Charging Futures

Reforming electricity charging together

# TNUoS Task Force

## Meeting 7.5

18th August 2023

# Agenda

**10:00 – 11:15**

- 10:00 Introduction & Welcome
- 10:05 Action Review
- 10:15 Stakeholder Feedback
- 10:30 OTNR Update
- 10:45 Reference Node Case for Change: Overview
- *11:15 Break*

**11:30 – 12:30**

- 11.30 Reference Node Case for Change: Feedback & Further Discussion
- 12:15 Workstream Plan: Resource Allocation
- *12:30 Lunch*

**13:00 – 14:00**

- 13.00 Data Inputs Workstream: Initial Thinking
- 13.30 Signals Workstream: CMP405 'TNUoS Locational Demand Signals for Storage'
- 13:55 Next Steps & Close



Charging Futures

# Action Review

## Jon Wisdom

# Actions from Meeting 7

| ID/ date | Agenda Item | Description | Owner | Notes | Target Date | Status |
|---|---|---|---|---|---|---|
| 1<br>27/07 | 3 | Consider whether updating the 'pseudo-CBA approach' to scaling factors is currently feasible with the data available and whether case for change should include the analysis from the consultants | JT | Consider as part of Backgrounds case for change | Mtg 7.5 | Open |
| 2<br>27/07 | 3 | Provide a viewpoint as to the extent to which scaling factors currently mitigate volatility | Frontier/LCP | | Mtg 7.5/8 | Open |
| 3<br>27/07 | 3 | Consider whether backgrounds are complicating understanding of how charges work or a necessary element of the cost reflectivity of the model. | Task Force | | Mtg 7.5 | Open |
| 4<br>27/07 | 3 | Share the draft case for change for the reference node for Task Force feedback ahead of Mtg 7.5 | JT, EB, DS | | 1 Aug | Open |
| 5<br>27/07 | 3 | Share any academic preference for a demand-/generation-weighted reference node | AMo | Pass on to TF to consider ahead of Mtg 7.5 (18 Aug) | 18 Aug | Open |
| 6<br>27/07 | 5 | Review past calculations for sharing to provide a recommendation for what work would be feasible now | Frontier/LCP | Information shared by SL 28 Jul | Mtg 8 | Open |
| 7<br>27/07 | 5 | Consideration of renewables in sharing (wind vs wind, treatment of solar). | Frontier/LCP | JS to assess information needed | Mtg 8 | Open |
| 8<br>27/07 | 5 | Exploration of turning off sharing to see impacts on final charges and volatility | Frontier/LCP | | Mtg 8 | Open |



Charging Futures

# Actions from Meeting 7

| ID/ date | Agenda Item | Description | Owner | Notes | Target Date | Status |
|---|---|---|---|---|---|---|
| 9<br>27/07 | 8 | Consider calculating using a 5 year average rather than current 5 year method | Frontier/LCP | | Mtg 8 | Open |
| 10<br>27/07 | 8 | Consider whether deemed generation (as used in CfD) could be used as part of the ALF calculation. | Frontier/LCP | | Mtg 6-10 | Open |
| 11<br>27/07 | 8 | Consider the information available to share with consultants & TF re: potential new ESO products and impacts on FPN, and possible new data input modification | JS | | 4 Aug | Open |
| 12<br>27/07 | 8 | Absolute values to be shared for the impact of using FPN only on Year Round components of the tariff. | Frontier/LCP | Material impacts possible for different scales of plant | Mtg 8 | Open |
| 13<br>27/07 | 8 | Contact DNOs for information on key assumptions used in their Wk 24 forecasting. | JS, NW | | Mtg 8 | Open |
| 14<br>27/07 | 8 | Consider aligning Week 24 data with the SQSS change and move to gross demand. | JZ | | Mtg 8 | Open |
| 15<br>27/07 | 8 | Contact TOs for a view on what data inputs could be more regularly updated (re: locational tariff calculations) with a material impact and their view on revenue being deferred for a year | JS, NW | | Mtg 8 | Open |
| 16<br>27/07 | 11 | Respond to the email requesting workstream assignments. | Task Force | | 02 Aug | Open |



Charging Futures

# Open Actions from Meetings

| ID/ date | Agenda Item | Description | Owner | Notes | Target Date | Status |
|---|---|---|---|---|---|---|
| 4<br><br>26/06 | 3-7 | Explore possibility of identifying similar backgrounds with different interconnector flows.<br><br>Information to be shared with the consultants from the ESO in relation to the BSUoS (Balancing Services Use of System charge) Task Force work relating to this. | Frontier/LCP and JS | NW and JS to provide BSUoS IC work but possibility another FES scenario to be run might meet the request | Mtg 7.5/8 | Open |
| 5<br><br>26/06 | 3-7 | Can indicative monetary values be provided for the impacts of the different backgrounds on differently-sized projects. | Frontier/LCP | | Mtg 6-10 | Open |
| 7<br><br>26/06 | 3-7 | Additional analysis shared on metrics used to compare volatility between actual and estimated charges. | Frontier/LCP | | TBC – Frontier need a steer on what is required | Open |
| 10<br><br>26/06 | 3-7 | Bring together the Task Force representatives and the ESO SQSS Review team (when in a position to do so) to discuss potentially parallel/overlapping interests. | JS, SS to explore with BD | To feed into case for change if required | TBC | Open |
| 11<br><br>26/06 | 8-10 | Consultants are to explore the questions raised on zoning | Frontier/LCP | Considering what adding more zones would do to the existing Ref. Node work? Clarity needed around the definition for zones & differing from sharing factors. Frontier to provide additional note for pack? | Mtg 7 | Open |



Charging Futures

# Open Actions from Meetings

| ID/ date | Agenda Item | Description | Owner | Notes | Target Date | Status |
|---|---|---|---|---|---|---|
| 12<br><br>26/06 | 8-10 | Revisit ESO work on embedded generation in relation to the transport model and share with the Task Force if relevant. | JS & NW | | To consider as part of demand generation element of next work package | Open |
| 14<br><br>26/06 | 12 | Task Force members are to engage industry colleagues and stakeholders and feed back at the next virtual meeting (incl. substantive effects on other work) | Task Force | | Mtg 7.5 | Open |
| 15<br><br>26/06 | 12 | Draft the defect for backgrounds ahead of the next virtual meeting | JS, JT, LJ | Case for change with defect identified (with JS, NW) | Mtg 7.5 | Open |
| 16<br><br>26/06 | 12 | Draft the case for change on the Reference Node ahead of the next meeting | BD, JT, colleague of AM | Note from JT to be shared with the TF | Note shared w.c. 31/07<br><br>Discussed Mtg 7.5 | Open |
| 17<br><br>26/06 | | Update from OTNR sub-group | JT | | Mtg 7.5/8 | Open |
| 6<br><br>17/05 | 7 | ESO to proceed with the wider-remit zoning modification | JS | Drafted but further review needed - Updated to be provided at Aug TCMF | August | Open |



Charging Futures

# Open Actions from Meetings

| ID/ date | Agenda Item | Description | Owner | Notes | Target Date | Status |
|---|---|---|---|---|---|---|
| 1<br><br>26/04 | 1 | Provide update on recruiting Non-Domestic user reps to Task Force | JS & NW | Discussions ongoing for a named rep. Non-Domestic Supplier forums updated by JS | Ongoing | Open |
| 8<br><br>26/04 | 7 | Further work on design vs cost reflectivity to be presented at Mtg 6 | JS & NW | Feedback from legal and SQSS to be shared by JS via feed into case for change relating to Backgrounds | Mtg 7.5 | Open |
| 10<br><br>26/04 | 7 | Investigate more granular data sources for DNO embedded distribution to support the methodology & analytics | JS | Need TF to identify the data needs before exploring sources (part of Distributed Generation work) | TBC | Open |
| 11<br><br>26/04 | 8 | Actions allocated across the TF group for topics progressing for further development or into draft modifications | JS | Packages to be agreed and volunteers sought via email post Mtg 7 | Post Mtg 7 | Open |



Charging Futures

# Stakeholder Feedback

## All

**The objective of this session is to discuss:**

- Any engagement with wider industry and feedback relating to Task Force work to date and consultancy output (analysis and potential options for reform).

# Feedback from Stakeholders

**Non-Domestic Energy Supplier Forum:**

- Comfortable with work to date but wanted visibility of when any changes might be raised and more importantly when they would potentially be implemented.
- Interest in the structure of charges but level and predictability most important.
- Keen to understand the work in relation to Triads and any impacts in terms of level of demand TNUoS.

**Transmission Charging Methodology Forum (TCMF):**

- Stakeholders keen to have early visibility of any workstream plan(s) - overall content, timings and when recommendations might take place.
- Welcomed review of backgrounds - any impact analysis needs to ensure a view of the future network is taken into account i.e. it is key that future generation patterns etc are considered.
- Positive feedback regards consideration of any improvements around Triad methodology.
- Important that output from other industry projects such as REMA and LMP are being fed into future Task Force discussions.



Charging Futures

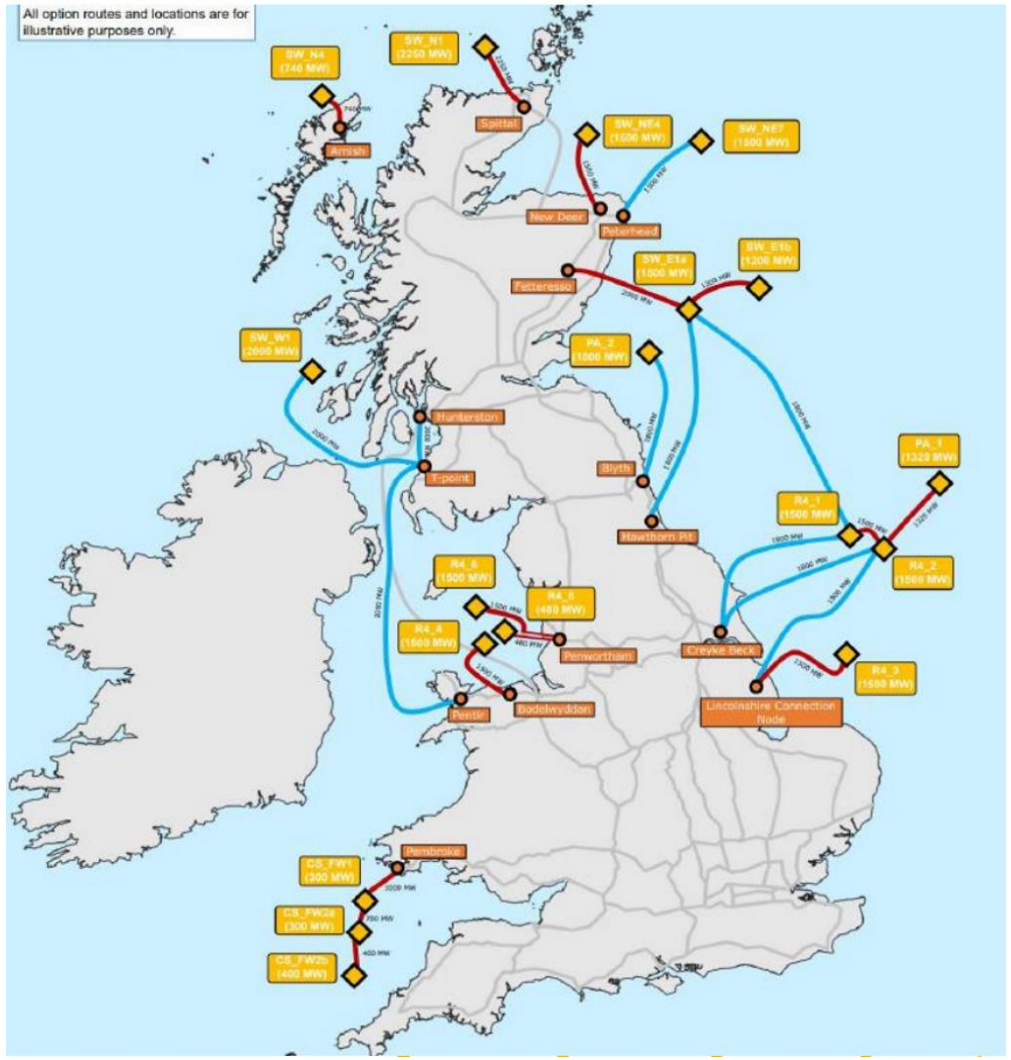
# Offshore Transmission Network Review: Charging Sub-group Update

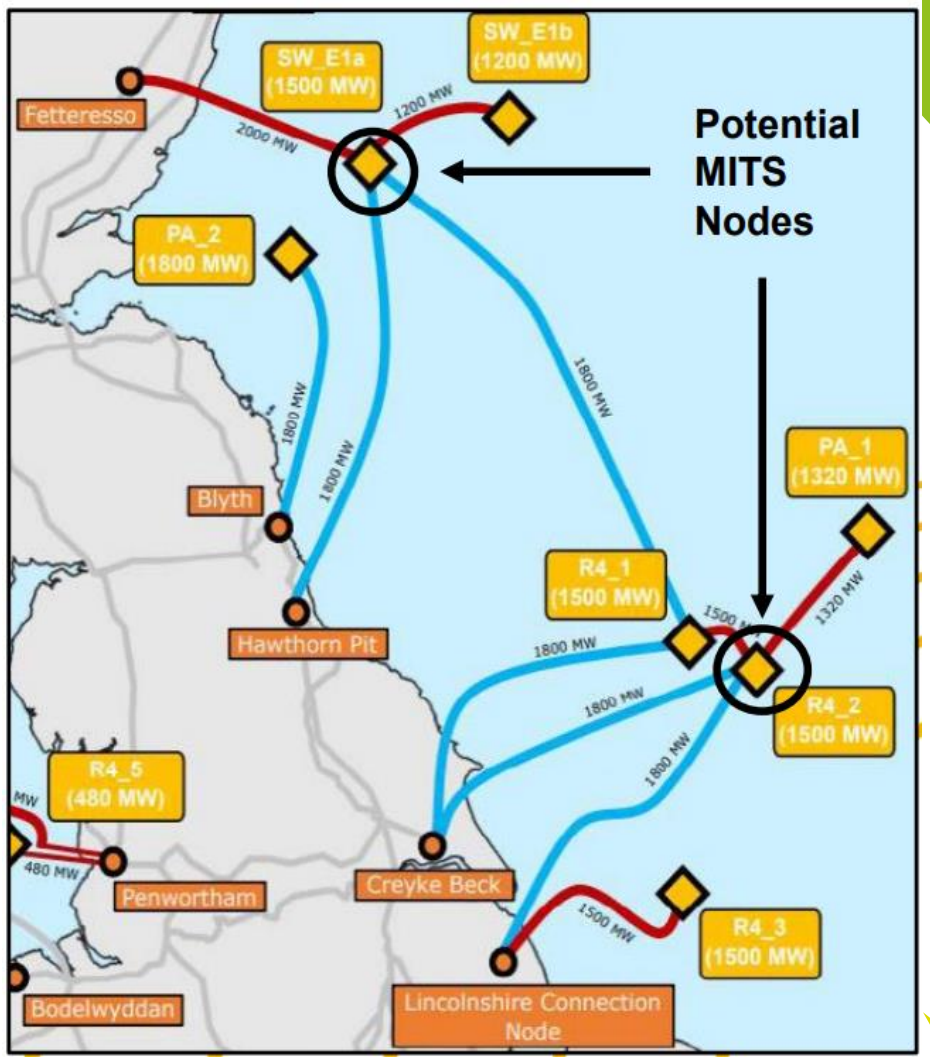
John Tindal

**The objective of this session is to provide:**

- An update regards the OTNR charging sub-group and any interactions with the current work of the TNUoS Task Force.

# Holistic Network Design (HND) Circuits






Charging Futures

# OTNR sub-group impacting Task Force

### Definition of offshore MITS

- TO led assets built for onshore wider reinforcement may be charged to offshore generators as local assets.
- Determines which offshore circuits are charged as wider vs local impacting wider charges for new and existing generators and demand

### How load flow on offshore grid is modelled

- Choice of Transport model load flow vs manual pro-rata approach that could conflict with the way the onshore wider load flow model calculates tariffs.

### Modelling of HVDC circuits as HVAC

- May be needed if offshore local circuits are added to the T&T load flow consistent with onshore local, impacting treatment of existing HVDC.
- Questions regarding how to select impedance value for HVDC circuits to affect share of incremental flow

### Offshore charging zones

- If and how are offshore zones created - will interact with onshore zones and could impact boundary sharing mapping for Year Round Shared vs Not-shared.



Charging Futures

# Task Force impacting OTNR sub-group

**Security Factor for Wider and local circuits (Interacts with offshore MITS definition)**

- Pricing of security can substantially distort offshore grid charges depending on whether particular circuits are treated as local, or wider.
- Security Factor has contradictory pricing for Local vs Wider and is not cost reflective for PS vs YR.

**Usefulness: Predictability vs cost reflectivity and fixed price TNUoS**

- Some of the OTNR options could create offshore TNUoS tariffs that are much more difficult to forecast and much more volatile than a radial OFTO solution.
- How useful is the price signal and does the benefit from the signal outweigh higher costs caused by the unpredictability and risk? Offshore generators at the mercy of TF solution to predictability.

**Changes to the Reference Node**

- Could substantially change the difference in charges paid by offshore generator tariffs between the two potential methods for calculating offshore charges of automatic load flow vs manual pro-rata.

**Price signal (charges and credits) vs revenue collection**

- Should offshore local circuits be treated as price signals, or revenue collection? Should some offshore generators receive credits for some shared offshore local circuits in the same way as onshore local?



Charging Futures

# Reference Node Case for Change: Overview

John Tindal & Binoy Dharsi

**The objective of this session is to provide:**

- A high-level overview of the draft ‘reference node case for change’ including; background and current approach, the defect identified, recommended option for change; and evidence to demonstrate the reasons for change.

# Generation weighted Reference Node

Case for change

# Why it matters: Choice of Reference Node is material for both relative and absolute charges

**Before TransmiT**

The choice of Reference Node didn't affect price signals because all locational and residual charges applied to all parties on the same charging base (100% Triad for HH demand, 100% TEC for generation).

- If the Reference Node changed, then a corresponding change in Residual would simply cancelled out the change in locational charges both in absolute and relative terms for both generation and demand.

**After TransmiT**

Choice of Reference Node does affect different parties differently through different relative exposure to charging elements. Changes to Residual, or Adjustment tariffs no-longer cancel out changes in locational tariffs for individual users:

- **Generation**: Different exposure to PS, YR, YRNS and Adjustment Credit tariffs
- **Demand**: Different exposure since Residual is removed from Triad. Further differentiation if demand charges apply lessons from TransmiT to apply PS and YR to different demand charging bases

- Impact both the absolute level of charges and relative price signals:
  - Between different types of generator at the same location
  - Between locations
  - Between generation and demand

- NERA report for Renewables UK submitted to Ofgem call for evidence on Reference Node

# Pros and cons

| | Better than baseline | Worse than baseline |
|---|---|---|
| **Cost reflectivity**<br>Better reflect the SQSS and ESO Network Options Assessment CBA | Better reflect the way individual generator and demand decisions cause an incremental change in long-run cost of network investment | |
| **Uncertainty**<br>Reduce need for Generator adjustment credit | Reduce risk from potential changes in the adjustment credit | |
| **Uncertainty**<br>Location of “average” Reference Node will change due to changes in generation instead of changes in demand | Reduced uncertainty caused by locations of growth in new demand | Increase uncertainty caused by locations of new generation |
| **Effective competition**<br>Increase demand charges, to become more equal/opposite to generation | Reduce distortions vs demand caused by demand floor at £zero | |
| **Effective competition**<br>Reduce average generator Wider charges | Reduce distortions vs international markets for TG, LDG and SDG | |
| **Effective competition**<br>Reduce need for generator adjustment credit | • **Between TG**: Reduce £/MWh distortions caused by Adjustment Credit based on TEC<br>• **Vs SDG and DSR**: That do not receive the Adjustment Credit | |

# Cost Reflectivity: Charges should reflect incremental network cost/benefit caused by a generator's investment decisions

"The underlying rationale behind Transmission Network Use of System charges is that efficient economic signals are provided to Users when services are priced to reflect the incremental costs of supplying them. Therefore, charges should reflect the impact that Users of the transmission system at different locations would have on the Transmission Owner's costs, if they were to increase or decrease their use of the respective systems. These costs are primarily defined as the investment costs in the transmission system, maintenance of the transmission system and maintaining a system capable of providing a secure bulk supply of energy." (CUSC para 14.14.6)

# Better cost reflectivity: SQSS and CBA scale generation to meet demand, not demand to meet generation

**Better for generation charges**

Incremental increase (or decrease) in generation at one location will tend to cause a corresponding offsetting decrease (or increase) in generation at another location.

- **Corresponding increases in generation:** For the purpose of providing a weighted average based on likelihood, corresponding increases in generation will, tend to take place in locations where there is already generation due to other limiting factors, such as: where there is access to gas grid, cooling, brown field sites, planning consents, wind resource, seabed availability. Not weighted towards taking place in areas dominated by demand e.g. London city centre

- **Corresponding decreases in generation:** Can only take place in locations where there is already generation. So the case to pro-rata generation is strengthened if the intention is to provide consistent investment and closure signals

**Better for demand charges**

Increases (or reductions) in demand will tend to be met with corresponding increases (or reductions) in generation.

By contrast, the current demand weighted Reference Node does not reflect reality, so is not cost reflective of the impact of demand decisions on incremental network costs. Demand investment/closure decisions tend to be open-ended and independent of each other, so:

- **Increased demand at one location**: Does not tend to cause a corresponding closure of existing demand at a different location
- **Reduced demand at one location**: Does not tend to cause a corresponding increase in other demand at other locations

# Better cost reflectivity: Better reflects the different generation scaling used by SQSS and CBA for Demand Security and Economy

**How SQSS scales generation**

**Demand Security Planned Transfer conditions (as reflected by Peak Security Background):**

- "*C.2.1. For stations powered by wind, wave, or tides, AT = 0. This zero factor is set for the Security planned transfer condition so that there is confidence that there is sufficient transmission capacity to meet demand securely in the absence of this class of generation."*
- *All other power stations are scaled equally "…applying a scaling factor to their registered capacity proportional to an availability representative of the generating plant type at the time of ACS peak demand such that their aggregate output is equal to the forecast ACS peak demand") (C.5 SQSS)*

**Economy Planned Transfer conditions (as reflected by Year Round Background)**

- In Economy Planned Transfer, SQSS scales wind at 70%
- *"In the Economy planned transfer condition the registered capacities of certain classes of power station are scaled by fixed factors… The NETS SO will review the appropriateness of these factors and revise them where necessary, based on alignment with cost benefit analysis. The period between reviews shall be no more than five years, but may be less if required."* (E.4 SQSS)

**How Network Options Assessment CBA scales generation**

- NOA is used to: **"*Recommend*** *the most economic reinforcements, whether infrastructure build or alternatives, for investment over the coming years, to meet bulk power transfer requirements as outlined by the ETYS."*
- *"The model is set to simulate 365 days per year, 20 years into the future with an appropriate time resolution. The year in which an option is commissioned can be varied. The primary output from the tool for the cost-benefit analysis process is the annual transmission constraint forecast; there are further outputs that help the user identify which parts of the network require reinforcement." (NOA methodology)*
- *NOA demand and generation capacities taken from the NG ESO Future Energy Scenarios (FES)*

**How FES scales generation**

"*Transformation of the whole energy system is achievable, and can deliver energy that is clean, secure, affordable, and fair. This requires strategic and holistic development of the networks, markets and technologies required, in a coordinated and timely manner, to ensure we make the most of the abundant renewable energy we could use to meet energy demand*." (FES 2022, page 100, emphasis added)

# Useful links

- Microsoft Word - NETS SQSS version 2 2 FINAL changes removed.doc (nationalgrideso.com)
- NOA methodology | ESO (nationalgrideso.com)
- Network Options Assessment (NOA) | ESO (nationalgrideso.com)
- Future Energy Scenarios: download (nationalgrideso.com)

Charging Futures

Reforming electricity charging together

# Break

## Next session starts at 11:30

# Reference Node Case for Change: Feedback & Further Discussion

## All

**The objective of this session is to:**

- Provide any further feedback in relation to the case for change.
- Capture pros and cons relating to the case for change - agree if this is sufficient to now progress.

# Feedback & Discussion on Case for Change

A summary of responses received to date:

- Both respondents felt a generation-weighted Reference Node would be more appropriate
- Rationale points from Response 1:
  - The choice of Reference Node is a mathematical feature of the model. Using a demand reference node removes any remaining link between the Peak and the Years round load flows rendering the outputs meaningless. Keeping the generation reference node and moving to G=0 collection would produce a much more robust solution.
  - DNO demand should be split into gen types (wind /storage etc) and added to each GSP node as a collection of generators.
  - Storage demand is probably only relevant in non-shared areas that are wind dominated, but may be useful to increase demand in these areas taking account of long duration (more than 9 hours say) storage (although this may not happen at peak). Need to run pricing model to see if this type of effect routine happen then say add 50% for storage demand as a surrogate.
  - Signal pure economics all users in a zone get the same charge based only on load factor and capacity. Charging different used different amount in the same zone based on plant type is likely to be suboptimal so some historic changes may need to be unwound.



Charging Futures

# Feedback & Discussion on Case for Change

- Rationale points from Response 2: ***COST REFLECTIVITY & NETWORK INVESTMENT***
  - Agreement with the case for change that the current approach of a demand-weighted Reference Node is not cost reflective and does not reflect the outcomes of an ESO Network Options Assessment-style cost benefit analysis
  - Agreement with the case for change that an assessment of the drivers of network investment cost indicate that, in order to be cost reflective, it would be appropriate for TNUoS charging to:
    - i) Use a generation-weighted scaling for the Reference Node
    - ii) Scale different types of generation differently between the Peak Security and Year Round backgrounds
  - For network investment decisions, it is generation that is scaled to meet demand, so a change in the registered generation capacity, or mix, will result in a pro-rata change in scaling of all other generation
  - Making the switch to a generation-weighted Reference Node would be better, firstly for cost reflectivity regarding the way network investment decisions are made, and secondly, also better reflect the difference in network investment decisions for security versus economy reasons.



Charging Futures

# Feedback & Discussion on Case for Change

Any further considerations (pros and cons) that need to be captured?

Does the evidence support the proposed change?

Is the ‘draft change’ sufficient to allow a modification to be drafted?



Charging Futures

# Workstream Plan: Resource Allocation

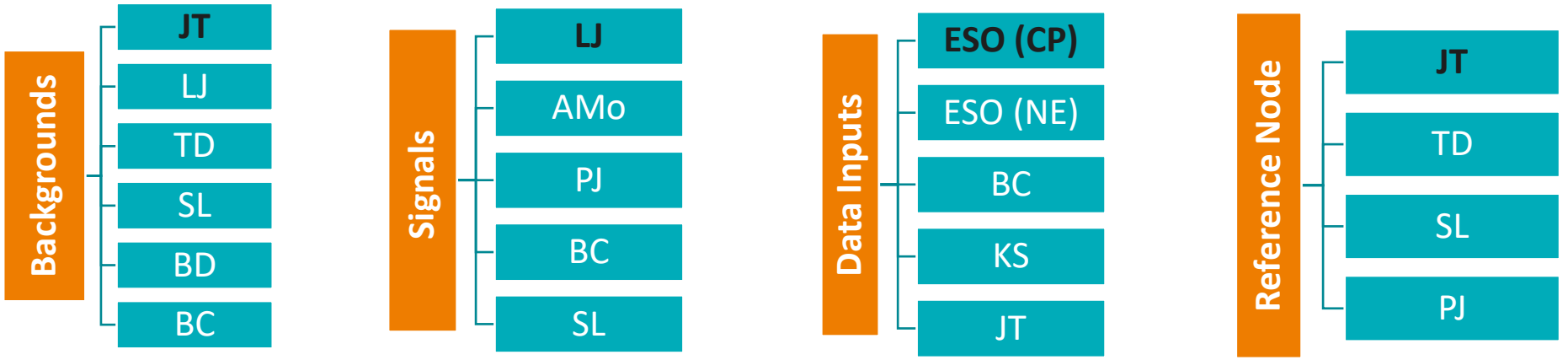
## James Stone

**The objective of this session is to:**

- Provide the proposed allocation of work packages across the Task Force member volunteers.
- Set out general expectations for progression/ development of the various defect work packages, suggested next steps and timings.

# Proposed Resource Allocation

**Following a request for volunteers, the ESO have now assigned Task Force members to lead and support the development of the defect work packages - key aim being to allow for a well-rounded view on topics with fair representation across sectors/workstreams.**

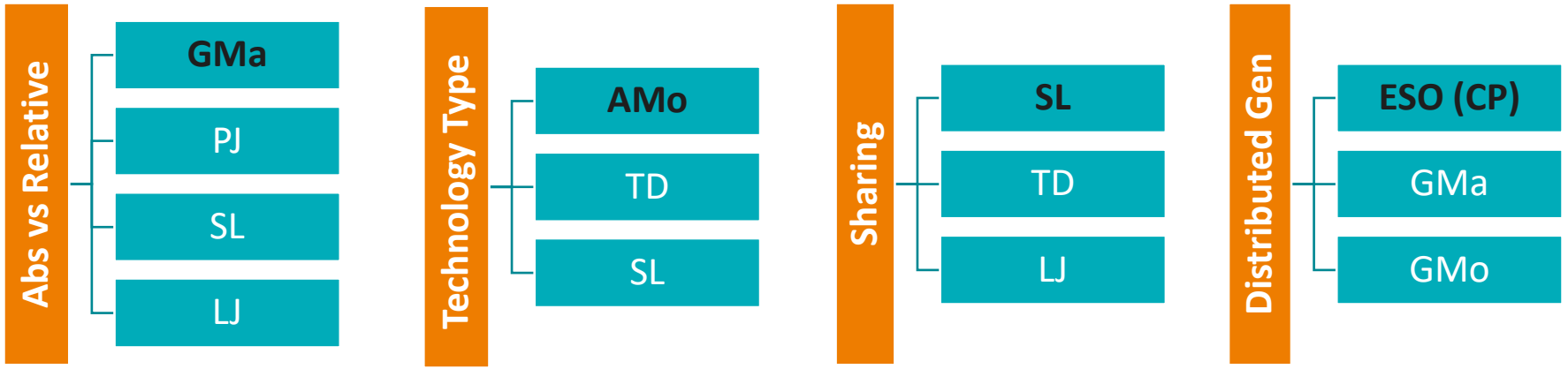



- **Note: ESO will be available to provide additional support for all workstream packages as and when required.**



Charging Futures

# Proposed Resource Allocation continued




- **Note: ESO will be available to provide additional support for all workstream packages as and when required.**



Charging Futures

# Next Steps

**To further develop each of the work packages it is proposed that over the coming weeks;**

- The individual defects within the scope of works (considerations and questions) are reviewed by the Task Force members assigned to each of the packages of work.
- Where questions are considered to be principle-based an initial view on these is to be drafted and then presented to the Task Force for further review and discussion.
- Where it is considered an item may require further investigation or analysis before a clear opinion/option can be formed - a recommendation in terms of approach to review is to be put forward.
- **It is proposed that the initial output from these workstream discussions can then be brought to the next Task Force meeting in September.**



Charging Futures

Charging Futures

Reforming electricity charging together

# Lunch

## Next session starts at 13:00

# Data Inputs: Initial Thinking

James Stone & Martin Cahill

**The objective of this session is to provide:**

- A high-level view of the suggested approach (initial steps) to reviewing the data inputs package of work.
- Further thinking in relation to part of the TNUoS tariff methodology and issues identified with negative scaling factors.

# Suggested approach to reviewing Data Inputs

**In relation to the data work package and concerns regarding the implications of certain data inputs for charge volatility and predictability the following steps are proposed:**

- Initial review of individual data items to see how these change over time.
- Further review of data inputs to identify which are most likely to cause tariff volatility - quantify relative impact on tariffs/charges to provide an order of magnitude.
- Once magnitude of volatility is determined this will allow focus on most appropriate inputs for next stage of review (i.e. consideration of options for change and or alternative data sets etc).



Charging Futures

# Data Inputs: TNUoS Scaling Factors

- Scaling factors are used in the calculation of TNUoS tariffs (Year-Round Background and Peak Security)
- There are pre-defined and variable scaling factors which are detailed in SQSS (Appendix E gives the different parameters (for directly scaled plant) and calculation (for variably scaled plant) to be used
- Factors are used to scale capacity of plants to equal the ACS Peak Demand (estimated unrestricted winter peak demand on the ETS for the average cold spell)
- If any scaling factors are negative the TNUoS tariff model ceases to work e.g. a –ve scaling factor for CCGTs would mean adding 1MW reduces network cost rather than increasing

**Table 1.5 Generation scaling factors for the purpose of tariff calculation**

| Generation Plant Type | Peak Security Background | Year-Round Background |
|---|---|---|
| Intermittent | Fixed (0%) | Fixed (70%) |
| Nuclear & CCS | Variable | Fixed (85%) |
| Interconnectors | Fixed (0%) | Fixed (100%) |
| Hydro | Variable | Variable |
| Electricity Storage (including Pumped Storage) | Variable | Fixed (50%) |
| Peaking | Variable | Fixed (0%) |
| Other (Conventional) | Variable | Variable |

*The statement of use of system charges*



Charging Futures

# Why is this an issue - the Defect

- Large amount of wind on the network shifts the calculation
- Wind has a direct scaling factor of 70%
- As the amount of wind in relation to other generation types on the network increases, the top of the formula becomes smaller and smaller, until it is negative and all variably scaled factors then become negative
- This breaks the model for additional calculations on shared tariffs
- In the next few years, this will result in negative calculated scaling factors, unless any changes are made
- TEC register regularly changes so difficult to pinpoint exactly when negative tariffs will occur
- There is also a question of current state of cost reflectivity – CCGTs around 8%, so adding 1GW of generation would only result in 80MW modelled

ACS Peak Demand

Direct Scaling Factor for specific plant

Capacity for directly scaled plant

$$S = \frac{P_{\text{loss}} + \sum_j L_j - \sum_{DT}\left(\sum_k \left(D_T \times R_{DT_k}\right)\right)}{\sum_{VT}\left(\sum_n R_{VTn}\right)}$$

Capacity of Variably scaled plant



Charging Futures

# Potential options considered

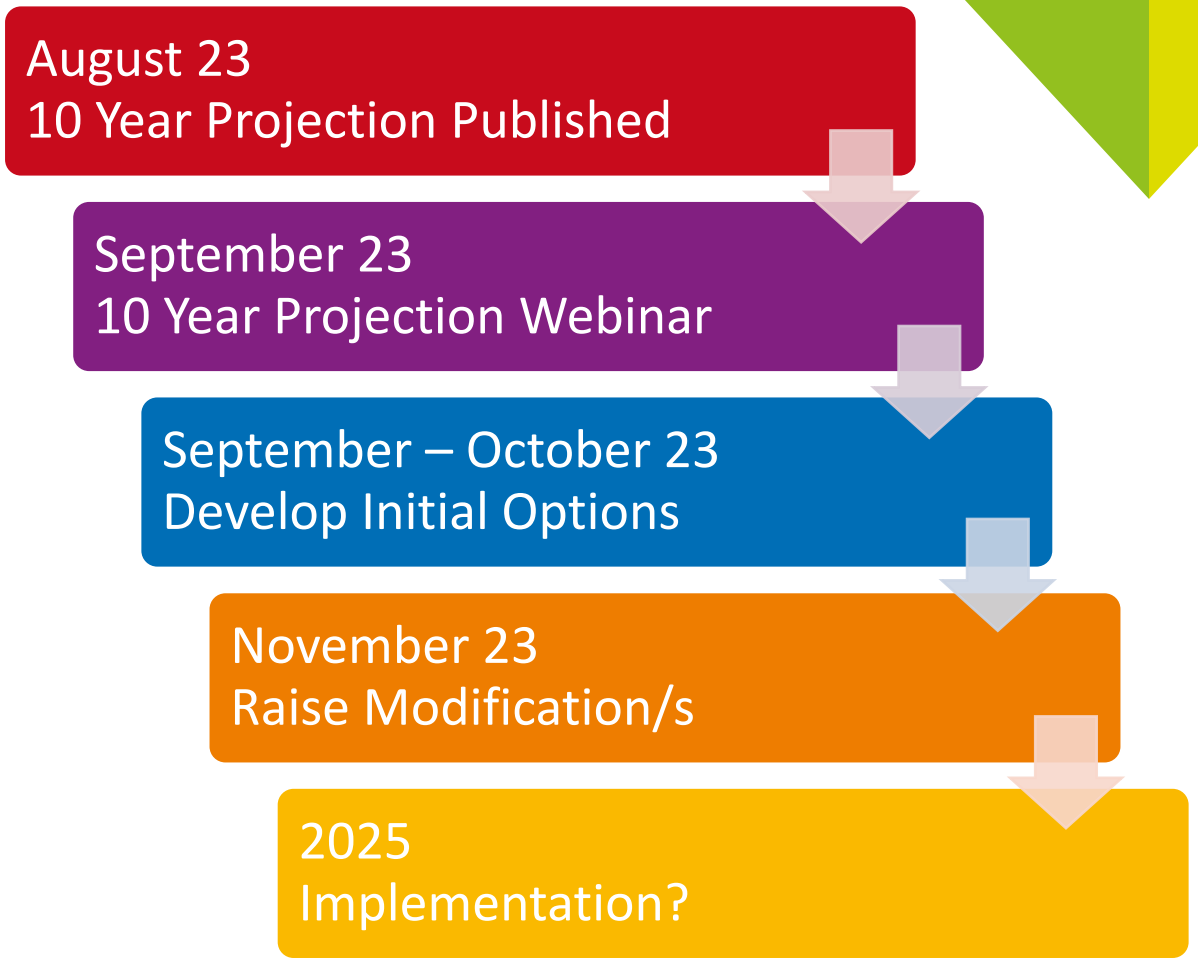
| Option | Pros | Cons |
|---|---|---|
| Reduce fixed scaling factors (particularly for wind generation) | • Simple Implementation | • With level of future renewable investment required, this may only delay the issue<br>• Could make model less cost reflective<br>• Discussion about appropriate levels to reduce scaling factor too could make this option more complex |
| Remove Interconnectors (currently 100%) from calculation | • Quick Fix<br>• Simple Implementation | • With level of future renewable investment required, this may only delay the issue<br>• Impact on Scottish Tariffs (removing contribution of Interconnectors which are predominantly in South |
| Implement Generic Scaling Factor | • Quick Fix<br>• Simple Implementation | • May reduce cost reflectivity of model |
| More fundamental methodology change | • May be more cost reflective | • Lengthy Fix<br>• At risk of not being implemented before we see negative factors |



Charging Futures

# Proposed Next Steps

- Continue to review alongside the ESO 10 year tariff projection being developed - this will help understand timescales of issue
- Further development of options
- Target raising modification in Q4 2023
- SQSS and CUSC modifications potentially required






Charging Futures

# Signals Workstream: CMP405 'TNUoS Locational Demand Signals for Storage’

John Tindal

# CMP405

# DEMAND CREDITS

SSE

# KEY MESSAGES

## Frontier and LCP's analysis suggests that a demand credit would provide a more cost reflective locational signal to storage assets

- CMP405 focuses the TNUoS demand charge for storage only
- It was Project Transmit that introduced the link between TNUoS charging and transmission constraints, however, demand charges (unlike generation charges) were never fully adapted to account for this
- It is only since the implementation of the Target Charging Review in 2021 and the lifting of the demand residual for storage that the floor of £0/MWh has affected TNUoS demand charges for storage in practice
- Even if storage is net neutral to constraints i.e. the benefit during charging is cancelled out by the cost during discharge, this suggests a demand credit is required to avoid distorted locational signals from the existing charge on generation from storage
- The modelling performed by LCP supports our hypothesis that there is a positive correlation between charging and constraints in Scotland for longer duration storage and the longer the duration the better this it, it also identifies wider system benefits of more storage in Scotland
- It is necessary that any change happens now to ensure appropriate locational investment signals in time for the Financial Investment Decision (FID) for long duration storage projects in 2024 in line with Government ambitions
- CMP405 would be a first step in addressing locational transmission charging for demand in high renewable resource areas, currently an area of high interest to policy makers
- There are different options for the design of the demand credit and we welcome ideas on the approach to propose

# PURPOSE OF CMP405

## CMP405 is intended to improve the TNUoS locational signals for storage assets in high renewables areas

### Purpose

The purpose of CMP 405 is to improve the TNUoS locational signals for storage assets in areas of high renewables resource in particular, by recognising the contribution that the demand from storage makes to relieving transmission constraints and so reducing the need for transmission network infrastructure. Therefore, **it is focussed only on the demand for electricity from storage**, it does not propose to change the approach taken to the generation of electricity from storage

### How?

CMP 405 proposes to do this by correcting two specific defects:

- Firstly, remove the current 'floored at zero' approach for storage demand charges to allow the negative demand charge (payment) already calculated by NG ESO's 'transport model' to be used to determine a credit for demand from storage.
- Secondly, change the charging base for storage Year Round demand credits. This would require moving from storage demand being charged wholly as 'peak demand' on Triad, to a charge based on a measure of annual consumption or Maximum Import Limit (MIL).

These changes would only change the approach to charging storage in areas of high renewables resource (where demand charges are negative i.e. would elicit a payment), it does not change the approach to storage in high demand areas as the locational signals in these areas are not affected by the floored at zero approach.

### How it fits in with wider market design

As this relates to TNUoS this mod is only about locational signals that relate to network build. It is not about any wider consideration of the most appropriate location for storage, which are addressed through other areas of the market design

# NETWORK INVESTMENT VS CONSTRAINTS

Ofgem's decision on CMP213, implementing TransmiT, recognised that increases, or reductions in constraints correspondingly cause more, or less cost of network investment

*"Post-CMP213, the charging methodology was required to reflect that system investment and operation has to efficiently balance longer-term costs, such as the use of infrastructure investment, with short-term network costs through system operation, such as constraining off generators." (p1, Ofgem decision CMP213)*

# CAUSES OF HIGHER/LOWER CONSTRAINTS

## The cost of constraints caused, or avoided, is a function of incremental volume multiplied by price of constraints

**Volume of Incremental Constraints (MWh)**

i. Generator output over the year

ii. Correlation between generation running within an area

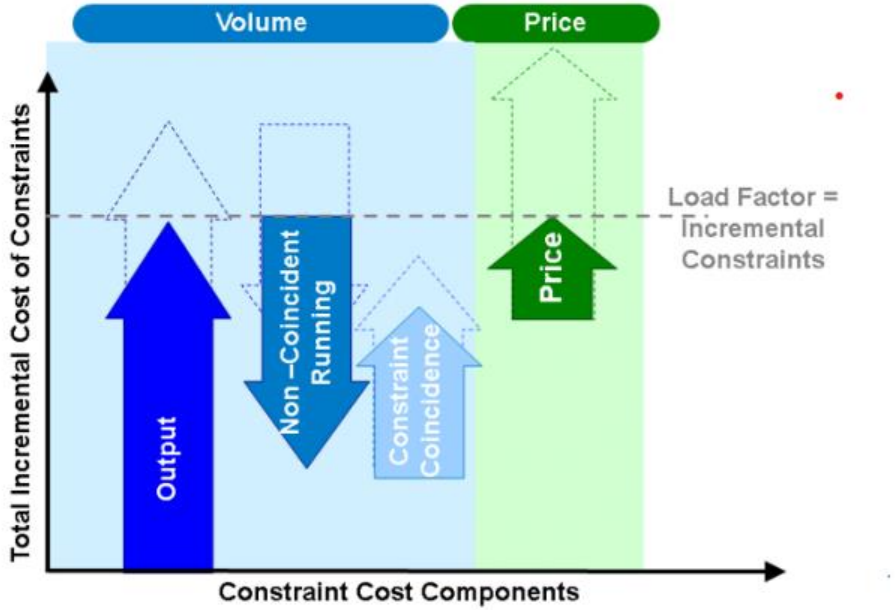
iii. Correlation with constraint times

X

**Price of Incremental Constraints (£/MWh)**

iv. Bid price of the marginal generator on the exporting side

v. Offer price of the marginal generator on the importing side




**Annual Load Factor (ALF) was introduced as a useful proxy for the incremental cost of constraints**

The higher the ALF, the higher the correlation with other forms of generation, and so the greater the need for transmission investment to reduce constraints. As if all generation is operating at the same time more capacity is needed to export it from the region.

# DCLF ICRP MODEL

## The DC load flow investment cost related pricing (DCLF ICRP) model calculates negative TNUoS charges for year-round demand charges

### How the 'transport model works

- TNUoS locational charges are calculated using the DC Load Flow Investment Cost Related Charging Pricing (DCLF ICRP) 'transport model'.
- The model calculates the cost of to the network of adding an additional MWh of generation or demand at a particular location (node).
- This cost is compared to a central node, so locations that require less network than the central node receive in negative charges (payments), those requiring more network receive positive network charges
- the further away the demand or generation is from the central node the higher the network charge/payment
- The highest potential demand payments are in Scotland where there is high wind resource and relatively low demand

### Implications of its calculations

- The transport model shows that according to NG ESO's methodology for calculating the costs of network build demand located in areas of high renewables resource reduces the cost of network build, hence the negative charges
- The biggest contribution to this is demand located in Scotland where there is high wind resource and relatively low demand
- Moving away from charging the 'year round' charge on peak demand and onto demand during times of constraint would better align with the intentions of the tariff calculation and avoid concerns over incentivising additional peak demand

### Forecast peak and year round tariffs for demand 2022/23

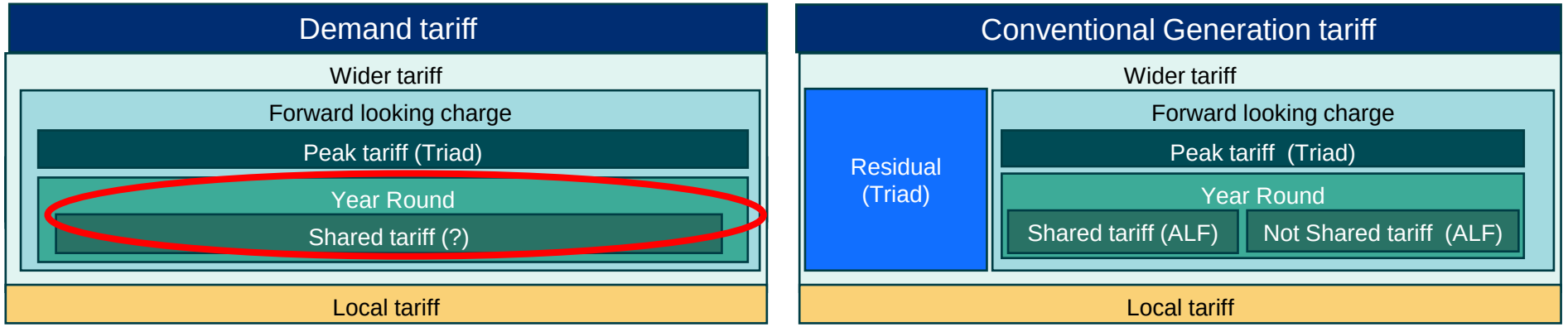
| Demand Zone | | 2022/23 April | |
|---|---|---|---|
| | | Peak (£/kW) | Year Round (£/kW) |
| 1 | Northern Scotland | -3.116462 | -27.428739 |
| 2 | Southern Scotland | -3.215416 | -18.599220 |
| 3 | Northern | -4.063048 | -7.542140 |
| 4 | North West | -1.585722 | -4.140701 |
| 5 | Yorkshire | -3.215572 | -1.813832 |
| 6 | N Wales & Mersey | -2.412292 | -1.988324 |
| 7 | East Midlands | -2.487282 | 1.150504 |
| 8 | Midlands | -1.419253 | 1.634158 |
| 9 | Eastern | 1.249970 | -0.069565 |
| 10 | South Wales | -3.583402 | 5.305982 |
| 11 | South East | 3.790322 | -0.265553 |
| 12 | London | 5.603960 | 1.059458 |
| 13 | Southern | 1.809885 | 3.419941 |
| 14 | South Western | 0.780133 | 6.380386 |

Source: NG ESO Forecast TNUoS Tariffs for 2022/23, August 2021,Table 21

# TNUOS CHARGING: CMP 405

## CMP 405 would make the year round charge for demand more consistent with the year round charge for generation

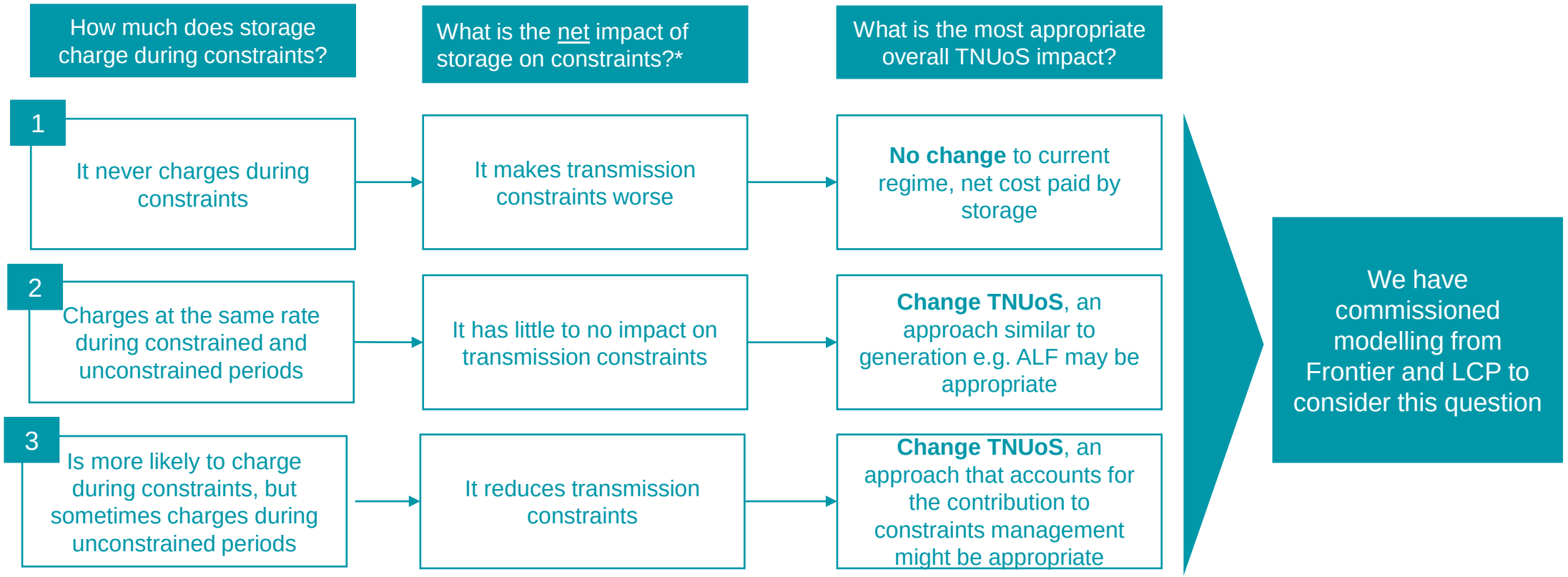
**Transmission charging for storage post Project Transmit, TCR and CMP405**




- CMP405 would change the charging base of the year round for storage from peak demand, measured by 'triads' to a metric that better reflects the contribution of demand from storage to relieving constraints in negatively charged areas
- There are different ways in which the tariff could be introduced e.g. whether it should mirror the generation tariff of ALF based on the last 5 historic years, or whether it should be more strongly linked to the contribution storage makes to reducing constraints
- **This is a key point for discussion with the CMP405 working group**

# IS CMP405 NEEDED?

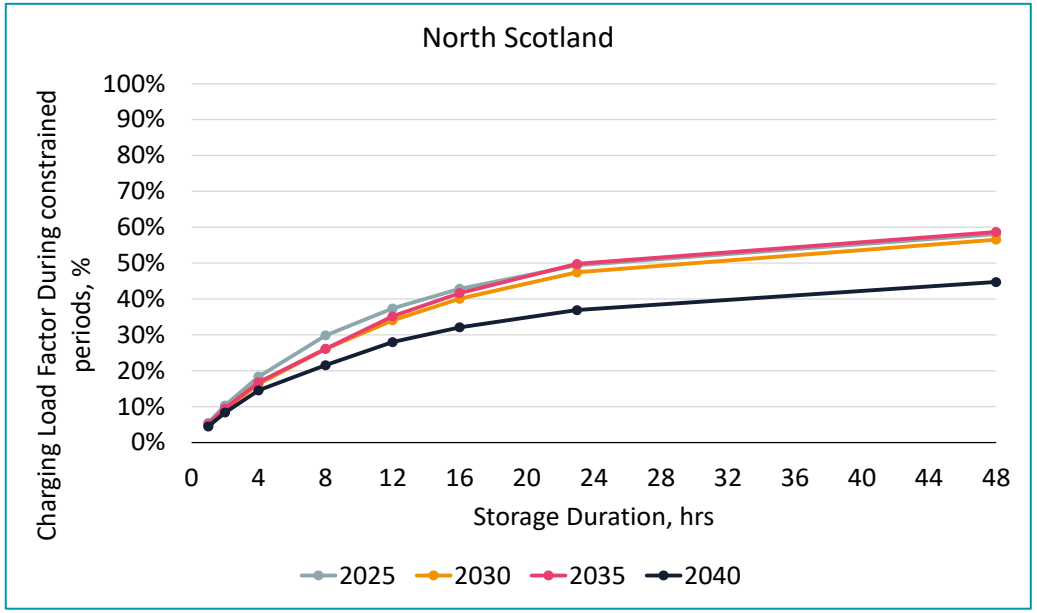
## Storage in Scotland is currently charged as if it exacerbates constraints, if this is not the case it the current TNUoS charging approach provides inaccurate locational signals to storage

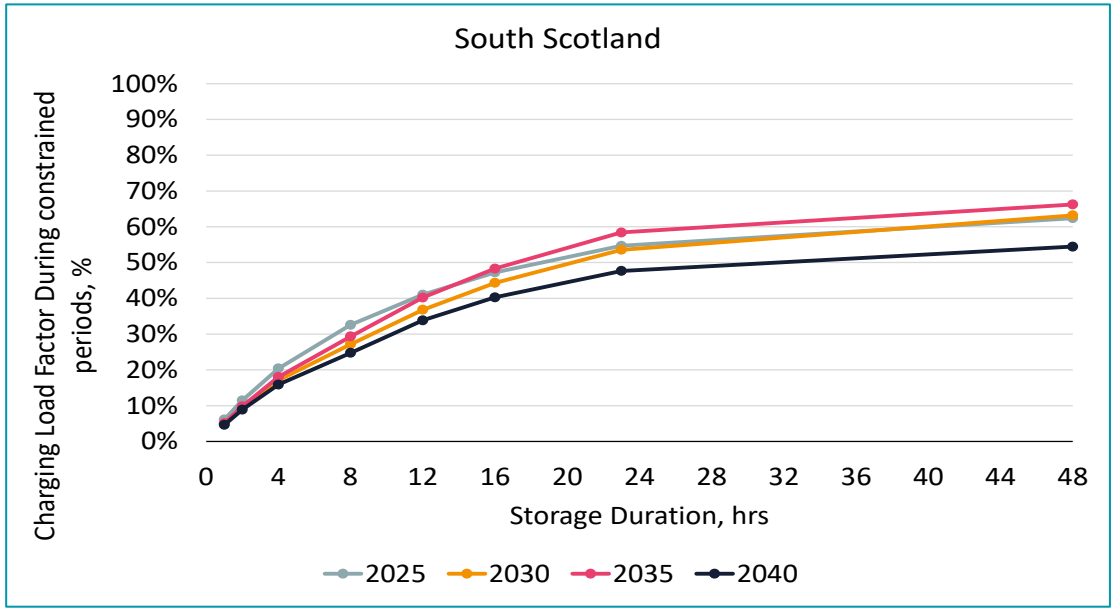



*This assumes that the generation charging structure is appropriate for storage

# DRAFT RESULTS FROM THE ANALYSIS - FRONTIER/LCP

## Storage with 23 hours plus duration can relieve constraints around half the time




- The longer the duration of the storage asset the higher its load factor during constraints
- For shorter duration assets, the LF during constraints is broadly the same as the LF of the asset i.e. no correlation with constraints
- For longer duration assets, the LF during constraints is more than the LF of the asset i.e. a positive correlation with constraints
- Projects in southern Scotland has a higher LF during constraints, this reflects the higher LFs of these assets

# DEMAND CREDIT DESIGN CONSIDERATIONS

| Option | Description | Advantages | Disadvantages |
|---|---|---|---|
| Volume-based credit | Credit set ex post based on annual (pumping) volume (MWh) | • Simple to implement, including for new plants as set ex post.<br>• Annual volume likely to have some relationship with contribution to relieving constraints | • Volumetric-based charges could distort dispatch<br>• Need to convert a £/kW Year Round charge into £/MWh charges |
| Capacity-based (MIL) | Credit set based on MIL | • Simple to implement for new plant, and is non-distortionary | • Does not reflect the impact of different types of storage plant on constraints and avoided network costs |
| Capacity-based (ALF) | Credit set based on MIL x ALF | • Is similar to the TNUoS year-round generation charge methodology for Conventional Low-carbon plant and is relatively simple. Non-distortionary. | • Differentials in charges may inaccurately reflect the contribution to avoiding network costs and therefore may distort investment in different storage assets. |
| Capacity-based (constrained ALF) | Credit set based on MIL x ALF during constraints or other de-rating factor | • Consistent with approach to application of sharing factors for Intermittent plant generator TNUoS charges.<br>• Better reflects the contribution of different storage plant to avoiding network costs. Non-distortionary. | • Practically, difficult to set value of constrained ALF for new plant ex ante, and may require modelled values until observed data available.<br>• Risk that if system deviates significantly from optimal expansion path of network, then observed constrained ALF may also not reflect value of storage in optimal system. May require modelling an optimised constrained ALF |

Source: Frontier draft report on the case for CMP405

# Next Steps and Close

Jon Wisdom

Charging Futures

Reforming electricity charging together

# Thank you