment within the project will provide answers to the key question of whether there is a clear business case for alternative framework(s) that can deliver more efficient production capacity and location decisions for producers and infrastructure investment. Or the current framework will support the most efficient solution.
- Identification and proposed amendments to the commercial and regulatory framework and processes required to facilitate the identified investment options that present a clear net benefit when compared to the current position.
- A system, comprising a set of analysis and decision tools that will be available to the wider industry to adopt and develop to evaluate and consider the full range of investment options associated with large scale investment options.
- A framework that provides potential shale gas producers with the ability to assess directly the costs and benefits of alternative infrastructure development and connection options and incorporate within its investment decisions and evaluation of the business case for each individual project.