NTS Charging Review: setting a tariff discount for storage

A report for GSOG

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1. Introduction

Following Ofgem's decision not to direct the implementation of UNC Modification 0621, or any of its alternatives in December 2018, National Grid raised UNC Modification 0678 which is subject to urgent procedures. Ofgem directed the timetable for development of this Modification with the aim of implementing an EU Tariff Code (EU TAR)[1] compliant solution to be effective from 1 October.

In line with UNC Modification 0621, National Grid has proposed in UNC Modification 0678 the adoption of an alternative Reference Price Methodology (RPM); replacing the LRMC methodology with the Capacity Weighted Distance (CWD) methodology.

Included in the EU TAR is Article 9, which allows for a minimum discount of 50% to be applied to capacity-based transmission tariffs aimed at storage utilisation (for entry and exit). Furthermore, in recitals 3 and 4 of the EU TAR it states that charges should be set based on:

"… a reasonable level of cost reflectivity …" and that there should be a commitment to *"… avoid double charging for transmission to and from storage facilities, this Regulation should set a minimum discount acknowledging the general contribution to system flexibility and security of supply of such infrastructure"*.

National Grid includes this minimum discount for all storage points connected to the NTS in UNC Modification 0678. In terms of alternative levels of discounts, if a party wishes to increase the discount beyond the default 50%, then it should provide arguments to support the change (albeit this is not stipulated in the EU TAR).

In 2017, GSOG commissioned WWA to identify whether the 50% discount was appropriate, and where possible, using the CWD model, provide quantitative analysis to support any conclusions. At that time, WWA recommended that a minimum discount of 86% was appropriate and this was adopted by a number of alternative proposals to UNC Modification 0621.

Following the submission of UNC Modification 0678 and the publication of the associated 0678 Sensitivity Tool (the Model) by National Grid, GSOG requested that WWA refreshed its analysis, to confirm whether the 86% discount was still valid.

This report summarises the methodology adopted by WWA and the results of the analysis carried out using the Model. It should be noted that the analysis considered only the CWD methodology, the Postage Stamp methodology was not examined. If the same methodology was applied to Postage Stamp, as the capacity prices are the same for all Entry Points and all Exit Points, the discount will also equate to 100%, due to the lack of any distance driver with the calculation of capacity prices.

In the past, WWA has produced analysis investigating the benefits which storage brings to the NTS. The benefits were quantified using the LRMC methodology as the RPM, however, following the publication of our initial report in 2007[2] and the updated report in

[1] Commission Regulation (EU) 2017/460

[2] WWA, UK Gas Transmission System Benefits from Gas Storage, Sept 2007

2014[3], no changes were made to the NTS tariffs targeted at storage. WWA believes that there is still merit in the proposals made in these reports irrespective of the form of the RPM adopted at the end of the NTS Charging Review. The RPM is a methodology for cost derivation and revenue allocation and the benefits identified in the previous WWA investigation remain valid even if the CWD (or Postage Stamp) methodology is deemed to be a more suitable RPM in future.

Using the model produced by National Grid, we carried out a review of the relative costs of transporting gas from storage to local offtakes. For example, using the Cheshire storage point, distances and costs were calculated for the transportation of gas to two local offtakes; Holmes Chapel and Warburton. Again, the results were compared with the costs of transporting the gas to the same offtakes without diversion via storage. This approach was repeated at all storage points using local offtakes. The results were aggregated and an average variation of charges, including and excluding storage routes, calculated, forming the basis for the recommended minimum level of storage discount.

Finally, the report considers other legitimate arguments which could be employed for the purposes of supporting a discount of greater than 50%. These arguments are not supported by CWD model based analysis.

[3] WWA, UK gas transmission system benefits from gas storage – an update to the initial report produced in 2007, April 2014

2. NTS capacity charges at storage points

2.1 Current arrangements

NTS charges are calculated by National Grid using its Transport Model (LRMC model) and the Tariff Model (adjustments to the LRMCs to generate charges). The method by which entry charges are set differs to that applied at exit. In simplistic terms, at entry the raw LRMCs are used to calculate auction reserve prices, whereas at exit, charges are scaled to recover a target level of revenue.

The cost of entry/exit capacity paid by Users is dependent upon the product purchased, with Users able to acquire firm entry capacity at a zero price, via the within day product. For both entry and exit interruptible capacity products, Users can also acquire rights at a zero price.

In terms of other NTS charges, Users at non-storage points will incur a TO commodity charge (a revenue reconciliation charge for under-recovered National Grid TO allowed revenue) and a SO commodity charge (for the recovery of National Grid SO allowed revenue). These commodity charges are not applied for flows into and out of storage points.

The charging methodology employed by National Grid and any changes to it must be consistent with the Relevant Charging Methodology Objectives as set down in SSC A4 and A5 of National Grid's Transporter Licence.

In summary the Objectives are as follows:

SSC A4

- Keep charging methodology under review
- Use reasonable endeavours regarding methodology and charge changes:
  - Not to make changes more frequently than twice a year (on 1 April and 1 October)
  - In relation to exit capacity once a year on 1 October

SSC A5

- Cost reflectivity
- Promote efficiency
- Avoid undue preference in the supply of transportation services
- Best promotes competition between gas suppliers and gas shippers
- Take account of developments in the transportation business
- Compliance with Regulation and decisions from the EC and ACER
- Follow any alternative arrangement determined by the Secretary of State

2.2 NTS Charging Review – application of the CWD model

National Grid has raised UNC modification proposal 678. The proposal provides a framework for the development of an alternative NTS charging methodology and associated tariffs. At its core, the proposal recommends the replacement of the LRMC methodology with a CWD methodology, which on its own will produce changes to the levels of capacity charges, at both entry and exit.

The CWD methodology is very simplistic, certainly when compared to the LRMC methodology. It is based on a single assumption that costs are driven by distance and capacity and it is on the basis of these two parameters that revenue is allocated to each and every entry and exit point. The CWD model produced by National Grid replicates the CWD methodology set out in the EU TAR and, as such, does not reflect the costs associated with the delivery of individual pipeline routes, for example, the model does not reflect the size, age or utilisation of pipelines which make up the NTS network.

In order for the CWD methodology to be considered as cost reflective it relies on the principle that the allowed revenue to be recovered by National Grid is realistic (incorporating historical and ongoing costs) and that the degree of socialisation caused by the simplification of the network, in terms of capacity and distance, is reasonable. Although arguments can be constructed which dispute the level of cost reflectivity of the CWD methodology, these may well be outweighed by the benefits which its introduction may present, such as simplicity, transparency and stability in charging.

If the CWD methodology is to be implemented a number of input assumptions and broader tariff structural issues will need to be “fixed”. The CWD model published by National Grid permits the user to vary the input assumptions, and tariff structures, and test a wide range of charging scenarios.

In relation to storage points, the most critical tariff structural change relates to the application of a discount for NTS capacity charges at storage points. Article 9 of the EU TAR recognises that storage is “unique” to other system points and requires that standard capacity charges are discounted by 50%, at a minimum. National Grid has adopted the 50% discount as a default position and although, on the face of it, this seems a reasonable concession for storage points, the overall NTS costs of flowing gas into and out of storage may increase significantly. The total costs faced by storage points (and other NTS points) will be dependent upon the input assumptions and any other structural changes to the tariff regime.

2.3 Alternative treatment of storage

The EU TAR Code provides for a discount to be awarded to storage related transmission capacity charges. The justification for this special treatment of storage is twofold: to avoid double charging; and to acknowledge the contribution to system flexibility and security of supply, however, no explanation is provided as to how the minimum 50% discount was derived.

It would be fair to state that the wording contained in the EU TAR is open-ended. Beyond making general references to the wider benefits it engenders it falls short of identifying, in any meaningful way, the services provided by storage and how they might be classified in terms of transmission charging.

In order to define storage services, and the manner in which it interacts with the network, it is prudent to start by recognising the physical characteristics of gas storage. Crucially, it is embedded in the network and is probably best described as providing a parking service for gas to be stored, for redelivery at some time in the future.[4] Its physical location within the network, combined with the symbiotic nature of its relationship with the operation of network[5], mean that storage can be regarded as being an integral part of the network

Expanding on this portrayal of storage, a case could be built that it is similar, in nature, to NTS linepack. In charging terms, linepack is not considered to be subject to locational charging and is used to add/remove pressure (and arguably add capacity) to the system. Charging storage for entry and exit capacity is less compelling than for other system points as, like linepack, it is "within the system" and ultimately used to support national pressures, albeit gas will inevitably be delivered to local offtakes. This is particularly the case where storage acts in accordance with demand, behaving in a manner consistent with National Grid's exploitation of linepack i.e. it injects during periods of low demand and delivers during periods of higher demand. Analysis is provided in Section 3 to confirm the interaction between storage flows and demand.

If this characterisation of storage is accepted to be accurate, then logically an argument can be constructed to exempt it from the application of NTS capacity charges.

Another alternative, and perhaps less radical approach, could be to consider how storage satisfies local demand. Again, this requires that storage is considered differently to other entry points, on the basis that:

a. it is embedded in the network;
b. it responds to changes in system demand;
c. it behaves in a manner akin to NTS linepack, but where deliveries only satisfy demand local to the storage facility.[6]

In order to test whether the 50% discount for storage is "cost reflective" in accordance with this alternative perspective of the relationship of storage with the network, analysis using the CWD model can be undertaken. The form of the analysis is described in section 2.5, while the CWD model assumptions adopted to support it, are set out in section 2.4.

2.4 CWD modelling assumptions

For the purposes of the analysis, the input assumptions made by WWA are as follows:

Used prices from 2019/20 assumed revenue of £867m
Split 50:50 entry:exit
Forecast Contract Capacity levels as set out in the Model
Existing entry contracts excluded
Storage discount of 50%

[4] See section 3.2 for further description of a parking service
[5] Flows in and of storage typically coincide with demand changes on the network
[6] It should be understood that this approach is somewhat at odds with the CWD methodology, as it is more representative of flows than of total capacity and distances between all entry and exit points. In essence, it implies that units of gas can be flagged for delivery at one point and offtaken at another, nearby exit point.

2.5 Analysis to test cost reflectivity of NTS capacity charges at storage points using unit costs at the Cheshire storage point

The hypothesis the analysis seeks to test is:

"The 50% discount applied to NTS capacity charges at UK storage sites is not cost reflective under the CWD model"

In order to test this hypothesis, two simple scenarios were created based on the characterisation of storage set out in section 2.3.

Scenario 1– a unit of gas delivered at all entry points and transported to the Holmes Chapel and Warburton exit points.

Scenario 2 - a unit of gas delivered at all entry points and transported to the Holmes Chapel and Warburton exit points via the Cheshire storage point.

In both cases, the Cheshire storage point and Holmes Chapel and Warburton offtake points were selected for analysis. The choice of storage point, and nearby offtake points, is not important, as the results are intended to be illustrative of the relationships between neighbouring points on the system. The hypothesis is proved if the average unit cost of transporting the gas to the offtakes increases under scenario 2 compared with scenario 1.

Figure 1 provides a simplified illustration of the two scenarios and the analysis undertaken. In scenario 1, the unit cost of transporting the gas from two entry points to the single offtake is calculated (where the unit cost equals the total cost divided by distance travelled). In scenario 2, the gas is transported from the same entry points to the same offtake point, via a storage point. Again the unit cost of transporting the gas along this route is calculated. If the unit cost for transporting the gas in scenario 2 is higher than that calculated in scenario 1, then the 50% discount applied is insufficient, meaning that gas transported via storage is paying disproportionately higher unit transportation costs.

Figure 1: a simplified representation of the two scenarios

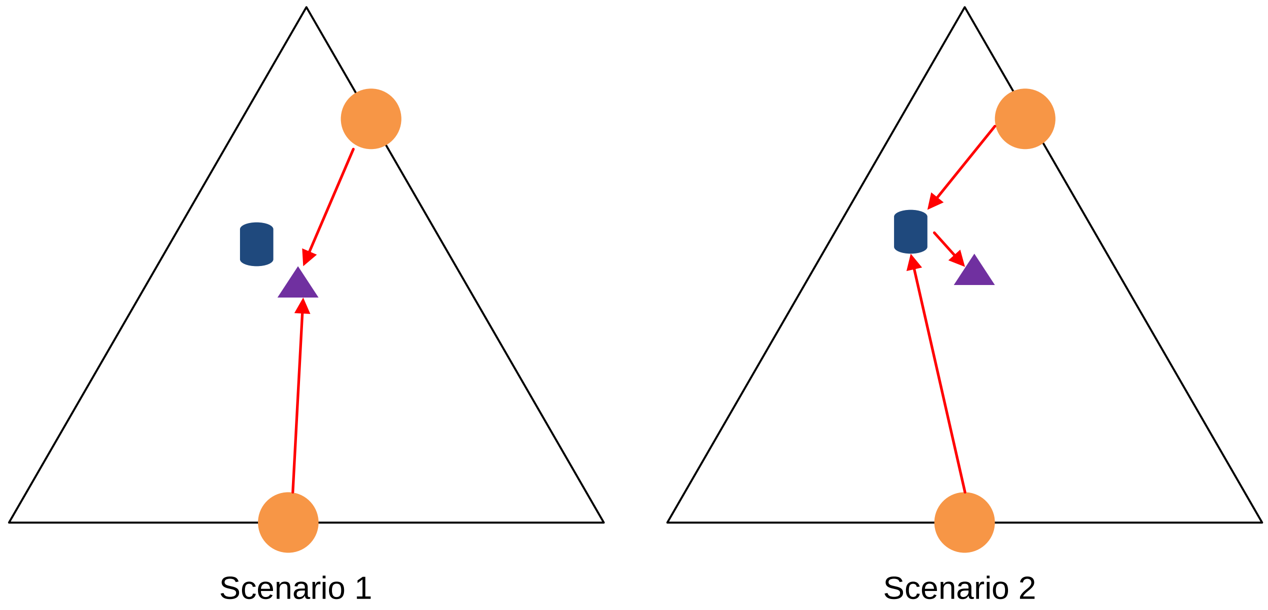


Figure 2 is taken from the Gas Ten Year Statement 2016 and shows the relative locations of the Cheshire storage site (inserted by WWA) and the two selected offtakes. The actual distances between the points, as set out in the model are: from Cheshire to Holmes Chapel 41km; and from Cheshire to Warburton 21km.

Figure 2: NTS Transmission Map – NW region

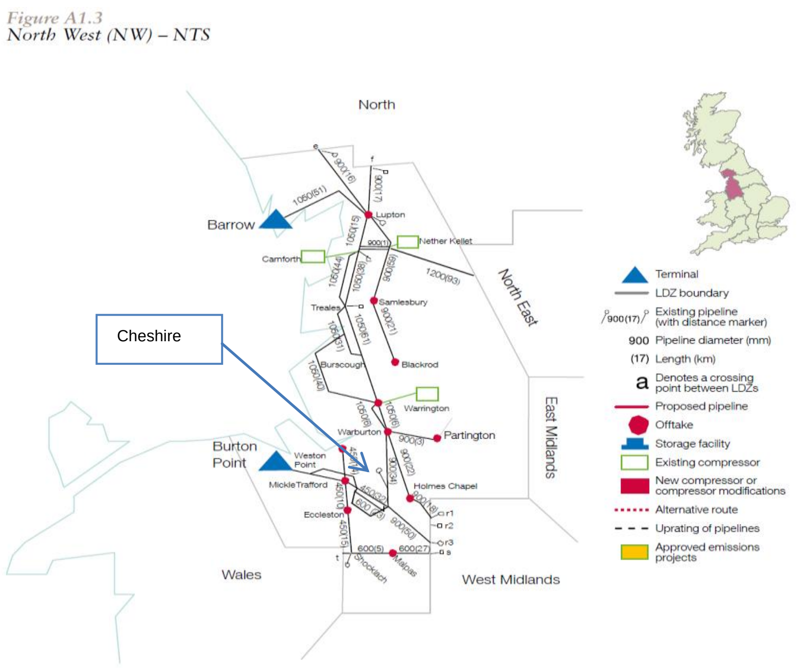


Table 1 sets out the results from the model. The distances from Cheshire to the offtakes are relatively short, however, the increases in the average unit cost are significant, averaging at 36%.

Table 1: Increase in costs for Cheshire storage users shipping to local offtakes

	Average increase in distance travelled	Average Increase in costs	Max Increase in costs	Average Increase in unit cost to transport gas	Max Increase in unit cost to transport gas
Offtake Point					
Holmes Chapel	14%	45%	54%	27%	36%
Warburton	6%	44%	54%	37%	51%

If it can be argued that storage sites should be treated differently to other points and that local demand should be used to determine "flow distance" then the hypothesis is correct and the discount afforded to storage should be greater than 50%. **On the basis of this analysis, limited to a single storage point, the discount should be closer to 100% to achieve improved cost reflectivity.**

2.6 Summary of results at all Storage points

Table 2 sets out the results for all storage points following replication of the analysis as described in Section 2.5.

Table 2: Increase in costs for all storage point users shipping to local offtakes

Increase in costs						
Storage site	Offtake point	Average increase in distance travelled	Average increase in costs	Max increase in costs	Average increase in unit cost to transport gas	Max increase in unit cost to transport gas
Barton Stacey	Braishfield A	5%	50%	60%	44%	60%
	Mappowder	10%	49%	58%	38%	57%
Cheshire	Holmes Chapel	14%	45%	54%	27%	36%
	Warburton	6%	44%	54%	37%	51%
Garton	Saltend BPHP (BP Saltend HP)	20%	42%	51%	22%	33%
	Ganstead	16%	42%	51%	24%	38%
Hatfield Moor (storage)	Blyborough	12%	41%	50%	28%	50%
	Rawcliffe	12%	41%	50%	28%	50%
Hole House Farm	Holmes Chapel	9%	44%	54%	33%	42%
	Warburton	8%	44%	53%	34%	50%
Hornsea	Pickering	18%	41%	51%	27%	44%
	Ganstead	25%	43%	53%	19%	38%
Average over storage sites		**13%**	**44%**	**53%**	**30%**	**46%**

Table 2 shows, that the average increase in unit costs of transporting gas to the relevant offtakes via storage when compared to the costs of transporting gas directly to the same offtakes is 30%. This infers that the total storage discount should be 80% (as a minimum) if the methodology applied in Section 2.5 is considered to be a sensible basis to calculate a level of discount, absent of any other considerations, including those described in Section 3.

3. Additional arguments to support further reductions in transmission charges for storage Users

The analysis carried out in Section 2 supports the application of a capacity discount of greater than 50% for storage, however, given that this scenario is based on an alternative characterisation of the CWD model; permitting the application of a bespoke methodology for the calculation of distances which gas would travel from storage points, it is prudent to consider other arguments which may justify improvements in the treatment of storage. These arguments could be used to substantiate a claim that the "meeting local demand" scenario is reasonable, or independent of this, that a more substantial discount is appropriate, with the level of discount being unrelated to the CWD outputs in this regard.

3.1 Behaviour of storage and capacity assumptions within the CWD model

The CWD model assumes independent booking of capacity at all points. Storage is bi-directional and as such requires that the User of storage acquires entry and exit capacity to support flows. Clearly, gas cannot flow in and out of a storage facility simultaneously, meaning that flows must either be in one direction, or the other.

Within the model, the User is required to input an assumption for the calculation of Forecast Contract Capacity (FCC). The FCC is reported as a daily volume of capacity at each entry and exit point. The derivation of the FCC is a matter for debate and can, at one end of the spectrum reflect the maximum technical capacity and at the other end a representation of the annual level of booked capacity on a daily basis e.g. total annual expected bookings divided by 365. In both cases, the concept of separate FCC's for storage entry and exit capacity does not reflect the physical operation of the facilities.

In the case of maximum capacity bookings, for the purposes of the scenario investigated in this report, we elected to use obligated levels of capacity.[7] The choice of FCC is important in relation to the derivation of the capacity charges, and the subsequent revenue adjustment, which in this case is an approximation of a level of peak day demand. As such, parallels can be drawn with the LRMC model which employs a 1 in 20 peak day demand assessment to derive a configuration of supply flows to satisfy demand.

The CWD model operates in a similar manner, in the absence of subsequent adjustments, where bookings are anticipated to match the FCC levels at each entry and exit point. Clearly, in nearly all cases the anticipated booking levels will greatly exceed actual bookings resulting in a revenue under-recovery.[8] For storage this is particularly erroneous as bookings for entry and exit capacity will not coincide, being dependent on the expected direction of flow.

In this case, accepting that the CWD model generates prices in a similar manner to LRMC (where a peak capacity FCC scenario is representative of the peak demand assumption underpinning the LRMC model) then, in the case of storage points, only that capacity which is booked on the equivalent peak day should be subject to a charge.

[7] Obligated capacity includes baseline and incremental capacity.
[8] This is also the case when a proportion of obligated is used to determine FCC, as the FCC will only match, or approximate a match on a limited number of "peak" booking days.

If it is shown to be true that at high levels of demand, gas would not be injected into storage, rather there is a net physical withdrawal, then there is an argument that storage should not incur any NTS exit capacity charges. If this is accepted in combination with the EU TAR requirement that storage should receive a discount to "*avoid double charging*" then, at a maximum, storage should only be exposed to 50% of entry capacity charges.[9]

In order to support the notion that physical flows to and from storage tend to reflect NTS demand (and CWD FCC assumptions) recent flow data were examined.

Looking at recent demand and supply patterns across the period 1 June 2015 to 1 June 2017, Figures 2 and 3 show the relationship between UK demand and storage withdrawals. Figure 2 shows trends that as demand increases, so do withdrawals, while injections increase as demand drops.

Figure 2 – NTS Demand and storage withdrawals and injections (June 15 to June 17)

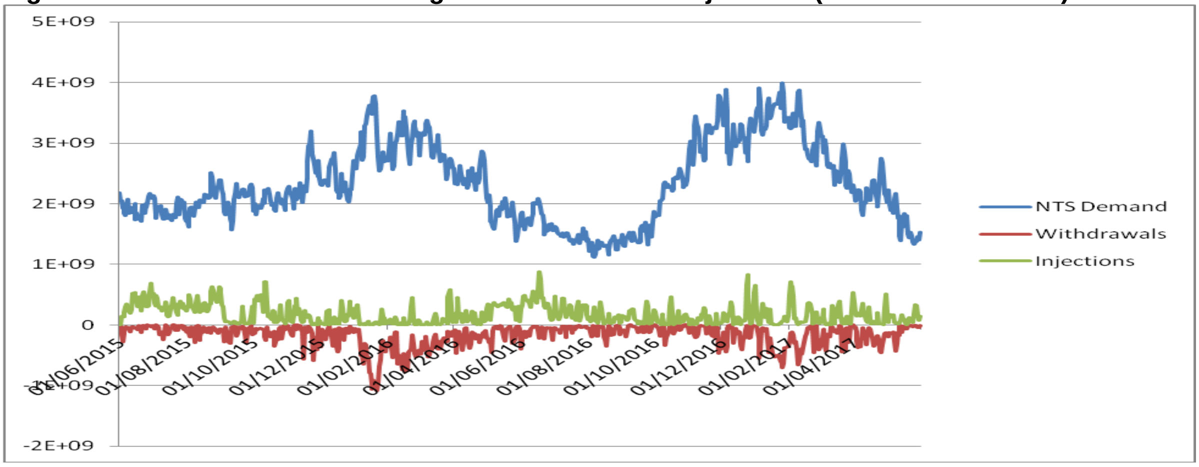
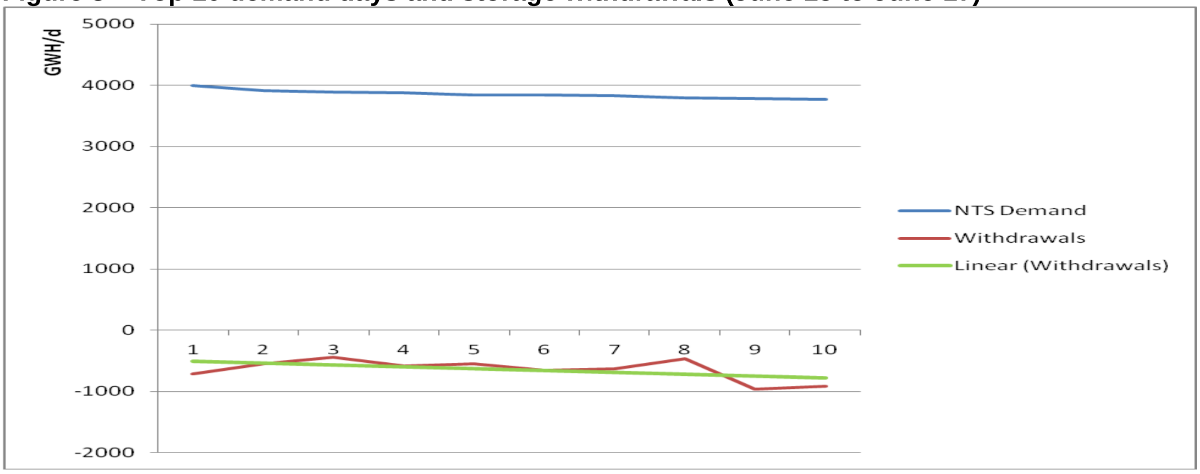


Figure 3 focuses on the top 10 demand days over the same period. It is striking that the relationship between demand and withdrawals is highly correlated, indicating that during this peak demand period the direction and the magnitude of flows from storage were closely aligned with UK demand.

Figure 3 – Top 10 demand days and storage withdrawals (June 15 to June 17)



[9] The 50% discount still applies to take into account, what is termed as "double charging" for entry flows in the EU TAR.

The data supports the notion that withdrawals coincide with peak demand days and it is arguable that as a **result NTS exit capacity should not be charged for gas injected into storage as NTS capacity bookings will not occur on the peak demand days.**

3.2 Storage as a parking service

In its NTS CMP Position Paper[10], Storengy argued that NTS capacity at storage sites should be awarded a discount of 100%. In putting forward this proposal, it made references to the EU TAR Recital 4[11] and Ofgem's GTCR Confirmation of Policy letter.[12] The views stated in the Ofgem letter, footnote 19, are particularly worth noting:

"Gas storage users don't pay the commodity charge. Storage gas circles around the system. It enters the NTS and exits to reach the storage facility; and then enters and exits the system again to meet demand. This means that gas going into storage has already paid an entry commodity charge, and will pay an exit commodity charge when it ultimately exits the system to meet demand. Storage gas has therefore made its contribution to historical cost recovery."

This statement is unequivocal in its assertion that storage effectively performs the role of a parking service for gas which has entered the system at a point in time, for subsequent later redelivery. Although it refers explicitly to commodity charges, this could equally be applied to all charges as they make a contribution to historical cost recovery. On this point, historical costs are "bundled" with current costs through the allocation of allowed revenue for each year within a price control period. Given commodity charges and in particular TO commodity charges are a vehicle for the recovery of revenue within a Formula Year, then it stands to reason that any charge, be it capacity or commodity fulfills the same purpose. If Ofgem is correct, then the application of any TO charge on storage should be regarded as untenable and in contravention of the principle of cost reflectivity.

3.3 Contribution to security of supply

The EU TAR Code permits the level of discount afforded to transmission capacity servicing the delivery and offtaking of gas at storage points to be at least 50% "*acknowledging the general contribution to system flexibility and security of supply of such infrastructure*"

It is well understood that storage provides security of supply benefits to energy markets and in a number of countries transportation charges for storage are discounted by more than 50%.[13] Further, there are numerous examples where governing authorities intervene in the market, putting in place further measures to secure the revenues of storage owners. These storage related obligations are imposed for the sole purpose of maintaining a level of security of supply and, typically, take the form of mandatory storage bookings, and in some cases, the holding of strategic reserves.

Interventions by governing authorities are traditionally used to remedy market failures. In the case of storage, it is understood that the market undervalues the security of supply

[10] NTS CMF Position Paper. Storengy, 1 March 2017
[11] Commission Regulation 2017/460, Establishing a network code on harmonised tariff structure for gas, EU Commission, 16 March 2017
[12] GTCR: Confirmation of policy view and next steps, Ofgem, 13 Nov 2015
[13] For example in France, Italy, Spain and Portugal

benefits which they provide, as these benefits are more societal in nature i.e. a public good. This is confirmed in a 2014 EU Commission Report[14] concerning gas storage:

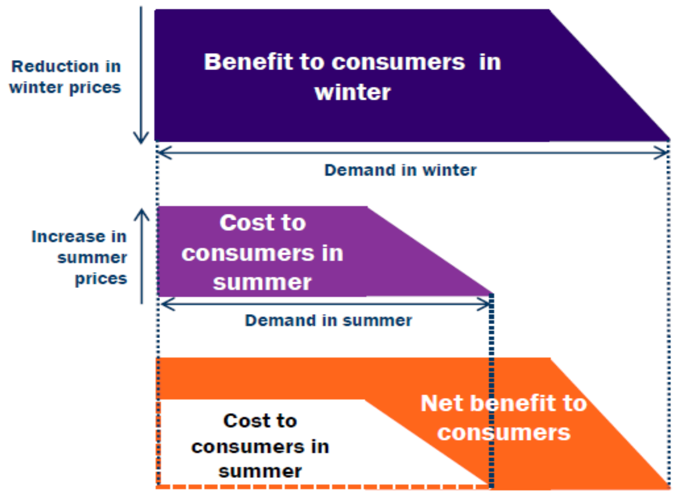
"From a theoretical perspective, it is not sure that companies will fully consider the insurance value of storage in their private investment and capacity booking decisions. They might have done more in the past, when incumbents under state control were seen as responsible for Security of Supply of their countries. However, as their profit orientation increases and the market evolution shrinks their margins, even the largest gas companies may increasingly disregard the benefits of security of supply, which are of a public rather than private nature"

This characterisation of storage and the benefits it provides is reiterated by CEER in its Vision for Gas Storage[15] which also states:

"In particular, some aspects of storage may be undervalued"

The creation of a societal benefit, the benefit which is greater than the private benefit and cannot be captured by the storage owner, is due to the impacts on trading prices of storage flows across periods of different levels of demand. This is shown in figure 4.

Figure 4 – Social Benefit of storage



Source: FTI Consulting

As the reduction in prices (and the duration of the reduction) exceeds the increase in prices (and the duration of the increase) a social benefit is generated. This benefit exceeds the private benefit which accrues to the storage owners, which in its simplest terms, reflects the spread between prices multiplied by the cycled volume. The periods shown in the figure represent the seasonal price effects of gas storage. The periods can be changed to reflect shorter timescales, such as weekends v weekdays, or any such comparative time periods where the demand curves are different. In this case, it is expected that demand is higher on weekdays, compared to weekends, resulting in higher weekday trading prices.

It is for each Member State to assess the security of supply benefits provided by storage. In the UK, government carries out regular assessments to the security of the supply

[14] European Commission, The role of gas storage in the internal market and ensuring security of supply, 2014
[15] CEER, Final vision on regulatory arrangements for the gas storage market, May 2015

position of the gas market.[16] The assessments do not consider price impacts on gas security and as such any interactions with the NTS gas charging regime are excluded.

For the UK, it has been the case that physical security has not been a matter for concern for government, however, arguments have been presented which highlight concerns with price security[17], in particular the effects of price escalation and volatility on consumers which may present themselves in the absence of storage. With the announcement of the closure of Rough, which follows the cancellation in recent years of proposed storage projects (that had been granted planning permission) such as Baird and Caythorpe, other new projects having been put on hold or struggling to attain a final investment decision (FID) given the economic challenges for gas storage in the UK (indeed, no storage FID have been taken for over 10 years) and previous announcements of capacity reductions by SSE (Hornsea), there is a danger that further temporary or, more likely, irreversible reductions in storage capacity may be announced in future as the economic case for owning storage continues to wane. These economic factors, combined with the growing variability in short term demand, future price security will certainly be more of a concern, and possibly physical security, and the role played by UK based storage will become increasingly important.

On the assumption that BEIS has not and will not assess the impacts of any changes to the NTS charging regime on security of supply, then industry must consider the effects of a 50% discount on storage commercial operations. In addition, Ofgem should be reminded of its primary duties and in particular how any deleterious impacts on storage, brought about by changes to transmission charges, may undermine the achievement of the Authority's principal objective:

"The Authority's principal objective is to protect the interests of existing and future consumers in relation to gas conveyed through pipes and electricity conveyed by distribution or transmission systems. The interests of such consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases in the security of the supply of gas and electricity to them and in the fulfilment by the Authority, when carrying out its functions as the designated regulatory authority for Great Britain, of the objectives set out in Article 40 (a) to (h) of the Gas Directive and Article 36 (a) to (h) of the Electricity Directive."

Where it can be shown that the charges imposed on users of storage are inconsistent with duties to ensure adequate levels of security of supply and as such in contravention of Ofgem's principal objective, then it can be argued that such charges, or any proposed changes to charges, should not be upheld. In particular, the impacts of an effective cost increase on storage operators, brought about by a change to transportation charges, need to be examined in relation to the profitability of the facilities and, in particular, their medium term financial viability.

3.4 Transmission System Benefits

Previous studies carried out by WWA on behalf of GSOG have argued that storage provides a benefit to the transmission system in terms of avoided investment in additional

[16] In accordance with the Energy Act 2004 as amended by the Energy Act 2011
[17] Numerous studies focus on price security including Timera Energy, CSL, WWA, Baringa and Poyry

capacity.[18] Using the LRMC model we estimated that the benefits, in the form of investment savings were concentrated in the region of £40m to £70m per annum.[19] The analysis remains valid, irrespective of the form of the RPM employed for the purposes of deriving charges, as the LRMC methodology is based on a cost assessment of delivering the transmission system.

The system benefits provided by storage are recognised in the CEER Vision for storage report, which states:

"When located close to demand areas, storage helps to lower network investment costs by reducing the size of the pipelines necessary to meet peak demand and can improve the efficiency of system operations"

.

It also notes in a footnote that:

"By providing additional pressure to the system, storage also helps reduce the run time of compressor stations along the transport lines thus lowering the operating costs."

In its 2012 report for Vereniging Gasopslag Nederland[20], Poyry also highlighted the transmission benefits of storage, stating:

"The potential avoided costs to be in the region of 9% to 16% of the value of the prevailing infrastructure" and

"….we see strong support for the premise that gas storage lowers the level of investment that would be required if it were not present. Through storage being located close to demand and through smoothing peaks in demand, storage allows more efficient levels of investment in both network capacity and import/production capacity."

In making this case for storage, it is necessary to draw comparisons with other "competing" sources of flexibility and establish rationales for alternative charging treatment.

To this end, we have identified the following:

UK storage is embedded within the UK gas network. It is bi-directional and gas flows directly into and out of the network and remains "in store" and arguably "in the system" until such time as it is withdrawn.

Storage is highly flexible and responds to price signals particular to the UK gas market. As all storage in UK is merchant, the single commercial driver for owners is in the capture of time value spreads. This singular dynamic, we would argue, is unique to storage and ensures flows are consistent with demand changes (and system needs).

Other system points will react to any number of variables, most obviously being: prices of substitutes; prices in alternative non-UK gas markets; cost of complimentary fuels/outputs; ability to deliver gas to the market in short time scales; and general cost efficiencies in

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[18] WWA, UK gas transmission system benefits from gas storage – an update to the initial report produced in 2007, April 2014

[19] Higher investment savings were identified across a range of scenarios

[20] Poyry, Transportation tariff discounts for gas storage, Nov 2012

extraction of the commodity, operation of an asset, transportation routes (outside of the NTS), and interruption of demand etc.…

There can be little dispute that storage embedded within the network leads to investment savings and ultimately lower costs to the consumer. If the savings calculated by WWA are representative then it is the case that the 50% transmission charge discount does not fully reflect the benefit which storage provides in this regard.

DN entry arrangements

Building on the transmission benefit argument, it is worth noting the approach taken by DNs in their charging methodologies where in all cases a relatively new tariff has been constructed to reflect the displacement of investment effect of embedded entry flows.

Since the implementation of UNC modification 0391 in April 2013 gas supplied directly into the DNs (known as Distributed Gas) has been subject to tailored transportation charging arrangements. The modification was proposed and ultimately approved on the basis that the LDZ charging methodology needed to be changed "*to more accurately reflect the costs associated with the entry of distributed gas directly into the distribution networks."*

The modification is targeted at DN entry points, which includes storage facilities at such times as they are delivering gas into the networks – during injection periods, flows into storage would be subject to DN charges normally applied to gas offtakes.

In simple terms the modification introduced the concept of a LDZ System Entry Commodity Charge calculated as follows:

Unit Rate for Opex Costs + Unit Rate for LDZ System Credit + Unit Rate for ECN

Where:

- The Unit Rate for Opex Costs would be zero or positive depending on the forecast Opex costs incurred to accommodate the individual distributed gas entry point.
- The Unit Rate for LDZ System Credit would be zero or negative depending on the pressure tier to which the entry point is connected.
- The Unit Rate for ECN would be zero or negative depending on the level of the average DN ECN charge and the load factor of the entry point.

The resulting LDZ System Entry Commodity could be positive or negative (i.e. providing a credit to for each kWh of gas delivered through the entry point).

In its decision the Authority stated:

"This modification introduces a LDZ System Entry Commodity Charge which reflects the cost impact of distributed gas entry in three different ways:
• unit rate for Opex costs – the level of entry-related equipment operating costs for each distributed gas entry point will be reflected in the unit entry commodity charge relating to opex costs;
• unit rate for LDZ system credit – a utilisation credit will reflect lower LDZ utilisation for gas entering from distributed gas entry points; and

• *unit rate for ECN credit – distributed generators will potentially receive a credit to reflect the fact that they provide an alternative to NTS Exit capacity to ensure the flow of gas into the DN network at peak times. The ECN charges will come into force from October 2012."*

As far as NTS charges for storage flows are concerned there are a number of discussion points which can be gleaned from the various components of the LDZ system entry commodity charge. Firstly, the approach to Opex costs is akin to that already applied to storage, as under the current methodology the SO commodity charge is not applied to gas delivered to or supplied from the storage facility.[21] Secondly, the LDZ credit is perhaps unique to the DN charging methodology which bases charges on the various pressure tiers comprised within the LDZ's. Unlike the LDZs the NTS is not made up of a series of different-sized pipes delivering gas at various pressures to the connected customers. On this basis, it would be difficult to argue that storage facilities should be subject to a NTS-equivalent LDZ system credit.

The ECN credit, however, does provide a reasonable precedent for supporting an argument that storage facilities provide a benefit to the NTS and should be "rewarded" accordingly. In summary, the case can be made as follows:

The ECN credit reflects the fact that the delivery of embedded gas flows reduces the need for a DN to purchase NTS Exit Capacity; necessary to support the supply of gas from the NTS. It is reasonable to state that the purchase of NTS Exit Capacity is a DN investment (the cost of which is passed through to DN shippers) which can be offset, or "saved", by the flows delivered by the DN entry points. The investment savings enjoyed by the DN are analogous to the NTS CAPEX savings identified in this section of the report.

Finally, and perhaps crucially, the LDZ system entry commodity charge permits the application of a negative charge, or credit which in short recognises the network benefits delivered by the distributed entry facilities.

[21] With the exception of own-use gas.

4. Concluding remarks

The paper explores a number of features of the CWD model and other additional factors which bring into question the validity of applying a minimum 50% discount to storage related transmission capacity charges.

The EU Tariff Code is not helpful in describing the rationale for the minimum discount and beyond making general statements around the added benefits which storage provides to the system, it leaves Member States with a considerable amount of latitude in setting an appropriate level of discount.

We have identified a number of weaknesses with the CWD model[22] when applied to storage and recommended alternative methods for characterising the way in which storage operates and interacts with the network, such as providing a parking service akin to NTS linepack. The proposal to treat flows from storage on a more localised level is consistent with these approaches and, although not perfectly aligned with the principles of CWD, provides a reasonable justification for the establishment of a more substantial discount. Based on this methodology, the analysis outputs suggest that the level of discount should be 80%, noting that this is a “base” discount not reflective of the benefits which could be reasonably assigned to storage.

Looking beyond the application of the model, there are numerous factors which can be reasonably reflected upon, which collectively, or individually imply that the discount should be increased. Each of these factors is consistent with the EU Tariff Code and UK legislation, meaning that if Ofgem so desires, it could comfortably justify any decision which improves the situation for storage.

Notwithstanding the economic, network and societal benefits produced by the existence of storage, it would be reckless to ignore the economic status of the facilities themselves. With the recent announcement of the closure of Rough, the ongoing concerns over the financial viability of the remaining storage facilities and the cancellation or postponement for FIDs on new, permissioned storage projects, it would not be unreasonable to prophesise that further closures would occur if any additional costs were to be levied on them.

For all of the reasons set out in this paper, we believe that the Charging Review should, at worst, not result in any increases in charges on the Users of storage. Furthermore, there is sufficient evidence in this report to support the removal of all transmission charges relating to storage points.

[22] These weaknesses also apply to the Postage Stamp methodology