CUSC Modification Proposal Form	At what stage is this document in the process?
# CMP282: ## The effect Negative Demand has on Zonal Locational Demand Tariffs	01 Proposal Form 02 Workgroup Consultation 03 Workgroup Report 04 Code Administrator Consultation 05 Draft CUSC Modification Report 06 Final CUSC Modification Report

Purpose of Modification: To amend how the DCLF model calculates Zonal Locational Demand tariffs so that the final locational zonal demand tariffs accurately reflect the underlying locational signals.

The Proposer recommends that this modification should be:

- be treated as urgent and should proceed as such under a timetable agreed with the Authority

This modification was raised **22 June 2017** by **National Grid** and will be presented by the Proposer to the Panel on **30 June 2017.** The Panel will consider the Proposer's recommendation and determine the appropriate route.

High Impact: As this modification aims to amend the Demand tariffs this modification will definitely effect Suppliers and Embedded Generators and potentially Transmission Connected Generators (depending on the final proposed solution)

Medium Impact: None

Low Impact: Transmission Companies

Contents

Timetable

The Code Administrator recommends the following draft timetable:

Initial consideration by Workgroup	18 July 2017
Workgroup Consultation issued to the Industry (10WD)	22 July 2017
Modification concluded by Workgroup	24 September 2017
Workgroup Report presented to Panel	29 September
Code Administration Consultation Report issued to the Industry (10WD)	2 October 2017
Draft Final Modification Report presented to Panel	19 October 2017
Modification Panel decision	27 October 2017
Final Modification Report issued the Authority	3 November 2017
Decision implemented in CUSC	1 December 2017

Any questions?

Contact:
Code Administrator

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Proposer Details

Details of Proposer: (Organisation Name)	Damian Clough (National Grid)
Capacity in which the CUSC Modification Proposal is being proposed: (i.e. CUSC Party, BSC Party or "National Consumer Council")	CUSC Party
Details of Proposer's Representative:	
Name:	Damian Clough
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Attachments (~~Yes~~/No): **If Yes, Title and No. of pages of each Attachment:**	

Impact on Core Industry Documentation.

Please mark the relevant boxes with an "x" and provide any supporting information

BSC	
Grid Code	
STC	
Other	

(Please specify)

This is an optional section. You should select any Codes or state Industry Documents which may be affected by this Proposal and, where possible, how they will be affected.

1 Summary

Defect

Final Zonal Locational Demand Tariffs most notably in North Scotland are distorted by nodes which are forecasted to Export at Peak when the Demand Zone is forecasted to Import or Import when the Demand Zone is forecasted to Export. The defect itself is contained within the calculation in the tariff part of the DCLF model which turns underlying locational signals into zonal weighted demand, and **not** the locational signals themselves within the Transport part of the DCLF model.

What

When calculating the incremental cost for a particular location on the Transmission Network, National Grid uses the DCLF ICRP transport model. The DCLF model calculates the impact of adding 1MW of Generation at that particular location has on base flows under both the Peak and Year Round Scenarios.

When calculating the incremental impact of adding 1MW of Generation the model also calculates the impact of adding 1MW of Demand at the same location. The impact of adding 1MW of Demand is the inverse effect of adding 1MW of Generation. The locational tariff for Demand is therefore achieved by multiplying the nodal locational signal for Generation by -1 to calculate the locational tariffs for Demand.

Tariffs are calculated on a Zonal basis to provide stability. To calculate the zonal locational tariff, the locational signal for a particular node is weighted according to total Contracted Generation or net Demand for that zone. These are summated to create a weighted zonal average.

Nodes are weighted so that the zonal locational signals are not distorted by nodes with minimal amounts of demand and Generation, and revenues are collected in proportion to the amount of Generation and Demand at that node.

The table below hopefully illustrates the above and shows how nodal locational signals for a zone are turned into a final zonal locational tariff.

Node	LRMC	Demand	Weighted Demand	Weighted LRMC
1	1300	0	0%	0
2	1400	0	0%	0
3	1300	10	13%	162.5
4	1300	5	6%	81.25
5	1200	20	25%	300
6	1200	20	25%	300
7	1300	10	13%	162.5
8	1300	5	6%	81.25
9	1300	10	13%	162.5
10	1400	0	0%	0
		80		**1250**

The Weighted Zonal LRMC is 1250. The LRMC's are calculated based on adding 1MW of Generation. They are subsequently turned into a Zonal Demand tariff by multiplying by **-1**, then by the Security Factor (1.8), then by the Expansion Constant (13.574496), with the final result divided by 1000 to turn the tariff into £/kW

I.e. 1250***-1***1.8*13.574496/1000 = -30.54

If Demand was actually Contracted Generation then the Zonal Generation tariff would be 30.54 (assuming we are calculating a tariff Peak) and not -30.54

If Embedded Generation was to connect at nodes 1, 4 and 8 this would reduce the net demand at that node. For the purposes of this example the amount of Embedded Generation is of sufficient quantity to turn demand at that node negative (i.e. Exporting).

Table 1

Baseline		
Node	LRMC	Demand
1	1400	-20
2	1500	0
3	1400	10
4	1400	-15
5	1300	20
6	1300	20
7	1400	10
8	1400	-15
9	1400	10
10	1500	0
		20

As you can see the Nodal costs for Generation (LRMC) have increased in this zone as you would expect. If you add Generation (or reduce demand) at a node, the Nodal costs are likely to increase for all nodes in that zone due to an increase in flows. Node 1,4 and Node 8 have turned into negative demand.

The underlying locational signals have increased for Generation. As Demand is the inverse of Generation when calculating the Zonal Demand tariff you would expect the Locational Demand tariff to **decrease**. The table below shows the exact opposite happens when calculating the Locational Demand tariff.

Table 2

Baseline					
Node	LRMC	Demand	Weighted Demand		
1	1400	-20	-100%	-1400	
2	1500	0	0%	0	
3	1400	10	50%	700	
4	1400	-15	-75%	-1050	
5	1300	20	100%	1300	
6	1300	20	100%	1300	
7	1400	10	50%	700	
8	1400	-15	-75%	-1050	
9	1400	10	50%	700	
10	1500	0	0%	0	
		20		**1200**	-29.32

The Zonal Demand tariff now equals -29.32

I.e. 1200***-1****1.8*13.574496/1000 = -29.32

This is an **increase** from the previous tariff of -30.54. So although the locational signal for Demand has decreased (LRMC's not weighted Demand) the demand tariff has gone up.

Why does this happen? Negative Demand is shown as a Negative number. When you multiply the LRMC's by Negative Demand the mathematics turn the LRMC's negative. To create a Demand tariff the Generation LRMCs are multiplied by -1 (A negative * negative = positive).

Negative Demand therefore has the effect of increasing the Locational Demand tariff when all the signals show that it should decrease further as there is less demand and more Generation.

For 18/19 the number of forecasted Exporting GSPs at Peak has increased to such an extent that the above defect is now having a material impact on Demand tariffs. The defect is exaggerated when Total Demand for a zone decreases closer to 0. When this occurs the weighted Nodal average for a node can significantly distort the Locational Demand tariff as demand at a node can be greater than the total demand for that zone (i.e. >100%).

There is a credible scenario where the Total Demand for a zone may become negative (exporting) as highlighted in table 3. In this scenario negative demand at a node actually creates an accurate locational signal, and it is positive demand nodes which work to distort the zonal locational demand tariff. The defect therefore is not negative Demand (exporting GSPs) but nodes which Export when the zone Imports and vice versa, and the underlying tariff calculations within the Tariff part of DCLF model.

Table 3

Node	LRMC	Demand	Weighted Demand			Node	LRMC	Demand	Weighted Demand		
1	1400	-20	-25%	-350		1	1400	-20	-25%	-350	
2	1500	-20	-25%	-375		2	1500	-20	-25%	-375	
3	1400	10	13%	175		3	1400	10	13%	175	
4	1400	-15	-19%	-262.5		4	1400	-15	-19%	-262.5	
5	1300	20	25%	325		5	1300	20	25%	325	
6	1300	20	25%	325		6	1300	30	38%	487.5	
7	1400	0	0%	0		7	1400	0	0%	0	
8	1400	-15	-19%	-262.5		8	1400	-15	-19%	-262.5	
9	1400	0	0%	0		9	1400	0	0%	0	
10	1500	-20	-25%	-375		10	1500	-20	-25%	-375	
		-40		**-800**	20.16			**-30**		**-637.5**	16.07

An increase in demand decreases the demand tariff which is incorrect.

The following section shows the legal text within the CUSC.

CUSC

14.15.40 Generators will have zonal tariffs derived from both, the wider Peak Security nodal marginal km; and the wider Year Round nodal marginal km for the generation node calculated as the increase or decrease in marginal km along all transmission circuits except those classified as local assets.

The zonal Peak Security marginal km for generation is calculated as:

$$WNMkm_{j\,PS} = \frac{NMkm_{j\,PS} * Gen_j}{\sum_{j \in Gi} Gen_j}$$

$$ZMkm_{Gi\,PS} = \sum_{j \in Gi} WNMkm_{j\,PS}$$

Where

Gi	=	Generation zone
j	=	Node
$NMkm_{PS}$	=	Peak Security Wider nodal marginal km from transport model
$WNMkm_{PS}$	=	Peak Security Weighted nodal marginal km
$ZMkm_{PS}$	=	Peak Security Zonal Marginal km
Gen	=	Nodal Generation (scaled by the appropriate Peak Security Scaling factor) from the transport model

Similarly, the zonal Year Round marginal km for generation is calculated as

$$WNMkm_{j\,YR} = \frac{NMkm_{j\,YR} * Gen_j}{\sum_{j \in Gi} Gen_j}$$

$$ZMkm_{GiYR} = \sum_{j \in Gi} WNMkm_{jYR}$$

Where

$NMkm_{YR}$	=	Year Round Wider nodal marginal km from transport model
$WNMkm_{YR}$	=	Year Round Weighted nodal marginal km
$ZMkm_{YR}$	=	Year Round Zonal Marginal km
Gen	=	Nodal Generation (scaled by the appropriate Year Round Scaling factor) from the transport model

14.15.41 The zonal Peak Security marginal km for demand zones are calculated as follows:

$$WNMkm_{j\,PS} = \frac{-1 * NMkm_{j\,PS} * Dem_j}{\sum_{j \in Di} Dem_j}$$

$$ZMkm_{Di\,PS} = \sum_{j \in Di} WNMkm_{j\,PS}$$

Where:

Di	=	Demand zone
Dem	=	Nodal Demand from transport model

Similarly, the zonal Year Round marginal km for demand zones are calculated as follows:

$$WNMkm_{jYR} = \frac{-1 * NMkm_{jYR} * Dem_j}{\sum_{j \in Di} Dem_j}$$

$$ZMkm_{DiYR} = \sum_{j \in Di} WNMkm_{jYR}$$

We would look to make changes to this calculation within the CUSC. Please note I have only included 15.40 as this clause includes definitions of the clauses within the formulae.

Why

If the defect is not resolved Demand tariffs will not accurately reflect the costs imposed on the System by taking demand at that particular location. Where Demand tariffs do not reflect underlying costs, end users will pay more or less than what is required (if someone pays more, then someone will pay less) This creates inefficient investment signals and may go so far as to incentivises adverse behaviour to the investment signal.

The Locational signal, plus total demand at Peak determines how much revenue is required to be recovered from a particular demand zone. If the locational demand tariff increases, an increased amount of revenue is required to be recovered from that zone. If underlying demand has not actually changed then this results in Non Half Hourly charges rising substantially more than Half hourly charges as NHH charges act as a Residual recovery mechanism for that zone. This explains why the forecasted NHH tariff for 18/19 rises more as a percentage change greater than HH tariffs in Zone 1.

How

Insert text here - *If total nodal demand for a zone is positive, sum all positive demands. All Negative Demand is adjusted to 0. This creates an adjusted Total Zonal Demand. All positive demand is weighted against this new demand figure.*

Original

Baseline						**Baseline**					
Node	LRMC	Demand	Weighted Demand	Weighted LRMC		Node	LRMC	Demand	Weighted Demand		
1	1300	0	0%	0		1	1400	-20	-100%	-1400	
2	1400	0	0%	0		2	1500	0	0%	0	
3	1300	10	13%	162.5		3	1400	10	50%	700	
4	1300	5	6%	81.25		4	1400	-15	-75%	-1050	
5	1200	20	25%	300		5	1300	20	100%	1300	
6	1200	20	25%	300		6	1300	20	100%	1300	
7	1300	10	13%	162.5		7	1400	10	50%	700	
8	1300	5	6%	81.25		8	1400	-15	-75%	-1050	
9	1300	10	13%	162.5		9	1400	10	50%	700	
10	1400	0	0%	0		10	1500	0	0%	0	
		80		**1250**	-30.54			**20**		**1200**	-29.32

Proposed

Baseline						**Proposal**						
Node	LRMC	Demand	Weighted Demand	Weighted LRMC		Node	LRMC	Original Demand	Adjusted Demand	Weighted Demand		
1	1300	0	0%	0		1	1400	-20	0	0%	0.00	
2	1400	0	0%	0		2	1500	0	0	0%	0.00	
3	1300	10	13%	162.5		3	1400	10	10	13%	186.67	
4	1300	5	6%	81.25		4	1400	5	5	7%	93.33	
5	1200	20	25%	300		5	1300	20	20	27%	346.67	
6	1200	20	25%	300		6	1300	20	20	27%	346.67	
7	1300	10	13%	162.5		7	1400	10	10	13%	186.67	
8	1300	5	6%	81.25		8	1400	-15	0	0%	0.00	
9	1300	10	13%	162.5		9	1400	10	10	13%	186.67	
10	1400	0	0%	0		10	1500	0	0	0%	0.00	
		80		**1250**	-30.54			**40**	**75**		**1346.67**	-32.9

The change in the locational zonal demand tariff now reflects changes in the underlying locational demand signal (i.e. in the correct direction)

2 Governance

Justification for Urgent, Procedures

The proposal should follow the Urgent CUSC governance process and should proceed to assessment by a Working Group. Drafts tariffs publications at the end of December 2017 seem an appropriate date for an Authority decision to be made ahead of.

Requested Next Steps

This modification should: be assessed by a Workgroup

- be treated as urgent and should proceed as such under a timetable agreed with the Authority

3 Why Change?

If the defect is not resolved Demand tariffs will not accurately reflect the costs imposed on the System by taking demand at that particular location. Where Demand tariffs do not reflect underlying costs, end users will pay more or less than what is required (if someone pays more, then someone will pay less) This creates inefficient investment signals and may go so far as to incentivises adverse behaviour to the investment signal.

The Locational signal, plus total demand at Peak determines how much revenue is required to be recovered from a particular demand zone. If the locational demand tariff increases, an increased amount of revenue is required to be recovered from that zone. If underlying demand has not actually changed then this results in Non Half Hourly charges rising substantially more than Half hourly charges as NHH charges act as a Residual recovery mechanism for that zone. This explains why the forecasted NHH tariff for 18/19 rises more as a percentage change greater than HH tariffs in Zone 1.

4 Code Specific Matters

Technical Skillsets

It would be very useful although not compulsory for workgroup members to have access to and a copy of the DCLF model. This can be arranged by contacting charging.enquiries@nationalgrid.com.

Reference Documents

n/a

5 Solution

These are the details of the Code changes that are proposed, setting out specific document changes to the Code.

This section is "owned" by the proposer and will not be altered by the workgroup and so should set out the change you, as proposer, wish to see made – which you can amend later to take into account issues raised by a Workgroup.

If total nodal demand for a zone is positive, sum all positive demands. All Negative Demand is adjusted to 0. This creates an adjusted Total Zonal Demand. All positive demand is weighted against this new demand figure.

Original

Baseline						**Baseline**					
Node	LRMC	Demand	Weighted Demand	Weighted LRMC		Node	LRMC	Demand	Weighted Demand		
1	1300	0	0%	0		1	1400	-20	-100%	-1400	
2	1400	0	0%	0		2	1500	0	0%	0	
3	1300	10	13%	162.5		3	1400	10	50%	700	
4	1300	5	6%	81.25		4	1400	-15	-75%	-1050	
5	1200	20	25%	300		5	1300	20	100%	1300	
6	1200	20	25%	300		6	1300	20	100%	1300	
7	1300	10	13%	162.5		7	1400	10	50%	700	
8	1300	5	6%	81.25		8	1400	-15	-75%	-1050	
9	1300	10	13%	162.5		9	1400	10	50%	700	
10	1400	0	0%	0		10	1500	0	0%	0	
		80		**1250**	-30.54			**20**		**1200**	-29.32

Proposed

Baseline						**Proposal**						
Node	LRMC	Demand	Weighted Demand	Weighted LRMC		Node	LRMC	Original Demand	Adjusted Demand	Weighted Demand		
1	1300	0	0%	0		1	1400	-20	0	0%	0.00	
2	1400	0	0%	0		2	1500	0	0	0%	0.00	
3	1300	10	13%	162.5		3	1400	10	10	13%	186.67	
4	1300	5	6%	81.25		4	1400	5	5	7%	93.33	
5	1200	20	25%	300		5	1300	20	20	27%	346.67	
6	1200	20	25%	300		6	1300	20	20	27%	346.67	
7	1300	10	13%	162.5		7	1400	10	10	13%	186.67	
8	1300	5	6%	81.25		8	1400	-15	0	0%	0.00	
9	1300	10	13%	162.5		9	1400	10	10	13%	186.67	
10	1400	0	0%	0		10	1500	0	0	0%	0.00	
		80		**1250**	-30.54			**40**	**75**		**1346.67**	-32.9

The change in the locational zonal demand tariff now reflects changes in the underlying locational demand signal (i.e. in the correct direction)

6 Impacts & Other Considerations

Details of any potential cross-code, consumer or environmental impacts and attach or reference any other, related work.

i. This impacts the CUSC

ii. The TNUoS tariff setting process is impacted

iii. No systems will be impacted

Significant Code Review (SCR) or other significant industry change projects

No impact observed with the TCR. This proposal does not appear to link in with any current ongoing modifications as no mods look to change the calculation of zonal weighted demand tariffs within the tariff model. All current mods 271/274/276 are not currently under Urgent timescales.

Consumer Impacts

Consumers in the North of Scotland, if tariffs are passed through by Suppliers will see an unjustified increase in their Electricity bills. If Suppliers choose not to pass this element directly on to the end consumer i.e. (Fixed tariffs) then this will harm competition. Although the defect currently affects consumers in the North of Scotland with the growth of Embedded Generation this could feasibly affect other parts of the country i.e. South West, Wales within 5 years.

7 Relevant Objectives

Impact of the modification on the Applicable CUSC Objectives (Charging):

Relevant Objective	Identified impact
(a) That compliance with the use of system charging methodology facilitates effective competition in the generation and supply of electricity and (so far as is consistent therewith) facilitates competition in the sale, distribution and purchase of electricity;	Positive
(b) That compliance with the use of system charging methodology results in charges which reflect, as far as is reasonably practicable, the costs (excluding any payments between transmission licensees which are made under and accordance with the STC) incurred by transmission licensees in their transmission businesses and which are compatible with standard licence condition C26 requirements of a connect and manage connection);	Positive
(c) That, so far as is consistent with sub-paragraphs (a) and (b), the use of system charging methodology, as far as is reasonably practicable, properly takes account of the developments in transmission licensees' transmission businesses*;	None
(d) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency. These are defined within the National Grid Electricity Transmission plc Licence under Standard Condition C10, paragraph 1; and	None
(e) Promoting efficiency in the implementation and administration of the CUSC arrangements.	None
*Objective (c) refers specifically to European Regulation 2009/714/EC. Reference to the Agency is to the Agency for the Cooperation of Energy Regulators (ACER).	

This section explains how this change will positively or negatively impact the relevant Code objectives and concisely explains the rationale.

a) Consumers in the North of Scotland, if tariffs are passed through by Suppliers will see an unjustified increase in their Electricity bills. If Suppliers choose not to pass this element directly on to the end consumer i.e. (Fixed tariffs) then this will harm competition. Although the defect currently affects consumers in the North of Scotland with the growth of Embedded Generation this could feasibly affect other parts of the country i.e. South West, Wales within 5 years.

b) Tariffs are meant to provide cost reflective signals. The tariffs currently for North of Scotland clearly do not reflect the underlying cost reflective signals. This may lead to increased Transmission expenditure funded by other users

8 Implementation

This proposal will not change any billing systems as demand zones will stay the same. National Grid will need to implement changes to the DCLF model and the code within the model which does require expert Excel knowledge.

9 Legal Text

The Proposer is welcome to put forward suggested legal text. If this is a proposed Fast Track Self-Governance modification then legal text and commentary must be provided. Otherwise the legal text will be provided in conjunction with the Workgroup Report to the CUSC Panel before progressing to the Code Administrator Consultation.

To be developed by the Working Group.

10 Recommendations

Proposer's Recommendation to Panel

Panel is asked to:

- Agree that Normal procedures should apply
- Refer this proposal to a Workgroup for assessment.

