British Hydropower Association

Contracts for Difference for Low Carbon Electricity Generation

Call for Evidence on introducing non-price factors into the Contracts for Difference Scheme

Closing date: 22nd May 2023

1. Background to the British Hydropower Association

The British Hydropower Association (BHA) is the leading trade membership association solely representing the interests of the UK hydropower industry and its associated stakeholders in the wider community.

Our Mission is to drive growth in the sector by engaging, influencing and promoting Hydropower, Tidal Range and Pumped Storage Hydro, as firm, renewable power, providing critical infrastructure for achieving Net Zero and Energy Security.

Table 1 – The BHA 'Asks' to Government

	Hydropower:	**Pumped Storage Hydro:**	**Tidal Range:**
Currently deployed	2GWs (900GWhs storage)	2.8GWs (27GWhs)	0GWs
Pipeline	1GW	7.8GWs (135GWhs)	20GWs
Potential deployable capacity	3GW	15GW`	20GW
What is the BHA calling for?	Move to 'Enhanced' Levelised Cost of Energy inc whole systems benefits. Replace 1 GW of coal with 1GW Hydropower. CfD tweak for AR6: – Strike price £140/180MWh. – Reduce >5MW to >1MW. – Ring fence and aggregation potential	A cap and floor, to enable delivery of the **15GW** called for in this CCC report	Regulated Asset Base, used for Nuclear, to enable delivery of **20GW**

	for Capacity Market inclusion		
What are the main barriers to support?	Hard to raise relevance (see as, too small, can't scale, too expensive)	Geographically constrained, market can deliver batteries	Too expensive (ie, Swansea Bay)
Why are these technologies important?	Resource adequacy, hydropower is cheaper than gas peakers (Reservoir hydro currently provides 900GWhs of storage and load follows)	Storage, reduced curtailment and balancing costs, grid stability/ flexibility (pumps and generates) currently 29GWhs, pipeline 135GWhs	Non-weather dependent, generation near increasing demand centres (circumvents transmission constraints), flood defence , socio economic value.
The counter points:	**Longevity:** All these technologies are intergenerational assets (100+ years) that will deliver well beyond 2050 – true energy security. **Resource adequacy:** What's the answer to 3 week Low wind period in 2035? Hydropower generates 2/3rds of its' energy in winter, 900GWhs of dispatchable, firm, low carbon generation. **Energy sovereignty:** Gas interruption, interconnector failure, French nuclear fleet refurbishment. **Reliability:** Hydro/ PSH/ TR are all proven, reliable, long lasting & deliverable with 80% of the supply chain in the UK. **Cost:** LCOE: cheapest kWhs will not deliver a stable grid. Lowest cost is not always best value. We need to move to 'Enhanced' LCOE and account for Non price factors. **Path to net zero:** • Fraught with delivery risk and time slippage • To mitigate risk, we need diversity. • We need all technologies being progressed rather than a favoured few. **Grid:** How can we deploy localised energy solutions that will not be hampered by Transmission constraints.		

The BHA is calling for the CfD to incentivise an additional 1GW deployment of hydropower, a no regrets option, with low risk of non-delivery.

2. Contents

3. Executive summary

The BHA Welcomes the Government's call for evidence "to consider ways in which the scheme could capture the wider value of renewable projects". The BHA agrees that the "Current market arrangements have worked well in meeting our objectives for dramatically lowering greenhouse gas emissions from electricity generation, while maintaining energy security cost-effectively" however the BHA agrees that the current mechanism to bring the cheapest kWhs onto the grid must be shifted to meet the challenges we have, in delivering a decarbonised stable gird by 2035. The delivery of low carbon kWhs, regardless of when or where they're generated and consumed, is exacerbating the issue of grid congestion, increasing the costs of constraint and balancing, exacerbating the bottle necks in transmission constraints, triggering huge costs in reinforcement (with risks around delivery of unprecedented workstreams to complete those upgrades), and now the grid poses one of the biggest barriers to Net Zero. The CfD currently does not address the other issues of Net Demand or deliverability risk.

At a time where the imperative is to speed up deployment of renewables, the landscape for delivery is becoming increasingly challenging, not only due to grid constraints, but also due to global competition for investment (the industry is reporting that the USA's Inflation Reduction Act and EUs 'Green Deal Industrial Plan' is impacting on investment conversations), planning and consenting delays (through resource issues and covid backlogs) and also unfavourable taxation, including the archaic system of business rates based on single individuals' assertions or interpretations.

The CfD mechanism is required by the Energy Act 2013 to consider factors such as security of supply, carbon targets and budgets, and cost to consumers. This is the main mechanism that is targeted to deliver the Government's aspiration to achieve a net zero power grid by 2035. The pathway to deliver this aspiration is led by modelling undertaken using the Dynamic Dispatch Model and the UK TIMES Model (UKTM) developed by BEIS and UCL. As with all models there are caveats made by BEIS as to the limitations of the model. One limitation noted is that only Solar, off-shore and on-shore wind are used whilst it is acknowledged that "other renewable generation technologies such as hydro, wave and tidal may have a role to play" these have not been included to date.

According to the NAO, decarbonising the power sector, P9, they state that "this model is only updated annually and therefore can quickly become out of date. Recent volatility in gas prices, for example, reduces the accuracy and usefulness of the model for policy decisions."

The CfD is moving from a subsidy support mechanism to a revenue stabilising mechanism. Government should expand the aspiration for the CfD scheme and make a much larger commitment to renewable energy deployment across all technologies, rather than the ones that are in the limited modelled scenarios. This would help to deliver net zero, but also make a substantial hedge for the UK consumer against future energy price rises. The scheme must be more holistic and enable a more diverse suite of technologies to come forward.

Currently the mechanism is based on Price, budget availability and GW Capacity. The BHA suggest that not only are non-price factors accounted for, but there is also an inclusion of GWhs delivered as well as GWs Installed. This is to account for load factor, but also a better understanding of TWhs in the pipeline rather than GWs.

The Objective of the non-price factors must be to build the value of non-price factors into projects so that it becomes business as usual. Methods 1 & 3 do not achieve this and risk the continuation of business as usual with some additional value, but not an intrinsic change in how projects are developed. Projects must be developed to offer the holistic best value to the consumer, not lowest cost.

The BHA are calling on the Government to:

- **Do more to appreciate when kWhs are generated and where they are consumed and prioritise impact on Resource adequacy within the CfD mechanism.**
- **Appreciate that the Net Zero modelling in DDM ad UK Times is limited and to consider as board a mix of technologies as possible, including Hydropower, which is too often dismissed as only being '2%' of total generation. A further 1GW of hydropower (equivalent to 4GWs of solar generation) will deliver across winter peak demand and remove the need of 1GW from the expensive capacity market.**

4. Introduction

In determining the answers within this call for Evidence, the questions have to be continually asked:

- What are the non-price factors trying to achieve?
- What are the objectives of these changes?

As set out in the National Audit Office Decarbonising the power sector, P5:

The Government's task is:

- increasing the amount of electricity generated by clean energy sources;
- developing the networks that transmit electricity from where it is generated to where it is used;
- establishing new market arrangements for buying and selling electricity;
- and encouraging consumers to use electricity in different ways so demand is more synchronised with patterns of supply.

This all needs to be down whilst giving the best value to the consumer. It is key to reiterate that the language move away from 'Lowest cost' as this does not always mean best value.

The non-price factors should be trying to achieve the first 2 points, whilst being mindful of the second 2 points.

Within the call for evidence the non-price factors have been broken down into the following subsets.

4.1. Grid – systems benefits

This has been described in the consultation through the headings of:

- Managing Variability
- Operability
- Location

This sits within the agenda of ESO and what will soon be the FSO.

4.2. Economic

This has been described in the consultation as 'Capacity building' to be delivered through the headings of:

- Developing supply chains
- Industry initiatives
- Collaboration
- Investment in infrastructure
- Investments in assisted areas

This broadly sits within the remit of the levelling up agenda and business growth.

4.3. Environment

This has been described in the consultation as Sustainability and is to be delivered through the headings of:

- Sustainable decommissioning
- Sustainable procurement
- Decarbonisation

These factors will fall into the remit of overarching net zero targets through carbon avoidance and sequestration.

Within in these 3 broad headings which have the ambition "to consider ways in which the scheme could capture the wider value of renewable projects" the key one that will determine whether we achieve the ambition of a net zero grid by 2035, is the Grid.

The non-price factors that will enable a stable decarbonised grid should be weighted accordingly within any matrices that will determine impact or benefits for the CfD.

5. Deliverability risks for Net Zero

Another key point that gives context to the delivery of the CfDs, is deliverability risk for achieving the 2035 decarbonised grid target.

As with investments, the best way to mitigate risk, is to have a board portfolio, this applies to the energy sector and should be considered when we're looking at the Net Zero Transition. We need all technologies to be mobilised towards deployment as rapidly as possible. Many will face long delays as they face the barriers of grid, planning, investment etc, so we need to start with as board a mix as possible, with the knowledge that only some of them will reach deployment. The queues for the grid give a false sense of security and certainly don't represent the reality of what will be delivered, nor how those technologies will deliver a secure, stable low carbon grid.

5.1. Emerging technologies to scale

The NAO also highlight the many risks in meeting the statutory targets to become NZ, this includes ' for both offshore wind and nuclear power there are significant delivery risks that DESNZ needs to overcome to achieve the rapid increase in speed of deployment required to achieve its ambitions.' P17 They also suggest that DESNZ should P11 "establish arrangements to understand and respond to system-wide risks and opportunities, to ensure its plan is resilient to setbacks, disruption and future uncertainty."

What will be the cost of delay from those setbacks? Hydropower is a small part of the bigger picture, but it is a very relevant part that will reduce risk, bring system stability (inertia, voltage control, storage, flexibility and black start) and most importantly, it has minimal risk of non-delivery and can be guaranteed to bring 1GW online within the next 2-7 years.

5.2. The grid

Increasingly, the issue of grid constraint will determine the amount of new connection coming online. The risk that grid constraints pose on the delivery of net zero transition are substantial. The grid adds risks of non-delivery but also has an impact on the increasing costs of curtailment and rebalancing.

Digitalisation of the Grid, fed with meteorological data, machine learning and automated demand side response load shifting in real time will be a key part of the future grid. This will bring huge efficiencies in what generation we need and the network capacity required to balance the demand and generation. Acceleration of innovation to achieve this, with much tougher penalties for TOs and DNOs that aren't achieving this, must happen if we are going to provide best value to consumers.

5.3. Resource/ Capacity Adequacy and meeting Net Demand

The Capacity Market is the Government's main incentive mechanism to provide resource adequacy which will become more important as the penetration from intermittent renewables increases.

Although both wind and solar will play a huge role in decarbonising the UK's energy supply, the **increased penetration of intermittent renewables on the system, means that increased storage and flexible technologies are needed** to counteract the issue. Unpredictability of Net demand will be an increasing challenge especially when events such as 'Dunkelflaute' or a period of no-wind besets the UK.

The aspiration for the CfD mechanism should now be to deploy a more diverse and secure energy mix that will meet the more holistic requirements of a decarbonised Grid. The drive to bring low cost MWhs on to the grid should make way for a more strategic approach that will deliver capacity that will bring grid security.

Government must move away from being focused on MWs delivered, but rather consider the MWhs generating and what is the profile and certainty of that generation. We need to move away from thinking about installed capacity and move to the just in time model of energy generation meeting demand.

Net demand or resource adequacy will be especially relevant in the next 25 years whilst the transition is in phase. The government plans for new nuclear, Hydrogen and abated gas with CCuS are longer term solutions and will not mitigate the resource adequacy risk in the shorter term. Hydropower and PSH are no-regrets decisions that must be delivered rapidly if we are going to continue to provide a decarbonised grid by 2035 with best value for the consumer. The interconnectors also provide backup, but Energy security through Indigenous energy development circumvents issues around geo-political risks.

The BHA is calling for:

- **More consideration of delivery risks and the impact this will have on delivery of a stable, net zero grid that can face the challenge of 'Dunkelflaute'.**

6. Question Responses:

In terms of a mechanism for implementation, views are invited on:

1. **To what extent do you support the top-up model as a mechanism for implementing Non-Price Factors and are there are any unintended consequences that come from this model?**

By inviting a top-up model, the principal of non-price factors is being treated as an 'add-on' rather than intrinsic to project development and meeting the objectives of the purpose of non-price factors which is to enable the delivery of low carbon electricity generation whilst capturing the "wider value of renewable energy projects".

This model also implies that the competition will still be between the lowest cost kWhs rather than the 'best value', accounting for the systems benefits, added value, or the overall objectives of the non-price factors principles.

The process would be the least impactful in terms of moving project developers to adopt a more holistic approach to delivery. This does not reward the integration of systems benefits and there may be an assumption that most developers will continue with business as usual and be satisfied with the CfD and any non-price factors will be a 'nice to have' but not integral to their business plan.

A process that tries to shift delivery to a more holistic model could embed the change needed in delivery to meet the objective of Government to capitalise on the "wider value of renewable energy projects"

2. **To what extent do you support the bid re-ranking model as a mechanism for implementing Non-Price Factors and are there are any unintended consequences that come from this model?**

This model offers the best potential route towards the addition of the non-price factors with the least chance of gaming the system and the best chance of ingraining the changes set out by the call for evidence to capitalise on the "wider value of renewable energy projects."

The second sub model is considered to be the best fit within those intentions. It also has the ability to be flexible and the non-price factors percentage weights could be shifted to meet the priorities of the decarbonised grid.

See Q 5 for further details on how this model could be implemented.

3. **To what extent do you support the model of amending the valuation formula as a mechanism for implementing Non-Price Factors and are there are any unintended consequences that come from this model?**

This model is not preferred as it does not incentivise developers to move away from business as usual and address the objectives of the Net Zero grid or to capitalise on the "wider value of renewable energy projects." This model could cost consumers more, take control away from the budget and not deliver 'best value' by capitalising on non-price factors.

4. **Are there are any additional risks of unintended consequences (e.g., for renewable energy deployment, auction design / competition and consumers) you have identified with certain models and think should be considered?**

Models 1 &3 risk continuation of the CfD model without developers looking at the wider objectives which must be addressed if we are to get to a NZ grid by 2035. There may be some added value, but unless there is a significant push to ingrain the non-price factors into the price and system, it is unlikely that it will happen.

5. **Ways in which the models for a mechanism for implementation could be improved?**

The table below detailing the suggested non-price factors and some additional recommendations (in bold) could be developed to consider all the wider benefits that are offered across the spectrum of technologies. They could be weighted against the wider objectives of deploying a decarbonised, stable grid offering the best value to the consumer and harnessing as much of the beneficial impacts of renewable energy projects for the wider economy.

A total available price for non-price factors 100% with weighting of each non-price factor could be determined through looking at the overall cost deferral of Grid reinforcements, GVA added value and carbon offsets.

It is noted that setting appropriate weighting for non-price factors could be subjective, however this criteria could be amended and adapted according to the needs of decarbonising the grid and delivering maximum value from projects to the wider economy and environment.

Non-price factor		Size of Scheme <300MWs	Size of Scheme >300MWs	% value available	% value awarded
Grid benefits: Review led or overseen by FSO and the proposed Regional System planners 60%					
Systems benefits & operability	**Managing variability: ability for flexibility**	Yes/No	Yes/No	5%	
	Dispatchability: Ability to be dispatchable	Yes/No	Yes/No	15%	
	Location: • **Near centre of demand** • **Ability to reduce congestion/ constraint** ○ **Distribution connected**	Details of Grid connection and boundary issues	Details of Grid connection and boundary issues	10%	

	○ **Trans connected**				
	% curtailment risk factor How many GWhs are likely to be curtailed due to congestion/ constraint?	GWhs	GWhs	10%	Sliding scale for 0 for curtailment
	Ability to generate across peak demand: Likely Generation profile, % generation across peak demands	Graph	Graph	10%	
	Ability to reduce costs on the CM/BM, with evidence	Yes/No	Yes/No	10%	
	Other operability benefits	Yes/No	Yes/No	5%	
Business and Levelling up Agenda, economic value 20%					
Capacity building	Supply chain utilisation rate in UK	Written details	Written details	8	
	% of supply chain SMEs	Quantitative	Quantitative	7	
	Collaboration with others: Suppliers/ infrastructure/ communities	Qualitative written answer	Quantitative % value to project	5	
	Infrastructure co-investment	Quantitative	Quantitative	5	
	Investment in assisted areas: Category of 'assisted areas' should be broad and include rural areas hard to decarbonise	Qualitative written answer	Quantitative % value to project	5	
Business and Levelling up Agenda, environmental value 20%					
Sustainability	Reduced carbon impact within project (low carbon intensity supply chains)	Qualitative written answer	Quantitative % value to project	2	
	Ability to create additional carbon sequestration (Kelp farm/ Peatland restoration/ nature recovery project)	Quantitative	Quantitative	2	
	Sustainable decommissioning **or life cycle factor**	Quantitative	Quantitative	2	
Innovation	Investment in R&D:	Quantitative	Quantitative	2	
	Use of new technologies: construction, operations and maintenance phases	Written description	Written description	2	
Social value	Apprenticeships	Written description	Written description	2	
	Skills gaps and shortages	Written description	Written description	2	
	Social value	SROI	SROI	2	
	GVA	Calculation	Calculation	2	
	Total %			100%	

A self assessment process with Evidence for each metric would have to be submitted and then assessed and marked for each project to require confirmation or clarification.

Quantifying factors could be incredibly complicated, but the key is the overall objective of the incentivization of the developers and the delivery of the most impactful projects, rather than the actual quantification.

FSO should be key to this process in terms of Grid/ flexibility and operability and delivery of best value for consumers.

Additional costs of non-price factors added to the cost £/kWh should be returned to the tax payer through:

- Grid: a more efficient grid and the reduced cost of reinforcements which are socialised on bills.
- Economy: Jobs, skills, infrastructure will boost GVA
- Environment: There has been much work and there is a large evidence base to suggest that the cost of climate change will far exceed the cost of carbon reduction

6.Are there alternative mechanisms that government should be considering (including models outside of the CfD mechanism)?

How the CfD interacts with the CM and the balancing mechanism should be considered in more depth. The aspiration is to create a decarbonised grid by 2035, that is stable. It will need to be more flexible and have the ability to cover 3 week periods of low wind. Resource adequacy is met through the Capacity Market, and is currently met with a mix that included 57% gas. Technologies that can reduce this, such as hydropower and that have a much lower cost than deploying expensive peaking plant, should be favoured in the CfD mechanism. As load factors of peaking plant decrease, the cost will go up. ***Currently peaking gas is around £250/MWh, which is considerably more than the Administrative Strike price suggested for Hydropower by the BHA of £180/MWh.***

6. **Which projects (in terms of size) and technologies do you think should be eligible for non-price factors?**

All projects and project sizes should be considered for non-price factors. Although Hydropower has been included in AR1, 4 & 5, no hydropower projects have been brought forward through the CfD. There are project pipelines, undelivered since the FIT ended, and delivery of these projects and the benefits that they will bring to the energy system should be urgently addressed.

"2.15 DESNZ considers that achieving its 2035 ambition requires all currently known technologies, including offshore wind and nuclear power, to deploy at or close to the maximum level technically feasible in that time. This approach does not build resilience into the portfolio to take account of potential setbacks, disruption and future uncertainty."

Hydropower has always been the 'workhorse' of renewables, quietly delivering zero carbon kWhs decade after decade. The BHA calls on the Government to allow hydropower to once again compete for a place within the Net Zero race, giving the industry a 1GW target and the long term price signal that can offer the stability for the project pipelines ready and waiting to mobilise and be an important part of the solution to a decarbonised grid.

Hydropower has long been overlooked and dismissed as too small, can't scale rapidly or bring down costs and as it isn't an emerging industry which should not need support. In a market that has been skewed by cheap fossil fuels, renewable energy technologies such as hydropower still need price certainty to counter the high upfront capital costs but brings significant benefits to the overall decarbonised energy system. However, this belies the fact that the generation from hydropower happens when the country needs that energy the most, at winter teatime peak demand, and is a lot cheaper than gas peaking plant, has 900GWhs of storage with many of those schemes having the ability to be zero carbon, dispatchable power. Due to Hydropower's higher load factor, generation from 1GW of hydropower is equivalent to the generation from 4GWs of solar, but is generating during the times when we actually NEED the energy (4-7 evenings in winter). A readily deployable 1GW of Hydropower could replace the 1 GW of coal still online, could be developed in the next 2-7 years, assisting one of the key issues we will face as a decarbonised grid with large amounts of wind and solar: resource adequacy.

The BHA is calling for the existing CfD's following parameters to be tweaked to allow a resurgence in the deployment of new hydropower:

- To reduce the lower entry limit from >5MW to >1MW with the ability to aggregate pipelines of projects to reach the 1MW threshold. (please see data on project size in appendix A)
- Allow an administrative Strike price of £180MWh. (Cheaper than the £250/MWh for gas peaking plant- see Jacobs, LDES report)
- Ring fence hydropower, as it cannot compete with Solar and Wind, but should not need to, as it brings unique qualities to the grid and the decarbonised energy system.

Electrification of heat and transport in Rural areas is going to increase load on the grid, a major challenge to LV networks. Active network management and smart local energy systems are going to be a key part of the solution if the transmission constraints are not to HALT progression in our Statutory NZ Ambitions. Hydropower could play a significant part in the continuation of decarbonising the grid within these rural areas.

With 80% of the supply chain for hydropower in the UK, the Hydropower industry can continue to deploy and deliver, creating new high skilled jobs in rural areas and brining benefits to the rural economy.

We need all technologies delivering as rapidly as possible within the constraints that we face (grid/ resource adequacy/; deliverability risk). Hydropower needs to be within that mix and due to the characteristics of how its deployed (bespoke, civil engineering project) and what it delivers (zero carbon generation at winter peak demand), it should be treated as a separate technology in terms of long term stable price signals (high capital cost, but 100+ lifecycle)

The deployment of hydropower has always been more expensive than other technologies such as Solar and Wind. This is in part because this long established industry had already found its baseline price curve and as bespoke, civil engineering projects, could not deliver for cheaper through economies of scale. It's a paradoxical position that could be likened to Government asking highways to build a road cheaper, by innovating and creating economies of scale? This thinking overlooked the properties of hydropower and has left the industry stalled, post FIT, whilst cheaper fossil fuels still dominate the setting of energy prices.

Hydropower already has non-price factors embedded in its cost. The BHA recommends that if a CfD pot is ringfenced for hydropower the administrative Strike Price would already be inclusive to the price. The higher price paid for other technologies added via the non-price factors will bring the costs of those technologies more in line with Hydropower.

In terms of potential non-price factors, views are invited on:

7. **Are the factors outlined above on addressing capacity building, sustainability, skills and innovation, the right ones to meet supply chain challenges, and are there are any unintended consequences or issues in terms of monitoring, that could come from these?**

The BHA are in agreement that these are the right factors to meeting challenge of supply chain.

8. **Are there alternative non-price factors that should be considered?**

See the table with the Bold type for additional factors, which are based around operability and cost savings for grid and power transfers.

9. **Is valuing non-price factors the right approach to address the specific issues identified related to system flexibility, operability and locational signals, and could there be any unintended consequences or better ways to address these issues through the CfD scheme or other policy instruments?**

The whole systems costs and benefits need to be factored into projects that are going to add additional value to society over and above those that will just deliver low carbon kWhs.

The CfD needs to move to a system that rewards the kWhs we need the most, which includes where and when they are generated. See the additional factors in the table in bold. This is not an exhaustive list.

10. **Are there any other issues identified in the REMA case for change that could be addressed through non-price factors?**

REMA's objective is to identify and implement the reforms needed to the electricity market arrangements in order to drive the necessary investment in, and the efficient operation of a secure, low carbon electricity system by 2035. In particular:

- Cost-effectiveness
- Security of supply
- Decarbonisation
- Least cost
- Deliverability
- Investor confidence
- Whole system flexibility
- Adaptability.

The non-price factors must be inline and share the same objectives as REMA, the approach set out in the table and with methodology 2 (sub-set 2) is felt to be complementary to the REMA vision. The CfD changes could be brought into delivery before there are any outcomes from REMA.

What financial value would need to be attributed to the potential factors outlined above to incentivise ambitious behaviour for each topic?

The whole systems costs need to be taken into account:

- Cost of curtailment and balancing
- Cost to the grid
- Cost of the CM and resource adequacy
- Social costs (added value of jobs GVA etc)
- Long term costs for systems benefits (longevity etc)
- Cost of location (near demand centres, distribution/ transmission)
- The key question is, when does it generate, where does it generate, where are the kWhs consumed and how are the kWhs consumed.

The value of the non-price factors will sit amongst these overall costs. It is suggested that a fixed sum for the value of non-price factors is calculated through a figure derived from the above metrics is used as the 100% total value of the non-price factors and each project looks at how many of the metrics they can meet.

In terms of quantifying and valuing non-price factors, views and invited on:

11. **Are there alternative ways of measuring and monitoring the non-price factors than the examples outlined in this Call for Evidence. The government would also be interested in your views on whether there are any factors where a more qualitative method of assessment would be more appropriate?**

See the table for an example of how individual non-price factors metrics could be determined.

12. **How we could measure non-price factors to value system flexibility, operability, and location?**

See the table for an example of how individual non-price factors metrics could be determined.

The methodology put forward is not skewed by scale, but also rewards the smaller projects which we'll need and will have a significant cumulative impact benefit as we wait for Transmission upgrades.

Often the headline figures for cheapest kWhs disguise the overall costs to the energy system, ie, cost of resource adequacy and the continued reliance on gas, or the expensive replacement to decarbonise gas (Hydrogen and abated CCuS) and the cost of transmission upgrades.

It is suggested that as the Grid and resource adequacy are the biggest threats to the NZ ambition, these non-price factors are weighted higher in the overall mix of non-price factors.

13. **Of the models for implementing non-price factors (top-up, bid re-ranking or valuation formula), are some likely to be more effective for certain non-price factors than others?**

Each factor will be determined by a mix of qualitative and quantitative data collation. The key will be giving the correct weighting to each factor, which could be deemed as a qualitative or qualitative process. (see table for suggestions)

The key is that the requirements may change with time and non-price factors %s and weighting can change alongside the needs for the decarbonised Grid.

In terms of compliance, views are invited on:

14. **Are the compliance and penalty options for non-delivery appropriate and proportional, and whether other alternatives could be considered?**

Yes

15. **When would be the best moment to introduce non-price factors in the CfD process and is the government's initial suggestion (up to 2 years in advance) appropriate?**

A % weighted system could be brought in with the next CfD. The key is that the mechanism becomes aspirational for developers, not an add on, so those who start to embed the wider benefits within their bids will be rewarded. This will be an incremental process and this should not delay the delivery of the pipeline.

Repowering projects to bring non-price factors that can provide benefits to the grid and wider decarbonisation should also be considered within the CfD.

Appendix A: Hydro project sizes

Table 2 – Table depicting historic hydro commissioned in the UK according to Birmingham University data collation and compared to DUKES

	Number of schemes	MW installed capacity	Generation , GWhs
Schemes from collated data	2,043		
Number of schemes with data gap	386	?	
Schemes > 5MW	56	1571.483	
Schemes < 5MW	1,601	473.181	
Total	**1,657**	**2,044.66**	
Further break down of data:			
Schemes < 1MW	1,472	213.148	
Schemes between 1-5MWs	129	260.033	
Comparison with DUKES 2021			
Total Hydro		**1,891**	**5,496**
Small scale		421	1,386
Large Scale		1,471	4,110

The following 2 scatter graphs go into more detail about what schemes have been delivered across the UK and when. It can be seen in figure 1, that no schemes greater than 5MWs have been deployed since 2008. Most of these schemes were delivered by SSE under the ROCs scheme.

Figure 1 shows the commissioning dates and sizes of schemes between 1-5MWs. It shows that there was much activity within this band induced by the Feed in tariff and the reduction in activity, as the last schemes commissioned under the FIT ceases.

The data in the table highlights that most activity within Hydro delivery happens at the sub 1MW category. This data highlights why there has not been projects brought forward under the CfD, as most projects fall in the category under the 5MW band.

Figure 1 – Graph showing commissioned dates of schemes and installed capacity >5MWs

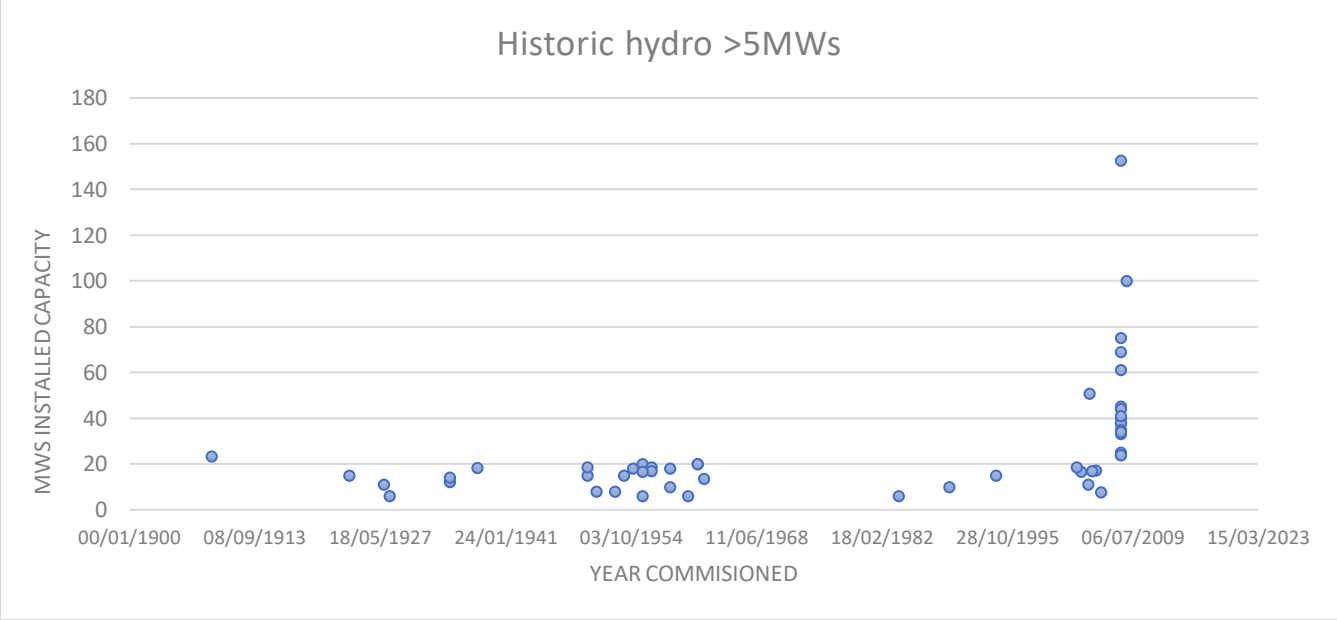

Figure 2 – Graph showing commissioned dates of schemes and installed capacity between 1-5MWs