



# CER GAS ENTRY TARIFF MODEL USER GUIDE<sup>1</sup>

## 1. Introduction

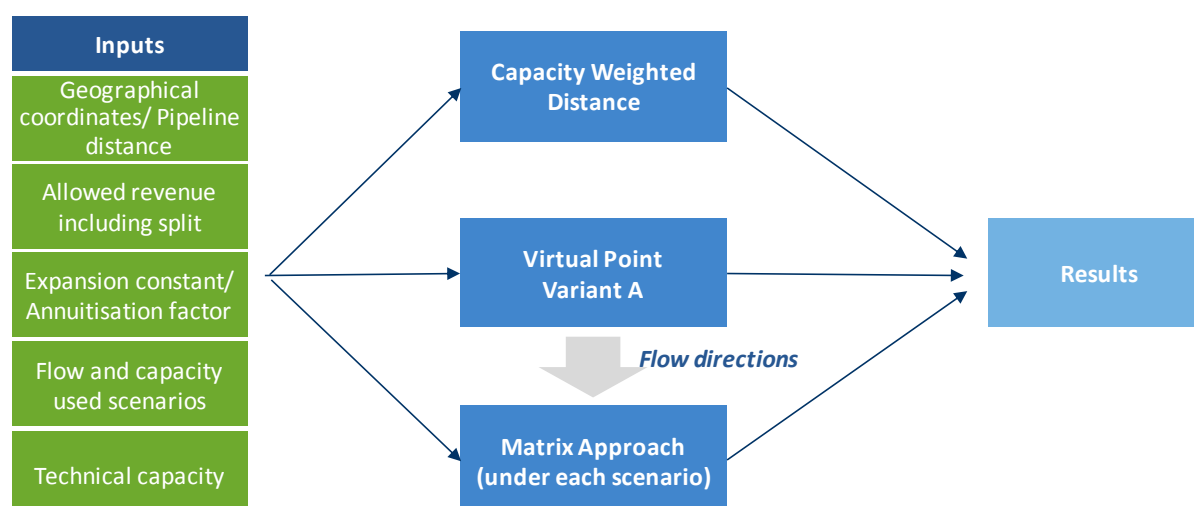
The CER Gas Entry Tariff Model has been set up to illustrate the potential impacts of a subset of the cost allocation methodologies set out in the ACER Framework Guidelines<sup>2</sup> on tariffs if applied to the Irish gas transmission network. This short User Guide describes the structure of the CER Gas Entry Tariff Model and the assumptions and calculations that are applied in each worksheet of the model.

The three cost allocation methodologies modelled are<sup>3</sup>:

- Capacity Weighted Distance (CWD);
- Virtual Point Variant A (VP(A)); and
- A version of the Matrix methodology.

The model is structured into an Input sheet, separate worksheets for each methodology (there are separate worksheets for each scenario under the Matrix methodology as described later on) and a Results spreadsheet (see Figure 1).

Figure 1 – Model structure



<sup>1</sup> This note has been prepared to support understanding of the tariff model published alongside the CER's consultation on the Future of Gas Entry Tariff Regime in Ireland. Neither the authors nor Cambridge Economic Policy Associates accept or assume any responsibility or duty of care to any third party. CEPA also accepts no liability for the use of data from third parties which has not been independently verified.

<sup>2</sup> ACER Framework Guidelines on rules regarding harmonised transmission tariff structures (November 2013)

<sup>3</sup> The fourth cost allocation methodology, postage stamp, simply involves equalisation of tariffs at entry and equalisation at exit.

In order to run the model correctly, Microsoft Excel macros have to be enabled and the Microsoft Excel Solver function activated. Whenever the Solver or Goal Seek function is run within the model, a message box will appear. Users should click the OK button after verifying that the message confirms Solver/ Goal Seek has found a solution.

## **2. Key modelling assumptions**

### **Exit zones**

The model is based on ten exit zones. This is a simplification of the Irish network, as there are over 250 exit points within the Irish network.

The exit points have been grouped into eight regions, with the Gormanston and Isle of Man offtake exit points being single points.

In calculating the exact exit zone location, the geographical co-ordinates of the individual exit points within a zone have been weighted by exit point technical capacity.

### **Nodes**

For the VP(A) and Matrix cost allocation methodologies, internal nodes have been used to create a representative network (e.g. N1, N2 etc.).

There are six internal nodes within in the representative network model, although the exact nature of the Irish network may need to be modelled when calculating precise tariffs that will enter operation in practice (which as noted, is not the purpose of this illustrative model).

These six nodes have been located at existing exit points in such a way as to capture the ring-shaped network present in Ireland.

### **Equalised exit**

The current model calculates individual exit tariffs for separate exit zones under each cost allocation methodology, but then as part of a secondary adjustment permitted under the ACER guidelines, equalises exit charges.

## **3. Results worksheet**

This worksheet summarises the results of the model for all methodologies under four supply scenarios (as described below).

This sheet contains a central macro labelled 'Get Results' that runs all four scenarios and all individual macros within the workbook and presents the results in the table. Users should be aware that these results are based on inputs and decisions made in the other sheets, so should consider these first before running the model.

## 4. Inputs worksheet

This sheet contains all input assumptions required for the model. All changes to input assumptions should be made within this sheet. Whilst other sheets may have switches, they will not have input assumptions included in them. The scenarios and assumptions noted above can be found in this sheet.

### Distances

The matrix of straight-line distances between all entry, exit points and nodes on the representative network can be found in rows 85:105. Pipelines distances between entry and exit points are user defined inputs in cells E111:H131.

Straight-line distances are calculated in the model using longitude and latitude coordinates in cells E7:F27 for each point on the network. Straight-line distances are calculated based upon changes in longitude and latitude, with a set figure used to represent 1 degree change in either direction (cells E5:F5).

The pipeline to the Corrib entry point in reality from the Irish ring main is to be treated separately to the calculation of onshore tariffs, with Corrib assumed to start at Cappagh South for the purpose of the modelling.

The table in cells C133:L155 shows the pipeline distances used in the VP(A) and Matrix approaches – i.e. pipelines distances from each entry point to internal network node and straight-line distances between internal network nodes and exit points.

### Allowed revenue inputs

The allowed revenue is the annual amount that needs to be recovered in total through both entry and exit charges. The default is €200m p.a., but this can be changed within the model.

The entry-exit split assumption details what proportion of the allowed revenue above should be recovered from entry and exit charges respectively.

The capacity commodity split sets out the proportion of allowed revenue that is gathered as capacity and commodity charges. The model takes into account recovery of allowed revenue from capacity charges only.

### Expansion constants

At present the model has the ability to utilise both an onshore ('dry') and an offshore ('wet') expansion constant. The value of both of these can be changed in the model – with the default setting using a wet expansion constant which is three times the dry constant.<sup>4</sup>

---

<sup>4</sup> For the representative network, the segment of pipe from Moffat to Node 1 (Isle of Man offtake) contains both onshore and offshore segments. The model takes Brighthouse Bay as the point where the pipeline reaches the sea and then calculates the proportions of the pipeline onshore and offshore. This gives an expansion

Within the VP(A) and all Matrix worksheets, users are then required to note which expansion constant should apply to different segments of the pipe (i.e. dry or wet).

### Conversion of units

A conversion factor is used to transform input data from SCM to GWh where necessary. The default option when dealing with the conversion factor is consistent with that applied by CER, but there is a built-in option to use different values. These alternatives are based on IEA data, but can be edited for user-generated factors.

### Selecting a scenario

The model allows the various cost allocation methodologies to be run under four scenarios, with different entry points of supply being in operation.

These scenarios are as follows:

*Table 1: Supply points under our scenarios*

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Moffat	Yes	Yes	Yes	Yes
Inch	Yes	Yes	Yes	
Corrib		Yes	Yes	
Shannon			Yes	Yes

These scenario assumptions should not be changed within the model. However users can change specific inputs under each scenario, such as technical capacities and peak flows.

Scenarios can be chosen by inputting a number from 1 to 4 in cell E164.

### Capacities and flows

Technical capacities, peak flows and proxy capacity demand are defined in rows 170:184.

Technical capacities currently used in the model are based on figures in the 2014 Network Development Plan (NDP).

For Inch, we understand the technical capacity is 63 Gwh/day (based on the Midleton Compressor Station), however the actual capacity to flow gas is constrained by upstream capacity limitations to approximately 35 GWh/day. For further details on the assumptions chosen, please see the CER consultation paper.<sup>5</sup>

---

constant for the Moffat – N1 pipe of 2.06 x the onshore (“dry”) expansion constant. For Moffat – N2, the model takes a weighted Moffat – N1 expansion constant and a wet N1 – N2 expansion constant. This gives a blended factor of 2.50 x to multiply by the dry expansion constant.

<sup>5</sup> CER (2014): ‘Future of Gas Entry Tariff Regime – Initial Modelling Evidence’, CER/14/455

For exit zones, the Cork Dublin technical capacity includes the Brownsbarn 40 barg feeder. Capacity associated with downstream AGIs on the 40 barg line downstream of Brownsbarn are included in the Dublin technical capacity figure.

Peak flows are used to calculate flow directions in the Virtual Point A and Matrix approaches. This calculation requires a balanced network (entry flows equal exit flows). Therefore the user should ensure that the 'Balanced network' checks in row 186 show the value 'TRUE' before running the model.

Cells E217:G231 contain the technical capacity, peak flows and proxy capacity demand values feeding through the model depending on the scenario chosen.

## **5. Capacity Weighted Distance**

The CWD sheet contains the calculations and results under the Capacity Weighted Distance (CWD) methodology.

All the inputs used in this sheet are feeding through from the Inputs worksheet and any user changes to the input data should be made in that sheet.

There is a choice for running the CWD approach using pipeline or straight-line distances between entry and exit points on the network.

There are also switches for calculating 'Proportion factors' and 'Weights' using technical or proxy capacity demand.

## **6. Virtual Point Variant A**

The VP(A) sheet shows the inputs, calculations and outputs under the VP(A) model.

The model calculation involves two steps to be conducted in the order described below:

- By clicking the 'Run Solver' macro, the model calculates the flows between different points on the network using a given balanced peak flow scenario.
- The 'Goal Seek' macro calculates the factor in cell E86 used to adjust flow distances to/from the reference node in order to meet a given entry-exit split.

Please note that the Solver and Goal Seek macros should be run each time a new scenario is selected or input data is changed.

### **Setting a reference node**

There is the option to choose a different reference node in the VP(A) approach. Currently the default option sets this equal to Node 2. Please note that the 'Results' tab will use whatever node is set as reference node in the cell I6 when the macro is run.

## Selecting expansion constant

A 'dry' or 'wet' expansion constant can be applied to segments of pipeline. This expansion constant (together with the annuitisation factor) is used to transform flow distances to/from reference node into tariffs.

## Negative tariffs

The VP(A) model gives the option whether to allow a negative 'primary' tariff for entry points and exit zones. If negative tariffs are not allowed, then any negative values are constrained to zero. This is prior to an adjustment to arrive at the allowed revenue term.

## Flows/ demand

Within the VP(A) model, but also in the matrix model, there is the choice whether to use peak flow data or proxy capacity demand data in the tariff calculation process for the secondary adjustments applied to entry tariffs.

## 7. Matrix

The Matrix methodology calculations are conducted in four separate spreadsheets, one for each of the four scenarios (Matrix S1, Matrix S2, Matrix S3, Matrix S4).

Depending on the scenario chosen, the relevant worksheet should be used to calculate tariffs (i.e. use Matrix S1 sheet for calculations under Scenario 1, Matrix S2 for Scenario 2, etc.). A warning message will appear in cell G1 of the worksheet when the scenario chosen does not match the scenario calculated within the sheet.

The Matrix worksheets use as inputs the peak flow calculations made under the VP(A) approach as well as distances and expansion constant values defined in the 'Inputs' worksheet. A dry or wet expansion constant can be applied to each segment of the network.

To solve the tariffs matrix, click the 'Run Solver' macro. This macro first runs the two macros in the VP(A) worksheet and then finds 'raw' tariff values in cells D95:D104 and E94:F94 respectively such as to minimize the value in cell D119.