Whole System CBA Workshop

Open Networks WS4 Product 1

Gary Dolphin & Ian Dunstan
5 July and 12 July 2022

Thank you for joining this Webinar.

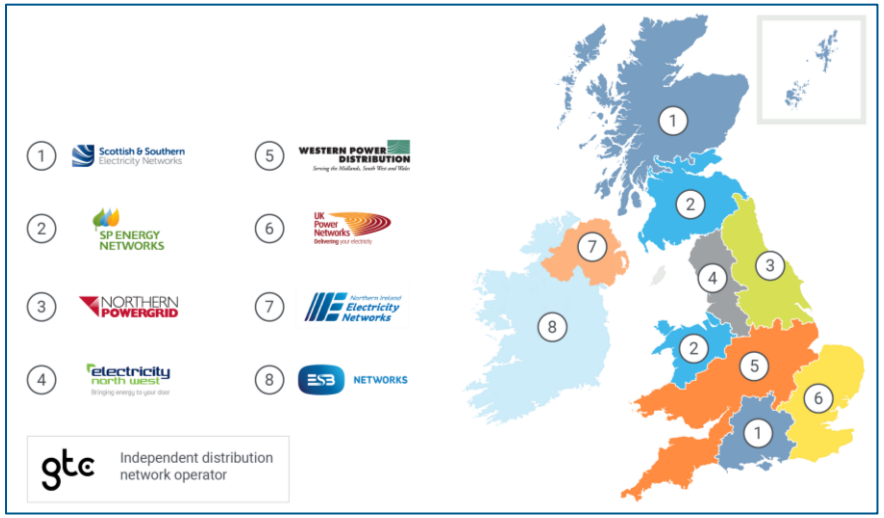
This webinar will commence at 14:00.

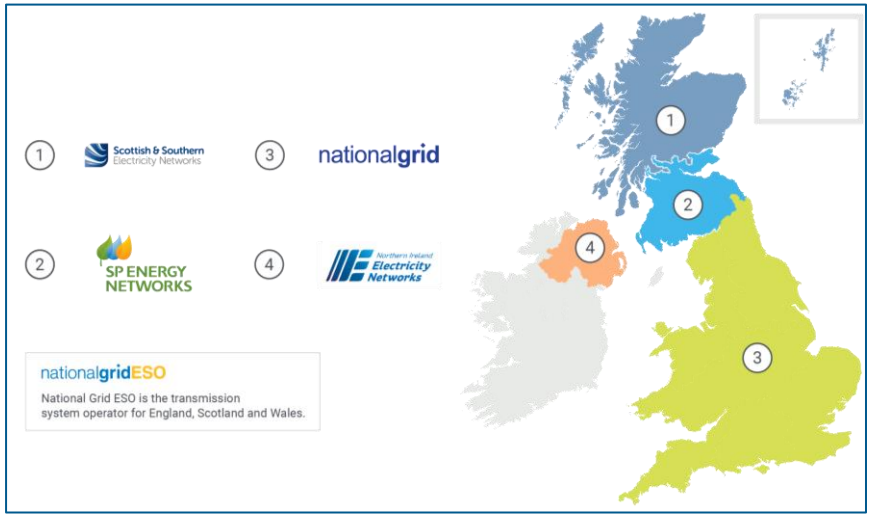
- If you are unable to play the audio through your device, you can **dial in by calling +44 20 3855 5885,,678706797# and using access code 678 706 797#**
- All microphones have been set to mute to avoid background noise.
- Please ask questions or make comments **via the chat function** throughout the meeting.
- Please note that the webinar will be recorded and made publicly available on ENA's YouTube channel. Please do not turn your video on if you don't want your likeness to be recorded and shared.
- The slides from the webinar will be made publicly available on ENA's website.
- If you would like any further information about the Open Networks programme or have any feedback you would like to submit, please get in touch with us at opennetworks@energynetworks.org.

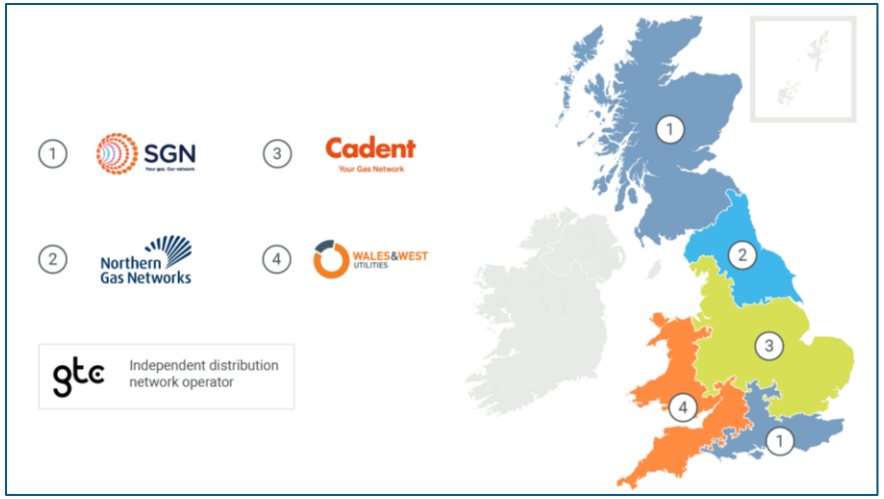
Introduction to ENA

The voice of the networks

- 29 million electricity customers
- 21.5 million gas customers
- 180,000 miles of gas network
- 519,304 miles of electricity network
- £60bn invested 2015-23



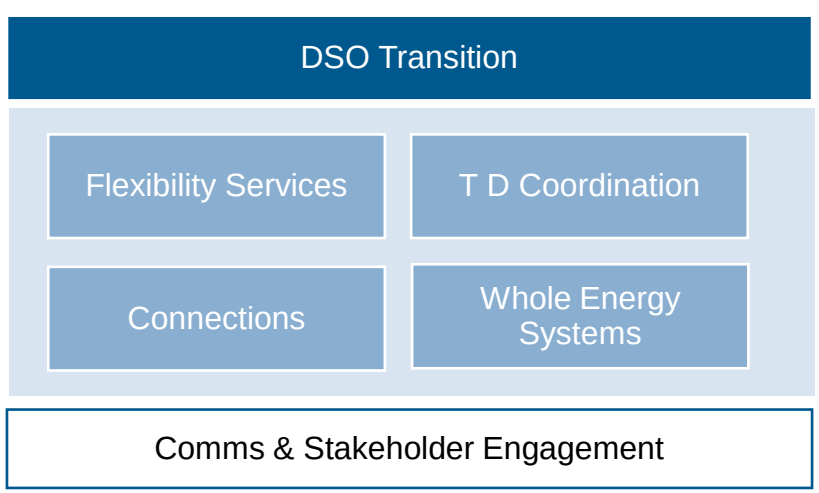


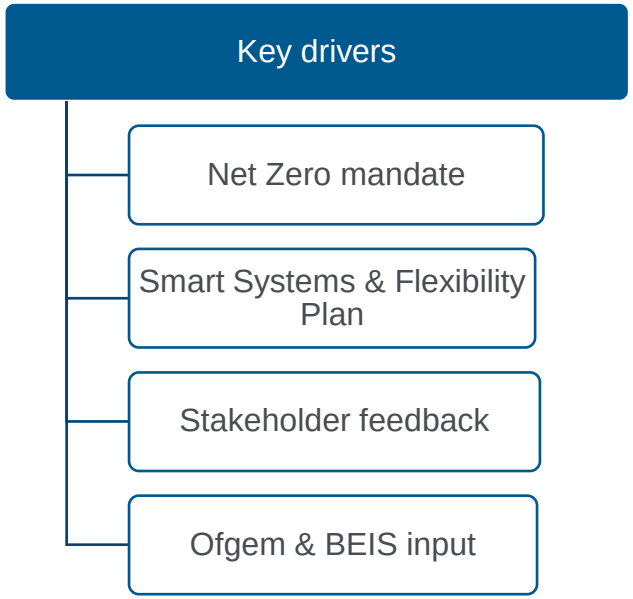


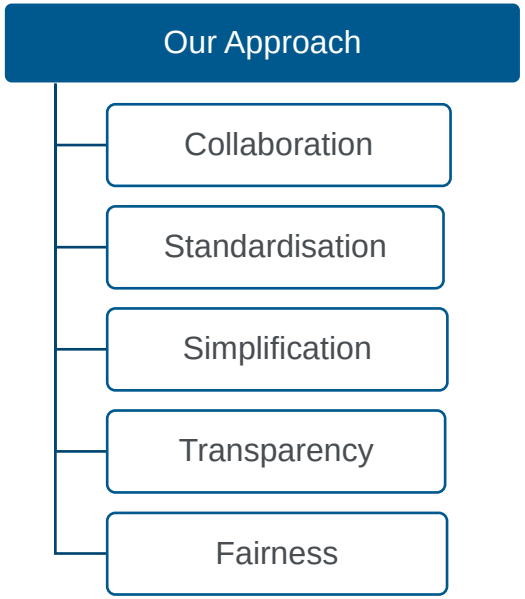
Open Networks – Delivering a Smart Grid

Started in 2017, the Open Networks programme is working with the networks and industry to lead the **transition to a smart and flexible energy system** that will enable net zero.

- ✓ Opening local flexibility markets to demand response and renewable energy
- ✓ Helping customers connect faster
- ✓ Opening data to enable customers identify best locations to invest
- ✓ Delivering efficiencies between network companies to operate secure and efficient networks







The product team leads

Gary Dolphin
Economics Assessment Team (acting manager)
Network Development
National Grid ESO

Ian Dunstan
Asset Strategy Manager
Asset Management
Wales & West Utilities

What we are looking to cover today

Overview of the Whole System CBA development and the proposed use cases

Tool description:

Inputs: User-defined inputs and tool capabilities

Outputs: Reporting metrics and results visualisation

Worked example of the tool

Whole System CBA Overview

- A whole system CBA should evaluate options to help achieve net-zero. This includes assessing the wider societal impacts of different options, considering both current and future consumers and developing a consistent approach to appraise options.
- Consumer impacts should be at the heart of decision making. A whole system CBA should capture the varied ways benefits can be delivered. The whole system CBA process should be transparent and understood both inside and outside of regulated energy networks. Key stakeholders should support it, including BEIS, Ofgem, the energy networks, other industry participants and other statutory bodies.
- The whole system CBA should be used to articulate the benefits the energy industry delivers. With growing political and regulatory scrutiny of costs and activities, a whole system CBA can be a key tool to demonstrate that energy networks are acting in the best interests of consumers.
- Help deliver a secure network at optimal value for money to consumers. This includes considering the needs of both present and future consumers, and wider society.
- Support objective, technology neutral and transparent decision making. It will enable costs and value to be drawn out, explicit for all to see.
- The whole system CBA should be one element of a decision-making toolkit. In any investment decision, several factors need to be considered, some of which may not be suitable for a whole system CBA.
- Supporting regulatory frameworks that allow sharing of the surplus value generated from allowing another company to provide a more net beneficial solution.

When should the WS CBA be used?

Three conditions must be met to determine whether a whole system CBA is appropriate.

1. Are there whole system interactions, or is there potential for it? If the only realistic options are within an individual network an appropriate sector-specific CBA should be used.
2. Could a whole system CBA drive you to make a different decision? A whole-system CBA needs to be carried out in good-faith with the genuine aim of considering and accepting a range of options. As we discuss below, regulatory changes may be needed to encourage this behaviour. The whole system options considered need to be plausible, but there is also likely to be a de minimis value.
3. Is a whole system CBA reasonable? CBA is complex. It can be difficult to estimate costs and benefits. There are limits on the number of factors that can reasonable be considered. A whole system CBA needs to be proportionate, transparent and understandable. Especially at first, this may limit some of the use cases.

Use Cases

Use Case	Test 1: Are there whole system interactions, or is there potential for it?	Test 2: Could a whole system CBA drive you to make a different decision?	Test 3: Is a whole system CBA reasonable?
Asset Intervention: Suppose a gas pipe feeding a small town is reaching the end of its asset life. Is it better to replace the pipe like-for-like, convert the town to electric heating or install a biomethane plant and upgrade the gas network?	Potential for interactions across gas and electricity.	The options appear feasible and potential benefits could be in tens to hundreds of millions	A number of factors should be considered, for example: Whether consumers are willing to switch to electric heating? Whether the local electricity network can manage increased demand?
Investment Planning: Suppose an electricity line is heavily constrained. From a whole system perspective, what is the best solution?	There may be opportunities to expand the range of options to include demand, service or looking to hydrogen in longer term.	Assuming the right regulatory mechanisms and incentives are there. Benefits could be in the billions .	Before proceeding with CBA confirmation of stakeholder buy in to secure necessary data will be required
Embedded Generation: farmer wants to build a biogas plant running on agricultural waste. Should it generate electricity or enter the heat network?	New connections have the option to connect and provide services to either the gas or electricity networks.	The options appear feasible and potential benefits could be in tens to hundreds of millions	This is a reasonably classic use case for a CBA.
Local Authority Planning: A local authority has been given £50 million funding from central government to support decarbonisation in their area. How should they spend it?	Any local area energy plan would interact heavily with gas and electricity networks, and would focus strongly on power, transport and heat.	Given the variety of potential options and the trade-offs between them, a whole system CBA would be a valuable tool.	Given the large number of potential options, so shortlisting based on commercial, technical and engineering judgement and stakeholder feedback would be necessary first.
Strategic Planning: What is the best way for the UK to meet its net-zero target?	By definition	Given the variety of potential options and the trade-offs between them, a whole system CBA would be a valuable tool.	Given the large number of potential options, so shortlisting based on commercial, technical and engineering judgement and stakeholder feedback would be necessary first.

Defining the CBA analysis

At the first stage of the analysis the user should define; the Use Case and its Strategies, Stakeholders, Scenarios and reference year for discounting and price base

The description of the **Use Case**, detailing the investment aim i.e. achieve a given carbon reduction or minimise cumulative carbon emissions, listing key drivers and assumptions

- Reporting which inputs are treated as exogenous vs endogenous

How many **Strategies** they will consider and their names. The tool can accommodate up to seven

- Which Strategy is the Reference Strategy; NPV outputs are also reported against the Ref. Strategy

How many **Scenarios** they will consider and their names. The tool can accommodate up to five

- Which Scenario is the Reference Scenario; NPV outputs are separately reported only for the Ref. Scenario

The set of relevant **Stakeholders** for each Strategy, regulated or non-regulated

The Reference Year for **Discounting**

The Reference Year for the **Price Base**

User Inputs and tool capabilities (1)

The user can then input the costs and benefits under each Strategy (up to 7) and Scenario (up to 5)

Stakeholders	Costs/Benefits	Tool Capability
Regulated Networks	Opex Capex Avoided Costs Monetised Risk Incentives/Penalties Ability for user to define more subcategories	Choice of Passthrough or Depreciation (ability for user to define WACC, Depr. Period and Capitalisation Rate by stakeholder)
Non-regulated stakeholders	User-defined	Choice of Passthrough or Depreciation (ability for user to define WACC, Depr. Period and Capitalisation Rate by stakeholder)
Society		
Safety	Fatality Non-fatal injury	User inputs the volume, tool calculates the monetised impact
Environmental	CO2 Emissions CO2 Emissions associated with elec. losses Elec. Losses GHG emissions - AirPlus TM, G3, H2, SF6, Methane Nox Emissions Oil leakage Leakage - CH4 Shrinkage - theft of gas and own use gas	User inputs the volume, tool calculates the monetised impact
Transport	Societal benefit of reduced vehicle journeys Impact of a switch to LEVs (Low Emission Vehicles) Vehicle journey related carbon emission reduction	User inputs the volume and links with appropriate unit price/value (common inputs are listed in the Input Depository)
Disruption	Disruption from road works Disruption from replacement of boilers in homes	User inputs the volume and links with appropriate unit price/value (common inputs are listed in the Input Depository)
Heat	Carbon impact of changing heat technology and/or fuel of consumers Bill impact to consumers from a change in heat technology and/or fuel	User inputs the volume and links with appropriate unit price/value (common inputs are listed in the Input Depository)
Additional, user-defined societal impacts	Ability for user to define more subcategories	User inputs the volume and links with appropriate unit price/value (common inputs are listed in the Input Depository)

User Inputs and tool capabilities (2)

The tool also takes into account the distributional impact of costs/benefits between the stakeholders and their customers

Customers	Costs/Benefits	Tool Capability
Customers of Non-regulated stakeholders	A percentage of the total cost of the intervention/investment	The tool uses the percentage (user input) and apportions the costs/benefits to the non-regulated stakeholders and their customers/counterparties
Customers of Regulated Networks	Sharing factor	The tool uses the sharing factor (user input) and apportions the costs/benefits to the non-regulated stakeholders and their customers/counterparties
DNO customers	Cis/CMLs GSOP Additional, user-defined	User inputs the volume, tool calculates the monetised impact
ETO customers	GSOP Additional, user-defined	User inputs the volume, tool calculates the monetised impact
ESO customers	User-defined	User-defined and calculated
GDN customers	GSOP Additional, user-defined	User inputs the volume, tool calculates the monetised impact
GTO/GSO customers	GSOP Additional, user-defined	User inputs the volume, tool calculates the monetised impact

Analysis of monetised impacts on a common basis

Discounting and Price Base

Using the Spackman approach for discounting i.e. using the Social Rate of Time Preference to discount future costs and benefits and taking into account the financing costs of all stakeholders

The tool allows for a dynamic discounting reference year

i.e. the user can choose to discount all costs and benefits to, say, 2020 or 2021, future-proofing the tool

The tool also allows for a dynamic price base reporting year

the user can choose which price base to input costs and benefits in i.e. in today's terms, or 2018/19

They can also specify and dynamically change the price base for reporting the results

Reporting metrics

A list of reporting metrics included in the tool

Net Cost/Benefit Impact

for each Strategy and relative to the Reference Strategy

Breakdown of Net Impact in

Costs and Benefits

Societal, Customer and Stakeholder Impacts

Carbon volume

Distributional impacts i.e. Customer Bill Impact, Stakeholder Impact post sharing factor

Qualitative Impacts (RAG assessment)

Payback periods

Least Worst Regrets

Tipping Points

i.e. how much a given stakeholder cost needs to increase by to change the order of least cost Strategies

High level tool structure

Intro

Version control

User guidance

Results under Reference Scenario

NPV per Strategy by stakeholder
Volume metrics
Qualitative impacts

NPV per Strategy relative to Reference Strategy
Volume metrics
Qualitative impacts

Results under all Scenarios

NPV per Strategy by stakeholder
Volume metrics
Qualitative impacts

NPV per Strategy relative to Reference Strategy
Volume metrics
Qualitative impacts

Sensitivities

Tipping points

Payback Periods and Least Worst Regrets

Inputs

Fixed inputs
(common and company-specific)

Time series inputs
(common and company-specific)

Input Depository
for consistency of sources

Strategies

Summary costs and societal benefits per Strategy, NPV

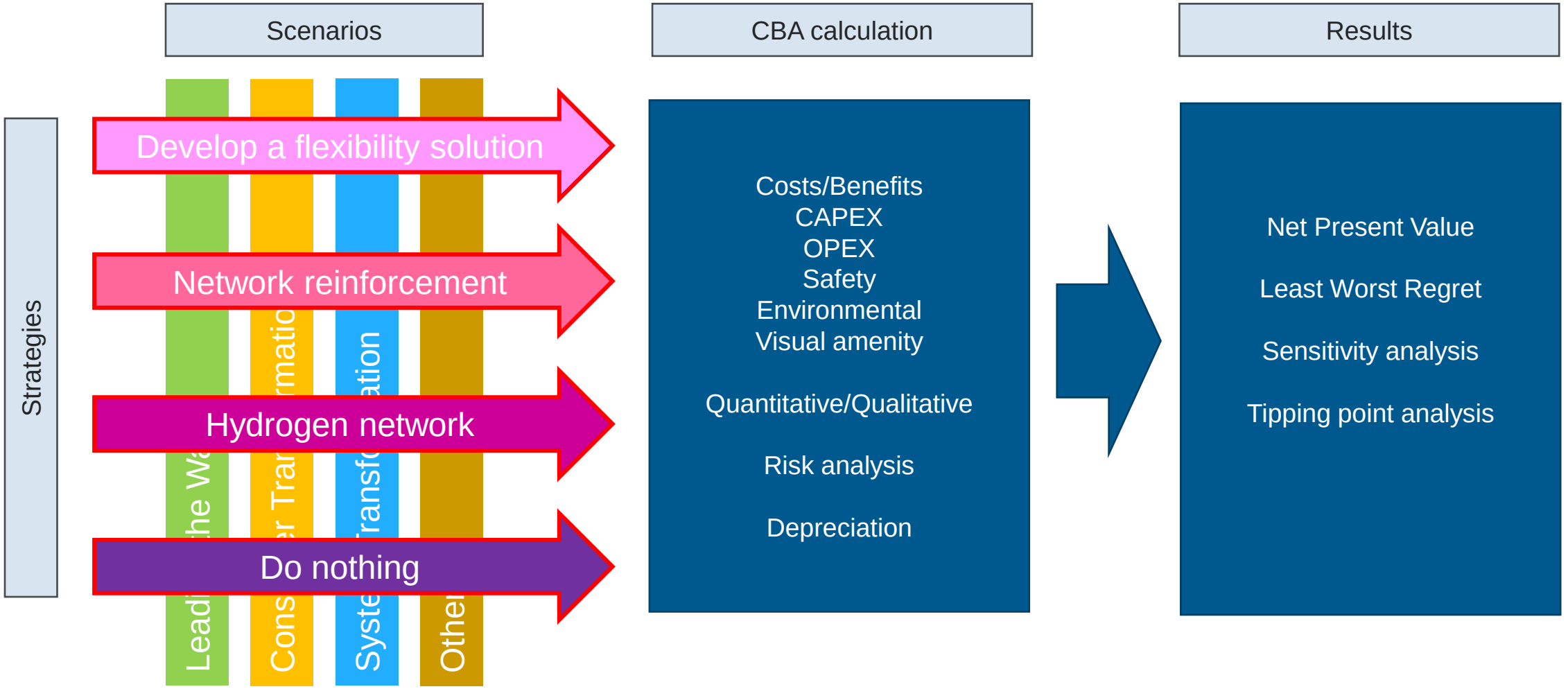
One tab per Strategy for the user to:
add direct line items (£) and volumes
for multiple scenarios and stakeholders

One tab per Strategy for the user to provide more detailed workings as necessary
i.e. linking scenarios and/or other underlying drivers to the £ inputs in the main Strategy tab

High level tool structure – sections and associated worksheets

User controls	Controls Use case description	Set number of scenarios, strategies, stakeholders. Apply depreciation, updating carts	User input
Strategies	Strategy 1-7 inputs Strategy 1-7 workings	Input costs (-ve), benefits (+ve) for each strategy+scenario for each stakeholder, society and customer	User input
Strategies summary	Strategy 1-7 summary	Summary of key impacts in each strategy. Depreciation calculated	
Outputs	Charts Output data e.g. NPVs	Charts of absolute and relative NPVs for ref. scenario, and all scenarios, payback, tipping point, distributional analysis	
Qualitative Inputs	Non-monetised impacts	Long list of strategies, qualitative impacts, risk register, BP cost categories	User input
Inputs	Fixed and time series inputs	Discount rates, societal and customer impacts, CO2 prices	
Non-functional	Hidden worksheets preforming calculations	Depreciation treatment, unused strategy sheets	

Whole System CBA



Survey