

Workgroup Consultation			
<p>CMP315: TNUoS Review of the expansion constant and the elements of the transmission system charged for and</p> <p>CMP375: Enduring Expansion Constant & Expansion Factor Review</p> <p>CMP375 seeks to amend the calculation of the Expansion Constant & Expansion Factors to better reflect the growth of and investment in the National Electricity Transmission System (NETS), CMP315 is a related but separate change and seeks to review how the Expansion Constant is determined such that it best reflects the actual NETS costs as a result of locational decisions taken by generation and/or demand.</p>	<p>Modification process & timetable</p> <ol style="list-style-type: none"> 1 Proposal Form 16 April 2019 (CMP315); 17 June 2021 (CMP375) 2 Workgroup Consultation 14 April 2022 - 17 May 2022 3 Workgroup Report 21 July 2022 4 Code Administrator Consultation 02 August 2022 - 31 August 2022 5 Draft Modification Report 22 September 2022 6 Final Modification Report 11 October 2022 7 Implementation 01 April 2023 		
<p>Have 5 minutes? Read our Executive summary</p> <p>Have 20 minutes? Read the full Workgroup Consultation</p> <p>Have 30 minutes? Read the full Workgroup Consultation and Annexes.</p>			
<p>Status summary: The Workgroup are seeking your views on the work completed to date to form the final solution(s) to the issue raised.</p>			
<p>These modifications are expected to have a: High impact on all Users who pay TNUoS charges, ESO, Onshore and Offshore Transmission Owners</p>			
<p>Governance route</p>	<p>Standard Governance modification with assessment by a Workgroup</p>		
<p>Who can I talk to about the change?</p>	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <p>Proposers: CMP315: Nick Sillito nsillito@peakgen.com</p> <p>Phone: 07491434518</p> <p>CMP375 : Grahame Neale grahame.neale@nationalgrideso.com</p> <p>Phone: 07787261242</p> </td> <td style="vertical-align: top; width: 50%;"> <p>Code Administrator Chair: Paul J Mullen Paul.j.mullen@nationalgrideso.com</p> <p>Phone: 07794537028</p> </td> </tr> </table>	<p>Proposers: CMP315: Nick Sillito nsillito@peakgen.com</p> <p>Phone: 07491434518</p> <p>CMP375 : Grahame Neale grahame.neale@nationalgrideso.com</p> <p>Phone: 07787261242</p>	<p>Code Administrator Chair: Paul J Mullen Paul.j.mullen@nationalgrideso.com</p> <p>Phone: 07794537028</p>
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<p>How do I respond?</p>	<p>Send your response proforma to cusc.team@nationalgrideso.com by 5pm on 17 May 2022</p>		

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Executive summary

CMP375 seeks to amend the calculation of the Expansion Constant & Expansion Factors to better reflect the growth of and investment in the National Electricity Transmission System (NETS), CMP315 is a related but separate change and seeks to review how the Expansion Constant is determined such that it best reflects the actual NETS costs as a result of locational decisions taken by generation and/or demand.

What is the issue?

CMP375 - As approved under [CMP353](#), the CUSC currently specifies that the Expansion Constant (EC) and associated generic onshore Expansion Factors (EF) are currently fixed at the value used in 2020/21 plus relevant inflation for each following year. Without establishing and implementing an enduring solution for the calculation of the EC and EFs there is a risk that the charging methodology will not appropriately reflect the incremental costs of the system to Users.

The issue identified by CMP315 is related but specifically seeks to change the current approach (rather than the more fundamental review that CMP375 has been raised to look at) and specifically the inputs that currently go into the calculation of the EC and EFs.

What is the solution and when will it come into effect?

Proposer's solution:

Extend the scope of works used in the calculation of the Expansion Constant to include circuit reinforcement, non-circuit and Life Extension works.

- Recalculate and apply a EC or EF value (for each circuit type as per today) applicable from the Implementation Date based on the wider scope of works.
- Create 'proxy circuits' to capture substations in the Transport & Tariff (T&T) model.

As of today, the EC is calculated as the length weighted average cost of all relevant construction over the previous 10 years with the construction cost in each relevant year indexed by inflation to the current year.

The only difference between the CMP315 and CMP375 Original Proposal is their respective interpretations as to what the Expansion Constant should represent.

- The Proposer of CMP375 argues that the current EC/EF calculation reflects the growth in the NETS and this interpretation should continue but be updated to reflect that NETS expansion is no longer primarily driven by new circuits. The CMP375 solution would be reflective of the cost and type of works over the last 10 years only, applied to the whole NETS, prior to the start of the price control.
- The Proposer of CMP315 believes that the EC/EF should be reflective of the cost of the whole NETS (i.e. a replacement value) which includes all historic assets and works undertaken on the NETS over its lifetime.

Implementation date: 1 April 2023

Summary of potential alternative solution(s) and implementation date(s):

Lane, Clark and Peacock (LCP) have presented a methodology similar in concept to the CMP375 Original Proposal and explained later in this document. The main differences are the data inputs and the treatment of non-circuit (substation) reinforcements, which are here allocated to existing circuits in the model based on capacity-added, as opposed to the CMP375 Original approach of creating proxy-circuits. The implementation date is also 1 April 2023.

What is the impact if this change is made?

The expectation of both changes is that they would better reflect the marginal cost of investment on the NETS. There will however be additional data and process requirements on Transmission Owners and Offshore Transmission Owners.

Interactions

CMP375 and CMP315

Given the overlap between CMP375 and CMP315, these Modifications are being developed in parallel but separately. There remains the option to request formal amalgamation of these modifications at a later date if beneficial.

STC

As the EC is calculated using data provided from the Transmission Owners / Offshore Transmission Owners to the ESO for the purposes of charge setting, there will need to be changes to the STCPs and possibly the STC to reflect the data requirements. The draft STCP Modification, PM0124, was presented at March 2022 Panel and will be formally raised at May 2022 Panel.

TNUoS Taskforce

On 25 February 2022, Ofgem published an update following the TNUoS call for evidence describing next steps (<https://www.ofgem.gov.uk/publications/tnuos-call-evidence-next-steps>). Key points are:

- There is a case for TNUoS reform. This reform should be split in to two stages;
 1. Task force(s) focussed on improvements to today's methodology whilst keeping its core assumptions/modelling approach; and
 2. Longer-term reform factoring in the changing energy landscape. Too early to launch a Significant Code Review today but may be needed in future.

At this stage, there is no impact on CMP375 or CMP315 as the scope of the TNUoS Taskforce is not yet formalised; however there is a need to avoid duplication/working at cross-purpose. The general view of the Workgroup was to proceed as soon as possible to Workgroup Consultation even if there is a risk that at least some of the scope could be caught in the scope of the TNUoS Taskforce.

EBR

This modification has no interactions with EBR Article 18 Terms and Conditions.

What is the issue?

CMP375 - As approved under CMP353, the CUSC currently specifies that the Expansion Constant (EC) and associated generic onshore Expansion Factors (EF) are currently fixed at the value used in 2020/21 plus relevant inflation for each following year. Without establishing and implementing an enduring solution for the calculation of the EC and EFs there is a risk that the charging methodology will not appropriately reflect the incremental costs of the system to Users.

CMP315 - The issue identified by CMP315 is related but specifically seeks to reform the current approach (rather than the more fundamental review that CMP375 has been raised to look at) and specifically the inputs that currently go into the calculation of the EC and EFs.

Why change?

The EC, which is an input to the TNUoS charging methodology, reflects the annuitized £/MW/km cost of 400kV overhead line and acts as a multiplier to the 'nodal' TNUoS prices (the relative costs of adding 1MW of generation at each point on the network, or 'node'). The EC directly affects the locational signals that users face and

- High EC values create a sharp locational signal – i.e. increase the strength of the locational price signal.
 - Makes TNUoS charges higher in more expensive zones and more negative in cheaper zones
- Low EC values do the opposite
- If the EC was zero, all the locational charges would be zero

The EC is currently set at the start of each Price Control period and has been (until [CMP353](#) decision explained below) based on projects built in the previous 10 years. It is then adjusted for inflation in each year of the Price Control period.

The GB electricity system is undergoing significant change as it adapts to the challenges of net zero. The methodology underpinning the locational signal for TNUoS charges needs to be robust and consider the changing nature of developments on the NETS compared to when the arrangements were introduced. The EC and EF currently used within the calculation of TNUoS tariffs are currently calculated based on a very limited scope of development to the NETS. As the nature of NETS development and investment has changed over time the number of projects eligible for consideration within calculation of the EC and EFs have shrunk. This means that the development of the NETS may not be accurately captured within the previous calculations and reverting to the prior methodology would not be suitable.

Due to a lower number of built projects in the 10 years prior to the start of RIIO-ET2 and the relatively high cost of these in comparison to the projects in previous periods, the EC would have increased significantly. Therefore, the ESO raised [CMP353](#) to maintain the locational signal at the start of the RIIO-2 period at the RIIO-1 value plus relevant inflation in each charging year until such time as the effect of any change in the locational signal can be better understood. Ofgem [approved CMP353](#) on 2 December 2020 and this was implemented on 1 April 2021.

The CMP353 decision letter also asked the ESO to look at a broader review of the Expansion Constant. CMP375 has been raised to cover this. There is an existing related Modification, CMP315, that “seeks to review how the expansion constant is determined such that it best reflects the costs involved” and was raised on 16 April 2019. There is interaction between CMP315 and CMP375 but amalgamation under CUSC 8.19.3¹ has not currently been sought. Instead, they are progressing in parallel – with joint workgroup meetings.

For the avoidance of doubt, if neither CMP315 nor CMP375 were approved by Ofgem, the current levels of EC would continue (continuing to be uplifted by inflation year-on-year).

What is the solution?

Proposer’s solution for CMP315 and CMP375

For both CMP315 and CMP375

Extend the scope of works used in the calculation of the Expansion Constant to include circuit reinforcement, non-circuit and Life Extension works.

- Recalculate and apply a EC or EF value (for each circuit type as per today) applicable from the Implementation Date based on the wider scope of works.
- Create ‘proxy circuits’ to capture substations in the Transport & Tariff (T&T) model.

As of today, the EC is calculated as the length weighted average cost of all relevant construction over the previous 10 years with the construction cost in each relevant year indexed by inflation to the current year.

In the opinion of the Proposers the only difference between the CMP315 and CMP375 Original Proposal is their respective interpretations as to what the Expansion Constant should represent.

- The Proposer of CMP375 argues that the current EC/EF calculation reflects the growth in the NETS and this interpretation should continue but be updated to reflect that NETS expansion is no longer primarily driven by new circuits. The CMP375

¹ CUSC 8.19.3 “Subject to Paragraphs 8.14.3 and 8.17A.4(b), the CUSC Modifications Panel may decide to amalgamate a CUSC Modification Proposal with one or more other CUSC Modification Proposals where the subject-matter of such CUSC Modification Proposals is sufficiently proximate to justify amalgamation on the grounds of efficiency and/or where such CUSC Modification Proposals are logically dependent on each other.”

solution would be reflective of the cost and type of works over the last 10 years only, applied to the whole NETS.

- The Proposer of CMP315 believes that the EC/EF should be reflective of the cost of the whole NETS (i.e. a replacement value) which includes all historic assets and works undertaken on the NETS over its lifetime

Workgroup considerations

The Workgroup convened 10 times² to discuss the perceived issue, detail the scope of the proposed defect, devise potential solutions and assess the proposal in terms of the Applicable Code Objectives.

Consideration of the proposer's solution

What else could be included in the future EC Calculation?

The ESO Workgroup Member shared a list of potential works that are currently excluded in the EC calculation but could potentially be included to provide a more accurate calculation and this is represented by Figure 1 below:

Figure 1

Type	Description	Examples	Current EC Methodology?	Creates MW capacity	Includes km
New circuit build	Construction of a new circuit	Brand New 400kV circuit	Y	Y	Y
Circuit Reinforcement	Reusing existing towers but reinforcing conductor	Reconductoring, hot wiring, circuit rebuild	N	Y	Y
New non-circuit build	Build of new assets not linked to a circuit	New substations and associated assets	N	Y	N
Substation reinforcement	Replacement or enhancement of assets at substations	Transformer/CB replacement, forced cooling	N	Y	N
'SMART' reinforcement	Works to allow increased network utilisation.	Intertrips, ANM	N	N	N
Life extension	Works to keep existing assets in use for longer than originally intended	Transformer/asset refurbishments	N	N	Y
Non-thermal solutions	Reinforcement to solve a non-thermal constraint (e.g. fault level) allowing access to MW capacity as a secondary benefit	Circuit Breaker replacement, voltage pathfinders	N	N	N

² 3 meetings solely for CMP315 and 7 meetings for CMP315 and CMP375

A Workgroup Member disagreed that ‘SMART’ reinforcement does not provide MW Capacity and noted that Scottish Power Energy Networks are delivering a NETS reinforcement³ that provides new capacity via ‘SMART’ reinforcement in lieu of network build, wherein connected users will be compensated for their network access being below design standards. However, the Proposer of CMP375 noted that this is still not physically firm capacity and therefore, in their opinion, does not create MW capacity for the purpose of the EC calculation. The Workgroup noted that ‘SMART’ reinforcement in lieu of network build could become more prevalent in the future, however, is not included as part of the original proposals for CMP315 and CMP375.

The Proposer of CMP375 then presented their assessment of each option using the following criteria with those in the Red category needing the most change:

Subject Area	Red	Amber	Green
Methodology (i.e. do we know how this would work and how it interacts with the wider TNUoS methodology?)	Would need to be developed in full.	Current methodologies would need to be substantially changed or interactions with other parts of the TNUoS methodology would need to be explored.	Minimal or no change from current methodologies with limited interactions with other parts of the TNUoS methodology.
System/Data (i.e. can our existing tools cope with the new methodology and do we have the needed data?)	Significant new tools would need to be created	Supplementary tools to be created or significant data changes needed	Minor changes to underlying data within existing tools
Timescale (i.e. when can we do it for?)	April 2025+	April 2024	April 2023

The results of the Proposer of CMP375’s analysis is represented by Figure 2 below:

Figure 2

Reinforcement Type	Possible Implementation approach	Methodology	System/Data		Timescale	
(A) New circuit build	1. No change	No changes needed from today				
	2. Circuit Specific calculation	Applies current methodology	Green for new circuits	Amber for reinforcement	Green for new circuits	Amber for reinforcement
	3. Boundary constraint	To be fully developed	New systems/processes needed	Time needed for development		

³ For further detail on this NETS reinforcement, please refer to TORI Quarterly Update report, which has 1 summary page on SPT-RI-284: [Transmission Connections - SP Energy Networks](#)

(B) Circuit Reinforcement	1. Treat the same as (A) i.e. included in EF basket together with (A)	Same as chosen option for (A) – EC and EFs are still single numbers.		
	2. New 'Reinforcement Factor' for a specific circuit	Methodologies to be revised	Data required from TO, may be insufficient projects	Development and data collection
(C) New non-circuit build & (D) Non-circuit reinforcement i.e. how you reflect substation costs into the EC/EF calculation	1. Allocate assets across existing circuits, and include in EF basket together with (A)	TBC how assets allocated, although a Workgroup Member believes that this should be amber as the LCP approach has shown that this can be done without entire new methodology nor significant tooling	Significant number of data changes	Data required from TO and inputting in to T&T model
	2. Create a new 'proxy circuit' with EF separate to (A)	Current methodology used but interactions to be considered.	Significant number of new circuits to be added	Data required from TO and inputting in to T&T model
	3. No change	No changes needed from today		
(E) 'SMART' reinforcement	1. No change	No changes needed from today		
	2. Treat the same as (C) and (D)	Interactions across TNUoS	Same as chosen option for (C) and (D)	
	3. New 'Reinforcement Factor'	Methodologies to be revised and Interactions across TNUoS	Data required from TO, may be insufficient projects	Development and data collection
(F) Life extension	1. No change	No changes needed from today		
	2. Treat the same as (A) i.e. included in EF basket together with (A)	Clarifications in methodology	Data required from TO	Data required from TO

Other key points were:

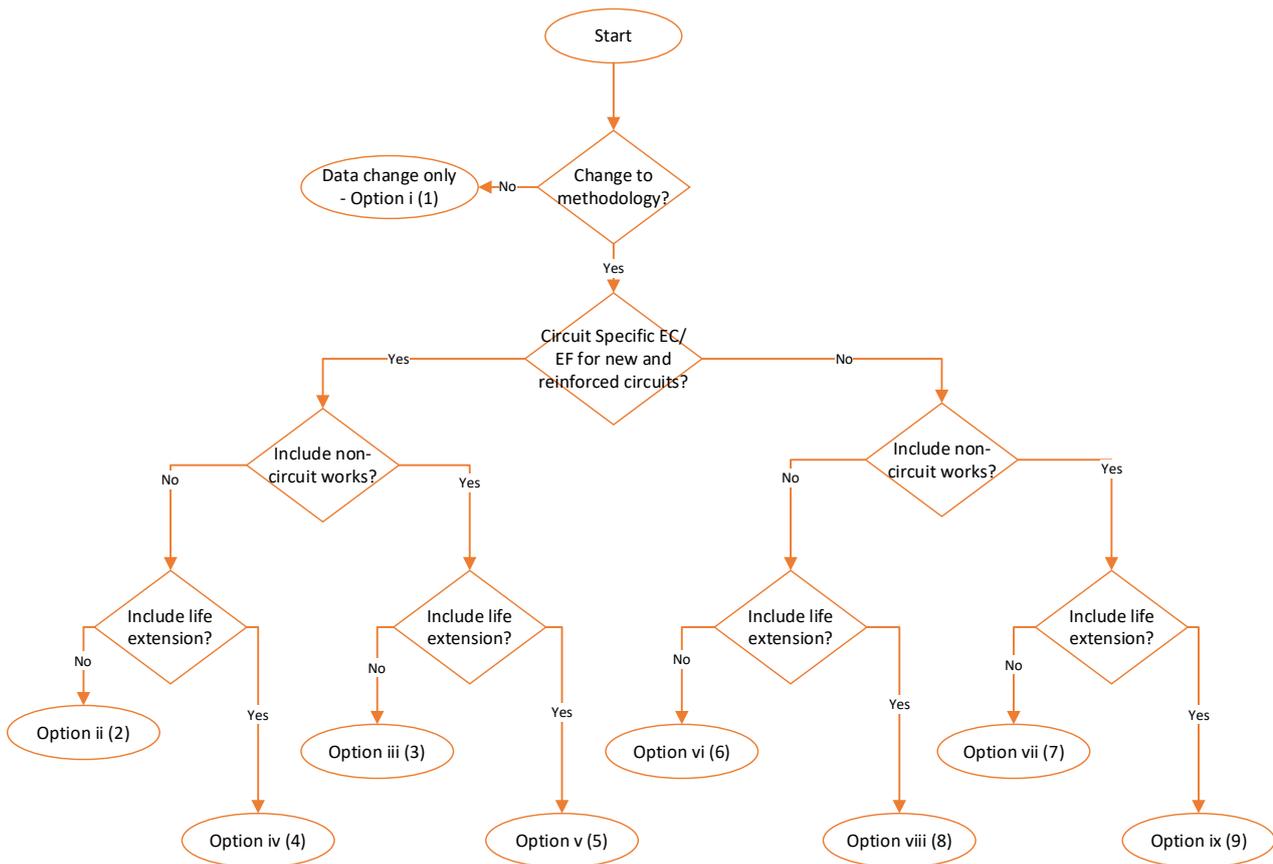
- Although Intertrips could theoretically be covered in the EC, 'SMART' reinforcement has too many interactions across TNUoS methodology (e.g. Security factor, Sharing Factor, Design variation v s operational intertripping) that need to be considered to progress quickly.; and
- For the Non-Transmission Owner led solutions, the costs of these projects will be covered by BSUoS and so not impact TNUoS and therefore including them would be double counting.

Based on excluding ‘SMART’ reinforcement and Non-Transmission Owner led solutions, the Proposer then presented 9 resulting options for the Workgroup to consider. These options arise from 3 broad key components;

- Should there be Circuit Specific Expansion Constants/Expansion Factors?:
- Should non-circuit works be included?; and
- Should life extensions (Works to keep existing assets in use for longer than originally intended) be included?

The following flow chart (represented by Figure 3) shows the 9 resulting options diagrammatically.

Figure 3



The Workgroup ruled out options which contemplated a Circuit Specific Expansion Factor for reasons of practicality and materiality, as you would need a number of years before there is enough data to make a significant difference to the calculation.

The Proposers of both CMP315 and CMP375 both indicated their preference for an option that includes non-circuit works and life extensions as this widens the net of what can be included when calculating the Expansion Constant. However, the Proposer of CMP375 has developed a proof of concept that any of these 9 options could work (subject to data).

The Workgroup acknowledged that the (mathematical) detail of how the EC/EFs are calculated to reflect reinforcement and life extensions is still unclear and needs to be defined in later meetings. This will partly be impacted by the different opinions in the Workgroup (discussed later in this document), which will impact how these works are reflected in the EC/EF calculation. The key factors to consider will be:

- How any additional cost/capacity of the (reinforcement and/or life extension) works is reflected in the T&T model compared to the existing circuit; and
- How annuitisation of the (reinforcement and/or life extension) works is calculated compared to the TNUoS assumption of 50 year asset life.

Specific Workgroup consultation question: Do you agree with the CMP315 and CMP375 Proposers' conclusions that the Expansion Constant should also include circuit reinforcement, non-circuit works and life extension works in addition to new circuit build. Are there any other reinforcement types that should be included? Please provide justification for your response.

Transport and Tariff Model Interpretation - General

Current TNUoS locational charges are based on an Incremental Cost-Related Pricing (ICRP) model of the long run marginal cost (LRMC) of the NETS. This is calculated by using the Transport and Tariff (T&T) model to work out the incremental flow on every circuit of the NETS caused by a change in generation and/or demand and multiplied by the annuitized value of the transmission infrastructure capital investment required to transport 1 MW over 1 km⁴.

The T&T model uses different classes of transmission infrastructure (400kV, 275kV and 132kV and overhead line and underground cable) and has a cost per MWkm for each asset class. In the model these are characterised by the EC, the cost for 400kV overhead line, and then EFs for each asset class representing the ratio of the cost of 400kV overhead line to the other asset classes i.e. with the EF's being a multiplier of the EC. The EF for new-build 400kV overhead line is 1.

This process is described in the CUSC at 14.15.4, where the T&T model is referred to as the DC Load Flow (DCLF) ICRP transport model:

“The DCLF ICRP transport model calculates the marginal costs of investment in the transmission system which would be required as a consequence of an increase in demand

⁴ CUSC 14.15.59

or generation at each connection point or node on the transmission system, based on a study of peak demand conditions using both Peak Security and Year Round generation backgrounds on the transmission system. One measure of the investment costs is in terms of MWkm. This is the concept that ICRP uses to calculate marginal costs of investment. Hence, marginal costs are estimated initially in terms of increases or decreases in units of kilometres (km) of the transmission system for a 1 MW injection to the system”.

Transport and Tariff Model Interpretation - General

The intention of both CMP315 and CMP375 is to retain the above methodology. However, the calculation of the cost annualized transmission investment should be expanded to reflect current practice that:

- i. Some assets are being life extended⁵; and
- ii. Some assets are having their capability enhanced (for example reconductoring overhead lines with higher capacity conductor).
- iii. The NETS consists of more than just circuits.

The purpose of the EC (and EF) is to convert the distance (km) figure determined by the T&T model into a cost. The EC and EF are previously (prior to [CMP353](#)) calculated using standardised costs from the latest 10 years of new circuit (overhead line and cable) build. There are differences of opinion within the Workgroup whether the incremental nature of ICRP relates to the incremental transportation of energy on the NETS or the incremental expansion of the NETS to transport energy. The 1992 Transmission Use of System Charges Review (page 15) states:

“The cost of capacity per MW/km represents the annual cost of building and maintaining capacity to transport one MW of power one kilometre between points on the NETS. This incremental cost comprises two components: a capital cost and an operating cost. The capital cost is the cost of building (or having built) one MW/km of transmission capacity converted to an annual charge. The operating cost component covers the cost of repair and maintenance of capital equipment plus administration costs. The basis of the capital cost component is the current average cost at replacement value of the present system.”

However, there is a difference of opinion as to how the value of the EC is reflected in the T&T Model and importantly the different interpretation won't affect how the T&T model works but will affect what data is input and what the T&T model's output is representing.

Transport and Tariff Model Interpretation – CMP375 Original

The Proposer of CMP375 believes that the current EC/EF calculation reflects the growth in the NETS and this interpretation should continue but be updated to reflect that NETS expansion is no longer primarily driven by new circuits.

Transport and Tariff Model Interpretation – CMP315 Original

The Proposer of CMP315 believes that the EC/EF should be broader and more reflective of the cost of the whole NETS (i.e. a replacement value) which includes all assets and works undertaken on the NETS and the Proposer of CMP315 provided a worked example in Annex 3 to support their conclusion. This interpretation is the only current difference

⁵ This could mean the depreciation period in the Expansion Constant could differ from the regulatory settlement

between the CMP375 and CMP315 Original solutions. Regardless of which interpretation(s) are progressed by the Workgroup, the Workgroup acknowledge that this is likely to also be discussed (and possibly revised) by the TNUoS Taskforce when it is established.

Transport and Tariff Model Interpretation – Other Workgroup Member View

Another Workgroup Member's view was that the TNUoS model need to change to better reflect the reality of developments in the NETS where incremental cost is no longer based on the installation of 400kV circuits. This alternate approach also challenges traditional thinking where sunk costs made up of the historic build of the 400kV network are the core of the marginal cost calculation used to determine the EC. This approach seeks to establish the forward-looking marginal cost over a realistic 5–10-year time horizon that is consistent with the RIIO-T2 business plans.

The vast bulk of the 400kV NETS is sunk cost and it is unlikely to be decommissioned or indeed expanded with new 400kV circuits, The Workgroup Member argued that to continue to include it in a forward-looking charge could be viewed as sub-optimal. The proposed alternate approach would replace the cost of new build 400kV in the EC with a representative “basket” of techniques and technologies that are expected to be used over the next 5-10 years. The ESO would determine the makeup of this basket that would likely be based on planned and future development drawn from the RIIO T2 business plan for each TO. These would likely include:

- a) New circuit build (existing methodology)
- b) Circuit replacement/refurbishment
- c) New non-circuit build e.g. substations
- d) Non-circuit reinforcement e.g. transformers
- e) 'Smart' reinforcement option e.g. intertrips and Active Network Management
- f) Life extension options
- g) Non-thermal solution options e.g. circuit breaker replacement
- h) Re-using existing connection points as traditional carbon-based generation closes

Each would be appropriately weighted to reflect the MW capacity they are likely to bring within each Transmission Owner region.

There are various ways that this change could be implemented in the TNUoS model. The Workgroup Member presented one solution would be to broaden the definition of the EC in CUSC 14.15.59 as follows (the changes are shown in red text):

*14.15.59 The expansion constant, expressed in £/MWkm, represents the annuitised value of the transmission infrastructure capital investment required to transport 1 MW over 1 km. Its magnitude is derived from the projected **cost of a representative basket of technologies and techniques that are used to accommodate changes in circuit use at 400kV of 400kV overhead line**, including an estimate of the cost of capital, to provide for future system expansion.*

The relative cost at other voltages and for cable circuits would be relative to this new definition.

The ESO is already required in the CUSC⁶ to derive this parameter using information from the onshore Transmission Owners but, under this approach, this will be expanded to include all of the technologies and techniques set out in (a)-(h) including re-use of existing connection points following the closure of the carbon-based generation where the marginal cost is close to zero.

Specific Workgroup consultation question: CMP315 and CMP375 have different proportions of each reinforcement type in the basket for the calculation of the Expansion Constant because the Proposers have different interpretations as to what the Expansion Constant should represent. Which one of these interpretations do you agree with or do you have a different approach? Please provide justification for your response.

Specific Workgroup consultation question: A Workgroup Member has also suggested an alternative approach to establish the forward-looking marginal cost over a realistic 5–10-year time horizon. Do you agree with this interpretation or would you suggest a different approach? Please provide justification for your response.

Data Considerations

NGESO receive data from the Transmission Owners / Offshore Transmission Owners for the purpose of producing the Network Options Assessment (NOA). The data that the ESO receives as part of NOA is listed in [Appendix B of the NOA methodology](#) and includes Transmission Owner proposed options and expected Costs. Currently this data is not used for calculating the EC and EFs; a separate process and data set used for the EC and EFs.

Both CMP315 and CMP375 provide for additional data requirements on the Transmission Owners and these will need to be formalised within the STC/STCP.

The Workgroup considered whether it is feasible to use non-Transmission Owner sources of data (EU TSOs, DNOs, commodity prices, manufacturer prices etc.) instead of Transmission Owner data but concluded it wasn't for the following reasons:

- Questions whether this was more accurate/reliable than the Transmission Owner's data
- Unclear if they need additional sources of non-Transmission Owner data as not clear on what data is missing and they haven't seen any actual data as yet to make an informed judgement.

The Workgroup also considered if there was any additional benefit of using a combination of historic and forecast data but the CMP315 and CMP375 Originals propose using historical data (as now). The Workgroup agreed that such data should be directly sourced from Transmission Owners.

⁶ CUSC 14.15.61 – “The transmission infrastructure capital costs used in the calculation of the expansion constant are provided via an externally audited process. They also include information provided from all onshore Transmission Owners (TOs). They are based on historic costs and tender valuations adjusted by a number of indices (e.g. global price of steel, labour, inflation, etc.). The objective of these adjustments is to make the costs reflect current prices, making the tariffs as forward looking as possible. This cost data represents The Company's best view; however it is considered as commercially sensitive and is therefore treated as confidential. The calculation of the expansion constant also relies on a significant amount of transmission asset information, much of which is provided in the Seven Year Statement.”

The Proposer of CMP375 argued that the current approach of 10 years historic data is preferable as it's quicker from a Workgroup development perspective (as it is current process) and the ESO no longer have details of the projects/calculations prior to RIIO-T-1 (i.e. from the Transmission Price Control Review era of price controls).

The Workgroup discussed different time periods over which to collect cost and reinforcement data. Some Workgroup Members expressed that a longer period may mitigate problems of insufficient data. Some Workgroup Members expressed that nearer to real-time and even partially forward-looking data (e.g. approved expenditure) may better reflect the growth of NETS. Specifically, these conversations covered:

1. **Data from a different timeframe.** More historic data (over the current 10 years) could be used to ensure there remains sufficient data for the calculation; however, this creates a risk that more recent developments do not affect the calculation sufficiently. This is partly mitigated by point 3 below;
2. **Forecast data (or a combination of historic and forecast data).** Historic data could be replaced by (or augmented with) forecast data so that it is more reflective of future NETS investment. The challenge is ensuring these forecasts are accurate and transparent to industry; and
3. **Weighted data.** Data from (1) and (2) above could be weighted so that certain data points are given more influence on the EC/EF calculation. The difficulty with this approach would be creating the methodology for weighting the data across work type (new build, reinforcement etc), data type (forecast vs historic) and data age (newer vs older).

At this stage there are no other options proposed by the Workgroup.

Cost data inputs versus Reinforcement Type data inputs

A Workgroup Member argued that it is possible to separate the period of time used to collect cost data, from the period of time used to reflect the relative deployment of different reinforcement types. To illustrate, it may be desirable to include cost input data from a longer period, e.g. 20 years, to ensure sufficiency. However, they added that when considering the relative deployment of different circuit and non-circuit reinforcements it may be desirable to use nearer-term weighting to better reflect the growth in NETS, e.g. using the most recent 5 years including approved price control investment plans.

- The CMP375 Original proposal, at the start of each price control, is to consider the previous 10 years of data for both the cost inputs and for reflecting different reinforcement types, in real money of today with no specific weighting of any particular year.
- The CMP315 Original proposal is also, at the start of each price control, to consider the previous 10 years of data for both the cost inputs and for reflecting different reinforcement types, in real money of today with no specific weighting of any particular year.

Specific Workgroup consultation question: CMP315 and CMP375 Originals propose using the last 10 years historical data when calculating the Expansion Constant/Expansion Factors. Do you agree with this approach or are there alternative approaches to consider? Please provide justification for your response.

The ESO Workgroup Member noted that the ESO will be submitting a formal data request (to include the data they need for this change) to Transmission Owners – the STCP Modification will be issued to the May 2022 Panel. The ESO have been in discussions with the Transmission Owners and the draft STCP Modification, PM0124, was presented at March 2022 Panel. The data that the ESO are requesting from the Transmission Owners is set out in Annex 5.

Specific Workgroup consultation question: Do you agree with the list of data items, the ESO require from Transmission Owners to calculate the Expansion Constant. Please provide justification for your response.

In parallel, alongside this ongoing data request, the analysis commissioned from LCP described below and in Annex 4 was designed to make use of data which could be more easily provided as part of a data request. The analysis described requires datasets which are included within each Transmission Owner's RIIO-T2 business plans. Some Transmission Owners expressed reservations about their ability to share this data as, in their opinion, this is commercially sensitive and in any case should only be provided to the ESO via an STC request. Some Workgroup members have also approached Ofgem, who have the ability under Transmission Licence to request such data; however there is no route for Ofgem to disseminate any further. Some Workgroup members asked the ESO for support in resolving this issue and whether or not they could engage with LCP directly to use data obtained by the ESO to progress this solution (only sharing the outcomes with wider industry). The ESO Workgroup Member does not believe they could use LCP as this could leave them open to legal challenge. In addition, whilst this could be undertaken for CMP315/375, given the expected nature and scope of the TNUoS Taskforces and the likely overlap with CMP315/375, ESO believe any consultancy support would provide more consumer value to the TNUoS Taskforces rather than CMP315/375 in isolation.

Lane Clark and Peacock's (LCP) analysis

To show what the EC / EF values could look like, LCP (commissioned by one Workgroup Member) presented their analysis using project costs included from Scottish Power Energy Networks' RIIO-T2 published Business Plan. This analysis, which is described in detail in Annex 4, shows how expansion factors can be calculated using data from Transmission Owner's RIIO-T2 business plans and published surveys of new build circuits. The methodology uses costs estimates from planned reinforcements over the next price control period, along with details of the planned works.

This analysis demonstrates that it is possible to calculate an EC and a new set of and EFs based on existing data sets which capture most of the reinforcement types required.

Using this data, LCP has developed a methodology for calculating the cost in £/MW-km terms for most of the reinforcement types covered, including circuit reinforcement and replacement, new non-circuit build and non-circuit reinforcement. This data is sourced from

the RIIO-T2 engineering justification papers. Within this work, LCP have developed a methodology for calculating the MW-km contribution of non-circuit build based on the average network capacity enabled by the reinforcement.

To calculate EFs using these reinforcement costs, LCP have calculated the volume-weighted average cost of reinforcement using the volumes of each type of reinforcement planned for the upcoming price control period. This data is sourced from the RIIO-T2 Business Plan Data Tables.

EFs are still calculated relative to the EC, which remains set as the cost of new build 400kV Overhead Line (OHL). However, as the 400kV OHL reinforcement category now includes other reinforcement types, the EF for 400kV OHL may differ from 1. An EC calculated for this analysis based on a published study into new build circuit costs – with a resulting value similar to that currently maintained by [CMP353](#). However, the other reinforcement types were costed separately, and as a result if a different EC was used (based on different input data), then the EFs would be scaled accordingly.

The table shows example EFs if all reinforcement types were included, based on the data made available by Scottish Power Energy Networks. Additional data from other Transmission Owners would enhance this analysis and may produce different EFs, particularly in cases where they are set by one or two reinforcement projects. To do this, some Workgroup Members asked the other Transmission Owners to consider passing information from their business plans directly to the ESO solely for the purpose of updating this analysis, however this issue has not been progressed, as explained in the previous section.

Voltage	New approach		Current approach	
	OHL expansion factor	Cable expansion factor	OHL expansion factor	Cable expansion factor
400kV	0.47	5.75	1.00	10.20
275kV	0.81	3.31	1.20	11.45
132kV	1.29	5.05	2.87	22.58

Specific Workgroup consultation question: In their analysis, Lane Clark and Peacock (LCP) have provided an alternative implementation approach proposing non-circuit build to be allocated to existing circuits and thereby included within the EFs rather than creating proxy circuits (as proposed by the CMP315 and CMP375 Original). Do you have any thoughts on this and do you agree with LCP's proposal for reinforcement factors? Please provide justification for your response.

The following summary table sets out how the CMP315 Original, CMP375 Original and LCP Analysis differ. This is based on the possible implementation options proposed under Figure 2 and the subsequent discussions, which are captured above.

Figure 4

	CMP315 Original	CMP375 Original	LCP Analysis
Proportions of reinforcement type in each EF basket	Based on proportions of	Based on proportions of	Based on planned reinforcements approved

		capacity delivered in last 10 years only	capacity delivered in last 10 years only	at the most recent Price Control
Implementation Approach for each reinforcement type	(A) New circuit build	1. No change	1. No change	1. No change
	(B) Circuit reinforcement	1. Included in EF basket together with (A)	1. Included in EF basket together with (A)	1. Included in EF basket together with (A)
	(C) New non-circuit build & (D) Non-circuit reinforcement i.e. how you reflect substation costs into the EC/EF calculation	2 Create a new 'proxy circuit' with EF separate to (A)	2 Create a new 'proxy circuit' with EF separate to (A)	1. Allocate assets across existing circuits, and include in EF basket together with (A) - <i>As well as the additional cost of the reinforcements, it also considers the additional network capacity provided by these reinforcements, relative to the counterfactual where no reinforcement is undertaken, by enabling network capacity on connected circuits.</i>
	(E) 'SMART' reinforcement	1. No change	1. No change	1. No change
	(F) Life Extensions	2. Included in EF basket together with (A)	2. Included in EF basket together with (A)	1. No change

Draft legal text

To be developed post Workgroup Consultation.

What is the impact of this change?**Proposer's assessment against Code Objectives****CMP315**

Proposer's assessment against CUSC Charging Objectives	
Relevant Objective	Identified impact
(a) That compliance with the use of system charging methodology facilitates effective competition in the	Positive

generation and supply of electricity and (so far as is consistent therewith) facilitates competition in the sale, distribution and purchase of electricity;	More cost reflective charging helps facilitate a level playing field for competition.
(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 The purpose of this modification proposal is to refine the expansion constant so that it reflects the costs of all the assets used to construct the transmission system (rather than simply an idealised overhead line). This will improve the cost reflectivity of the locational element of the TNUoS charge allowing more cost reflective charging.
(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;	Positive More cost reflective charging provides a better match between allowed regulated revenues and actual costs so more properly takes account of developments to the transmission licences' business (c)
(d) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency *; and	Positive Improving the cost reflectivity of charging also matches the objectives in Special Condition C10.
(e) Promoting efficiency in the implementation and administration of the system charging methodology.	Neutral
*Objective (d) refers specifically to European Regulation 2009/714/EC. Reference to the Agency is to the Agency for the Cooperation of Energy Regulators (ACER).	

CMP375**Proposer's assessment against CUSC Charging Objectives****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 Clarity in the development of the EC and its likely direction of travel will provide more certainty to Users of their costs in future years.
(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 Amending the EC will allow the charging methodology to better account for developments in the costs of the transmission system.
(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;	Positive Amending the EC will allow the charging methodology to better account for developments in the costs of the transmission system.
(d) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency *; and	Neutral
(e) Promoting efficiency in the implementation and administration of the system charging methodology.	Positive This modification will remove the temporary EC methodology and implement an enduring solution.
*Objective (d) refers specifically to European Regulation 2009/714/EC. Reference to the Agency is to the Agency for the Cooperation of Energy Regulators (ACER).	

Impacts on Users who pay TNUoS charges

High EC values create a sharp locational signal and makes TNUoS charges higher in more expensive zones and lower in cheaper zones. Low EC values do the opposite.

Differences in revenue recovered due to the changing locational signal will cause changes to the value to be recovered through the Transmission Demand Residual (TDR) so the total value of TNUoS collected by the ESO is unchanged.

Impacts on ESO

There will be changes to the T&T model inputs and ESO would need updated processes to include the additional data items in the EC calculation.

Impacts on Transmission Owners and Offshore Transmission Owners

If this change is implemented, Transmission Owners will need to provide additional data to the ESO, potentially including additional data as part of their Business Plans.

This modification will not affect the overall cost recovery by the ESO on behalf of the Transmission Owners.

Standard Workgroup consultation question: Do you believe that CMP315 Original proposal better facilitates the Applicable Objectives?

Standard Workgroup consultation question: Do you believe that CMP375 Original proposal better facilitates the Applicable Objectives?

When will this change take place?

Implementation date

1 April 2023

Date decision required by

If needed in time for draft TNUoS tariffs for 2023/2024 to be published, then a decision on both the CUSC and STC Modifications would be needed by 1 September 2022 as there would need to be sufficient time for Transmission Owners to provide the data to ESO and ESO to update the T&T model and run the draft TNUoS tariffs. However, a decision date of 1 September 2022 is not possible under the current timeline.

If only needed in time for final TNUoS tariffs for 2023/2024 to be published, then a decision on both the CUSC and STC Modifications would be needed by 1 December 2022. This is possible under the current timeline; however, some Workgroup Members expressed concerns with the lack of notice given that this is such a big change but noted that if the Workgroup's analysis was sufficiently detailed i.e. broke down the new EC/EFs per TNUoS zone, then this approach is possible.

Implementation approach

1 April 2023 is based on minimal changes made to the methodology, data and systems Transmission Owners to provide the data to ESO, which is line with that proposed for both CMP315 and CMP375.

Standard Workgroup consultation question: Do you support the implementation approach?

Specific Workgroup consultation question: To achieve implementation by 1 April 2023, the Workgroup understand that it will not be possible under the current timeline to include the new EC/EFs in the draft TNUoS tariffs for 2023/2024. Do you support this and, if so, in the absence of draft TNUoS tariffs for 2023/2024, what detail will you need ahead of final TNUoS tariffs being published?

Interactions

- | | | | |
|--|--|---|--------------------------------|
| <input type="checkbox"/> Grid Code | <input type="checkbox"/> BSC | <input checked="" type="checkbox"/> STC | <input type="checkbox"/> SQSS |
| <input type="checkbox"/> European
Network Codes | <input type="checkbox"/> EBR Article 18
T&Cs ⁷ | <input type="checkbox"/> Other
modifications | <input type="checkbox"/> Other |

How to respond

Standard Workgroup consultation questions

1. Do you believe that CMP315 Original proposal better facilitates the Applicable Objectives?
2. Do you believe that CMP375 Original proposal better facilitates the Applicable Objectives?
3. Do you support the proposed implementation approach?
4. Do you have any other comments?
5. Do you wish to raise a Workgroup Consultation Alternative request for the Workgroup to consider?

Specific Workgroup consultation questions

6. Do you agree with the CMP315 and CMP375 Proposers' conclusions that the Expansion Constant should also include circuit reinforcement, non-circuit works and life extension works in addition to new circuit build. Are there any other reinforcement types that should be included? Please provide justification for your response.
7. CMP315 and CMP375 have different proportions of each reinforcement type in the basket for the calculation of the Expansion Constant because the Proposers have different interpretations as to what the Expansion Constant should represent. Which one of these interpretations do you agree with or do you have a different approach? Please provide justification for your response.
8. A Workgroup Member has also suggested an alternative approach to establish the forward-looking marginal cost over a realistic 5–10-year time horizon. Do you agree with this interpretation or would you suggest a different approach? Please provide justification for your response.
9. CMP315 and CMP375 Originals propose using the last 10 years historical data when calculating the Expansion Constant/Expansion Factors. Do you agree with this approach or are there alternative approaches to consider? Please provide justification for your response.
10. Do you agree with the list of data items, the ESO require from Transmission Owners to calculate the Expansion Constant. Please provide justification for your response.
11. In their analysis, Lane Clark and Peacock (LCP) have provided an alternative implementation approach proposing non-circuit build to be allocated to existing circuits and thereby included within the EFs rather than creating proxy circuits (as proposed by the CMP315 and CMP375 Original). Do you have any thoughts on this and do you agree with LCP's proposal for reinforcement factors? Please provide justification for your response.

⁷ If the modification has an impact on Article 18 T&Cs, it will need to follow the process set out in Article 18 of the Electricity Balancing Regulation (EBR – EU Regulation 2017/2195) – the main aspect of this is that the modification will need to be consulted on for 1 month in the Code Administrator Consultation phase. N.B. This will also satisfy the requirements of the NCER process.

12. To achieve implementation by 1 April 2023, the Workgroup understand that it will not be possible under the current timeline to include the new EC/EFs in the draft TNUoS tariffs for 2023/2024. Do you support this and, if so, in the absence of draft TNUoS tariffs for 2023/2024, what detail will you need ahead of final TNUoS tariffs being published?

The Workgroup is seeking the views of CUSC Users and other interested parties in relation to the issues noted in this document and specifically in response to the questions above. Please send your response to cusc.team@nationalgrideso.com using the response pro-forma which can be found on the CMP315/CMP375 modification page.

In accordance with Governance Rules if you wish to raise a Workgroup Consultation Alternative Request please fill in the form which you can find at the above link.

If you wish to submit a confidential response, mark the relevant box on your consultation proforma. Confidential responses will be disclosed to the Authority in full but, unless agreed otherwise, will not be shared with the Panel, Workgroup or the industry and may therefore not influence the debate to the same extent as a non-confidential response.

Acronyms, key terms and reference material

Acronym / key term	Meaning
BSC	Balancing and Settlement Code
CMP	CUSC Modification Proposal
CPI	Consumers Price Index
CUSC	Connection and Use of System Code
DNOs	Distribution Network Operators
EBR	Electricity Balancing Guideline
EC	Expansion Constant
EF	Expansion Factors
ESO	Electricity System Operator
EU	European Union
LRMC	Long Run Marginal Cost
NETS	National Electricity Transmission System
NOA	Network Options Assessment
RIIO	Revenue=Incentives+Innovation+Outputs
SRMC	Short Run Marginal Cost
STC	System Operator Transmission Owner Code
SQSS	Security and Quality of Supply Standards
T&Cs	Terms and Conditions
TO	Transmission Owner
TPCR	Transmission Price Control Review
TSO	Transmission System Operator

Reference material

- None
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Annexes

Annex	Information
Annex 1	CMP315 and CMP375 Proposal forms
Annex 2	CMP315 and CMP375 Terms of reference
Annex 3	CMP315 Proposer's view of how Expansion Constant value should be represented in the Transport and Tariff Model
Annex 4	Lane Clark and Peacock's (LCP) analysis
Annex 5	ESO Data request to Transmission Owners