B6 Constraint Management Pathfinder (CMP): Commercial Assessment Methodology (WS3083013661)

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Contents

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1. Introduction

The B6 Constraint Management Pathfinder (CMP) is seeking to procure transmission-connected generation that can be connected to the Anglo-Scottish Commercial Intertrip Scheme (CIS) and disconnected in the event of a network fault (within 150ms). The exact volume (800MW + largest loss compensation criteria) and sources of generation to be procured for B6 CMP are to be decided through a commercial tender process. NGESO aim to run a B6 CMP commercial tender periodically to increase market competition. These periodic tenders will be supplemented by opportunities for successful units to resubmit their prices during the contract term to increase their utilisation in the service. This way NGESO can ensure a transparent, competitive procurement method exists that continually increases value for consumers.

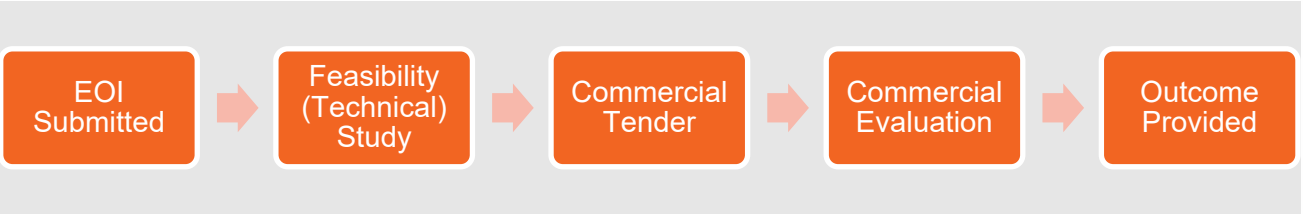
This publication outlines the methodology and process NGESO will implement to conduct the B6 CMP commercial assessment, thus making the process more transparent by allowing stakeholders to better understand ways of working and parameters to be used in the commercial assessment process.

Future CMPs are expected to follow the approach outlined in this document and hence readers should not assume that all of the situations described in this document are being experienced on B6 CMP.

2. Technical and Commercial Assessments

The process for procuring units is two staged:

1. Expression of Interest (EOI) – Determines the feasibility of connection of the unit;
2. Commercial Tender – Identifies the most economic method of achieving the required intertrip generation volume (MW).



Following the feasibility study stage, successful units will be entered into the commercial tender. This involves providing the relevant arming and utilisation (tripping) fees to determine the most economical portfolio of connected generation units to achieve the required MW volume. Units that are unsuccessful at the feasibility study stage will not progress further in the process.

3. Feasibility (Technical) Study

During this stage of the assessment process, a feasibility study will be commissioned between NGESO and the Scottish Transmission Owners (TOs).

NGESO will provide the EOI responses to the Scottish TOs who will thereafter advise NGESO:

1. If the units can be connected to the CIS;
2. If so, whether connection to the CIS will be completed by October 2023* along with the connection costs involved. NGESO's intent is to be able to connect as many units as possible to the CIS but if the cost of a unit's connection is excessively high and shows a significant deviation from the average connection cost of other units, then NGESO can remove the unit or units from the process. Please note that the cost of connecting successful units to the CIS is expected to the financed by regulatory funding rather than by the owner's successful units. Therefore, tenderers should not factor in the costs of connecting their unit(s) to the CIS in their commercial tender submission, as this could distort the commercial assessment process.
3. NGESO shall also be made aware by the Scottish TOs of any possible constraints units face in delivering the service as required, such as if there are multiple units connected behind a single circuit breaker (CB).

* Please note that NGESO reserves the right to remove any unit(s) from the process at this stage if there is a significant risk to the system, based on the way that the Scottish TOs propose the unit(s) are connected to the CIS (as per the technical feasibility study results).

Because the CIS is connected to TO CBs, it is possible that multiple applicants could be connected behind a single CB. If there is >1 unit connected behind the same TO CB, then:

1.
    a. If all relevant units submitted an EOI, then all will be informed of dependencies before the commercial tender stage commences to ensure any arrangements can be put into place between the dependent units. The units can either submit separate or joint pricing information but will be assessed as a single unit from a total price and volume perspective in the commercial assessment process. The process of jointly submitting

prices (if used by the parties) must be decided and managed between the parties in question, as NGESO shall not be involved in any discussions between the parties. If successful in the commercial tender process, the dependent units will be treated separately from a contractual and settlements perspective but treated as a single unit by NGESO in operational timescales. For instance, if Party A and Party B are connected behind the same CB then both parties must be expecting to connect to the transmission network before the expected service commencement date of October 2023* else both Party A and Party B will be removed from the process. The rationale behind this approach is that if in this example Party B fails to connect before the expected service start date, then it could leave significantly less volume available for use by NGESO on the CIS.

b. If a party is the sole connecter behind a CB then they can participate providing they are also expecting to connect to the transmission network before October 2023*.

2. If only one of or some of the units (i.e. not all units) connected to or expecting to connect to the CB have submitted an EOI, the unit or units in question will be informed of the situation and removed from the commercial tender process. This will give those parties the opportunity to organise themselves (as per point 1a above) in anticipation of a later B6 CMP tender.

* Please note that NGESO reserves the right to commence contracts early (pre-October 2023) if the Scottish Transmission Owners (TOs) deliver the required connections for successful units before October 2023, or late (post-October 2023 up to September 2025) if the Scottish TOs are delayed in delivering the required connections for successful units.

NGESO are prohibiting stacking of services with the Stability Pathfinders in this iteration of the B6 CMP as the two (2) service designs are conflicting. For this reason, any units participating in both the B6 CMP as well as a Stability Pathfinder shall be informed of the conflict prior to the tender launch for B6 CMP to decide in writing which service they would rather participate in. Please note that in operational timescales, NGESO shall decide if the unit(s) can be armed under B6 CMP dependent on whether the unit(s) are stacking with any other conflicting services, such as reserve and response.

4. Commercial Assessment

Participants included in the commercial assessment stage will have successfully cleared the feasibility stage of the process.

In this stage of the tender process, NGESO will have received the output from the feasibility study undertaken by the Scottish TOs. This will identify the number of channels available to NGESO on the CIS and the possibility of extending the CIS to accommodate more units. If there is a limit to the number of channels available on the CIS, then participants shall be made aware of this at the beginning of the commercial tender stage.

In the commercial tender stage, participants are expected to submit arming and utilisation (tripping) prices to NGESO. To determine the cheapest MW volume available to provide the service, the following process will be used:

1. Identify all possible unit size combinations across the available number of CIS channels;
2. If required, apply an average outturn factor to the submitted output capacity of the relevant units – reference Table 1 for an example;
3. Filter and remove combinations that do not meet the MW volume requirement;
4. The arming and utilisation (tripping) fees will be used to identify the lowest cost combination of units. This lowest priced combination of units will be awarded the contracts.

* Please note that for the purpose of this assessment process, all applicable volumes shall be de-rated using the average outturn factor (refer to Table 2) and then prices shall be applied to the unit's de-rated Transmission Entry Capacity (TEC) rather than the unit's total TEC.

4.1.1. Identification of all possible combinations

Due to the potential limit on the number of CIS channels available and the generators interested in providing this service, NGESO expects numerous possible combinations for achieving the MW volume outlined above. The number of combinations is given by the following formula, where:

$$\sum_{r=1}^{r\leq n} nCr$$

1. n = The total number of units involved in the commercial tender process;
2. r = The total number of channels available on the CIS.

For example, if there are five (5) units which have submitted an expression of interest and four (4) of them are successful following the feasibility study (as shown below):

Table 1: Example

Unit	Type	Size (MW)	Feasible (Yes/No)	Arming Fee (£/MW/SP)	Tripping Fee (£)
A	Wind	700	Yes	2.00	15,000
B	Hydro	1,150	Yes	1.50	8,000
C	Wind	950	Yes	4.00	20,000
D	CCGT	700	Yes	2.00	3,000
E	Wind	400	No	N/A	N/A

In the commercial tender, if there are three (3) channels available on the CIS and four (4) qualifying units, there are fourteen (14) options available, as shown below:

$$\sum_{r=1}^{r=3} 4Cr = \sum 4C1 + 4C2 + 4C3 = (4 + 6 + 4) = 14$$

* Please note that NGESO reserves the right to procure more or less than the MW volume required (≥800MW) if it is cost-effective to do so.

4.1.2. Application of the average outturn factor

NGESO have a requirement for the Electricity National Control Centre (ENCC) to be able to arm up to 800MW of generation, which can be tripped to manage the B6 boundary (see section 4.

Because a significant proportion of the generation is likely to come from wind, contracting a capacity significantly greater than 800MW (as wind rarely achieves 100% output) is required to ensure that the MW volume requirement is always achieved. This means that wind units shall be given an average outturn factor in accordance with Table 2.

Table 2: Average outturn factors

Technology Type	Average Outturn Factor
Wind	65%
Other Technology Types	100%

Please note that the statistical value in Table 2 is taken from operational planning data where depending on the system condition, the constraint is most likely to be active (i.e. when the expected transfer becomes greater than the constraint limit) when generation from this unit type is at or in excess of the outturn factor.

The average outturn factor shall be applied by NGESO to the affected unit's TEC and this is the unit size that will be considered for the purposes of the commercial assessment process. There is an example of this shown in Table 3.

Table 3: Updated example with average outturn

Unit	Type	Size (MW)	Size (MW) (Incl. Average Outturn Factor)
A	Wind	700	455
B	Hydro	1,150	1,150
C	Wind	950	617.5
D	CCGT	700	700

The assessment on which units shall be armed during the service term is dependent on system conditions, which considers factors like output being generated in real-time, the effectiveness of the unit if tripped, and the counterfactual cost in real time as well as other variables.

4.1.3. Filtering the combinations

During this stage of the assessment process, the combinations that do not meet the MW volume requirement shall be eliminated. To ensure no single unit (N-1) being unavailable leaves the remaining MW volume available on the CIS under NGESO's MW volume requirement, the largest unit in a stack of generators will be removed from the combination to see if the requirement is still met/exceeded. The following formula is used to establish this pass/fail criteria:

$$(\text{Sum of all unit sizes in stack (after average outturn factor)} - \text{Largest unit in the stack (after average outturn factor)}) \geq 800\text{MW}$$

For example, using the units defined in Table 3, a couple of the combinations could be:

Table 4: Filtering combinations

#	Example Unit Combination	Volume of the combination excluding largest unit in that combination (MW)	Outcome of the Combination
1	A, B (where unit B is the largest at 1,150MW)	(455 + 1,150) – 1,150 = 455	<800MW = Fail
2	A, C, D (where unit D is the largest at 700MW)	(455 + 617.5 + 700) – 700 = 1,072.5	≥800MW = Pass

Based on Table 4, combination one (1) does not meet the MW volume requirement after removing the largest unit in the combination, meaning this combination will be filtered out and no longer considered.

* Please note that NGESO reserves the right to ignore this condition if there is deemed (at NGESO's sole discretion) to be an insufficient amount of MW volume competing in the commercial tender.

Table 5 shows the output of applying the filter to the stack outlined in Table 3.

Table 5: Application of the compensation criteria

#	Combination	Combination Size (MW) (Excl. Average Outturn Factor)	Combination Size (MW) (Incl. Average Outturn Factor)	Requirement of Stack (MW) (Incl. Average Outturn Factor)	Base Requirement Met? (Yes/No)	Largest Unit Compensation Criteria Met? (Yes/No)
1	A	700	455	1,255	No	No
2	B	1,150	1,150	1,950	Yes	No
3	C	950	617.5	1,417.5	No	No
4	D	700	700	1,500	No	No
5	A+B	1,850	1,605	1,950	Yes	No
6	A+C	1,650	1,072.5	1,417.5	Yes	No
7	A+D	1,400	1,155	1,500	Yes	No
8	B+C	2,100	1,767.5	1,950	Yes	No
9	B+D	1,850	1,850	1,950	Yes	No
10	C+D	1,650	1,317.5	1,500	Yes	No
11	A+B+C	2,800	2,222.5	1,950	Yes	Yes
12	B+C+D	2,800	1,892.5	1,500	Yes	Yes
13	A+B+D	2,550	2,305	1,950	Yes	Yes
14	A+C+D	2,350	1,772.5	1,500	Yes	Yes

Table 5 shows that only combinations eleven (11) through to fourteen (14) can be taken through to the commercial evaluation.

4.1.4. Calculating prices for all the combinations

In the commercial tender, units must submit an arming and utilisation (tripping) fee. The assessment assumes the following:

1. For the purposes of the arming fee assessment, NGESO will assume 1500-hours (3000 settlement periods) of arming per annum (units are expected but not guaranteed to be armed between 1500-hours a year);
2. Statistically, NGESO expects the network fault to be a rare occurrence. Subject to all involved units adhering to network policy for asset and maintenance and assumed historical weather conditions, the fault is forecasted to occur once every 25-years.

From the above assumptions, the utilisation (tripping) fee will be calculated on a pro-rata basis and added to the arming fee per settlement period (SP).

$$\text{Combination price} = \sum_{n=1}^{n=n} \left(Arming\ fee\ per\ SP + \left(\frac{Tripping\ fee}{3000 \times 25} \right) \right)_n$$

Once the price for every compliant combination is determined, the prices will be sorted in ascending order to find the lowest cost combination that meets the MW volumed required by NGESO.

Table 6: Combination price stack

#	Combination	Combination Price Formula	Total Price (£/SP)
11	A+B+C	$(455 \times 2.00) + (1{,}150 \times 1.50) + (617.5 \times 4.00) + \left(\frac{15000 + 18000 + 20000}{3000 \times 25}\right)$	4,532.21
12	B+C+D	$(1{,}150 \times 1.50) + (617.5 \times 4.00) + (700 \times 2.00) + \left(\frac{18000 + 20000 + 3000}{3000 \times 25}\right)$	5.595.55
13	A+B+D	$(455 \times 2.00) + (1{,}150 \times 1.50) + (700 \times 2.00) + \left(\frac{15000 + 18000 + 3000}{3000 \times 25}\right)$	4,035.48
14	A+C+D	$(455 \times 2.00) + (617.5 \times 4.00) + (700 \times 2.00) + \left(\frac{15000 + 20000 + 3000}{3000 \times 25}\right)$	4,780.51

The optimum combination based on Table 6 is number thirteen (13) with £4,035.48 per SP which means all units – units A, B and D – that form part of this combination will be awarded contracts at the discretion of NGESO.

The approach outlined above shows that a unit could be a cheap individual option but once considered as part of a combination of units, is no longer commercially preferable and therefore not contracted with. This circumstance is likely to occur if there is a limited number of CIS channels available to NGESO or because multiple units are connected behind the same CB and as a result are dependent on each other's submissions – refer to section 4 (Commercial Assessment) for further information. The successful tender is therefore based on the lowest cost combination of units able to achieve the volume required by NGESO.

5. Counterfactual

NGESO operates the system in accordance with the SQSS and must secure the system for credible faults (single circuit faults, double circuit faults etc.). The amount of power that can be securely transferred across a boundary post fault will set the pre-fault transfer limit (the constraint limit) and is calculated by power flow studies using the typography of the system at a given point in time. The transfer across a boundary is defined as:

$$\text{Transfer} = \text{Generation within a group} - \text{Demand with the group}$$

$$(\text{where Transfer} < \text{Constraint limit})$$

If the transfer is greater than the calculated constraint limit, NGESO must act to reduce the transfer by decreasing generation or increasing demand within a group, by trading, enacting contracts or taking bids/offers in the Balancing Mechanism (BM).

Intertrips are used as tools by NGESO to help manage constraints, by raising the constraint limit pre-fault, thereby reducing the MW volume of power needing to be constrained off the system.

The cost of using an intertrip for constraint management must demonstrate significant benefit in comparison to NGESO's current methods of managing constraints for the tenders to be accepted and contracted with. Please refer to the National Grid Data Portal for historic constraint costs.

6. Use of Intertrips in Operational Timescales

The arming and disarming of an intertrip is a decision taken in operational timescales based on the transfer flow across the boundary and the cost of alternative actions. Because the prevailing form of generation within Scotland is renewable, consideration must be given for the changing output of these generators. Generators do not have to be at full output to be beneficial and shall be armed whenever the cost of arming is more economic than the total costs of reducing generation within the constraint boundary. The ENCC shall select units on a cost basis although there are other factors that the ENCC must consider in arming units. The outcome of the commercial tender may lead to NGESO securing a greater MW volume of intertrip capacity than is expected to be regularly armed to manage B6 boundary constraints. Because units are only paid once armed, this will not lead to any inefficient spend from NGESO. However, this could lead to circumstances where a unit is accepted in the most economically advantageous combination of units but rarely economic to arm, hence the provision for the NGESO to request updated arming costs from successful units intermittently throughout the contract term. Refer to the Contract Terms for further information on this provision.

Intertrips are one of several tools that NGESO utilises to manage interactive network issues. This means that this CIS might not be the most optimal solution to manage the B6 constraint in all circumstances.

7. Indicative Timeline

Table 7: Indicative timeline

Indicative Date(s)	Stage
23/08/2021	Launch Commercial Tender
10/09/2021 at 15:00pm (BST)	Close Commercial Tender
~September-October 2021	Evaluate Commercial Tender Responses
~October-November 2021	Confirm Results from Commercial Tender
~October 2021 to September 2023	Connect Successful Units to the CIS
~October 2023 to September 2024	Initial Service Delivery Period
~October 2024 to September 2025	Extended (Optional) Service Delivery Period