Congestion costs and Balancing Services Use of System Charges

RWE

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1. Introduction

1.1. This note explores issues associated with the treatment of congestion costs in the CUSC in the context on compliance with Regulation (EU) 2019/943 of the European parliament and of the council of 5 June 2019 on the internal market for electricity (recast)[1] (Regulation 2019/943) and Regulation 838/2010[2].

2. Background - the legislative framework

2.1. Regulation 2019/943 sets out the basis for the operation of the internal market for electricity in EU member states. There are a number of definitions in the Regulation that are relevant for consideration of congestion charges in GB. These include the following:

- 'Congestion' means "*a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows*" Article 2 Definitions (4) ;
- 'Structural congestion' means "*congestion in the transmission system that is capable of being unambiguously defined, is predictable, is geographically stable over time, and frequently reoccurs under normal electricity system conditions*" (Regulation 2019/943 - Article 2 Definitions (6)); and
- 'Redispatching' means "*a measure, including curtailment, that is activated by one or more transmission system operators or distribution system operators by altering the generation, load pattern, or both, in order to change physical flows in the electricity system and relieve a physical congestion or otherwise ensure system security*" (Regulation 2019/943 - Article 2 Definitions (26)).

2.2. Under Regulation 12019/943 structural congestion helps to define 'bidding zones which are "*the largest geographical area within which market participants are able to exchange energy without capacity allocation*" (Regulation 2019/943 – Article 2 Definitions (65)).

2.3. Article 14(1) states that "*Bidding zone borders shall be based on long-term, structural congestions in the transmission network. Bidding zones shall not contain such structural congestions unless they have no impact on neighbouring bidding zones, or, as a temporary exemption, their impact on neighbouring bidding zones is mitigated through the use of remedial actions and those structural congestions do not lead to reductions of cross-zonal trading capacity in accordance with the requirements of Article 16*".

2.4. Congestion is defined with respect to "network areas" and "network elements"[3]. "Structural congestion" is envisaged within bidding zones (Article 14(1)). Re-dispatch can take place to resolve physical congestion and structural congestion within bidding zones as well as between bidding zones.

2.5. Recital 30 in Regulation 2010/943 states the following: "*To efficiently steer necessary investments, prices also need to provide signals where electricity is most needed. In a zonal electricity system, correct locational signals require a coherent, objective and reliable determination of bidding zones via a transparent process. In order to ensure efficient operation and planning of the Union electricity network and to provide effective price signals for new generation capacity, demand response and transmission infrastructure, bidding zones should reflect structural congestion. In particular, cross-zonal capacity should not be reduced in order to resolve internal congestion".*

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[1] Regulation 2019/943 at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0943
[2] Regulation 838/2010 can be found at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:250:0005:0011:EN:PDF
[3] These terms are not defied in Regulation 2019/943

2.6. In the context of network charges Regulation 2019/943 sets out in Article 18 (1) that "*charges applied by network operators for access to networks, including charges for connection to the networks, charges for use of networks, and, where applicable, charges for related network reinforcements, shall be cost-reflective, transparent, take into account the need for network security and flexibility and reflect actual costs incurred insofar as they correspond to those of an efficient and structurally comparable network operator and are applied in a non-discriminatory manner. Those charges shall not include unrelated costs supporting unrelated policy objectives*".

2.7. Regulation 2019/943 Article 18 (3) states the following: "*Where appropriate, the level of the tariffs applied to producers or final customers, or both shall provide locational signals at Union level, and take into account the amount of network losses and congestion caused, and investment costs for infrastructure*".

2.8. Regulation 2019/943 Article 19 (2) sets out the objectives which have priority for the treatment of congestion revenues resulting from the allocation of cross-zonal capacity:

(a) "*guaranteeing the actual availability of the allocated capacity including firmness compensation; or*

(b) maintaining or increasing cross-zonal capacities through optimisation of the usage of existing interconnectors by means of coordinated remedial actions, where applicable, or covering costs resulting from network investments that are relevant to reduce interconnector congestion".

2.9. Regulation 2019/943 Article 19 (3) states that "*Where the priority objectives set out in [Article 19] paragraph 2 have been adequately fulfilled, the revenues may be used as income to be taken into account by the regulatory authorities when approving the methodology for calculating network tariffs or fixing network tariffs, or both. The residual revenues shall be placed on a separate internal account line until such a time as it can be spent for the purposes set out in paragraph 2*".

2.10. Congestion costs relate to charges for network access. Such charges which must be cost reflective take into account the need for network security and flexibility and reflect actual costs incurred Article 18(1) and costs incurred within bidding zones may be subject to a methodology for setting tariffs that is approved by the relevant regulatory authority (Article 19(3)).

2.11. Congestion costs as network charges may require consideration of compliance with respect to Regulation 838/2010, particularly with regard to average transmission charges paid by producers.

3. Consideration of congestion costs in GB

3.1. Regulation 2019/943 establishes the basis for the consideration of structural congestion and bidding zones in the context of the internal market for electricity. It establishes the fact that such congestion can occur within bidding zones, provided that it does not impact on cross border trade. The Regulation also sets out the basis for network charges which include those associated with congestion. Such charges should be cost reflective, transparent, take into account the need for network security and flexibility and reflect actual costs incurred

3.2. There is no explicit recognition of congestion charges as network charges in the GB arrangements However, Balancing Services Use of System (BSUoS) charges include an element of costs associated with "constraints" as well as costs related to ancillary services[4].

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[4] Ancillary services are defined in Regulation 2019/944 - Article 2: Definitions (48). '*Ancillary Service' means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management.* Note that this definition specifically excludes "congestion management".

3.3. The ESO describes constraint costs as follows: "*Running the transmission network also requires actions to protect equipment, enable access to the system, keep within the SQSS and prevent the loss of large parts of the network. In order to do this, we sometimes ask a generator to reduce, or constrain, the amount of electricity it's producing. When we do that, we still need the electricity it would have produced – so we can balance the system – but we can't move it in or out of a certain area. We make up the difference by buying energy from another generator in a different part of the transmission network. It can also happen the other way around: we might need to produce more energy in some areas, which means we need to reduce production elsewhere*"[5]. These costs would appear to be congestion costs for the purposes of compliance with Regulation 2019/943.

3.4. The monthly costs of constraints have been reported in 2019/20 up to the end of January 2020 (Table 1). The majority of these costs related to activity in the GB balancing market for the purpose of operating the GB transmission system ("BM-Transmission). The monthly cots in 2019/20 range from £7.82m (May 2019) per month to £71.56m (Jan 2020). Annual BM constraint costs were £293m in 2017/18, £419m in 2018/19 and are £289m in 2019/20 (to Jan 2020)[6].

Table 1: Monthly Constraint Costs in GB

Costs (£m)	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
BM - Transmission	27.47	7.82	16.15	10.24	19.28	25.41	49.19	14.80	47.92	71.56	0.00	0.00
Trades - Transmission	0.14	0.11	1.03	1.75	4.23	1.07	2.04	1.61	0.73	1.03	0.00	0.00
BM - Voltage	1.10	1.69	5.15	2.16	7.86	6.29	3.66	3.14	2.86	1.15	0.00	0.00
Trades - Voltage	0.57	1.06	2.74	3.06	5.45	4.87	0.86	1.28	0.46	0.27	0.00	0.00
BM - ROCOF	1.63	2.26	2.95	1.69	3.83	4.24	5.99	5.06	7.49	7.67	0.00	0.00
Trades - ROCOF	7.61	8.24	17.57	10.00	14.63	13.22	12.50	6.45	13.63	10.40	0.00	0.00
SO-SO - Constraints	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AS Costs	5.229	2.416	1.351	2.445	1.934	2.911	1.222	2.319	2.288	2.086		

3.5. BSUoS charges including constraint costs are allocated such that Generation pays 50% of the cost and suppliers pay 50% as a half hourly commodity charge (£/kWh). The charge is applied ex post to recover costs that are reflect the actual costs incurred in each settlement period (half hour).

3.6. The first BSUoS task force recently reviewed the totality of BSUoS charges and concluded that they relate mainly to the recovery of costs. Therefore such costs could be considered alongside other similar charges for users as set out in the Targeted Charging Review/Significant Code Review (TCR/SCR).

3.7. The fist BSUoS task force assessed whether individual elements of BSUoS have the potential for being charged more cost-reflectively and hence could provide a forward-looking signal. The task force identified four such potential options: locational transmission constraints; locational reactive and voltage constraints; response and reserve bands; and response and reserve utilisation. The task force considered that each of these elements would not or could not provide a cost-reflective and forward-looking signal that would drive efficient and effective market behaviour.

3.8. The task force made the following observations:

> *"The Task Force concluded that whilst there are some theoretical advantages to all four potential options identified, the implementation of each of these would not or could not provide a cost-reflective and forward-looking signal that would drive efficient and effective market behaviour.*
> *A significant limitation is that BSUoS is based on total costs incurred by the ESO, which can vary significantly. An effective forward-looking signal should be built from marginal costs rather than the total costs incurred by the ESO, so market parties face the cost they impose on the system. It is unclear how to achieve this through BSUoS, other than by some form of market splitting i.e. separating the Great Britain market into different zones with limited cross-zonal capacity for trading. Market splitting has however not been explored as it is out of scope of the Task Force.*

[5] ESO Monthly Balancing Services Summary (MBSS) Report – see for example latest report (Jan 2020): https://www.nationalgrideso.com/document/165056/download

[6] Based on the MBSS Reports.

Assuming a forward-looking BSUoS signal could be developed, another significant limitation is that this signal could be ineffective, as other signals are already in place through other market and charging arrangements (e.g. TNUoS, Balancing Mechanism and cash-out) so double-counting issues therefore arise. The main issue with double-counting is the risk of underestimation or overestimation, leading to market distorting signals.
In addition, allocating BSUoS costs to market parties responsible for these costs would be highly complex due to services being procured and used by the ESO based on complex assessments of the whole system (e.g. a party may be efficiently called once to cover a number of balancing issues, without being the single 'cheapest' option when considering those issues in isolation). Also, there is no evidence that the issues that exist currently (i.e. the charge being hard to forecast, complex, highly volatile, etc) will cease to apply in any of these potential options. Indeed, moving elements of charges to targeted groups of users may have the effect of making their charges more difficult to forecast, more complex and more volatile".

3.9. From this the concerns over cost reflective locational elements of BSUoS charges raised by the taskforce appear to related to the following:

- **temporal variation** : Forward looking BSUoS charges can vary significantly over time;
- **marginal versus average costs**: An effective forward-looking signal should be built from marginal costs rather than the total costs incurred by the ESO;
- **double counting** : A forward-looking locational BSUoS signal could be ineffective, as other signals are already in place through other market and charging arrangements (e.g. TNUoS, Balancing Mechanism and cash-out) so double-counting issues therefore arise;
- **distorting locational signals** : The main issue with double-counting is the risk of underestimation or overestimation, leading to market distorting signals (this is related to the temporal variation) ;
- **complexity**: allocating cost reflective locational BSUoS costs to market parties responsible for these costs would be highly complex due to nature of the services procured;
- **solve more than one problem**: BSUoS costs relate to a number of balancing issues, without being the single 'cheapest' option when considering those issues in isolation;
- **no improvement over current arrangements**: Cost reflective locational BSUoS charges would remain difficult to forecast, complex, highly volatile, etc.; and
- **increases forecasting risk**: Cost reflective locational BSUoS charges may be difficult to forecast, complex and volatile.

3.10. The task force concluded that "*It is not feasible to charge any of the components of BSUoS in a more cost-reflective and forward-looking manner that would effectively influence user behaviour that would help the system and/or lower costs to customers. Therefore, the costs included within BSUoS should all be treated on a cost-recovery basis*"[7].

3.11. In the light of these findings the second BSUoS task force is currently considering the arrangements for the recovery of BSUoS costs in a manner that meets the TCR/SCR objectives (fair, proportionate and non-distortive). It is understood that the second BSUoS task force has not, to date, considered the implications of Regulation 2019/943.

[7] First BSUoS Taskforce Report at http://www.chargingfutures.com/media/1348/balancing-services-charges-task-force-final-report.pdf

4. The Treatment of Congestion costs in GB

4.1. Congestion that occurs on the transmission system within the GB bidding relates to either:

- congestion that is permitted in the GB transmission price control regime or
- congestion that occurs as a result of unplanned events that on the GB transmission system.

4.2. As far as permitted levels of congestion are concerned these comprise the following:

a) an allowed level of congestion which relate to the efficient trade-off between transmission investment and re-dispatch;
b) an allowed level of congestion associated with the connect and management regime whereby users are allowed to connect to the network in advance of wider network investment; and
c) an allowed level of constraint costs associated with the forecast level of annual planned outages over the price control period.

4.3. Congestion costs that are allowed for under the GB price control are inherently predictable. They are taken into account as part of the price control review for the transmission licensees and the ESO as part of the network options assessment (NOA). Therefore transmission licensees and the ESO should be able to forecast these costs with a reasonable degree of accuracy across a price control period and within a charging year.

4.4. The actual costs of congestion incurred in each settlement period may be more difficult predict since there is variability in the disposition of generation output and demand offtake. These variations are heavily influenced by factors external to the transmission networks such as weather conditions.

4.5. The ESO and Transmission Licensees are unable to predict congestion that relates to unforeseen or unforeseeable events that occur on the transmission network as a result of network faults or failures. An example of this type of congestion is the re-dispatch costs incurred as a result of unplanned outages that occurred on the western HVDC link in 2019/20 or unplanned interconnector outages (which occur from time to time).

4.6. GB congestion can be evaluated in the context of the findings of the BSUoS taskforce, as follows:

- **Temporal variation**: permitted costs of congestion are inherently predicable (subject to temporal variation dependent on the actual patterns of output and demand) while the costs of congestion relating to unforeseen or unforeseeable events are unpredictable;
- **Marginal versus average costs**: the marginal costs of congestion relate to the re-dispatch costs, typically the costs of turning off generation (or demand) in certain locations and the cost of turning on generation (or demand) in others. In general, the nature of the constraints in the GB system relate to curtailment of renewable capacity on one location and the replacement with fossil generation in other locations. The short run marginal costs (SRMC) of users are known in the GB balancing mechanism and are reasonably predictable. Congestion costs relate to the spread of costs between users in different locations[8] (note that renewable costs, which tend towards zero (or below) and the cost of gas fired generation, which relate to the cost of gas. Therefore the marginal cost of constraints, particularly those that are predictable can be forecast with a considerable degree of accuracy dependent on the generation mix in different locations;
- **Double counting**: Locational signals for constraints relate to the short run dispatch costs incurred by the ESO. These costs are separate from the costs that relate to other locational signals such as TNUoS (**investment costs**) and the BM (where cash out prices relate to the **cost of imbalance** in

[8] Note that the costs of constraints in certain locations related to the spread of SRMC between renewable generators, which tend towards zero (or below) and the SRMC of gas fired generation, which relate to the cost of gas.

the BG bidding zone). Therefore locational constraint costs can be constructed in a way that does not result in double counting;

- **distorting locational signals** : If constraint costs relate to the short run marginal costs of re-dispatch then locational signals could be created that are efficient subject to addressing issues associated with the potential for locational market power;
- **complexity**: the general costs of managing constraints are relative simple to identify, but developing consistent market signals and reflecting them appropriately on users could be complicated particularly if related to unpredictable events;
- **Solve more than one problem**: The extent to which actions associated with constraints relate to other balancing activities is not clear from the information available to the market. However, the fact that the ESO can identify constraint costs separately from other costs suggests that the allocation process in terms of cost categories can be relatively straightforward (the costs of constraints are identified in the MBSS reports and noted in daily BSUoS reports);
- **No improvement over current arrangements**: Some constraint costs could be relative easy to predict but others such as unforeseen or unforeseeable events on the transmission network will remain unpredictable. However, addressing predictable constraint costs could provide an improvement over the current arrangements; and
- **Increases forecasting risk:** Given the difficulties in forecasting overall BSUoS charges it would seem that improvements in the treatment of certain BSUoS charges would decrease the level of forecasting risk (this of course depends on the solution).

4.7. Regulation 2019/943 requires consideration of predictable and unpredictable congestion in the context of network charging (Article 18). In particular Article 18 (1) requires that network charges are cost reflective, transparent, take into account the need for network security and flexibility and reflect actual costs incurred. These network charging objectives are considered below:

- **Cost reflectivity**: the regulation does not set out the basis for cost reflective charging. However, with regard to congestion costs it would seem that the element associated with predicable costs could be charged more costs reflectively. These costs relate to the patterns of generation and demand that are delivering and off taking during the period in which the predictable constraints occur. Since generation and demand are jointly responsible it is cost reflective to target on the delivering and off taking volumes. However, unforeseen and unforeseeable costs relate to faults or unplanned outages on the transmission network and it would seem inappropriate the levy such costs on generation and demand since they relate to costs create by the transmission licensees. The principle of cost reflectivity suggest that these costs should be targeted on the transmission licences (perhaps in the form of incentive);
- **Transparency**: The level of GB congestion/constraint costs vary significantly in each year and each settlement period. The costs are not disaggregated in a manner that allows and assessment of the costs allowed for in the price control regime separately from those related to unforeseen or unforeseeable events. Congestion costs associated with the price control could be identified separately in a transparent manner at the start of the price control period (and subject to reporting the predicted costs against actual outturn). Congestion costs associated with unforeseeable or unforeseen events could be reported ex post to ensure transparency;
- **Taking into account the need for network security and flexibility**: Congestion is currently managed through re-dispatch, reflecting the short run marginal costs of users in the balancing mechanism. The GB arrangements for managing congestion through the Balancing Mechanism takes into account network security and flexibility; and
- **Reflecting actual costs incurred**: Commodity based half- hourly BSUoS charges f reflect the actual costs incurred by the ESO in manging the GB transmission system (including congestion).

4.8. Regulation 2019/943 Article 18 (3) requires that the level of the tariffs applied to producers or final customers "…shall provide locational signals at Union level". BSUoS charges do not currently provide any locational signals for users.

5. **Towards a solution for the treatment of GB congestion/constraint costs**

5.1. As noted above there are essentially two components to GB congestion costs: those that are allowed for under the GB price control: those that are inherently predictable and those that relate to unforeseen or unforeseeable events (unpredictable). These types of costs are examined separately in this section.

Predictable congestion costs

5.2. Predictable congestion costs are established at the start of each price control. They relate to

a) the costs of the allowed level of congestion which relate to the efficient trade-off between transmission investment and re-dispatch (allowed congestion cost);

b) the costs of the allowed level of congestion associated with the connect and management regime whereby users are allowed to connect to the network in advance of wider network investment (connect and mange congestion cost); and

c) the costs of the allowed level of constraint costs associated with the forecast level of annual planned outages over the price control period (planned outage congestion cost).

5.3. The costs relate to the re-dispatch of users to address the congestion. These are based on short run marginal costs of users. The net costs in each half hour relate to the spread of the costs of reducing the output of some users and the costs of increasing the outpour of others (or increasing demand and reducing demand associated with users). Under the NOA assessment process the general costs of congestion can be estimated for allowed congestion, connect and manage costs and outages in determining the optimal investment plan for the price control period.

5.4. Currently congestion costs are recovered in the generality of BSUoS charges as "constraint" costs. However, based on the objective set out in Regulation 2019/943 an alternative approach towards the treatment of GB congestion costs that are known or can be predicted can be outlined. This could take the following form:

- A forecast by the ESO of the predicted volume of constraints for each category of constraints (allowed constraints, connected and manage constraints and outage constraints) for a relevant period (price control, annually, or monthly). The forecast would be consistent with the NOA and published;
- A ex ante tariff (£/kWh) based on the net costs of re-dispatch for each of the categories of constraint and for each "charging period". This could be a single tariff or a tariff that varies with the type of constraint. The tariff would be published;
- The application of the ex ante tariff to generation and demand. Users would be liable to the extent that they are delivering (generating) or off-taking for the relevant settlement period (this is therefore cost reflective);
- Ex post reconciliation for the relevant period (which could be positive or negative) to take into account the actual costs incurred;
- Incentives arrangements for the ESO and transmission licensees to forecast the costs accurately and transparently; and
- Incentives on the transmission licensees to manage efficiently constraints (this could, for example take the form of benefits to the transmission licensee if outage periods are reduced against those forecast or penalties if the outage periods are longer than forecast).

5.5. These arrangements would be compliant with Regulation 2019/943 Article 18(1). They would be:

- **Cost reflective**: Costs would be recovered from users on the system at the time that the congestion occurs. Incentive arrangements on the ESO and transmission licensees would ensure that congestion costs were managed efficiently;
- **Transparent**: Congestion forecasts and related tariffs would be published. These congestion plans would be subject to ensuring that users are not able to exercise locational market power (e.g. by withholding plant at time of congestion);
- **Take into account the need for network security and flexibility:** The arrangements would be managed through re-dispatch using the balancing mechanism and other tools available to the ESO; and
- **Reflect actual costs incurred**: The tariff would ensure that the actual costs of congestion are reflected on all users at the time that the congestion occurs and recover all of the cost of congestion from those users.

5.6. The ex ante tariff approach would be compliant with Regulation 2019/943 Article 18(3) in relation to locational signals since users will be able to take into account the ex ante tariff in their market based dispatch decision. The actual costs of congestion are recovered from those users on off-taking and delivering at the time that the congestion occurs.

5.7. If predictable congestion charges form an ex ante tariff that form part of generation network charges then they may need to be taken into account with regard to compliance with Regulation 838/2010.

Unpredictable congestion costs

5.8. Congestion that occurs as a result of unforeseen and unforeseeable events on the transmission system is inherently unpredictable. Since they relate to failures or faults on the GB transmission system, it does not seem appropriate to target such costs on users. Indeed it is not cost reflective to target such costs on users.

5.9. In the context of the TCR/SCR it would seem appropriate to recover unpredictable congestion costs through an approach that is consistent with the objectives of the TCR/SCR i.e. fair, predictable and non-distortive. Therefore it is proposed that:

- Unpredictable congestion costs are recovered from users through adjustments to the fixed Demand Residual;
- Such adjustment should be published and enable the efficient pass through of costs for a defined period; and
- Incentive arrangements should be designed to ensure that the transmission licensees manage unpredictable congestion costs.

5.5. These arrangements would be compliant with Regulation 2019/943 Article 18(1). They would be:

- **Cost reflective**: Incentive arrangements would ensure that the transmission licensees' mange unpredictable congestion costs in an economic and efficient manners. These arrangements would ensure a degree of cost reflectivity with respect to the ESO and transmission licensees. Since the costs are created through unplanned transmission outages they should not be directly reflected on users;
- **Transparent**: Adjustments to the demand residual should be published in advance so that suppliers can take them into account in the recovery of costs;
- **Take into account the need for network security and flexibility**: The arrangements would be managed through re-dispatch using the balancing mechanism and other tools available to the ESO; and
- **Reflect actual costs incurred**: The demand residual adjustment would ensure that the actual costs of unforeseen and unforeseeable congestion are recovered from users in a manner that is fair, proportionate and non-distortive.

5.6. The ex ante tariff approach would not produce any locational signals in relation to compliance with Regulation 2019/943 Article 18(3).

6. Conclusions

6.1. This note has reviewed the treatment of congestion charges in the GB arrangements in the context of Regulation 2019/943. The note proposes that BSUoS component that comprises congestion costs should be applied to users on the following basis:

i) An ex ante fixed commodity charge (£/kWh) which reflects to the extent possible the predictable element of congestion costs on users (Generation (50%) and Suppliers(50%)) subject to reconciliation to ensure that it reflects actual costs incurred; and
ii) Adjustment to the demand residual to reflect the costs associated with unforeseen or unforeseeable outages on the GB transmission system.

6.2. The approach proposed would be compliant with Regulation 2019/943 Article 18(1) in relation to cost reflectivity, transparency, taking into account the need for network security and flexibility and reflecting actual costs incurred.

6.3. Predictable congestion charges form an ex ante tariff that form part of generation network charges may need to be taken into account with regard to compliance with Regulation 838/2010.