CORNWALL INSIGHT

CREATING CLARITY

Department for the Economy (DfE) Renewable Electricity Support Scheme for Northern Ireland (NI)

Design Considerations

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HELPING YOU MAKE SENSE
OF THE ENERGY SECTOR

Contents

Contributors

Andrew Enzor
Managing Consultant

Alex Asher
Senior Consultant

Ratnottama Sengupta
Senior Consultant

Ruth Young
Senior Consultant

Tim Dixon
Consultant

Tom Andrews
Consultant

Eoin O'Donnell
Senior Consulting Analyst

Nicholas Gabriel
Consulting Analyst

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Executive summary

Executive Summary (1/4)

The Department for the Economy (DfE) is currently in the process of developing a renewable electricity support scheme for Northern Ireland (NI). The potential objectives for a renewable support scheme for NI are to:

- Incentivise sufficient renewable electricity generation to meet 80% of electricity consumption in NI by 2030
- Encourage a wide range of renewable sources and diversify the technology mix
- Reduce the potential for unexpected consumer price increases or spikes

The objective of this scoping phase is for the DfE to be in a position to undertake a meaningful consultation on the key considerations for renewable support scheme design. Cornwall Insight ("we", "us", "our") have been commissioned by the DfE to produce a scoping exercise to feed into the early stages of development of this subsidy scheme.

We have provided a breakdown of the key considerations for design of the subsidy, the key factors which will be applicable for each consideration, and how these considerations could impact consultation questions. In order to provide the considerations, we first produced a consideration class which allowed us to group each consideration. The different consideration classes are shown in Figure 1.

The scheme purpose is a significant consideration class, as it will drive how the considerations in the other classes will be shaped and, as a result, should be considered first.

Figure 1: Consideration Classes overview

Consideration Class	Overview
Scheme purpose	The reason for the subsidy being in place, and how success should be quantified
Fundamental drivers	The fundamental drivers and core elements of the scheme, and how they can be implemented
Structure of the scheme	How the scheme will be put in place, assessing the practicalities of how the scheme operates
Generation and output	What the assets will need to deliver within the scheme
Scheme financing	How the scheme will be paid for, and how costs will be distributed
Eligibility criteria	Which assets will be eligible, what information will be required to show eligibility and how this may impact the NI fuel mix
Security of supply	What impact the scheme will have on the management of the network from the System Operator's (SO) perspective
International Interaction	How the scheme will interact with the Single Electricity Market (SEM), the market in the Republic of Ireland (RoI) and wider markets
Legal/admin	What legislative and administrative factors will be important in the delivery of the scheme
Evolution	How changes in the future will be managed within the scheme

Source: Cornwall Insight

Executive Summary (2/4)

Key subsidy scheme design parameters

We consider there to be several key elements of the subsidy scheme which are important to consider in its design and development which we outline in Figure 2 below.

Figure 2: Key subsidy scheme design parameters overview

Key requirements will need to be looked at by the DfE in developing the scheme.

These include retaining a high level of competition, meeting decarbonisation objectives, protecting consumers, maintaining investor confidence and maintaining the relevant relationships with the GB and RoI markets.

Multiple considerations will need to be included in the development of the subsidy scheme.

Many elements of scheme design interrelate, so approaches under some considerations are mutually exclusive with other approaches under other considerations, while some are mutually dependent. Additionally, balance will need to be found in many of the approaches taken to ensure the scheme meets the objectives in the round – some approaches will meet one objective at the cost of meeting another. Many of these considerations have impacts on project costs, which in turn impact the expected competition seen in the scheme and the potential costs to consumers, along with level of price certainty achievable for investors/generators. As a result, consultation on these considerations will be crucial for determining the optimal approach to be undertaken in the NI market.

Careful sequencing will be required for scheme design decisions.

Some considerations are, by definition, dependent on decisions on other considerations having been made. For example, good decision making on all other considerations will be dependent on a clear set of objectives being defined for the scheme. Likewise, later in the timeline decisions on the legal framework rely on the scheme structure being largely finalised.

Some considerations will only be of interest to certain market participants.

Some considerations will only be of interest to certain market participants, and some (such as legislative approaches and fundamental drivers of the subsidy scheme) will likely only be of interest to the DfE and not to stakeholders. It will be important for the DfE to consider how to approach certain elements and prioritise which considerations it chooses to consult on.

Lessons can be learnt from other markets, but the nature of the NI market means some approaches will not be useful or applicable.

There are several areas in which conflicts between different markets create uncertainties, such as the RoI RESS scheme which is considering extending the lifespan of the subsidy to encourage participation from investors. This opposes consultations on the GB CfD subsidy which have suggested shortening the scheme to benefit consumers.The DfE will need to carefully balance these types of considerations.

The nature of the NI market, and the potential for a large amount of microgenerators is key.

Focusing on larger investors and economies of scale would mean that a highly competitive auction process similar to those seen in the GB and RoI markets is likely to be the best approach. However, a focus on small-scale assets would require a very different subsidy, with more certainty and less complexity. There are, therefore, important factors which the DfE needs to consider on how a scheme can be structured to meet the needs of all parties, or if alternative approaches (such as separate pots or even separate subsidies) are required.

Source: Cornwall Insight

Executive Summary (3/4)

Key consultation considerations

There are some considerations which are key for the market to consider and should therefore form an important part of the consultation.

Figure 3: Key consultation considerations overview

Consideration	Importance to NI market	Possible approach	Impact of possible approach
Consumer protection	Recent high wholesale prices internationally have caused considerable concerns for NI consumers and additional protection on a national level is important	High protection approaches, including structures under which generators repay consumers when market prices are high	Offers additional protection, with repayment back to consumers which helps with wider energy costs
Sustainability and net zero	Achieving the 80% target level of electricity consumption met using renewables by 2030 will need to be a key driver for determining the structure of the subsidy scheme	Focus on renewable technologies	Focus on suitable renewables will allow for achieving the 80% target, but a balance will need to be achieved with consumer costs implications
Diversify energy mix	The NI market has a large amount of potential but also some limitations on types and scale of technologies deployable. Diversification will therefore be key	Use of auction structures which allow for subsidy parameters to be changed, such as using different technology pots	Utilising pot structures will allow a regulator to react to deployment levels of technologies, allowing a focus on the required technologies to achieve the desired energy mix
Funding approach	How the scheme is funded will impact both the level of investor confidence and, as a result, has significant implications for the distributional impacts on consumers as well as investor costs	Taxation or levy on demand, depending on the requirements of the scheme	Taxation will likely reduce the overall cost per consumer, but levies are likely to be more reflective of the actual electricity consumed
Agreement length	The length of the agreement will be crucial in understanding costs to consumers, as well as driving investor confidence in the scheme and the level of competition in the scheme	Potentially 15 years, but subject to investor interest, as other markets have seen different levels of interest	15 years has been acceptable in other markets, but has also seen some schemes struggle to be competitive
Allocation process	How subsidy payments under the scheme are secured will impact the level of competition in the scheme, with investors having different levels of interest based on how easy they perceive obtaining the subsidy	Competitive auction process	Competitive auctions keep costs to consumers low, as they encourage generator cost reduction
Contract structure	Different contract structures will impact both investors and consumers in different ways, providing varying levels of price certainty. This will also impact competitive tensions	Two-way Contracts for Difference should be considered, in which generators repay any payments achieved when market prices are high	Provides additional protection to consumers, allows for a reasonable level of cost certainty and has been accepted by investors in other markets
Price sources	The level of price certainty available under the scheme will impact investor confidence, whilst also impacting cost certainty for consumers	Subsidy prices submitted by the generator in the subsidy submission process, and an associated market price	Submitted prices encourage competition and reduce costs

Source: Cornwall Insight

Executive Summary (4/4)

Key consultation considerations

Figure 3 (cont.): Key consultation considerations overview

Consideration	Importance to NI market	Possible approaches	Impact of possible approach
Timing of the subsidy	How regularly the subsidy is available for generators will drive competition levels and investor engagement	Annual auctions or constant access, depending on subsidy structure	Annual approaches allow the DfE to control parameters for the auction and have still led to competitive auctions in other markets. Constant access provides generators more certainty of subsidy structure
Technologies included	Which technologies are included will not only impact how successful NI is at meeting decarbonisation targets, but will also impact the level of competition in the scheme and overall subsidy costs	This should be driven by NI requirements, but should focus on established technologies (solar, wind etc) in the short term	Short term focus on established technologies allows for quick deployment at relatively low cost
Treatment of different technologies	Not only will this impact the level of decarbonisation achieved, but also the diversity of the generation mix in NI	Utilise different pot structures	This approach allows for different technologies to be treated differently when required, but does not add significant additional complexity to the scheme
Payment metric	What metric payments are based on will determine the level of competition in the scheme, as well as the likelihood of projects being successfully awarded a subsidy. It will also impact consumer costs	Payment for utilisation (i.e., electricity generated)	Payments for actual electricity produced mean that there is no risk to consumers of paying for non-deployment or non-generation by the asset
Ability to control inputs	How the subsidy can evolve will be crucial for the DfE for adapting the scheme as the market changes	Utilise levers in the subsidy scheme which allow for focus on different asset types, such as caps/budgets allowing focus on different technologies	Greater granularity of levers means that the DfE has more control on the parameters, and can therefore aim to meet specific targets more effectively
Interaction with flexibility markets	How subsidised assets engage in the SEM will be important for system management	Require visibility of flexible trading, and assets to provide services in a system stress event	Visibility and engaging in system management services should provide benefits to the SO and potential reduce consumer costs, although this will depend on the details of the approach taken
Capacity requirements	The size of assets which can participate in the scheme will be crucial, as it will impact competition levels and therefore impact consumer costs	Separate subsidy scheme/arrangements for domestic or microgeneration assets	Separate schemes allow for the needs of different types of developers to be met, increasing deployment levels. This would also add additional complexity

Source: Cornwall Insight

These considerations have the potential to significantly impact project costs, which in turn impacts the expected competition seen in the scheme, potential costs to consumers, and level of price certainty achievable for investors/generators. Therefore, consultation on these considerations is crucial for determining a viable approach for the NI market.

Introduction

Introduction

The Department for the Economy (DfE) is currently in the process of developing a renewable electricity support scheme for Northern Ireland (NI). The potential objectives for a renewable support scheme for NI are to:

- Incentivise sufficient renewable electricity generation to meet 80% of electricity consumption in NI by 2030
- Encourage a wide range of renewable sources and diversify the technology mix
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The objective of this scoping phase is for the DfE to be in a position to undertake a meaningful consultation on the key considerations for renewable support scheme design. Cornwall Insight ("we", "us", "our") have been commissioned by the DfE to produce a scoping exercise to feed into the early stages of development of this subsidy scheme. This report assesses what elements should be considered in the production of the subsidy scheme, how the development of the scheme should take place and what aspects should be considered by the DfE in engaging with the market.

In the report we show a breakdown of key considerations for a subsidy scheme, and the possible approaches that could be taken for each consideration, which will need to be looked at by the DfE. The pros and cons of each consideration and possible approaches have been assessed in the context of the NI market, based on our experience of other subsidy schemes in Great Britain (GB), the Republic of Ireland (RoI), the Netherlands, Germany and Italy. We have then provided a view of what the drivers should be for forming the questions in the consultation based on the considerations.

The Path to Net Zero Energy document released by the Northern Ireland Executive, published in December 2021, states that the executive were working with the GB government "to explore whether we can extend the Contracts for Difference scheme currently operating in GB to Northern Ireland, with a view to inclusion for the next Allocation Round in 2023. If not, we will seek to put in place an alternative support mechanism for investors".

We have therefore used the GB scheme as a baseline position for the possible NI subsidy scheme in this report. However, it will be important to consider any limitations of the GB scheme and to assess how the NI market is sufficiently different to the GB market so that considerations and associated consultation responses can determine if certain parameters of the GB scheme provide additional benefit to the NI market and its consumers.

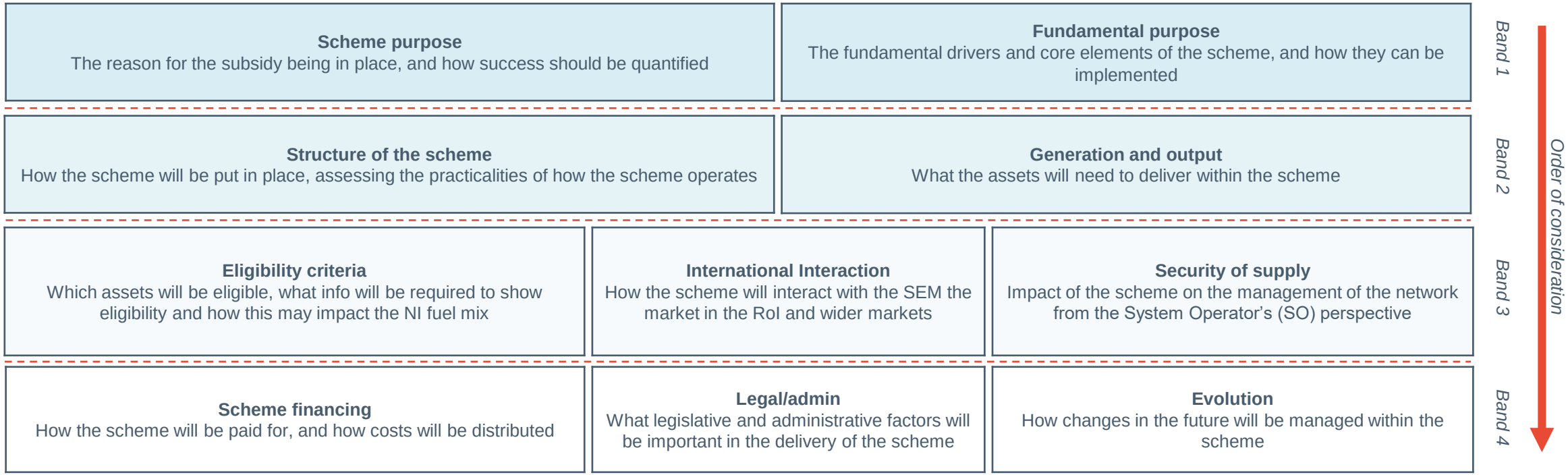
With the understanding that microgeneration may be of importance to the NI market, and that the treatment of such generation within subsidy schemes is often substantially different to that of large-scale generation, we have also considered how microgeneration may be treated.

Key considerations and consultation question drivers

Consideration classes

We have produced ten initial consideration classes to allow for broad considerations around the scheme. The order in which these considerations are reviewed will be important, as the approach implemented in some consideration classes will drive the discussion on other aspects. As a result, we have produced a hierarchy of consideration classes, outlining the order in which the considerations classes have been considered. This hierarchy is shown below:

Figure 4: Consideration classes hierarchy



Source: Cornwall Insight

The first considerations should be associated with the scheme purpose, as this will dictate a number of the details of the scheme. In contrast, aspects for the future of the scheme and the administration of the scheme will have a less significant impact, as they will need to be considered once the finer details of the scheme have been agreed.

Granular considerations

Within each consideration class there are several individual considerations, as shown in Figure 5.

Figure 5: Granular considerations

Scheme purpose:
- Objectives
- Success measurement
- Targets setting

Fundamental drivers:
- Consumer protection
- Sustainability and net zero
- Diversify energy mix
- Funding approach

Structure of the scheme:
- Agreement length
- Allocation process
- Contract structure
- Delivery body(s) & stakeholders
- Impact on wholesale market
- Payment timescales
- Price sources
- Stakeholder roles
- Price indexation and adjustments
- Timing of the subsidy
- Price clearing process

Generation and output:
- Eligible generation
- Technologies included
- Technology agnostic schemes / technological separation
- Constraint and curtailment
- Payment metric
- Volume requirements

Eligibility criteria:
- Community considerations
- Key documentation
- Micro grids, storage assets and private wires
- Network costs
- Non-delivery impacts and financing requirements
- Set locations
- Site definition
- Alternative requirements
- Capacity requirements
- Grid connection requirement
- Wider considerations - Asset status, Corporate Power Purchase Agreements (CPPAs), Part merchant assets, Project start timelines

International Interaction:
- Engagement with GB and RoI assets
- Export allowed
- Impact on interconnectors
- Integrating offshore technologies with interconnection
- Integration with the Single Electricity Market (SEM)
- Interaction with EU policy

Security of supply:
- Ability to control inputs
- Capacity Market engagement
- Flexible markets – Engagement
- Flexible markets - Requirement
- Integrating storage/Co-location/flexible technologies
- Reliability

Scheme financing:
- Charge avoidance
- Defining impacted supply arrangements

Legal/ admin:
- Legal and legislation
- Workload

Evolution:
- Innovation considerations
- Future changes

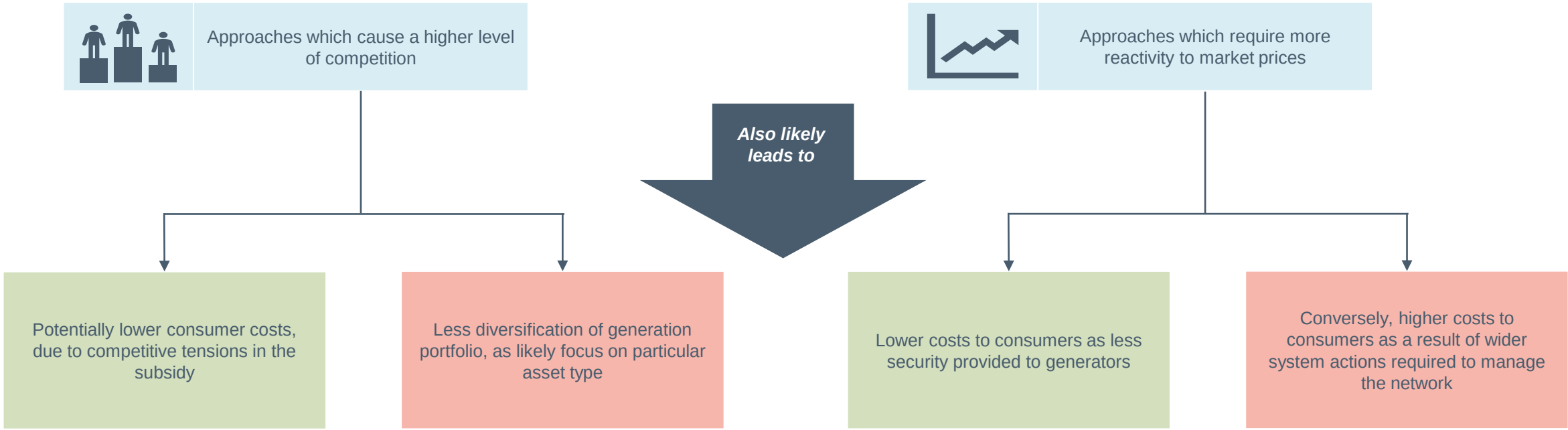
Source: Cornwall Insight

It is also important to note that most of these granular considerations are linked, and are thus not mutually exclusive, which is detailed further on the following slides.

Interlinking

In discussing these considerations, it is important to note that several of the possible impacts are linked, insofar as one approach may create impacts elsewhere. For example:

Figure 6: Example linking between considerations



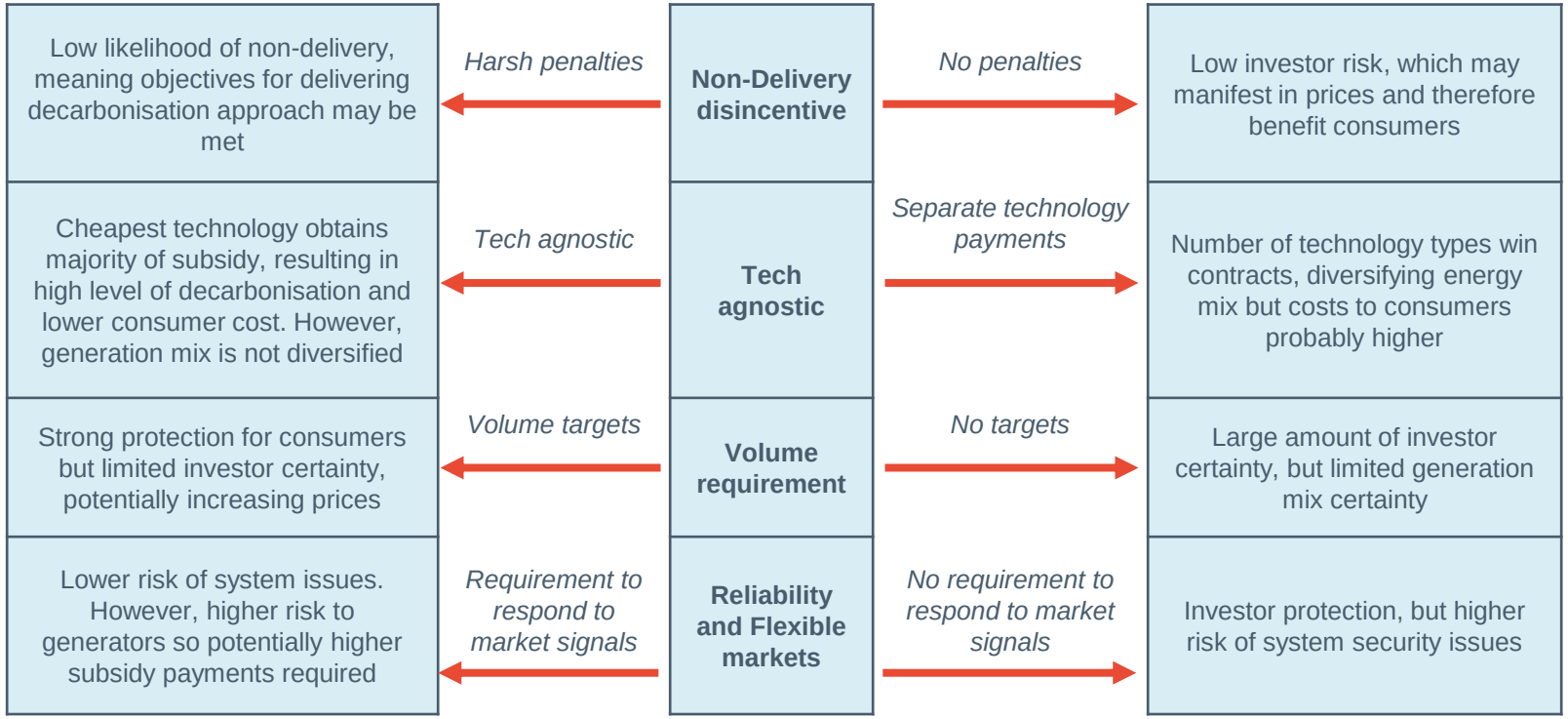
Source: Cornwall Insight

It will therefore be an important consideration for the DfE in assessing how the impacts from the different approaches taken in relation to the considerations are linked, as changing one approach may result in a negative impact in regard to the subsidy (or wider NI market) elsewhere. A diagram showing how interlinking could work is shown in Appendix 2.

Balancing Approach

For several of the considerations outlined, a number of the solutions favour one of the stated objectives of the scheme over another:

Figure 7: Balancing approaches examples



Source: Cornwall Insight

It will therefore be important for the DfE to balance their approach and determine what the optimum approach should be to meet the objectives in the round. The following slides detail our view on the key considerations based on their importance, the possible approaches for implementation and the possible interlinked impacts these approaches could have on the subsidy scheme.

Key considerations (1/3)

We have assessed many considerations within this report, but not all are equally significant in developing the subsidy. We have provided a view of the key considerations based on their importance to the subsidy scheme design and the significance of the consideration to market participants. An overview of these key considerations, along with their perceived importance, possible approaches for implementation and the possible impacts of these approaches on the subsidy scheme, are shown in the table below. More detail on these key considerations and wider considerations can be found in Appendix 1.

Figure 8: Key considerations overview

Consideration Class	Consideration	Importance	Possible approaches	Possible impacts
Fundamental drivers	Consumer protection	This will be one of the fundamental requirements of the scheme	• Market linked prices • Paying back for over expenditure • Price fixes • Careful planning of subsidy & allowing regular amendments to the scheme	• Requiring generators to repay values when high wholesale prices are achieved provides strong protection • Fixed prices provide cost certainty but will not offer any additional consumer protection • Any approach linked to price changes will offer minimal cost certainty
	Sustainability and net zero		• Developing a strong scheme • Deploying a high target • Proper engagement with the market promoting investor confidence	• Balancing targets will be the key approach • Setting targets too high may discourage engagement or not be representative of the market • Setting prices too low may result in falling short of the required objective
	Diversify energy mix		• Allowing a large amount of scheme controllability • Promoting different technologies • Providing different levels of price granularity	• Greater flexibility to control the inputs may better achieve this scheme objective, particularly in relation to technology deployment levels • However, this will need to only be future facing and should be sufficiently clear to avoid reducing investor confidence and deterring competition
	Funding Approach		Although other options may be considered, the main approached considered are a: • Levy, or • Taxation process	• Failure to properly fund the scheme may result in a failure to meet the relevant sustainability and energy diversification targets • How the scheme is funded will outline how consumers are charged, and impact consumer protection as a result
Structure of the scheme	Agreement length	Will drive interest from developers and will also be important for confirming the extent of cost to consumers	• Length of an asset's life • A fixed duration • A length submitted by the generator as part of an application process • May also be technology specific	• Focus on asset life may be costly to consumers • Technology specific approaches will lead to more complexity but potentially a better managed generation mix in NI • Submissions by generators may lead to lower overall costs, but could lead to unsuccessful projects and non delivery due to incorrect submissions • Fixed periods provide certainty for generators and consumers

Source: Cornwall Insight

Key considerations (2/3)

Figure 8 (cont.): Key considerations overview

Consideration Class	Consideration	Importance	Possible approaches	Possible impacts
Structure of the scheme (cont.)	**Allocation process**	This will drive the level of competition within the scheme, and will also impact which delivery bodies are required	Subsidies could be awarded by: • An auction process • A process in which a regulator assigns agreements to an asset • A process in which generators are nominated	• Auction processes allow for competitive tensions, reducing prices • However, auctions must be designed to encourage competition • A regulator sign off allows for more control, but is open to legal challenges and could lead to an oversupply of sites (resulting in high consumer costs) if suitable caps are not in place
	Contract structure	This will determine investor confidence levels, as well as costs to consumers and what other considerations are required	Payments could be made on a: • Fixed basis • Certificate scheme basis • A variable payment, such as a Feed-in Tariff (FiT) • Contract for Difference (CfD) scheme • On a tiered structure	• Fixed approaches provide consumer protection but may not encourage competition • Certificates add complexity and rely on supplier engagement • FiT schemes can result in high costs if an asset generates at high levels with no cap • CfDs avoid this issue through repayments to consumers if prices are higher than subsidy prices
	Price sources	How payment figures are calculated provides significant importance to investors, and impacts consumers	• Regulator forecasts • Clear calculation formulas • Relevant market price, such as the Single Electricity Market (SEM) Operator power exchange between SONI and EirGrid (SEMOpx)	• Setting prices by a regulator adds complexity and risk that calculated prices will not be reflective of current or future markets • Clear formulas remove these risks, but adds additional complexity to the process • Linking to SEM allows for clear indication of prices, but will depend on the agreed structure of the scheme
	Timing of the subsidy	How often the subsidy is open to the market will drive competition and the associated benefits	The possible approaches will be driven by the wider requirements of the scheme, but likely either: • Continuous • Annual • Biennial (two yearly)	• Continuous approach provides security to generators, but may be administratively more challenging and leaves risks of high costs if the scheme is oversubscribed and has no cap • Timed auctions removes these issues, but must be sufficiently regular to not remove competitive tensions
Generation and output	**Technologies included**	The technologies eligible for the scheme will impact investor confidence, consumer costs and the success of the scheme in decarbonisation of the NI network	A variety of technologies could be included, and could be broken into: • Low carbon • Flexible • Fossil fuel-based assets	• Focus on cheaper assets will benefit consumers but may not lead to a robust future generation mix • Including different technologies will likely decrease costs amid greater competition, but may not benefit decarbonisation • A focus on more expensive new technologies will likely increase costs to consumers • Focusing on specific technologies might also result in a lack of competition

Source: Cornwall Insight

Key considerations (3/3)

Figure 8 (cont.): Key considerations overview

Consideration Class	Consideration	Importance	Possible approaches	Possible impacts
Generation and output (cont.)	Technology agnostic schemes / Technological separation	How different technologies are treated in the scheme will drive investor confidence, consumer costs and will impact generation mix	• No separation of technology • Separate prices for each technology • Separate pools/pots (in which some, but not all, technologies compete against each other)	• No separation of technologies will likely lead to lower costs but may also lead to a less diversified generation mix • Depending on the allocation structure, separate prices for different technologies will resolve this but may lead to additional costs to consumers • Separate pools can also avoid this issue, but require more administration and careful management
	Payment metric	How payments are made is crucial for both investors and consumers in determining how much they receive/pay	Payments could be made on: • Availability (where the asset is available but may not generate) • Utilisation (what the asset actually generates) • A fixed rate or capacity basis	• Fixed rate & availability payments provide security in total costs, but mean assets can receive payment if not generating • Payments made on utilisation mean assets only benefit if they generate, which protects consumers from non-delivery whilst also providing investor security • There is a risk of high payment if assets generate high volumes and there is no cap on payments
International interaction	Integrating with the SEM	This will be significant for investors	There is limited optionality here, as interaction with SEM will be required. It will be important, however, for the DfE to make sure they are clear on what is required and how this interaction can take place	
Security of supply	Ability to control inputs	Levers which can alter the subsidy scheme as and when required will be important, as they can fundamentally change the scheme which can impact all parties	Ability to change parameters as deemed necessary, including: • Target capacities • Budgets • Subsidy requirements, including considerations around changing capacities or technology types	• Generally, a high level of variation in the subsidy will allow the regulator/DfE to have more control over the results, but also enable the scheme to adapt to changing market conditions • Regular changes or changes to existing agreements may reduce the engagement levels of investors as they may lose confidence in the scheme
	Flexible markets - Requirement	Requiring assets to provide flexibility services will impact system security, investor confidence and consumer costs	Assets may or may not be required to provide flexibility/ system services to the NI system (such as frequency support) under the scheme	• Requiring assets to provide services means that the work the SO has to do to manage the network is reduced, potentially reducing consumer costs • However, this cost is likely to be seen in the subsidy, as investors will require higher payments to account for the increased risk of reduced revenues
Additional considerations	Scheme funding	How the scheme is funded will have a major impact on consumers	• A taxation process; or • Levy, paid by electricity consumers (on a fixed rate or consumption basis)	• Payments based on taxation may cover a high number of parties, reducing overall costs. • However, this is less reflective of the level of consumption actually used and thus could be seen as less equitable

Source: Cornwall Insight

International Markets and NI Market Approach

International Markets

We have reviewed several existing subsidy schemes from other international markets, including GB, RoI, the Netherlands, Germany and Italy. We provide an overview of each market's renewable energy subsidy scheme, including its structure and fundamental purpose, in Figure 9. The CfD structures used in the GB and RoI markets are useful starting points for the NI scheme. These approaches allow the subsidy to meet the needs of investors (providing long term, fixed pricing) while also providing some level of protection to consumers (with maximum costs for consumers being known and any upside achieved by the developer being paid back to consumers). The pot structures and the ability to change the parameters of the pots (including which technologies are included, the budget/capacity limits in the pots and the ability to set maximums and minimums) also mean that there is a high level of controllability – this approach would allow the DfE to modify the scheme between auctions to account for developments in the market, changes in policy, and to ensure the scheme objectives are being met. This will, however, need to be managed in a method which is acceptable to investors. More detail of each market's subsidy scheme, including its structure, evolution and lessons learned, is detailed in Appendix 2.

Figure 9: International Markets overview

International Market	Scheme	Structure	Purpose
Great Britain (GB)	**Contracts for Different (CfD) Feed-in-Tariff scheme**	The CfD scheme involves a two-way payment process, whereby generators receive (or payback) a £/MWh value based on the difference between the wholesale Market Reference Price (achieved price in the market) and the Strike Price (price achieved in the allocation process on pay-as-clear basis). Technologies are split into different pots, each pot differing between Allocation Rounds (or ARs). The scheme is based on 15-year private law contracts between generators and the Low Carbon Contracts Company (LCCC)	To help decarbonise GB's energy sector and provide long term support to low carbon generators, allowing investment to come forward at a lower cost of capital. This is intended to provide financial certainty, stability of revenues, and deliver new investment at lower cost to consumers
Republic of Ireland (RoI)	**Renewable Electricity Support Scheme (RESS)**	The RESS auctions are a contract for difference (CfD), referred to as a two-way Feed-in Premium (FiP), where the award price equals the bid price (i.e. pay-as-bid pricing rule). The structure has evolved with each auction round but have all given subsidy support contracts for a periods of 15 years	Set up in 2020 to encourage investment in renewable technologies and help the Republic of Ireland achieve its 2030 renewable electricity target of 80%
The Netherlands	**Sustainable Energy Transition (SDE++) subsidy scheme**	The SDE++ is a one-way contract for difference (CfD), pay-as-bid scheme that compensates the difference between cost price of the technology (base price) and the market value of the product that the technologies deliver (market price). Applications are considered on avoided tonnes of Carbon Dioxide (CO_2) emissions. The subsidy is apportioned across technology categories (electricity, sustainable heat, green gas, and CO_2 reduction technologies) with the subsidy period running for 12-15 years (technology dependant)	To reduce carbon emissions by 49% by 2030 and promote the large-scale roll-out of technologies for renewable energy production, stimulate competition, and offer long term security for investors
Germany	**Renewable Energy Sources (EEG) act**	Initially set up as a feed-in-tariff scheme, the EEG is an auction-based system to allocate 20-year FIPs for assets with capacities exceeding 750kW (>150kW for biomass). FIPs are competitively determined in auctions for installed generation capacity (in kW) and are paid per generated electricity unit (ct/kWh) on a pay-as-bid basis	Initially developed to increase uptake of renewable energy technologies, the EEG forms part of Germany's target to ensure renewable energy accounts for at least 80% of its gross electricity consumption by 2030
Italy	**Variety of schemes, including the Renewable Energy Decree (FER)**	The FER Decree is an auction scheme which is differentiated for sites that are above 1MW, and those that are below 1MW. The auctions are pay-as-bid, price only, multi-unit tenders, where the form of support is a two-sided sliding premium (i.e., a CfD). Multiple technologies can compete within an auction but are divided into technology "baskets" and are only able to compete within their basket. Support is given to generators for 20 years for all technologies except hydro, which receives 30 years of support	The FER decree scheme aims to support the production of electricity from plants powered by renewable sources of various kinds (photovoltaic, wind, hydroelectric and gas) in line with the European targets for 2020 and 2030, through incentives and methods of access that promote effectiveness, efficiency and sustainability

Source: Cornwall Insight

Passthrough of costs

Whilst many of the schemes considered aim to provide consumer protection by forcing generators to pay back the value when market prices achieved are higher than their relevant clearing/strike price, it is important to consider if this benefit practically reaches the consumers. There are a number of methodologies for these payments being passed to consumers, and some are more effective than others, so there are important lessons to be learnt for the DfE.

Figure 10: Passthrough of costs in other international markets

GB: In the GB market, whilst the scheme was designed to provide consumer protection, the actual amount of benefit being passed to consumers by suppliers is limited in some scenarios. For non-domestic customers, a lot will depend on their contractual set up. In order to limit costs, some contracts will fix prices, which means that a move to negative prices (and payments) is not captured. Some contracts will include passthrough of prices, so should be representative of changes in the price, but some may be fixed at 0, so no benefit is passed to consumers. For domestic consumers, the price cap had to be updated to account for negative prices. However, whether the benefit is passed through for those on fixed price contracts is dependent on the details of the contract.

RoI: RESS is financed through the Public Service Obligation (PSO) levy. It is charged or credited to customers through their electricity bills. All suppliers are obligated to collect or pay this levy to their customers, who are residential or business users. The Commission for Regulation of Utilities (CRU), the regulator, calculates the PSO levy annually for a period starting from October every year. The levy is calculated based on the wholesale electricity prices and the generation needed for the year ahead. Payments are then adjusted as per actuals. The wholesale electricity market prices impact the PSO levy along with the bid prices for RESS projects. For the period October 2022 – September 2023, the PSO levy is negative for the first time historically, and customers should be receiving a credit as a part of their electricity bills. How the benefits are passed through by suppliers is yet to be seen.

Germany: For over 20 years, electricity consumers financed Germany's EEG scheme via a surcharge/levy applied to their electricity bills by transmission network operators (TSOs) to reimburse their loss of revenue. However, with rising energy and living costs, the levy became controversial, accounting for roughly 20% of consumers' electricity bills. Following Germany's most recent energy policy reform in July 2022, the 'Easter Package' eliminated the surcharge to relieve the pressure of increasing electricity prices and provide consumer protection. The surcharge has been removed (and therefore no longer applies to consumers' electricity bills) meaning German households can now expect to save on their electricity bills. The Federal Government now carries the burden of managing the passthrough of costs and reimbursing renewable generators for the loss of revenue out of the Energy and Climate Fund (EKF). The fund has recently expanded to create the Climate and Transformation Fund (KTF) and has budgeted €177.5bn for 2023 to 2026 to recover surcharge finances and promote an environmentally friendly and affordable energy supply.

Source: Cornwall Insight

Approach for the NI Market (1/2)

Some of the considerations and lessons learnt from other markets are more applicable for the NI market than others due to the nuances of the market. In order to assess these considerations, we have looked at the key considerations and discussed the possible approach for the NI market when compared to the RoI RESS scheme and the GB CfD scheme.

Figure 11: Approach for the NI Market overview

Consideration class	Consideration	RESS Approach	GB CfD approach	Approach for NI Market
Fundamental drivers	Consumer protection	• High level protection – CfD scheme, no payments for negative price periods • Changes proposed for RESS 3 to insulate investors against external risk with the aim of protecting consumers from undue cost burden	• High level of protection – CfD scheme, no payment to generators in negative wholesale price periods • Full costs of the scheme are unknown, but maximum cost is known (except for risk of high inflation)	• **High level of protection should be deployed through repayment of upside** – we expect that payments under the scheme should be capped and any payment above the achieved strike price in the wholesale market should be repaid to consumers • This approach (where generators pay upside back to consumers) has been shown to provide additional protection to consumers in the GB market when wholesale prices are high • It also provides a reasonable level of price certainty for consumers • It will also be crucial to facilitate competition in the scheme to keep prices low – how this is done will depend on a number of factors, particularly eligible asset types and sizes • Wider considerations which provide benefits to consumers will need to be considered based on the overall benefit achieved to the NI market; providing no constraint payments prevents additional consumer costs, but the RESS scheme has shown investors have struggled to engage in the scheme if they are not offered a reasonable level of protection
	Sustainability and net zero	• Only low carbon assets included	• Only low carbon assets included, although this includes nuclear	• **Focus on renewable technologies will be vital –** a fundamental objective of the scheme is for decarbonisation, so a focus on low carbon assets is required
	Diversify energy mix	• Transition from use of technology specific pots to Evaluation Correction Factor (ECF) • Separate offshore auctions	• High potential – use of pots, caps, budgets and minimas/maximas mean there is plenty of scope to allow development of alternative technologies beyond the cheapest	• **Use of pot structure** – this allows DfE to control the level of competition associated with the subsidy schemes for different technologies and avoid emerging technologies having to compete with more established technologies • This will be crucial in meeting the relevant decarbonisation obligation • The more possibility to vary pots, the more ability the DfE has to impact deployment rates • The types of eligible technologies utilised in the scheme will also therefore be important, and should be driven by the available technologies in the NI market (expected to be predominantly onshore wind, offshore wind and solar)
	Funding approach	• Public Service Obligation (PSO) Levy, placed on consumers	• Levy placed on consumers	• **This will depend on views from the market -** taxation covers more parties, reducing costs per person, but may not be considered as equitable
Structure of the scheme	Agreement length	• RESS 1 & 2 15 years, possibly extending to 20+ years for RESS 3	• 15 years	• **Subject to investor interest** – investors will likely want support for as long as possible and some have been happy with 12 to 15 years in other markets, but equally these length contracts have been seen as a hurdle in the RESS scheme
	Allocation process	• Competitive auction	• Competitive auction	• **Competitive auction** – a competitive auction approach is the most likely to provide low costs for consumers through competitive tensions • Other markets, such as the GB scheme, have shown that carefully scoped auctions can be very competitive, although other markets (such as the Italian subsidy schemes) have shown auction parameters are crucial for competitive tensions
	Contract structure	• Two-way CfD	• Two-way CfD	• **Two-way CfD** should be considered – this provides a reasonably large amount of protection to consumers and has been accepted by many investors in a number of different markets

Source: Cornwall Insight

Approach for the NI Market (2/2)

Figure 11 (cont.): Approach for the NI Market overview

Consideration class	Consideration	RESS Approach	GB CfD approach	Approach for NI Market
Structure of the scheme (cont.)	Price sources	• Strike price – set in auction, must be below a maximum price • Market reference price – for variable projects; hourly DAM price. For non-variable projects; time weighted average of the DAM over the PSO levy year	• Strike price – set in auction, must be below a maximum price • Market price – Relevant market references (N2EX, EPEX or LEBA)	• **Generator led strike and market price** – assuming a CfD scheme is in place, a competitive strike price should be used. • This offers additional consumer protection, adds a certain amount of price certainty and also prevents overpayment. • The approach has also been acceptable to investors as seen in the GB market • A suitable market price is also important, and the day ahead SEM appears the prime choice given its utilisation in the RESS market • However, the size of the NI market means realistic targets will need to be set and fixed prices may be required for microgenerators
	Timing of the subsidy	• Every 1-2 years, every 2 years for offshore	• Historically, auctions every 2 to 3 years, but moving to annual from 2022 onwards	• **Annual auctions** – some markets are moving to annual auctions due to the expectation that this will increase deployment and not limit demand • However, some markets which have regular auctions have struggled to remain competitive • The size of the NI market means that there is potentially a requirement for less frequent auctions. • This will depend on the auction parameters
Generation and output	Technologies included	• HECHP (W2E, Biogas, Biomass), wind, solar, hydro, hybrid	• Low carbon gen (including nuclear), including floating wind and tidal • No CCUS or Hydrogen	• **This should be driven by NI requirements** – initial auctions should focus on currently viable technologies (onshore, solar and fueled), but future auctions should have scope to include other technologies • This will also be impacted by what other technologies are available in the NI market and realistically could be utilised for the scheme
	Technology agnostic schemes / Technological separation	• Different pots used; one focused on community, one focused on all tech (in RESS 1, solar was separated out into its own pot to encourage diversity)	• Different pots used • Pot structures can change between each auction	• **Utilise different Pots** - use of different pots will be highly advantageous to the NI scheme • Not only will this assist in allowing them to achieve diversification, but it also allows for evolution of the scheme, with pots being changed between auctions in the same manner as the other schemes
International Interaction	Integration with the SEM	• Underpins auction design • DAM prices used for market reference price and provides revenue considerations to form project bids • Capacity market considerations for setting of ECF	• None	• **Careful balance required** – the nature of the NI market, being linked to the SEM, will cause risks and DFE will likely have limitations in the possible approach they can take due to these arrangements
Security of supply	Ability to control inputs	• Caps and budgets create ability to control/focus on one technology, and focus on community schemes (although community scheme moving out of RESS to SSG scheme)	• Caps, budgets and maximums/minimums create ability to focus on one technology	• **Utilise caps/budgets** - as much control as possible should be implement into the scheme to protect consumers, so caps and maximums/minimums are crucial • Assuming a CfD structure is used, more granularity is optimum, allowing for the different parameters of the scheme to be changed between each auction, to reflect market conditions, as is the case with the GB market
	Flexible markets - Requirement	• ECFs used to reflect the relative value different technologies provide to the system	• None directly, although no payment for assets if market prices drop below 0	• **Require flexibility** - as a minimum, it will need to be confirmed that any engagement in the Balancing Market (BM)/flexible markets can not lead to any revenue above the subsidy payment and that all entitles need to engage in the schemes • How this is implemented will, however, depend on the relevant legislation

Source: Cornwall Insight

Microgeneration

Microgeneration

Whilst we have considered possible approaches in regards to the subsidy schemes in relation to all generation types, there is the potential that specific consideration should be given to microgenerators. Small-scale generators are likely to have different requirements compared to a larger renewable generators and so consideration around the possible approaches for microgenerators will be important for the DfE to consider.

There are several key questions which the DfE will need to consider as part of the consultation process in relation to subsidy scheme, including:

Figure 12: Microgeneration considerations

What size assets should be considered microgenerators in the NI market?

The possible size of a microgenerator varies between different markets, and even different subsidy schemes or reference points in the same market can consider small-scale assets at different capacities. Additionally, different approaches or sizes may be applicable for different asset types (such as different technology types). As a result, any consideration around integrating microgenerators into the subsidy scheme will also need to consider at what capacity an asset is considered a microgenerator.

Do microgenerators require a subsidy or support?

Consideration should also take place to determine if a microgenerator will require a subsidy scheme or alternative support to be deployed. Different funding approaches and repayment requirements may be applicable for microgenerators, such as having a focus on supply cost reduction as opposed to obtaining revenue. As a result, deployment of these assets may be easier. The DfE would therefore need to consider whether there is sufficient scope for a subsidy-free market of microgeneration assets to be deployed.

Should microgenerators have their own subsidy scheme/sufficiently different subsidy structures to the scheme deployed for larger assets?

The likely different funding requirements for microgenerators means that they are likely to have different payment requirements than larger assets. Additionally, other subsidy structures which may encourage competition and engagement for larger assets (such as competitive auctions) may be less appealing for microgenerators. As a result, it may be the case that alternative subsidy schemes are required, or that how a microgeneration asset engages in the subsidy is very different than the approach used by larger assets.

Source: Cornwall Insight

There are, therefore, a number of considerations relating to microgeneration. We have examined these in more detail in Appendix 3 but additional investigation is required to fully determine the requirements of microgenerators, especially in regards to the question of if they require a subsidy or are suitably placed in the market to be deployed without support. It will be important to analyse this question in more detail to allow for as robust of an approach as possible in relation to microgeneration assets.

In the following sections we have outlined our view on how a subsidy approach for microgeneration assets could operate, how it may differ from an approach undertaken for larger generators and what impact this may have on the NI market. However, a subsidy approach for microgeneration assets may not be the optimum approach for the NI market, and so alternative approaches may be better suited to allow meeting the relevant objectives.

Microgeneration approaches

Possible approaches

There are a number of factors which indicate that microgenerators require very different possible approaches compared to large-scale assets due to their financial requirements, operational possibilities and approaches to the market. As a result, we would suggest that the DfE consider the benefits of potentially operating two different approaches, either as separate subsidies or as part of the same subsidy, so as not to prevent the development of assets in one part of the renewable market by focusing on the other. The possible subsidy structures for the two types of generator are shown below.

Figure 13: Overview of possible subsidy structures

Large-scale generators

- CfD structure
- Paid on utilisation
- Prices based on strike price
- Won in competitive auction
  - Each auction has budget/capacity limit to prevent oversubscription
- Generators/market driven prices
- Pay-as-clear
- Complex contract (constraint payments, bid bonds, negative price considerations)
- 15 years
- Grandfathered

Microgenerators

- Set payment
- Paid on utilisation or upfront grant
- Prices based on asset costs
- Won in application process
  - Prices based on technology/capacity specific pricing
  - Caps in place to prevent oversubscription
- Regulator calculates prices
- Paid price predetermined in scheme
- Minimal operational or administrative requirements
- 15 years
- Grandfathered

Source: Cornwall Insight

Both approaches have been structured to try and provide protection to the generators, whilst also providing a certain level of price certainty to consumers and promoting a variety of renewable assets to be deployed. In that way, the two approaches are similar. However, the fundamentals of the approaches are very different, with the large-scale generator approach being far more complex than the microgeneration approach. The DfE will therefore need to consider if having two structures is appropriate for them, and what elements of risk they want to put in place for consumers and generators. The NI market is well positioned to facilitate microgeneration so it is expected that more benefit can be achieved by encouraging these assets and there is more viability in engaging these assets in the subsidy scheme. However, this would need to be confirmed, and will play a significant role in determining how the scheme should be structured.

It is therefore important for the DfE to consider the following key questions:

- What is the potential volume of microgeneration sites in the NI Market?
- Should microgeneration be given a separate payment structure/pot approach?
- What size should be considered in relation to microgeneration?

Microgeneration market approach (1/2)

We previously provided an overview of the key considerations and possible approaches for the NI market, when compared to how the subsidy schemes operate in the GB and RoI markets. However, as discussed, microgenerators are likely to require their own scheme or their own parameters as part of the wider scheme. Therefore, Figure 14 below provides key considerations and possible approaches in the NI market for microgeneration.

Figure 14: Approach for the NI Market overview – Microgenerators

Consideration class	Consideration	Approach for Microgeneration assets in the NI Market
Fundamental drivers	Consumer protection	• **Set by regulator rates with a cap are likely to be required** – this provides the investors the level of certainty required, but also means consumers have visibility of costs • As seen in the GB FiT scheme, however, it can be difficult to correctly forecast a fixed payment, so a cap or other preventative measures will need to be in place • This approach is likely to require different technologies to have their own tariffs/payments so these elements will need to be shaped to make sure suitable engagement in the scheme takes place – the use of fixed price approaches (which is likely) however would mean competition is less significant as long as pricing was suitably robust • Elements such as constraint payments and reliability of delivery may be too complex under the scheme for small entities, so they may not favor this approach
	Sustainability and net zero	• **Focus on renewable technologies will be vital –** a fundamental objective of the scheme is for decarbonisation, so a focus on low carbon assets is required
	Diversify energy mix	• **Tiered and technology specific prices should be used** – a tiered structure (based on capacity) should be considered to reflect different economies and scales • Different technologies should have different tariffs to reflect the relative costs of deployment • This will add administrative burdens, however, so is an important consideration for the DfE. Again, which technologies included will depend on the options available in the market, and is likely to require consideration by the DfE
	Funding approach	• **This will depend on views from the market -** taxation covers more parties, reducing costs per person, but may not be considered equitable
Structure of the scheme	Agreement length	• **Subject to investor interest** – shorter term contracts provide greater support to consumers • Investors will likely want support for as long as possible and some have been happy with 12 to 15 years in other markets, but equally these length contracts have been seen as a hurdle in the RESS scheme
	Allocation process	• **Application process** – an application process is likely to be more viable for smaller assets as they are unlikely to be competitive in auctions • They are less likely to have sufficient resources to engage in a complex auction process • Assuming fixed price approaches are in place, competitive tensions are less of a concern, as the main objective will be incentivising deployment levels • Suitable caps will, however, be required to protect consumers
	Contract structure	• **Fixed rate –** whilst microgenerators have shown willing to engage in more complex contracts, fixed rate approaches will provide additional comfort and prevent lack of engagement as there is more visibility of the relevant rates achieved

Source: Cornwall Insight

Microgeneration market approach (2/2)

Figure 14 (cont.): Approach for the NI Market overview – Microgenerators

Consideration class	Consideration	Approach for Microgeneration assets in the NI Market
Structure of the scheme (cont.)	Price sources	• **Prices determined by the delivery body –** lack of market linking to prices will add significant comfort • Microgenerators are unlikely to be able to monitor or track wholesale prices, so any price structure which is linked to wholesale prices may prevent them from wanting to engage in the scheme • Volume linked price determined by the regulator means that all parties have clarity on the prices for a particular auction/application phase • These prices would need to be grandfathered • Fixed prices also allow for a certain amount of price certainty and price security, as long as suitable caps are in place to prevent over generation
	Timing of the subsidy	• **Consistent access –** access to the subsidy scheme at all times is likely to be required by smaller generators so that they can have certainty that they have access to a subsidy whilst they are developing their assets • This would require the regulator to regularly monitor the scheme and have suitable flexibility to change parameters as required, which could be challenging
Generation and output	Technologies included	• **This should be driven by NI requirements** – the types of microgenerators which are visible in the NI market, or which the DfE believes will be viable in the market, will drive these considerations
	Technology agnostic schemes / Technological separation	• **Assets should be split by technology and into different tiers based on capacity** – assuming a fixed/non-competitive price is used in the subsidy for microgeneration sites, as granular pricing as possible should be in place to account for the nuisances of different technologies • This means the technologies in the scheme will all have their own prices, but will still need to meet certain wider budget limitations
	Payment metric	• **Either payment on Utilisation or as an upfront grant** – whilst a fixed fee approach may be more favorable from a generator perspective, utilisation has been established in many markets and removes non-delivery risk for consumers • However, a suitable cap will be required to make sure that overgeneration does not result in high consumer costs
International interaction	Integration with the SEM	• **Minimal interaction** – assuming payments are made based on fixed price arrangements or set £/MWh payments, interaction with SEM is likely to be less applicable. However, any legislative requirements will need to be included in the contract
Security of supply	Ability to control inputs	• **Individual tiers and budgets** – if possible, individual tiered pricing approaches should be used, with their own budgets, so the DfE can control exactly which assets are being deployed in the NI market • This also allows them to respond to changes in the market, changing the possible tiered structures as required
	Flexible markets - Requirement	• **Do not require flexibility** – delivery of flexible services will be very difficult for microgenerators due to the likely focus on onsite consumption, the probable lower scope to control the asset and the limited visibility generators will have of the relevant market changes which will signal them needing to engage in the scheme

Source: Cornwall Insight

The updated scenarios show a considerable amount of different approaches compared to those highlighted for the larger/commercial scale assets, so it is important for the DfE to consider balancing the needs of the two types of assets against the likely challenges of operating a more complex process allowing for different subsidy structures. If considering two separate approaches, the DfE must also be mindful of the risk of "boundary distortions" where assets with similar properties which happen to sit just above and just below the microgeneration boundary respectively receive substantially different treatment. This can lead to a risk of assets sizing to be the "right" side of a boundary rather than sizing at the optimal level for an efficient system.

Conclusions

Conclusions (1/3)

Key subsidy scheme design parameters

We consider there to be several key elements of the subsidy scheme which are important to consider in its design and development which we outline in Figure 15 below.

Figure 15: Key subsidy scheme design parameters overview

Key requirements will need to be looked at by the DfE in developing the scheme.

These include retaining a high level of competition, meeting decarbonisation objectives, protecting consumers, maintaining investor confidence and maintaining the relevant relationships with the GB and RoI markets.

Multiple considerations will need to be included in the development of the subsidy scheme.

Many elements of scheme design interrelate, so approaches under some considerations are mutually exclusive with other approaches under other considerations, while some are mutually dependent. Additionally, balance will need to be found in many of the approaches taken to ensure the scheme meets the objectives in the round – some approaches will meet one objective at the cost of meeting another. Many of these considerations have impacts on project costs, which in turn impact the expected competition seen in the scheme and the potential costs to consumers, along with level of price certainty achievable for investors/generators. As a result, consultation on these considerations will be crucial for determining the optimal approach to be undertaken in the NI market.

Careful sequencing will be required for scheme design decisions.

Some considerations are, by definition, dependent on decisions on other considerations having been made. For example, good decision making on all other considerations will be dependent on a clear set of objectives being defined for the scheme. Likewise, later in the timeline decisions on the legal framework rely on the scheme structure being largely finalised.

However, some considerations may only be of interest to certain market participants and not others.

Some considerations will only be of interest to certain market participants, and some (such as legislative approaches and fundamental drivers of the subsidy scheme) will likely only be of interest to the DfE and not to stakeholders. It will be important for the DfE to consider how to approach certain elements and prioritise which considerations it chooses to consult on.

Lessons can be learnt from other markets, but the nature of the NI market means some approaches will not be useful or applicable.

There are also several areas in which conflicts between different markets create uncertainties, such as the RoI RESS scheme which is considering extending the lifespan of the subsidy to encourage participation from investors as opposed to consultations on the GB CfD subsidy which have suggested shortening the scheme to benefit consumers. The DfE will need to carefully balance these types of considerations.

The nature of the NI market, and the potential for a large amount of microgenerators is also a key consideration.

Focusing on larger investors and economies of scale would mean that a highly competitive auction process similar to those seen in the GB and RoI markets is likely to be the best approach. However, a focus on small-scale assets would require a very different subsidy, with more certainty and less complexity. There are, therefore, important factors which the DfE needs to consider on how a scheme can be structured to meet the needs of all parties, or if alternative approaches (such as separate pots or even separate subsidies) are required.

Source: Cornwall Insight

Conclusions (2/3)

Key consultation considerations

There are some considerations which are key for the market to consider and should therefore form an important part of the consultation.

Figure 16: Key consultation considerations overview

Consumer protection: recent high wholesale prices internationally have caused considerable concerns for NI consumers and additional protection on a national level is important

Sustainability and net zero: achieving the 80% target level of electricity consumption met using renewables by 2030 will need to be a key driver for determining the structure of the subsidy scheme

Diversify energy mix: the NI market has a large amount of potential but also some limitations on types and scale of technologies deployable. Diversification will therefore be key

Agreement length: the length of the agreement will be crucial in understanding costs to consumers, as well as driving investor confidence in the scheme and the level of competition in the scheme

Allocation process: how subsidy under the scheme is secured will impact the level of competition in the scheme, with investors having different levels of interest in the scheme based on how easy they will perceive obtaining the subsidy

Contract structure: different contract structures will impact both investors and consumers in different ways, providing varying levels of price certainty. This will also impact competitive tensions

Price sources: certainty available on price will impact investor confidence, whilst also impacting cost certainty for consumers

Timing of the subsidy: how regularly the subsidy is available for generators will drive competition levels and investor engagement

Technologies included: which technologies are included will not only impact how successful NI is at meeting decarbonisation targets, but will also impact the level of competition in the scheme and overall subsidy costs

Treatment of different technologies: not only will this impact the level of decarbonisation achieved, but also the diversity of the generation mix in NI

Payment metric: what metric payments are based on will determine the level of competition in the scheme, as well as the likelihood of projects being successfully awarded a subsidy. It will also impact consumer costs

Ability to control inputs: how the subsidy can evolve will be crucial for the DfE for adapting the scheme as the market changes

Interaction with flexibility markets: how the assets engage in the SEM will be important for system management

Funding approach: how the scheme is funded will impact both the level of investor confidence and, as a result, has significant implications for the distributional impacts on consumers as well as investor costs

Source: Cornwall Insight

These considerations have the potential to significantly impact project costs, which in turn impacts the expected competition seen in the scheme, potential costs to consumers, and level of price certainty achievable for investors/generators. Therefore, consultation on these considerations is crucial for determining a viable approach for the NI market.

Conclusions (3/3)

Key consultation question drivers

We think there are a subset of key points which should be the primary focus of the consultation for the DfE, and the individual considerations should be used to define the details of these key points. Whilst we attach more detail in Appendix 1, we consider the key consultation question drivers to be:

Figure 17: Key consultation question drivers overview

Purpose – The purpose and objectives of the scheme will be the main driver for the details of how the scheme operates, with different objectives requiring different subsidy arrangements.

Competition and lack of participation – Getting the right level of competition within a scheme is important; if the eligibility requirements are too stringent, there is a risk of non-participation, meaning it fails to deliver the required targets and may increase costs. Lack of delivered generation in the subsidy has been seen in the RoI and Italian schemes. A number of considerations, such as the reliability/volume of generation, possible requirement for engaging in flexible markets and asset size will all impact the level of competition achieved in the auction. It will also be important to consider the potential level of competition between the RESS scheme and NI subsidy scheme, as there is the potential that a number of developers may consider developing in both markets. If one scheme is considerably more favourable than the other, this may impact the level of competition in both schemes, having wider impacts on the SEM.

Price protection for consumers and investors – Balancing the protection of consumer costs and the level of investor protection will be important. The scheme should not force significant costs onto consumers but, at the same time, must provide sufficient comfort to developers in order to ensure projects can be delivered. The Renewables Obligation scheme in the GB market was very successful at providing investor confidence but proved to be costly for consumers, showing the risks. Consideration such as the contract structure, payment structure and price sources will be important in determining the best way to provide protection to both parties.

Generation mix and decarbonisation – The established targets mean that decarbonisation of the NI electricity system is crucial. A number of the considerations will drive the success of the subsidy in meeting these targets, such as eligible technologies, eligible generation and asset status.

Impact on wider NI market – How the scheme impacts the wider market will be crucial, and so many considerations will drive the DfE's thinking on this point. Considerations will include if system security should be factored into the subsidy scheme or if this is better managed by the SO. This will be captured through consideration of elements such as constraint management requirements and the requirement to engage in flexible markets. Network costs and planning considerations will also interact with the impact that geographical locations have on the subsidy (and vice versa).

SEM and the EU – Whilst engagement in the GB scheme will be mainly a legal consideration, a high level of complexity will revolve around how the subsidy scheme works in relation to the SEM market and, in turn, how EU policy will need to be integrated into the subsidy scheme. It will therefore be important to consider this from both a legal perspective and a market perspective.

Microgeneration – The possible approaches which need to be undertaken in relation to microgeneration assets will be an important consideration for the DfE, as it will be important to determine the level of subsidy required by smaller/domestic assets and if an alternative/different approach is required compared to the subsidy needs of larger, commercial generators.

Source: Cornwall Insight

Appendices

Appendix 1 – Key considerations and consultation question drivers

Respondent level of interest (1/2)

Within the NI energy market, there is likely to be variety of respondents from a variety of different stakeholders in the market. As a result, whilst all the considerations in this report are considered important, some are only of interest to certain respondents.

In order to assess which considerations are more important to which stakeholders, we have provided an overview of the considerations against seven types of respondents.

For each consideration and for each respondent type, we have provided a view of the likely level of interest on a high, low and medium assessment, as shown in the key below.

Key	High	Medium	Low

The full results of this assessment are shown opposite and on the next page.

Figure 18: Respondent level of interest overview

Class	Consideration	Respondent level of interest						
		DFE	Other regulatory bodies	Developers/ Generation	Investors	Consumers	Suppliers	System Operator
Scheme purpose	Objectives	High	High	Medium	Low	Low	Low	Low
	Success measurement	High	High	Medium	Low	Low	Low	Low
	Targets setting	High	High	Medium	Low	Low	Low	Low
Fundamental drivers	Consumer protection	High	High	High	High	High	High	High
	Sustainability and net zero	High	High	High	High	High	High	High
	Diversify energy mix	High	High	High	High	High	High	High
	Funding approach	High	High	High	High	High	High	High
Structure of the scheme	Agreement length	Medium	Medium	High	High	High	Medium	Medium
	Allocation process	High	High	High	Medium	Low	Low	Low
	Contract structure	High	High	High	High	Low	Low	Low
	Delivery body(s) & Stakeholders	High	High	High	High	Low	Low	Low
	Impact on wholesale market	High	High	Low	Medium	Low	High	High
	Payment timescales	Medium	Medium	High	High	Medium	Low	Low
	Price sources	Medium	Medium	High	High	High	High	Low
	Stakeholder roles	High	High	Medium	Medium	Low	Medium	Low
	Timing of the subsidy	High	High	High	High	Low	Low	Low
	Price indexation and adjustments	High	High	High	High	High	High	Low
	Price clearing process	High	High	High	High	Low	Low	Low
Generation and output	Eligible generation	High	High	High	High	Medium	Medium	High
	Technologies included	High	High	High	High	Medium	Low	Low
	Technology agnostic schemes / Technological separation	High	High	High	High	Low	Low	Low
	Constraint and Curtailment	High	High	High	High	High	Medium	High
	Payment metric	High	Medium	High	High	Medium	Medium	Low
	Volume requirements	High	Medium	High	High	Medium	Medium	Low
International Interaction	Engagement with GB and GB assets	High	High	Medium	Medium	Low	Medium	Medium
	Export allowed	High	High	Medium	Medium	Low	Medium	Medium
	Impact on interconnectors	High	High	High	High	Medium	Medium	Medium

Source: Cornwall Insight

Respondent level of interest (2/2)

Figure 18 (cont.): Respondent level of interest overview

Class	Consideration	Respondent level of interest						
		DFE	Other regulatory bodies	Developers/ Generation	Investors	Consumers	Suppliers	System Operator
International Interaction (con.)	Integrating offshore technologies with interconnection	High	High	High	High	Medium	Medium	Medium
	Integration with the Single Electricity Market	High	High	High	High	Medium	Medium	Medium
	Interaction with EU policy	High	High	Low	Low	Low	Medium	Low
Eligibility criteria	Community considerations	High	High	Medium	Low	High	Medium	Low
	Key Documentation	High	High	High	High	Low	Low	High
	Micro grids, storage assets and private wires	High	High	High	High	Low	High	High
	Network costs	High	High	High	High	Low	Low	High
	Non-delivery impacts and Financing requirements	High	Medium	High	High	Low	Low	Low
	Part merchant assets	High	Medium	High	High	Low	Low	Low
	Project start timelines	High	Medium	High	High	Low	Medium	Low
	Set locations	High	Medium	High	High	Low	Low	High
	Site definition	High	Medium	High	High	Low	Low	High
	Alternative requirements	High	Medium	High	High	Low	Low	High
	Capacity requirements	High	Medium	High	High	Low	Low	High
	Grid connection requirement	High	Medium	High	High	Low	Low	High
	Asset status	High	Medium	High	High	Low	Low	Low
	Corporate PPAs (CPPAs)	High	Medium	High	High	Low	Low	Low
Security of supply	Ability to control inputs	High	Medium	High	High	Medium	Medium	High
	Capacity Market engagement	High	Medium	High	High	Medium	Medium	High
	Flexible markets – Engagement	High	Medium	High	High	Medium	Medium	High
	Flexible markets - Requirement	High	Medium	High	High	Medium	Medium	High
	Integrating storage/Co-location/flexible technologies	High	Medium	High	High	Medium	Medium	High
	Reliability	High	Medium	High	High	Medium	Medium	High
Scheme Financing	Charge avoidance	High	Medium	High	High	High	High	High
	Defining impacted supply arrangements	High	Medium	High	High	High	High	High
Legal/admin	Legal and legislation	High	High	Low	Low	Low	Low	Low
	Workload	High	High	Low	Low	Low	Low	Low
Evolution	Future changes	High	High	Medium	Medium	Medium	Medium	Medium
	Innovation considerations	High	High	Medium	Medium	Medium	Medium	Medium

Source: Cornwall Insight

Key considerations

In discussing the key considerations in this section, we detail an overview and contents of the key considerations below.

Figure 19: Key considerations overview and contents

Key consideration	Overview	Page
Scheme purpose	Considers the reason for the subsidy being in place, and how success should be quantified.	38
Fundamental drivers	Considers the fundamental drivers and core elements of the scheme, and how they can be implemented.	41
Structure of the scheme	Considers how the scheme will be put in place, assessing the practicalities of how the scheme operates.	45
Generation and output	Considers what the assets will need to deliver within the scheme.	54
Eligibility criteria	Considers which assets will be eligible for the scheme, what information will be required to show eligibility and how this may impact the NI fuel mix.	60
Security of supply	Considers what impact the scheme will have on the management of the network from the System Operator's (SO) perspective.	68
International Interaction	Considers how the scheme will interact with the Single Electricity Market (SEM), the market in the Republic of Ireland (RoI) and wider markets.	74
Other considerations	Considers other factors important for delivery of the scheme, including scheme financing, legislative and administrative factors, as well as future change and scheme evolution.	78
Investor Impacts	Considers how changes in the future will be managed within the scheme.	83
Mandatory subsidy schemes	Considers the structure of the subsidy payments and its impact on investor confidence.	85
Consumer cost considerations	Considers how costs are passed to consumers.	88
Interlinking example	Provides an example of how interlinking can impact the considerations	89

Source: Cornwall Insight

Key considerations assessment

In order to assess the key considerations and determine their level of importance in being included into the consultation currently being considered by the DfE, we have provided an assessment of each consideration in the report.

To do this, within this section of the report, we have provided:

- An overview of the consideration (the **Consideration**)
- A high-level overview of the possible approaches which could be undertaken in relation to the consideration, along with a high-level overview of the pros and cons for each approach (the **Possible approaches**)

In addition, for each consideration, we have produced a Red, Amber, Green (RAG) assessment across three parameters:

- **Requirement** – which shows if the consideration should be included in the consultation (with a high requirement indicating that it is seen as very important to be consulted upon)
- **Importance to the subsidy** – which shows how important the consideration will be in shaping the subsidy scheme
- **Significance to the market** – which shows our view on the general trend of interest which is likely to be shown by consultees in relation to the consideration

For each of these parameters, we have provided an overview of the level of importance which will be applicable for each of the considerations. The level of importance is considered on a high, low or medium basis, as shown in the table below:

Figure 20: RAG assessment key

Key	High	Medium	Low

Source: Cornwall Insight

We have also included the key questions involved with each consideration which could form an important part of the consultation produced by the DfE. These considerations have the potential to significantly impact many elements including project costs, which in turn effects the expected competition witnessed in the scheme, the potential costs to consumers, and the level of price certainty achievable for investors/generators. Therefore, consultation on these considerations is crucial for determining a viable approach for the NI market.

Scheme purpose (1/3)

As discussed previously, the purpose of the scheme should be the starting point for development, with clear objectives being crucial. Once those objectives have been set, how more quantifiable targets are set and measured will then be important to demonstrate how the scheme is meeting those objectives.

1) Objectives

Consideration: Determining the objectives of the scheme will be crucial for driving the development of the scheme. DfE have provided an indication of the initial view on what the purpose of the scheme will be, including to incentivise sufficient renewable electricity generation to deliver 80% of electricity consumption by 2030, encourage a wide range of renewable sources (to diversify the technology mix) and to reduce the potential for unexpected consumer price increases or spikes. However, there are a number of other objectives which need to be considered (such as security of supply). Failure to consider these objectives and factor them into the scheme could result in the scheme not delivering as required. It is also important to consider how different objectives interact, as many will not be directly compatible and so balancing of the objectives will be crucial. Additionally, whilst some objectives might not reflect the fundamental drivers of the subsidy scheme, they will be implied objectives which need to be factored into its development (for example, avoiding increasing system management and imbalance costs).

Possible approaches: There are a number of considerations which need to be included in any discussion on the objective of the scheme, including elements such as decarbonisation, consumer protection, investor confidence and security of supply. There are also a number of secondary considerations which might impact the objectives of the scheme, such as the impact on wholesale prices and carbon measuring. These elements may need to be factored into the objectives. However, whilst each approach obviously would help improve the deployment of generation in the NI market in a particular way, to focus on a single consideration and dismiss the others is likely to lead to significant issues in other regards. For example, a focus on decarbonisation but not considering consumer protection can lead to unacceptable charges for consumers to fund new renewables. As a result, consideration is also required on how these elements interact. A suitable balance will therefore need to be put in place. A focus on one objective is likely to make achieving the other objectives more difficult. All the existing schemes considered focus on decarbonisation, but factor in the other objectives as well to make sure that the schemes are not detrimental to the rest of the wider energy industry in their respective markets. For the NI market, the scheme purposes should be driven by the required objectives of the scheme, as defined by the DfE and consumers within the market.

Scheme purpose (2/3)

2) Targets setting & success measurement

Consideration Within the subsidy the setting of targets will be important, either at the outset or at given intervals (such as on a per auction basis if applicable). How these targets are set and when will be an important consideration for the subsidy, as it will drive the level of interest in the scheme. Failure to provide realistic targets will mean that interest in the scheme from developers is likely to reduce, whilst setting targets too low will mean the scheme fails to meet its objectives. It is important to consider how targets are measured, and how the scheme can be monitored for success. Demonstrating the success of the scheme will be important for developing confidence in participants that the scheme will be a viable option for them. It will also be important for consumers, as it is likely to dictate the level of costs associated with the scheme.

Possible approaches: Setting targets and measuring success are strongly linked, due to the fact that assessment of the success of any given targets will depend on the success of measuring those targets. There are a number of approaches which have been used in the other markets, including focusing on capacity (MW) targets, volume (MWh) targets and targets based on costs. These could be done on a total level or on a more granular basis (i.e., by technology or by asset size). Setting robust capacity or volume targets can be beneficial for driving delivery, and provide reasonable signals to investors, but could also limit innovation and engagement by smaller generators who may see targets are difficult to achieve. Limiting costs will benefit consumers but also may mean that deployment of specific technologies is limited or challenging. Capacity and volume targets are likely to encourage deployment, whereas a target with a cost cap is likely to discourage deployment to a certain extent. It is therefore important to achieve a balance between the two approaches. Many markets discussed have levers which allow them to apply different targets on an auction-by-auction basis, as the need requires. The GB scheme, for example, sets both capacity and/or budget limits on auctions, pots and individual technologies for each auction – this provides the government strong control over the potential outcome.

Scheme purpose (3/3)

Figure 21: Consideration RAG rating – Scheme purpose

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Objectives	Decarbonisation, keeping consumer costs low/protecting consumers, promoting investor confidence, system security, security of supply, diversifying the NI energy mix				We would expect that the three objectives previously outlined (meeting 80% decarbonisation on electricity consumption, diversify the energy mix and reducing unexpected consumer price increases) will be the focus of the scheme
Targets setting and success measurements	Targets set, based on capacity, volume or cost. No direct scheme targets				This will depend on how the scheme is structured, but setting clear budget and capacity targets/limits will give better certainty to stakeholders

Source: Cornwall Insight

Figure 22: Key questions – Scheme purpose

Consideration	Key questions
Purpose	• What is the purpose of the scheme? Should the scheme focus on decarbonisation or consumer costs? Should other factors, such as security of supply, be included? Which purpose is most significant and why? How can purposes interact?
Scheme Objectives	• The key questions in the consultation will not be which objective should be utilised in the subsidy, but should one objective take precedent over others • It will also be important to determine which indirect objectives will be applicable
Targets setting/success measurement	• How should targets be set? What kind of metrics should be used? • How will they be measured?

Source: Cornwall Insight

Fundamental drivers (1/4)

Despite the possible alternative purposes of the scheme which could be considered important, there are several factors which are seen as fundamental drivers of the scheme and so need to be considered in relation to all the other considerations. These include:

1) Consumer protection

Consideration: How consumers are going to be protected from high prices, lack of price certainty and volatility in the wholesale market are all important factors in relation to the subsidy scheme. Failure to properly control the costs of the scheme will result in the scheme not being viable from a consumer perspective.

Possible approaches: Key will be to determine the cost of the scheme, making sure this is viable for both consumers and generators. This can be achieved through the use of market linked prices, but also requiring generators to pay back prices when market prices are high, such as has been seen in the GB market. This not only allows consumers protection from generators achieving windfalls but also means that some of the impact of higher prices in the wider wholesale market are mitigated. Careful planning of the subsidy will be important, as will allowing the details of the scheme to be changed for new applicants as/when required, as this will mean that any approaches in the subsidy scheme which have an unexpected impact on consumers can be mitigated quickly. However, this will need to be only applicable for new applicants, so as not to result in the loss of investor confidence. In regard to consumer protection, however, it is also important to consider the differences in the NI market – heating in the NI market is still based on non-network connected generation, with NI Direct reporting that more than two-thirds of NI households use oil boilers as their main source of heating. This is considerably higher than in other markets, and creates additional complications for consumers, as it means that there is less correlation between gas prices (which also impact electricity wholesale prices) and costs to consumers.

2) Sustainability and net zero

Consideration: Increasing the sustainability and renewable generation on the network is an important factor for the NI market, with a targeted 80% of electricity consumption to be met by renewables by 2030. This will be driven by the subsidy scheme.

Possible approaches: Key to allowing the scheme to meet these targets and deploy a large number of assets will be through making the scheme suitably robust to allow the regulator to set relevant budget and/or capacity targets as part of the subsidy process. Being able to set targets means that the government can dictate the rate of new renewables on the network. Being able to change these targets as well means that the government can react if too much or too little renewable power is successful under the scheme. This will allow them to control the scheme, but also may negatively impact investor confidence if the scheme changes regularly. They will therefore need to build and encourage investor's confidence through making the scheme suitably stable and providing a high level of certainty. It will also be important to make sure that the targets used/deployed are realistic for the NI market. We have seen in the RoI and Italian subsidy schemes that scheme costs can be very high or successful deployment can be very low if there is not sufficient competition from assets to meet the required targets. The high percentage (15%) of power in the NI market coming from net imports of electricity indicates that any subsidy scheme is likely to require more focus on the relationship between NI, the RoI and GB markets to provide electricity security.

Fundamental drivers (2/4)

3) Diversify energy mix

Consideration: Whilst encouraging generation from renewable sources will be important for the NI market, there are substantial risks if all that power comes from a single technology type. As a result, diversifying the energy mix will be important.

Possible approaches: Whilst the potential to set budgets and capacity targets will be important for meeting the renewable targets, there will also need to be the ability to encourage different technologies throughout the course of the subsidy scheme. This means they need to be in a position to change how the subsidy operates, increasing or decreasing the requirements for different technologies as the market develops. This will result in more competitive sites and more expensive technologies engaging in the process, whilst not necessarily discouraging cheaper/faster to deploy renewables such as onshore wind. Use of robust pot structures in the GB market or separate tiering structures in the Dutch market have allowed deployment of multiple technologies, including some less established technologies. It is therefore also important to consider if providing different pricing structures/price granularity would be possible. It is, however, important to manage how these different structures are put in place; lots of changes to the scheme may discourage investors from engaging in the subsidy so it will be important to make sure they have certainty of what can and cannot change in the subsidy. It will also, again, be important to make sure the relevant different categories used in the subsidy are sufficiently competitive to make targets obtainable and to avoid high consumer costs.

The smaller level of demand in NI compared to the wider GB market also means there are different risks. Whilst the current percentage of NI demand currently met by onshore wind (17%) and other renewables is lower compared to the rest of the GB market, and there is a high reliance on gas in the market, the smaller total level of demand means that there is scope to obtain considerable benefits from a few assets. A single 1.5 GW offshore wind asset, as has become competitive in the GB scheme, would meet ~83% of the peak demand in the NI market (based on the Utility Regulators figures). This means there are important considerations for the DfE in regard to if a focus should be placed on a few larger assets or a diverse range of smaller assets. However, focusing on a smaller number of larger assets could result in more delivery risk, with network stability issues being more likely if a large generator goes offline/does not generate when required.

In addition, the different focus of the DfE should be taken into consideration, with potentially different technologies being used to diversify electricity generation compared to other markets. There is, for example, limited direct support for small-scale geothermal projects (such as Ground Source Heat Pumps) in the GB scheme, but the DfE indicating that Geothermal Energy was an important sector as part of their Net Zero Pathways.

Fundamental drivers (3/4)

4) Funding approach

Considerations: Several funding approaches are possible for the scheme, and determining the correct one is likely to be a contentious issue, impacting consumers and therefore potentially becoming a political issue. Approaches include payment occurring through taxation placed on all consumers or via a levy linked to the level/amount of power in the market consumed.

Possible approaches: A number of different approaches can be utilised to fund the scheme. This can include taxation, placed on either the general populous or on consumers, a levy (in which consumers pay a fee on a £/MWh basis, so the cost is higher for those who use more power), or through a supplier charge in which suppliers can determine how they recoup this cost from consumers. The taxation approach means that the overall cost is likely to be spread over a wide variety of consumers, potentially limiting the cost per consumer and making the impact lower. However, this means that parties which may not be utilising the power are also paying for it. The opposite is true for the levy approach. A supplier charge approach allows suppliers freedom to approach obtaining the charges how they wish, but it is likely that they will utilise a similar approach to a levy anyway. The high percentage of consumers in the NI market which rely on non-network connected generation for heat and electricity may mean that a levy becomes more expensive for those who rely more heavily on electricity. The fewer the number of customers who are paying for the subsidy, the higher the cost per person and this is likely to be impacted by the high number of consumers which rely on other fuel types.

Within the GB scheme, a supply cap is used for certain domestic customers to pass through any benefit of the CfD scheme to consumers. The lack of this approach may mean that the NI market can not make sure the benefit is paid “by default” as part of the cap. However, the process in NI in which suppliers have to amend prices through approval with the regulator will allow the DfE/regulator to guarantee that the subsidy price is included. This will add additional protection and may avoid the issues seen in the GB market in suppliers failing to make the payments based on the subsidy in certain cases due to contractual ambiguity. However, it will also create additional administration issues and adds additional complexity to the regulators role in confirming pricing approaches. In addition, constant changes to the pricing approaches could make budgeting for both suppliers and consumers more difficult.

Recent increases in wholesale power prices have been addressed differently between the NI market and the rest of the GB market, and this has led to additional complexities and failings, such as the delay in providing some support payments to NI consumers in 2022. There is the potential, therefore, that the subsidy scheme could be utilised to provide a possible support scheme, similar to the Warm Homes Discount used in the GB market.

Fundamental drivers (4/4)

Figure 23: Consideration RAG rating – Fundamental drivers

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Consumer protection	Market linked prices, pay back for over expenditure, careful planning of subsidy, allowing regular amendments to the subsidy scheme				A market linked top up payment (under a Contract for Difference or two-way Feed-in Premium) will be ideal for the NI market, with their use in the SEM already shown to be viable under the RESS scheme. However, this process may not be acceptable to smaller parties in the market, so a fixed rate approach may be more suited to smaller parties in the NI scheme. If this is the case, then there should be suitable limits on the payments associated with the sites so that there are limits on costs borne by consumers
Sustainability and net zero	Developing a strong scheme, deploying high targets, proper engagement with the market promoting investor confidence				Strong budgets and clear market arrangements will be required
Diversify energy mix	Allowing a large amount of controllability of the scheme, promoting different technologies, providing different price granularity				We recommend the DfE maintains the ability to amend the scheme to target specific technologies, but that it gives the market significant notice of any change to avoid undermining investor certainty. Factors such as technology specific budgets and different pot structures will likely be viable, but elements such as tiered pricing based on technology/capacity may be beneficial to the NI scheme as well
Funding approach	Taxation, Levy, supplier obligation				This is open to discission, with both taxation and levy approaches being possible approaches for the NI market. Key will therefore be in determining which approach provides most comfort to consumers whilst also allowing the scheme to be investable

Source: Cornwall Insight

Figure 24: Key questions – Fundamental drivers

Consideration	Key questions
Consumer protection	• What is the best approach for protecting consumers?
Sustainability and net zero	• What is the best approach to encourage engagement from renewables? Will there be sufficient capacity to be competitive in the subsidy?
Diversify energy mix	• What is the best way to incentivise competition in the scheme?
Funding approach	• The nature of the NI energy network means that taxation could result in a number of parties which have minimal engagement in the electricity network being charged, adding to potential fuel poverty issues. It will therefore need to be considered what the impact would be on adding taxation or a levy to existing costs (such as the Public Services Obligation) and which is more beneficial for consumer

Source: Cornwall Insight

Structure of the scheme (1/9)

1) Allocation process

Consideration: It will be important to determine how participants can register or win the subsidy. This will drive elements such as the level of competition (and the impact this has on costs), the certainty of costs to consumers, the level of administration associated with the scheme, and the details of how the scheme will be implemented. This will be an important consideration in the early stages of development, as some approaches (such as auctions) will have very different requirements and impacts on the market compared to other approaches (such as a regulator sign off approach).

Possible approaches: A number of approaches could be implemented in relation to the actual allocation of the scheme. Determining successful sites could be undertaken by an auction/tender process, application process or with a regulatory/stakeholder sign off process. Auction processes could focus on cost, capacity or other parameters in relation to the sites, and allow for high competition (reducing costs). This approach also allows greater control of volumes by the regulator. However, it potentially limits the development timeframes for the project, and also may prevent some parties from engaging in the scheme. Application processes allow more assets to benefit from the subsidy, but require more administration, and also have the risk of high costs if a large number of eligible applicants apply. Similar concerns are applicable for the regulator sign off process, but the regulator has more control to allow/reject certain assets. However, there may be a demand from applicants for clarity of approach, removing this benefit.

The NI scheme would be in an unusual position, with links to both the GB and RESS schemes. There is therefore the argument that one of these CfD schemes could be used as a base of the subsidy scheme, but the DfE would need to modify the schemes to make it viable for the NI market. Additionally, considerations around the size of assets deployed may mean that a CfD scheme is not viable; if a focus is placed on domestic/microgeneration assets, a CfD structure may be less appealing to applicants. This is discussed more below.

2) Contract structure

Consideration: How payments are made, and how contracts are structured, has a number of different options (such as a Contract for Difference or a fixed payment), so clarification on approach taken will be important, particularly in regards to determining the level of payment certainty and the level of risk associated with the contract from a generator's perspective. It will also impact consumer costs.

Possible approaches: A number of contract structures are possible for the subsidy. The regulator could put a certification process in place, where generators get a certificate related to generation and the suppliers are required to purchase these certificates to meet obligations. There is a fixed payment approach, where single prices are paid for the output from an asset with minimal wider considerations. A Feed-in Tariffs (FiT) may also be applicable, in which the subsidy is paid on the expected difference between wholesale prices and asset levelised costs of energy (LCOE). This is in contrast to a Feed-in Premium (FiP), which is also an option and in which the subsidy is paid on the actual difference between wholesale prices and asset LCOEs. Additionally, a Contract for Difference (CfD) scheme may be put in place, in which the difference between the asset costs and the wholesale prices is paid, with the generator returning any payment when the wholesale price rises above the agreed asset costs.

Structure of the scheme (2/9)

Possible approach (cont.): A certification scheme has the benefit of placing some of the administrative burden on suppliers. However, there is a strong risk that over generation could lead to either higher consumer costs or a reduction in the price of certificates. The introduction of an additional trading element means that there is more price risk for investors. FiT schemes provide more certainty for investors. However, the uncapped payments associated with the sites mean that assets which generate more than anticipated will cost consumers more than expected.

Failure to properly forecast the payment requirement for sites could lead to higher than required payments from consumers. Additionally, if the asset has additional access to market payments, they may achieve considerably higher revenues than required, making the scheme unreflective and costly. FiP schemes remove part of this concern by only paying the difference between the market price and the price agreed. This means there is a limit on the cost to consumers. CfD schemes have the additional benefit of meaning that any upside is past to consumers, meaning that there is more visibility of the maximum cost of the scheme, and that consumers are protected when wholesale prices are very high. This does mean that generators have less potential for upside benefit but also have a level of guarantee under the scheme.

3) Delivery body(s) & Stakeholders

Consideration: Which stakeholders (regulators, government, SO etc) are involved in the scheme will be important for producing both consumer confidence and assessing administrative requirements, so this will be an important consideration in creating the scheme.

Possible approaches: Delivery bodies in the scheme will be important, as there will be significant administrative (and potentially financial) risk placed on the bodies. Services could be provided by the government, the SO, the Energy Regulator, the code manager, a public 3rd party or a private 3rd party. Each entity will have their own benefits and issues with providing the service, and will have their own level of interest in providing the service. A large number of markets, including the GB market, utilise a number of different entities to undertake a different role in the scheme (such as running the auction, acting as the contract counterparty, providing billing and invoicing). This may be the best approach for the NI market.

There is an argument for utilising the existing bodies (National Grid, Low Carbon Contracts Company etc) used in the GB scheme to provide similar services for the NI market. This would reduce costs and allow for greater efficiency of deployment practically in the early stages of delivery. There is, however, uncertainty if these entities would be in a position to provide these services for an additional market. In addition, some control over how the scheme is delivered may be lost by the DfE. Also, there is likely to be a costs element associated with obtaining these services, so pricing metrics would need to be very clear to make sure that neither subsidy scheme (or associated market) believed they were covering more than their fair share of costs.

Structure of the scheme (3/9)

4) Timing of the subsidy

Consideration: How regularly the subsidy is available to the market (such as determining if it is a continuous process or only open to applicants in a single process each year) will be important, as this will impact both confidence in the scheme and the level of competition. It will also impact the administrative burden of the scheme.

Possible approaches: It will need to be determined when entry to the scheme should take place. Access to the subsidy may be allowed on a continuous basis, or may be managed on a regular basis (i.e., allowing access on an annual or biennial basis). Alternatively, the regulator may only open the subsidy to new applicants when required. Opening the subsidies on a set timeframe allows for greater control in the number of applicants and the process implemented. It also allows for amendments to be made to the scheme between each subsidy round, rectifying issues and responding to changes in the market. It should also lead to higher levels of competition, as generators have to wait for an auction period to apply for the scheme. However, it may also cause issues for entities looking to get eligibility requirements in place in time for certain auctions.

Swift deployment of the scheme is likely to be important for the NI market, with a large amount of conventional generation due to close in the next few years, likely exacerbating any continued supply issues. Many arrangements in the NI scheme may require alternative timelines to be considered. Within the NI market, for example, the grid connection process is often dependent on obtaining planning consent. This means that the timeframes for obtaining each element (and therefore being eligible for the subsidy) would need to factor in these possible time delays. This would impact how investors engage in the subsidy, and could impact prices. The purpose of the scheme will also be important; more focus on microgeneration/domestic assets will likely require continuous/more regular options for obtaining a subsidy.

5) Agreement length

Consideration: How long the payments are in place for will impact bidding strategies, investor confidence and scheme costs, so will be an important consideration, as balance will need to be found which allows investors to achieve their required levels of return but not place unnecessary price burden on consumers.

Possible approaches: The contract lengths which can be considered vary depending on scheme approach. Payments can be associated with the lifetime of the asset, or looked at for a fixed period. Alternatively, they can also be based on a timeframe submitted by the applicant as part of the submission process. Payments based on asset lifetime may allow for lower prices due to potentially lower risk at the end of an assets operating life (the merchant tail), but potentially means higher costs in total. It would also be challenging to determine the suitable life of an asset given technological advancements. Fixing prices for a period means that there is less administrative risk and probably lower cost overall, but this means investors have more risk in regards to revenues after the contract has ended, negating the lower cost consideration. By submitting the period in which prices are covered, competitive tensions should make this more beneficial for consumers. However, this is a sizable risk that the calculations employed are not suitable and therefore non-delivery risk becomes significant.

Structure of the scheme (4/9)

Possible approaches (cont.): Key to the length of contract in the approach undertaken by the DfE in NI will be balancing investor confidence with consumer costs, as failure to provide suitable comfort to investors will result in lack of engagement, but high prices will lead to consumer concerns. This is seen in other schemes, with longer duration agreements being considered in the RESS auctions to provide additional support to developers whilst a call for evidence in relation to the GB scheme suggested shorter term contracts may be more beneficial.

6) Stakeholder roles

Consideration: There are a number of different roles which will need to be filled in order to deliver the subsidy (such as requiring an authority to manage an auction if an auction is in place), and so it is important to consider the requirement of these roles in detail.

Possible approaches: There are likely to be a number of different stakeholder roles in the auction. This is likely to include a scheme manager (who addresses changes to the scheme), a settlements company (making payments), a regulator (managing wider issues with the schemes), a contracting company (signing and managing contracts) and possibly others. Additional burden placed on certain stakeholders may also impact existing requirements within the NI market, such as the role of the regulator in approving changes to the prices charged by suppliers. As discussed above, there may be scope for cross over with the GB scheme, but this would require discussion and potentially could lead to a loss of autonomy for the DfE if not implemented correctly.

7) Impact on wholesale market

Consideration: Subsidies which provide payments for assets based on generation output, with no limits set, can result in periods where demand is low but generation is high and unabated. This, in turn, results in the cannibalisation of wholesale prices, dampening prices and even resulting in negative price periods. This is beneficial to consumers but provides negative signals for investors. It also negatively impacts generators not on a subsidy. How cannibalisation and negative price events are accounted for in the subsidy will therefore be important.

Possible approaches: Assets could be forced to react to certain market events to limit the impact they have on wider wholesale market prices. This can be seen in the GB scheme, in which assets successful in recent allocation rounds do not receive any payment in relation to generation which occurs during periods when the market price is below zero. This provides protection to subsidy free assets in the market, for whom the wholesale price is a significant factor. However, approaches such as these will increase risk for subsidised generators, which may lead to higher costs in the subsidy.

With the NI market forming part of the SEM market, and therefore impacted by generation in the RoI market, there is additional complexity as wholesale pricing is impacted more directly by the actions of generators in other markets. It also, however, provides additional benefits as it gives market participants more trading options to utilise the generation. The nature of the NI subsidy scheme will also have an impact; a focus on microgeneration will require less/no requirement to react to market prices, as smaller assets will have less capacity to do so.

Structure of the scheme (5/9)

8) Price sources

Consideration: Details will need to be produced on how the prices are produced and where this methodology is outlined. It will also need to consider if any market linked prices are applicable and, if so, how they are sourced. This will be important for both investors and consumers as it will determine the level of payment but also the amount of variability and predictability associated with the payments over the life of the subsidy. This not only applies to the price paid to the generators, but any additional pricing metrics used in the subsidy (such as defining the market payment which is topped up to the agreed price in a CfD structure, if applicable).

Possible approaches: Price sources will depend on the details of the auction approach and payment approach; a CfD scheme will require a strike price to be agreed with participants but will require a reference price which is market linked, whilst a fixed price payment will require clear methodologies for calculation. Linking prices to a market price means they are reflective of the market and thus indicate a fair payment to generators compared to what they would receive in the market. However, this means consumers pay more if market prices increase and have less certainty on the cost of scheme if there is no cap in place (such as via CfDs). Fixing prices, conversely, provides more scheme costs certainty, and increases generator payment certainty. However, they may lead to consumers paying more than anticipated.

9) Price clearing process

Consideration: If the subsidy is delivered via an auction structure, how prices are cleared under the subsidy scheme will be important. It will determine how investors engage in the scheme due to the level of control and certainty they can achieve in the auction. It will also, as a result, have an impact on the costs to consumers achieved in the scheme.

Possible approaches: Pay-as-clear prices encourage competition, as assets can bid in prices knowing they will be uplifted to the clearing price and thus achieve additional benefits. However, this also means that consumers could be in the position of paying more money to an asset than the asset is required to be developed. Pay-as-bid approaches mean that assets can achieve a level of revenue required for developing the asset without this risk, but also means that generators may be able to achieve higher revenues in uncompetitive auctions. Fixed rates provide a large amount of certainty to developers and consumers, but require calculation which can be risky and not reflective of either the market power prices or asset costs. A set by regulator approach, in which the relevant authority calculates the payment based on expected asset costs/requirements, means that there is more complexity for the regulator in calculating costs, and there is more risk to consumers if a suitable cap is not put in place. However, this approach provides additional benefit to generators as it provides more certainty and is easier to forecast.

The requirement within the NI scheme to include diversification and decarbonisation means that there is a potential conflict in approach on price clearing process. It will therefore be important for the DfE to consider key drivers in approach and how this will impact decision making for those engaging in the subsidy. The scale of asset is likely to have an impact, with smaller developers less likely to have a firm understanding of their cost requirements, making set by regulator prices more beneficial as they potentially mitigate poor price calculation (and therefore non-delivery) risk.

Structure of the scheme (6/9)

Possible approaches (cont.): Using a set by regulator approach means that there is likely to be a different perspective on competition compared to other approaches, as generators will not be competing to achieve the lowest price. However, the increased certainty of payment within this approach could result in a high number of entities engaging in the subsidy if the set prices are reasonable. There is, however, also a risk of oversubscription if the prices are not set correctly and are set too high. This was seen in the GB Feed-in Tariff (FiT) scheme, which saw high payments for certain assets as a result of the cost of capital reducing more than expected during the operation of the scheme. This approach will therefore be important as the DfE would have to have confidence that they had set suitable prices. This approach is, however, likely to be favored by smaller generators as it removes the uncertainty of competitive auctions, so may be more beneficial for the NI market.

10) Payment timescales

Consideration: The regularity of payments to developers under the scheme will impact investor considerations, and could impact required payment levels. In addition, the payment timelines from consumers could also be problematic if they are stringent.

Possible approaches: Considerations about payment timescales will be required, both in regards to when the generators receive payment under the scheme and when suppliers/consumers have to make a payment. Monthly payments are likely to be favorable for generators, but this might make obtaining payments from consumers challenging. Longer term timelines for payments from consumers may make this easier, but also potentially leads to an issue if offtakers miss payments due to the sums associated being much bigger.

The current lack of a price cap means that suppliers in the NI market are able to change prices more regularly and with more accuracy than in the GB market, protecting consumers from substantial changes in electricity prices, hedging some elements of price risk and being quick to reflect reductions in prices. However, the introduction of a subsidy scheme in which payments are made on a set basis may limit the ability of suppliers to amend their prices/contract offerings so this will need to be taken into consideration by the DfE.

11) Price indexation and adjustments

Consideration: How prices are adjusted throughout the life of the subsidy will be crucial for generator/investor confidence; the more scope there is for the prices to change, the less certainty they will have and the more they will have to price into the scheme, increasing costs.

Possible approaches: A variety of approaches can be used for the scheme. Adding an inflation element means the scheme is more appealing to investors, but also means that the real cost to consumers increases. Market linked approaches, in which the scheme has prices change as a result of changes in the market, mean the scheme remains reflective of the market but can lead to lower generator certainty and higher consumer costs. Linking prices to the level of generation or volumes generated means that there can be protections to consumers, but also limits the incentive for generators to deploy large amount of output. Policy changes, like accounting for changes in network costs, can offer more protection to investors, but also may increase consumer costs. Regulator led approaches, such as the approach taken in the SDE++, may allow the regulator to control costs, protect consumers, but lack of visibility on the process for amending prices can lead to generator uncertainty and risk. It is therefore also crucial to determine if the market will have visibility on how a price change is calculated.

Structure of the scheme (7/9)

Possible approaches (cont.): The use of the Consumer Price Index (CPI) in NI, and its associated use in the GB market, means that this is a viable possible approach. Evidence from the RESS market also indicates that investors have concerns about clearing/subsidy prices which do not increase with inflation, so it is likely that some sort of inflation factor is required to make the scheme attractive to investors.

Figure 25: Consideration RAG rating – Structure of the scheme

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Allocation process	Auction prices, tender process, application process, authority/regulator sign off				Auction processes are likely to be viable in the NI market, but the scale of assets and the focus on microgenerators may mean that an application process is more acceptable to smaller NI participants
Contract structure	Certification scheme, FiT, FiP, CfD, Fixed payment (based on volume, capacity or per annum)				A CfD scheme protects consumers so should be considered first. The key question will be the level of competition from microgeneration. Smaller developers may find a CfD structure challenging, so a fixed rate FiT may be appropriate
Delivery body(s) & Stakeholders	Various, driven by the details of the scheme				This will be driven by the details of the scheme and likely can be considered later in the process once other variables have been confirmed
Timing of the subsidy	Will be driven by the scheme, but likely either continuous, annual or two yearly				This will be driven by the details of the scheme, particularly if a CfD structure is used (in which case regular auctions will be required) or if a fixed rate approach is used (in which a continuous process is required)
Agreement length	Lifetime of the asset, fixed period, technology/site specific period, length based on figures submitted in the application				This will be contentious, with many markets seeing investors having different requirements based on the other parameters of the scheme. It will therefore be an important element for the DfE to consult on

Source: Cornwall Insight

Structure of the scheme (8/9)

Figure 25 (cont.): Consideration RAG rating – Structure of the scheme

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Stakeholder roles	Various, driven by the details of the scheme				This will be driven by the details of the scheme, and will need to be considered in more detail once the details of the scheme have been implemented
Impact on wholesale market	Various, including no payment is market prices go negative, no penalties				Incentivisation of non-delivery under the subsidy will be important, but again microgenerators may find this difficult to deliver so careful consideration is required
Price sources	Regulator (DfE etc) forecasts, calculation formulas, market references (SEM)				This will be driven by the details of the scheme, but the SEM appears a suitable approach for any price calculations where applicable, given its role in RESS
Price clearing process	Pay as clear, pay-as-bid, fixed rates				Pay as clear is likely to be more beneficial if an auction is put in place, whilst fixed rate approaches will be better for smaller assets if alternative structures are considered ideal
Payment timescales	Monthly, quarterly, annual				Monthly is likely to be expected by investors and should be manageable for consumers/suppliers
Price indexation & adjustments	Index linked, market linked, generation impacted, policy changes, regulator led				Whilst a risk for consumers, inflation will be expected in the NI market, and the lack of inflation within the RESS scheme as seen high prices being achieved. In contrast, the certainty provided by indexation in the GB scheme has seen a large amount of engagement and lower pricing

Source: Cornwall Insight

Structure of the scheme (9/9)

Figure 26: Key questions – Structure of the scheme

Consideration	Key questions
Allocation process	• Key considerations will include determining the number of applicants which are likely to take part in the subsidy, and assessing if this means that an auction would be competitive or not. It is also important to consider the capacity of a regulator/stakeholder to manage an application process. Purpose of the scheme will also remain important, as this will determine if the DfE want to have more control over applicant success rates
Contract structure	• Key considerations will be in regards to which approach is best suited to protect consumers
Delivery body(s) & Stakeholders	• In order to consider which stakeholder(s) to manage the subsidy scheme, NI will need to gauge the interest of entities in provide these services, as well as their capacity. Discussion with the entrants should also be sort to determine the level of acceptance they would have in dealing with some of these entities. It is also useful to assess if there is the possibility to use a similar structure to those seen in the GB scheme
Timing of the subsidy	• The type of roles which need to be considered will depend on the agreed make up of the scheme. An auction approach is likely to depend on set parameters (such as holding an auction every year), whilst a certification scheme is likely to result in the requirement for continuous access to the subsidy
Agreement length	• Key will be determining the length of contracts which the investors in the scheme will be comfortable with, and how realistic it would be to have generators set their own targets
Stakeholder roles	• The type of roles which need to be considered will depend on the agreed make up of the scheme (i.e. if an auction approach is considered, a stakeholder will be required to manage the auction process)
Impact on wholesale market	• Key will be assessing what capabilities assets will have to react to market signals, what possible actions could be taken to mitigate any concerns and what impact this approach would have on pricing. This will ultimately determine the viability of determining the approach to be taken, with a balance being required between maintaining investor confidence and providing network support
Price sources	• It will be important to determine what investors are comfortable with in relation to possible pricing approaches • It will then need to be determined what impact this has on consumers
Price clearing process	• Key will be determining if pay-as-bid or pay-as-cleared approaches will encourage more assets to engage in an auction or subsidy if this approach is used
Payment timescales	• Payment timelines will depend on what offtakers (and by extension consumers) believe to be suitable and what investors deem to be a suitable payment period
Price indexation and adjustments	• How should price indexation be accounted for? • How much clarity on price adjustment calculations should be included in the subsidy?

Source: Cornwall Insight

Generation & output (1/6)

1) Payment metric

Consideration: Determining what units/approach will be used to organise payment will impact the level of certainty achieved by investors as well as the level of consumer costs and, as a result, will be important for the scheme.

Possible approaches: There are a variety of payment approaches available in subsidy schemes, including payments on the generation from the asset (utilisation), payment for the asset being available (availability) and payment on a fixed rate/asset capacity rate regardless of the operating parameter of the asset. The greater the focus is placed on the actual output of the asset, the more representative the payment will be to the assistance from the asset in providing generating power to the grid. This approach additionally removes the risk of assets being built but failing to deliver power and still being paid. However, the greater the risk to consumers in approaches based on generation, with the cost of the scheme potentially being higher than expected. Volume linked payments are also less favorable for investors. However, most of the schemes assessed make a payment based on volumes delivered so investors are confident (or are likely to become confident) in this approach. Payment on generation allows the generators to receive payments for all generation and increase the renewable output on the network, but disregards the impact of generation on system imbalance. Payment on availability looks to mitigate this issue relating to imbalance, but potentially results in renewable generators being paid for non-generation, whilst maintaining cheaper but fossil fuel producing generators to continue operation; if there is oversupply for power, renewable assets under this structure will likely to be the first assets to be turned off, whilst fossil fuel assets may continue to be operational. It will therefore be important to consider how significant impacts on the wider market will be in regards to the subsidy scheme. This will link back to the purpose of the subsidy scheme as previously discussed.

Providing payments on a fixed rate/standing charge provides long term certainty on costs to consumers, whilst also providing investors with suitable levels of confidence that payments will be received. However, they may mean that assets are being paid without providing the output expected from the asset. Basing the payment on utilisation will mean that payment is only made in relation to renewable output. This will also encourage greater efficiencies in asset optimisation, potentially reducing costs. However, it means costs to consumers are less certain, with higher than expected generation resulting in additional costs to consumers.

Payment based on capital costs as an upfront grant allows the generator to determine the expected return from the asset with limited risk. However, this approach means there is a large amount of non-deliver or non-development risk. This also requires careful setting of subsidy payments up front and there are risks of over or underpayment, meaning consumer payments may not be properly optimised.

2) Volume requirements

Consideration: Considerations will be required in regards to if volume targets should be set under the scheme. Setting volume targets is likely to remove some assets which are unable or unwilling to compete, reducing competition. However, it may also result in more security being available for the system operator. Volume target levels will impact delivery risk, so will be important considerations for generators. This will, also, impact consumers for whom costs may be impacted.

Generation & output (2/6)

Possible approaches: A number of different approaches could be undertaken to fix the volumes required under the subsidy scheme. Volumes could be required to be delivered on a fixed basis, such as requiring the generation of a set or target volume on an annual basis. Minimum or maximum volumes of power delivered could also be applicable, with a maximum cap used to prevent payment occurring if the asset generates more than expected. Alternatively, no volume targets may be applicable within the subsidy, and assets may be free to deliver as much or as little power as they can. These approaches could be applied agnostically or different approaches could be applied for different types of sites (i.e., by technology). Setting volume targets has the benefit of guaranteeing a certain level of volume produced by the asset under the subsidy, allowing for certain guarantees in regards to the effectiveness of bringing new renewable generation to market. The use of maximum caps allows this, and allows protection for consumers by limiting the overall payment under the scheme. However, setting caps could mean that there is more risk to developers or investors as risks are higher if they have issues in construction. This might reduce confidence in the scheme and increase payment requirements. The GB scheme does not have any volume caps, and penalties are only introduced if an asset terminates their contract.

There is an inherent conflict in the possible approach for the NI scheme of utilising the GB scheme as a base, as there are a number of elements in the CfD such as linking the metered data to the Balancing and Settlement Code (BSC). In contrast, the RESS scheme shows the possible approaches which could be incorporated into the subsidy to fit into the SEM scheme, but does not provide all information required for a suitable contract to be put into place in line with UK legislation. It is therefore crucial for the DfE to consider how this conflict between the contractual arrangement of the GB scheme and the practical arrangement of the RESS scheme are balanced.

3) Eligible generation

Consideration: Considerations will be required around what type of output from the site is eligible for payment, and whether power consumed on site should be eligible for the scheme. This consideration is likely to impact competition.

Possible approaches: A number of different approaches can be undertaken in relation to what power is eligible for payment. Parasitic load is unlikely to be included, but inclusion of power consumed on site (either by the generator or by a 3rd party) may be viable. However, only making payments on export may be viable. By focusing on export only payments, the NI consumers obtain the direct benefit of the renewable power from the assets. However, this might mean that some assets can not be developed because they have a large amount of onsite consumption. In contrast, making payment in relation to onsite consumption will allow for decarbonisation of those sites, but means the consumers at those sites achieve a double benefit (subsidy plus lower consumption costs). Payments in relation to onsite consumption will also require more complex metering arrangements, which adds complexity and more challenges from a regulatory and legislative perspective. Given the nature of the NI market, with potentially a large number of developers with large onsite consumption requirements, payments for onsite generation may be important and need careful consideration. This is particularly important if a focus is placed on domestic and microgeneration assets.

Generation & output (3/6)

4) Technologies included

Consideration: A key question will be what types of technologies are eligible for the subsidy. Considerations will need to be made about what metrics will be used to determine the technologies included, and how they are measured. Many schemes in other markets look at low carbon or renewable technologies, but it will be important to define these technologies. Aspects such as should fueled assets (like Energy from Waste assets) be eligible and, if so, should payments only be applicable for the renewable content of the relevant fuel mix. This consideration will not only impact the resulting fuel mix from the subsidy, but also the level of competition and potential costs.

Possible approaches: The inclusion of different technologies or not within the subsidy scheme will be crucial in meeting the overall purpose of the scheme. Considerations exist around if all technology types should be included, or if low carbon technologies should be the only technologies included. It will also be important to consider if flexible assets should be included. The inclusion of all technologies will help keep prices low but is likely to be less beneficial in decarbonisation. Focus on low carbon technologies will obviously achieve this but probably at much higher consumer costs. Inclusion of flexible assets may mean that there is more cost-effective use of renewables, but funding models are more difficult and add complexity and uncertainty. Technology specific selections may also be a possibility, but may be politically challenging. It is also important to consider the wider drivers which will dictate the technologies which need to be eligible for the scheme, both in the first iteration of the scheme and in the future. Aspects which will need to be considered will include:

- Security of supply considerations – it will be important to consider how the technologies used in the subsidy will provide security to the NI energy market
- Carbon impact of trading – subsidies such as the SDE++ in the Netherlands also include a consideration about the level of carbon produced and offset by the generator. This adds complexity in regards to the scheme but also potentially allows the government to succeed at meeting their decarbonisation targets

5) Technology agnostic schemes / Technological separation

Consideration: An important consideration will be whether the scheme should be technology agnostic, allowing all technologies to compete against one another. A technology agnostic approach is potentially beneficial to consumers as the cheapest assets are likely to be successful in the process. However, this is also likely to prevent innovation of new technologies, result in a generation mix with limited diversity, and reduced generation security.

Possible approaches: Potentially one of the most controversial considerations will be the technology split. The scheme could be a full agnostic scheme, resulting in all assets competing against each other. This approach will potentially lead to the lowest prices to consumers, but is likely to lead to a lack of diversity of generation mix (in turn potentially causing system management issues). Pot/tiered structures may also be useful, as it allows high competitive tensions whilst allowing focus on technological diversity. It may, however, be challenging to justify which technologies are separated into which pots. Technology specific pricing may be possible, but may lead to increased costs for consumers by promoting a large amount of deployment of expensive technologies.

Generation & output (4/6)

Possible approaches (cont.): The focus of the NI scheme on diversification will mean that a number of different technologies will need to be included into the scheme, but the requirement for decarbonisation will mean that these technologies will need to have a focus on sustainability. The focus of the DfE on technologies such as geothermal projects, which require additional considerations and are less established (and therefore more expensive) will mean the subsidy will need to be carefully planned to facilitate meeting these needs. This consideration is also therefore heavily linked to other elements such as if the subsidy is technology agnostic.

6) Constraint and Curtailment

Consideration: Assets which are constrained by the SO more regularly result in lower output and therefore have less of an impact on decarbonisation and the generation mix. It is important to consider if these elements need to be factored into the subsidy scheme process or if the expectation would be that generators would need to account for this risk in their price determination process. This will impact consumer confidence in the scheme, as well as the success of the scheme in meeting its objectives, and the impact on consumer costs.

Possible approaches: By including a compensation element for curtailment events, generators and their investors achieve a higher level of certainty of payment. However, this will increase the overall costs of the scheme. Not including a constraint/curtailment compensation element will increase risks to generators, however, and could lead to higher prices being required. This is particularly a concern given the expectation of higher future constraint occurrences due to the increasing pressure on the network. A middle ground approach, where compensation only occurs where constraints occur a set number of times, may be beneficial.

In RoI, RESS 3 is looking to provide compensation beyond the curtailment compensation arrangement (CCA) used in RESS1 and 2. The CCA has not proven sufficient to remove risk premium being included in bid prices due to uncertainty relating to curtailment and oversupply and therefore unrealised available energy compensation (UAEC) is being proposed which compensates availability not converted to generation for curtailment or oversupply. Given the similar levels of curtailment in NI and RoI, this expansion of curtailment compensation may be worth considering to dampen the overall participant bid prices.

However, there may be limitations in regards to how constraints can be managed under the scheme due to limitations placed on the application on the Clean Energy Package (CEP) and the SEM. Options around how constraints are included into the subsidy scheme for NI may, therefore, be limited. There may also be scope for including constraints as part of the assessment process for eligible sites, with sites which have a higher probability of being constrained having a less favourable position in a competitive process. This would result in more protection to consumers and more success in decarbonising the network, but also may reduce competition as some sites which would otherwise be eligible for the scheme become no longer viable.

Generation & output (5/6)

Figure 27: Consideration RAG rating – Generation & output

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Payment metric	Payments made on availability, payments made on utilisation, fixed rate payments, payments made on capacity, upfront grant				Availability payments provide the most security to consumers and incentivise renewable generation in favor of other assets, so is likely to be the best option for the DfE
Volume requirements	Fixed volume targets, minimum volume targets, maximum volume caps, no targets, tiered structures				Whilst volume targets are beneficial, they are not established in most other schemes, so are likely to be unacceptable to investors in the current market without significant caveats
Eligible generation	Allow payment for parasitic load, allow payment for power consumed on site, allow payment for power consumed by a third party, only allow payment on exported power				The potential nature of NI assets, with a focus on consuming generation on site, means that payment for all power generated (except parasitic load) is likely to be of interest to a number of parties. However, payment just for exported power may be seen as viable as well
Technologies included	Low carbon only, all generation, flexible generation (batteries), future generation (CCS and Hydrogen)				Low carbon only generation should be how the scheme initially operates, but there should be scope left for new technologies to be included into the auction as/when they develop
Technology agnostic schemes / Technological separation	Full technology agnostic, split into different categories/pots, all technology get separate prices				This will depend on the allocation process. If an auction is seen as the optimum approach, then pot structures provide a good balance between allowing a high level of competition whilst facilitating new more expensive technologies. If an application process is used, then a tiered process split by technology is likely to be more beneficial, as it can provide greater granularity
Constraint and Curtailment	Fixed volume targets, minimum volume targets, maximum volume caps, no targets, tiered structures, penalties based on probable level of constraint				This will be driven by investor interest; the constraint requirements in the RESS scheme have impacted competition levels. It will therefore be important for DfE to find a suitable balance between consumer protection and investor confidence

Source: Cornwall Insight

Generation & output (6/6)

Figure 28: Key questions – Generation & output

Consideration	Key questions
Payment metric	• Key will be in determining if there is a benefit to consumers in one approach over another and, if that approach is implemented, what impact this would have on investors
Volume requirements	• Key will therefore be in determining if the scheme is designed to guarantee the volumes produced or allow for investors/generators to have more flexibility in regards to their approach – this links back to the purpose of the scheme
Eligible generation	• Key to this consideration will be determining the number of sites which will require on site demand, and how big an impact it would have subsidising this generation. This may be relevant to NI, given the large number of potential small-scale generators
Technologies included	• Whilst the purpose of the scheme will be important, it will also be important to assess the possible types of assets which can be deployed in NI, as the size of the possible market should also drive the technologies considered • What technologies should be eligible for the scheme? • How will these elements change in the future?

Technology agnostic schemes / Technological separation	• An important aspect of determining the correct approach will be the possible level of deployment of different technologies in the NI market. Additionally, consideration will be required to assess how levelised costs of energy compare from one technology to the next
	• Should the auction be agnostic, so all technologies compete against each other?
	• If an alternative approach is implemented, how should this work?
	  ○ Should a Pot Structure be used?
	  ○ Should technology specific prices be applicable?

Drivers for technology selection	• How should the scheme determine which technologies are eligible? • Should this be based on renewable or low carbon generation? If so, how should renewable or low carbon be defined? Should other factors, such as co-location, be factored into the considerations? • Should fueled sites be included? If so, how should assets without 100% renewable fuel stocks be considered?

Source: Cornwall Insight

Eligibility criteria (1/8)

1) Non-delivery impacts and Financing requirements

Consideration: Considerations will be required in regards to the penalties associated with not delivering the asset as tendered for. The more severe the penalties, the fewer developers will engage in the process but the less scope there will be for asset non-development.

Possible approaches: Penalties for non-delivery will need to be well balanced, in order to allow developers comfort to attempt to participate in the scheme, but not be so minimal as to result in high non-delivery risk. Options can include charging a bid bond at the stage of tendering for the subsidy (which is then retained by the regulator if a subsidy is put in place but delivery does not occur), exclusion of the asset from future auctions, or (most severely) the generator having to pay the lost costs (i.e. the value of the scheme) if generation does not occur. Alternatively, no penalties for failure to deliver could be considered. Including a financial security in the auction process, such as a bid bond approach, are important as they increase the cost of developing an asset. The possible inclusion of bid bonds may limit the number of participants in a subsidy who do not reach financial close and therefore do not develop. However, it may also mean that smaller developers are unable to compete for the subsidy, not having the additional funds required to cover the bonds. The more aggressive the non delivery penalties and the more they put a financial risk on developers, the less competition will be seen in the auctions and the more risk will lie with generators, which may result in higher prices. Lack of a bid bond is likely to be the optimum approach for the NI market, given the likely scale of assets participating in the scheme.

2) Key documentation

Consideration: Determining which pieces of documentation will need to be in place for an asset to be eligible will be crucial. Elements such as determining if planning will need to be in place will be important, as they will determine both the level of competition seen in the scheme as well as the likelihood of the scheme meeting its objectives. Additional technical requirements may also be applicable, based on the details such as technology or size. Examples include offshore leasing arrangements in the GB scheme for offshore wind sites and supply chain plans for assets above a certain size. Determining these alternative requirements will be crucial, as they will dictate the level of competition between different asset types.

Possible approaches: There are a number of pieces of key documentation which can be considered when assessing a site's eligibility for the scheme. This can include planning permission and if this is required for the site. The more stringent these requirements are and the more they need to show the asset is in a strong development position, the likely lower the level of competition in the auction but the higher the level of certainty that the assets will actually be developed. Whether the documentation is or is not required will therefore depend on the level of competition required in the market compared to the level of development risk which the DfE is willing to take in regards to the scheme. NI approaches will not, however, be a direct analogue for approaches undertaken in the GB and RESS schemes. The grid connection requirements in the NI auction may, for example, need to be more complex due to the clustered approach for grid connections which mean approval is dependent on other assets. These nuances will need to be considered by the DfE.

Eligibility criteria (2/8)

3) Alternative requirements

Consideration: A wider number of additional requirements could be put in place for assets (such as supply chain plans explaining the providence of the equipment to be used at site). It is important to consider if these elements are required, both for all assets and for assets with certain development details (such as technology/size/location specific), as this will impact competition and costs to consumers.

Possible approaches: Linked to the key documentation, there are several additional pieces of documentation which may be important for specific site types. This might include:

- Fuel mix disclosure agreements – for fuelled sites (such as Energy from Waste, or EfW)
- Supply chain plans – for large assets (such as over 300MW assets in the GB scheme)
- Offshore licencing agreements – for offshore projects

As with the key documentation, the higher the level of detail in these documents, the higher the level of delivery certainty but the higher the potential of low competition, impacting prices.

4) Grid connection requirement

Consideration: The requirement for grid connections to be in place could be costly for developers but equally provides greater certainty that the asset will move forward in development. Subsidy schemes may, however, have a knock on effect by leading to a number of assets signing agreements to be eligible for a subsidy scheme but being unsuccessful in the auction, leading to capacity issues on the network and restricting further applications for grid connections.

Possible approaches: Having a suitable grid connection to be in place provides more certainty that the asset is in a shovel ready position, reducing non-delivery risk. However, the development timelines for renewables may mean that requiring a grid connection to be in place will limit a number of projects and can reduce competition. In addition, there are a number of different stages in signing a grid connection, so it will be important to consider if applicants require a signed grid connection agreement, a grid connection offer which has not been accepted or an alternative approach.

5) Community considerations

Consideration: Schemes such as the RESS scheme in Ireland dictate the level of support in which the local community should receive from an asset subsidised under the scheme. In contrast, the GB CfD scheme has no previsions for the local community. Including a provision within the subsidy payments which means that payments are made to the local community means that there is certainty of community benefits from the scheme. However, it may also mean that payments to communities are restricted in regards to how they are used and the level of benefit achieved.

Eligibility criteria (3/8)

Possible approaches: There are a number of possible approaches in relation to including community benefits. There could be a direct inclusion element, in which a generator is forced to pay a set value to the local community in a heavily prescribed manner (such as in the RESS scheme). The subsidy could require community benefits to be provided by the generator but have limited information around what this approach should be, or it can not include any prevision in the subsidy scheme. By not including in the subsidy scheme, this reduces demand on generators. Additionally, it does not lead to additional charges for generators if they have set up a scheme as part of another part of the development cycle (such as in their planning application). However, it also means there is a risk local communities do not receive any benefit from a scheme being located in their region.

Community benefit approaches have been split in other markets (such as the RESS scheme having a community project pot in earlier auctions). This approach may be of interest for the NI market, allowing community projects to compete with larger commercial projects. However, the additional complexity of this approach in the RESS market has caused issues in regards to competition, and appears to be in the process of being changed/removed. Additionally, community benefits are potentially of reduced interest in the NI market. Developers in the country have more possibility of being local landowners as opposed to larger multinational developers, so community engagement in the schemes may be higher by default. It will also be difficult to considerer community benefits if the schemes are small-scale/domestic.

6) Set locations

Consideration: Considerations will be required around if the scheme will be open to assets in the whole of the NI market, or if the scheme will only be open to schemes in certain locations which provide a benefit to the system operator (such as due to providing network benefits). It will also be important to consider how these locational considerations are applicable and if they are applicable for all sites or selected sites as this will impact consumer costs and competition.

Possible approaches: Setting specific locations in which an asset must be based to be eligible for the scheme provides a large amount of potential benefit for the regulator, as they can have more control over the impact that successful applicants have on system security. This can also be beneficial from a cost perspective, as it means that regulators can force assets to target the cheapest locations possible. However, as wider locational signals drive asset placements, this approach may remove a number of applicants, resulting in less competition and higher price requirements.

7) Capacity requirements

Consideration: It will be important to consider what capacity of assets are/are not allowed under the scheme. Focus on larger assets mean that economies of scale can be utilised to achieve better rates for consumers. However, it also introduces a risk that smaller assets are discouraged from participating in the scheme. This could negatively impact funding.

Eligibility criteria (4/8)

Possible approaches: The size of the assets which are eligible for the scheme will be crucial in determining the level of competition. Not setting a limit on the size of assets means that very small/domestic scale assets would be able to take part. This might improve consumer engagement but will also lead to significant administration costs. In addition, the costs considerations for domestic and commercial generators are very different, so levels of competition are not likely to be consistent. Planning a minimum and/or maximum capacity limit allows for more targeting of assets sizes more suited for the purpose of the scheme, but if not properly organised, these limits may lead to lack of competition in the markets. Different asset sizes (such as different minimum capacities for certain technologies) can be considered and may be more beneficial, but increase administration and competition risks.

The key questions will therefore be what are the capacity levels of assets currently in development in the NI market, and how will they compare to the NI subsidy schemes targets. It will be key to see if any approach taken will lead to competitive auctions. The relative size of developers in the NI market may mean that a focus on smaller scale assets and no minimum capacity is favourable. This is discussed more in later sections.

8) Locational considerations: There are many locational elements which may impact how the subsidy scheme is interacted with and utilised:

- **Micro grids, storage assets and private wires**

  Considerations: Generators may wish to provide the power produced by the asset to consumers through private networks. It will therefore be important to determine whether these behind the meter approaches will be allowed, especially given that the likely payment the asset is receiving under their private agreements means the asset could obtain financial close without a subsidy

  Possible approaches: An asset providing power directly to a consumer instead of the network could be eligible for the scheme, as there is the argument that this is still helping to decarbonize the NI energy network. However, some would argue that such assets are not benefiting consumers. This is particularly a potential concern given the higher revenues often achieved via private wire arrangements. Whether they are included in the subsidy scheme will therefore be crucial

- **Network costs**

  Considerations: The use of system charges can vary significantly depending on the location of the asset. High costs in a particularly location might lead to a focus of generation assets in other regions. This, in turn, could lead to security of supply issues. It is therefore important to consider how these costs are captured in the subsidy scheme

  Possible approaches: The inclusion of network costs into the subsidy calculation is also important. By including, assets in potentially more expensive areas but with better operating profiles can be more competitive in the subsidy scheme. However, this also removes certain competitive tensions and may increase consumer costs

Eligibility criteria (5/8)

9) <u>Wider considerations:</u> There are a number of other eligibility considerations which will be important for allowing the scheme to be successful whilst also providing potential applicants certainty in process. These include:

- **Project start timelines -** Consideration is required regarding the requirements for the asset to prove it has met the obligations in order to allow payment to commence (most likely commissioning) and what sort of target dates are in place. Approaches in relation to the proposed start time of the project include setting a fixed period since the subsidy was put in place (such as requiring commissioning within 12 months of the signing of an agreement), a fixed time period (i.e., within 2024), a flexible approach in which different asset types have different requirements, or no limitations on project timelines. Having no timelines is beneficial for generators, but increases non-delivery and late delivery risk. Setting fixed periods, either on a uniform basis or variable basis, is likely to protect consumers but increases the development risk for generators. As part of this process, penalties for late delivery will also need to be considered. Approaches can include terminating the contract or starting the contract at the expected delivery date regardless of if the asset is operational (essentially meaning the asset loses the value of the contract for the period in which it is not generating). Again, the more stringent the approach, the more risk sits with a generator and therefore higher prices may be required
- **Asset status –** Consideration will be required regarding if existing, refurbished or extended technologies should be included in the scheme. The inclusion of already operational and refurbished assets is an important consideration. Utilising existing infrastructure may reduce costs compared to building new assets. However, it can be argued that old assets, particularly those which had a previous subsidy, have already been provided a benefit and paying a new subsidy to these schemes would not be promoting new low carbon generation. As part of this discussion, considerations will also be required around how new build assets are defined – very clear requirements will need to be in place to meet the definition, if only new assets are allowed, in order to prevent the scheme being abused
- **Corporate PPAs (CPPAs) –** It will be important to consider how CPPAs (in which the generator sells power, through the network, to a specified end users) are included in regard to the subsidy. The possibility of incorporating CPPAs in the subsidy scheme is important. Allowing the approach means that the overall cost to consumers is likely to be lower, as assets should cover some cost of the asset through their CPPA. However, it may be that assets are already financially viable under the CPPA and obtaining a subsidy is an additional benefit, which reduces the effectiveness of the subsidy and potentially limits other renewable assets (which do not have CPPAs) from being built under the scheme. It may be possible to restrict how the CPPA scheme works, such as limiting payment to only generation not associated with the CPPA

Eligibility criteria (6/8)

9) Wider considerations:

- **Part merchant assets –** Similarly consideration will be required assessing if part merchant assets (where part of the asset achieves a subsidy and the other part relies on the merchant market) can participate in the scheme. Linked to the CPPA considerations, it is important to consider if an asset which is part merchant should be allowed and what the distinctions are between the two aspects of the site. By allowing part merchant, this potentially reduces scheme costs, allowing the generator to leverage the subsidised part of the scheme to minimize risks in the merchant part. This will need to be considered, however, in more detail
- **Site definition –** It will be important to set clear parameters in regards to how a site's boundaries are set for the purpose of the scheme. Defining the site can be done in a variety of methods, such as being based on grid connection location, site footprint, post code or grid reference. Utilising an element such as grid reference or post code allows for a large amount of flexibility in determining the location and make up of the site, but can be seen to be highly inaccurate in previous subsidy schemes, due to the difficulty in determining a suitable point at which to take a grid reference/post code for a large asset. In contrast, utilising grid connections may allow assets to have more certainty in their given location. However, if old/extended/refurbished assets are not allowed into the scheme, then use of their reference point might exclude some assets, reducing competition and potentially preventing some viable sites from engaging in the scheme

Figure 29: Consideration RAG rating – Eligibility criteria

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Non-delivery impacts and Financing requirements	Bid bonds, penalties of non-participation in the future for assets which fail to deliver, paying for lost volumes, no penalties				Bid bonds should be used for larger assets, to avoid non-delivery of projects. This should be obtained after the sites which are successful in the relevant application have been approved. It is likely a limit will be required on the minimum capacity which requires a bid bond, as microgenerators are likely to have less scope to put forward a bond
Key Documentation	Wide variety subject to details of technology and market				Planning and grid connections are expected to be a requirement as a minimum. Other documentation may also be included
Alternative requirements	Wide variety subject to details of technology and market				This will depend on the technologies included, but should not be too onerous as to put a large number of participants off applying
Grid connection requirement	Signed agreement, accepted offer, offer without acceptance, no requirement				We believe full, accepted grid connections should be required to reduce development risk, but this will be dependent upon how much this approach prevents competition

Source: Cornwall Insight

Eligibility criteria (7/8)

Figure 29 (cont.): Consideration RAG rating – Eligibility criteria

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Community considerations	Direct community support, indirect community support, no community support				This should depend on the level of feedback from communities, but we expect to be minimal given the relatively high number of local participants engaging in a NI subsidy scheme
Set locations	Set locations based on network requirements, set locations based on resource availability/development likelihood, set location based on wider market needs, no locational setting				The scale of the NI market, plus the difficulties associated with engaging in certain parts of the network, mean setting specific locations will significantly reduce the number of viable participants in the scheme, and so we consider it unlikely to be viable
Capacity Requirements	Single capacity limit for entry into the scheme, different tariffs/payments for different asset sizes, no capacity limit				Given the scale of the NI market, we expect that the minimum capacity of entry will be low/not applicable. Inclusion of microgenerators will potentially have a big impact on the scheme structure required
Locational considerations	Account for the different locational considerations in the auction/payments, do not account for different locational considerations and have no benefit to the generators				We expect that no locational elements will be implemented in the scheme, given the size of NI and the additional administration associated with implementation. This will, however, depend on views from the DfE and SO
Project start timelines	Single fixed approach, target delivery window, variable parameters based on site details (technology etc), no limitations				Strict timelines will need to be in place, with hard cut off dates, but with a suitable delivery window to facilitate any minor issues in development timelines. These should be considered on a technology-by-technology basis
Asset status	All assets allowed, operational assets allowed, refurbished assets allowed, new build assets only allowed				Due to the decarbonisation targets of the NI, only new build assets are likely to be beneficial, and so only new build assets should be included
Corporate PPAs (CPPAs)	Subsidised assets allowed a CPPA, subsidised assets not allowed a CPPA				CPPA should be allowed, but with clear information around how and what output receives payments
Part merchant assets	Subsidised assets allowed to be part merchant, subsidised assets not allowed to be part merchant				Part merchant assets should be allowed, but with clear information around how and what output receives payments
Site definition	Based on grid location/post code, based on site footprint, based on wider parameters				This should be based on a post code, grid reference or grid connection

Source: Cornwall Insight

Eligibility criteria (8/8)

Figure 30: Key questions – Eligibility criteria

Consideration	Key questions
Non-delivery impacts and Financing requirements	• The key question will be to assess what level of comfort is required by investors/generators in the market to prevent penalties being too penal, whilst also providing the regulator with enough certainty that assets will get delivered
Key Documentation	• This will be driven by the technologies required and how they are developed, but views from the market will be important as they will also dictate how viable the requirements are and the possible impacts on competition
Alternative requirements	• This will be driven by the technologies required and how they are developed, but views from the market will be important as they will also dictate how viable the requirements are and the possible impacts on competition
Grid connection requirement	• Depends on the level of engagement in the scheme which would take place if a grid connection was or was not required
Community considerations	• Given the nature of the NI market, it will be important to consider how the local community engages with projects generally
Set locations	• It is important to consider the size of the NI market, the potential level of benefits achieved through this approach and the extent to which investors will be dissuaded from engaging in the scheme as a result of this approach
Capacity Requirements	• How low do capacities need to be to have sufficient competition in the scheme? Also, it is important to not set capacity levels too low, as this may discourage larger investors from engaging in the scheme (subject to contract structure)
Locational considerations	• This should be driven by the network requirements, and the impacts of adding new assets in new locations. This will need to be strongly connected to the number and type of assets deployed
Project start timelines	• Key considerations will therefore need to be around when does financing for a generator start, when do generators require financing to start, how could risk to generators be put in place whilst still protecting consumers
Asset status	• It is key to determine how many assets are likely to be in a position to benefit from the subsidy, how many of them are old/existing sites and how these sites compared to the purpose or the scheme
Corporate PPAs (CPPAs)	• Views should be sort on the viability of CPPAs in the NI market and, particularly, how many more assets would be deployed as a result of having CPPAs in place as well as possible subsidies
Part merchant assets	• Views should be sort on how many more assets would be deployed as a result of having the option to deploy assets on a part merchant basis, as well as possible subsidies
Site definition	• Clear clarity on approach needs to be produced, with several possible options available

Source: Cornwall Insight

Security of supply (1/6)

1) Integrating storage/Co-location/flexible technologies

Considerations: It will be important to establish if assets co-located with storage assets will be eligible for the subsidy. How any storage asset co-located with a subsidised asset is integrated into the subsidy will be important, as it will determine how metering should be implemented to prevent any double payment in relation to discharged power from the battery asset. It will also be important to consider if new flexible technologies, such as Hydrogen production and Carbon Capture Utilisation and Storage (CCUS) can be incorporated into the scheme in the future, or if these technologies should have their own separate subsidy approach.

Possible approaches: The possibility of including co-located storage could provide multiple benefits. It would allow the output from the renewable asset to be better optimised by the generator, in turn providing better network management benefits to the SO. This could also lead to greater revenues for the renewable asset. It also allows for the lower cost of development for flexible assets, as it allows for utilisation of existing infrastructure. However, there is the risk that generation from the asset could be counted twice when claiming a subsidy if suitable metering is not in place. This may also shape the results of the subsidy in unfavorable ways, with assets which are easier and cheaper to co-locate with storage assets (such as solar PV) having an undue competitive advantage. It may be the case, therefore, that renewables which are co-located with storage are allowed into the scheme but are subject to strict restrictions on how the generation they produce is sold to the market. Storage assets could provide considerable additional benefit to the NI market, and therefore co-location is likely to be beneficial under the subsidy scheme. However, clear metering requirements will be required, so that all parties (commercial and domestic) are prevented from double counting any subsidy payment as a result of stored power.

There is scope that flexible technologies could have their own pot/budget within the subsidy. This would allow for development of a more diverse energy mix and would also provide support to the SO for managing supply and demand on the network. However, the process for incorporating a flexible service is likely to be challenging. The nature of these assets means they require different revenue considerations compared to renewable generators. Renewable generators require as much price certainty as possible whilst flexible assets require the ability to discharge/produce when prices are high. For storage and hydrogen production they will also want to consider how to arbitrage wholesale prices, so also need a large amount of volatility. Shaping a subsidy scheme for such assets will therefore potentially be more challenging and require different structures compared to the renewable subsidy scheme. In the GB market, separate subsidy schemes are currently being considered for CCUS assets which, whilst based on the CfD structure, will operate independently and have some key differences. The SDE++ scheme in the Netherlands does show that a scheme can be modified to include CCUS, Hydrogen and heat production, although there are some key differences for how the CCUS aspect of the auction operates compared to the electricity auction.

Security of supply (2/6)

2) Ability to control inputs

Considerations: What approaches should be in place to control the level of deployment of different technologies. In the GB scheme, different technologies can have specific budgets (minima or maximums) placed on them. This essentially restricts the particular technology from dominating a particular subsidy/part of a subsidy, or allows certain technologies to experience less competition. The introduction of these possible input controls will impact investor confidence, but may also allow the government to dictate the level of technologies they require in their future fuel mixes.

Possible approaches: A number of different parameters can be put into place to control the inputs (and thus the outputs) of the scheme. The technology specific caps on capacity or on cost to consumers allows the regulator to prevent oversaturation in the market of a heavily competitive technology, whilst minimums are used in the GB scheme to allow less established technologies an opportunity to obtain a contract by removing some initial competition from more established technologies. The pot structure in the GB scheme allows focus on different technologies, and allows again for less competitive tensions in relation to certain emerging technologies. Other schemes, such as the SDE++ provide different payment levels for different capacities. These approaches provide considerable benefit to the regulator, making sure that certain technologies, capacities or other drivers can be targeted in the subsidy. This generally can provide a more diverse generation mix, but promotion of more costly technologies can result in higher consumer costs. Additionally, it may be politically difficult to justify separating some technologies. Given the stated objectives of diversification of energy mix, the NI scheme is likely going to require some optionality when it comes to control inputs. It will therefore be important to determine how viable possible approaches will be for potential market participants; a tiered structure with clear prices has been beneficial for smaller generators of a variety of technologies under schemes like the SDE++ and small-scale FiT in the GB market, but ability to control parameters has allowed the GB CfD scheme to target specific technologies for support.

3) Flexible markets - Requirement

Considerations: Consideration should also be given on how flexible services could be provided by the assets within the agreements. There is considerably benefit to the network operator in having the ability to turn down renewables in certain periods or areas. This could be implemented as part of the subsidy or could be separated from the agreement but integrating into the agreement so that the System Operator has more control over the assets.

Possible approaches: Whether an asset has an obligation to provide flexible services beyond those already required by the network operator is important. Renewable assets have limited controllability, so placing an obligation to deliver services may be challenging for them and result in engineering risk. However, the asset being asked to turn down as a result of a system stress event may add significant benefit to the SO, and (assuming a process is in place in the subsidy to provide compensation) does not leave the generator with lower revenues.

Security of supply (3/6)

4) Flexible markets – Engagement

Considerations: Whilst traditionally, renewable assets have had limited scope to provide flexible services for the network, a number of services may allow renewables to provide these services in the future. This, coupled with the reduction in carbon-based assets which can provide flexible service, mean considerations around whether the subsidised assets can engage in providing services to the SO under the terms of their subsidy are important.

Possible approaches: Conversely to the requirement to engage in the flexible markets, it is important to consider if there are any restrictions on the asset engaging in balancing markets if they wish. Allowing them access means they can provide additional services to the SO. However, achieving additional payment above a subsidy in relation to the same generation (or turn down of generation) may be seen as the asset recovering double payments. As a result, including a provision which prevents the asset achieving a revenue higher than its subsidy in certain circumstances (such as turning down) may be required. This approach can be as part of the subsidy or may be as part of other licensing/code requirements (such as the limitations placed on assets in the GB market under the Transmission Constraint Licence Condition). There is potentially a benefit to the network in obtaining these benefits. However, the payment approach within the subsidy will be import, as there is a risk that subsidies paid on availability will result in double payment for the site if they are also being paid for turning down/providing flexible services.

5) Capacity Market engagement

Considerations: Considerations will need to be given to determine if assets which engage in the subsidy should also be able to engage in the relevant Capacity Market (CM). There is the argument that including the asset in the CM means that there is more incentive for these unpredictable assets to be in a position to provide required services during system stress events. However, it can also be seen as the assets receiving multiple payments for the same generation/output.

Possible approaches: There is an argument that the assets can provide support under a CM scheme, and so should be eligible to win contracts for both the subsidy and the CM. However, this can be seen as the asset achieving a double benefit and so may not be acceptable, as is the case in the GB market. Additionally, the intermittent nature of renewable assets mean they are unlikely to be able to guarantee availability during a stress event. The approach undertaken would also need to adhere to the Capacity Remuneration Mechanism (CRM).

Security of supply (4/6)

6) Reliability

Considerations: The level of predictability and reliability of the asset is also a significant consideration. A number of cheaper renewables (solar, onshore, offshore wind) have a low level of reliability of output. There is a risk therefore that security of supply concerns are raised if a subsidy is put in place which only encourages the development of these types of assets. However, more predictable low carbon assets (such as EfW) may be more expensive. There is also the risk that a large number of subsidised assets could significantly impact the wholesale market, making developing subsidy-free assets more challenging.

Possible approaches: Whether the asset can provide a level of reliability is important. This could be the requirement that the asset delivers (or turns down) generation during a stress event on the system or it delivers power during certain time periods. Alternatively, there could be no limitation on when the power is/is not delivered. Placing obligations on the asset to deliver (or turn down) means that operation of the network would be easier for the system operator, limiting the impact of system stress events and potentially reducing the overall cost for system balancing actions. However, the intermittent nature of most renewables means that a large amount of risk will sit with the generators, which is likely to increase subsidy costs. The key questions will therefore be; are renewables best placed to help with system stress events or should other, more flexible assets be in a position to provide these services? Key will also be in establishing how significant the new capacity of renewables developed under the subsidy will be in exacerbating stress events on the network. It will also be important to make sure whatever approach is implemented adheres to the requirements of the all-island markets, including the CRM and the Delivering a Secure, Sustainable Power (DS3) systems.

The focus of the subsidy in the NI market will also have an impact on how significant reliance is and how viable asking for reliable outcome is within the scheme. The nature of the NI market may result in a focus on microgeneration assets and it may be difficult to ask these entities to provide certainty of output both due to metering arrangements and the level of onsite consumption they have. This consideration is therefore heavily linked to the type of generation upon which payment is eligible under the scheme (if applicable).

Security of supply (5/6)

Figure 31: Consideration RAG rating – Security of supply

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Integrating storage/Co-location/ flexible technologies	Allow all storage, allow co-located renewables with no limit on metering, allow co-located renewables with strict metering requirements, don't allow co-location into the scheme				Co-location with storage should be allowed, as it benefits the network, but very clear metering parameters will need to be in place to make sure that double counting does not occur
Ability to control inputs	Wide variety, including maximums and minimum targets, setting budget levels on a regular basis, setting maximum prices, setting technology specific limitations				As high a level of control of scheme inputs as possible should be included. The only exception should, however, be any changes which impact assets which already have a subsidy, as these sites will need to be protected
Flexible markets – Requirement	Place an obligation on asset to engage beyond current licensed requirement, reduce obligation by removing licensing requirements, no change from current licensed requirements				Whilst beneficial to the network, flexibility requirements may be seen as too challenging for investors, so are unlikely to be viable for inclusion in the subsidy at least initially
Flexible markets – Engagement	Full access to flex markets (with no concern on revenue achieved), access to flexible markets but cap revenue at value of subsidy, no access to the flexible markets				Engagement should be facilitated and allowed where possible, but it should be managed so that no additional revenue should be obtainable for the sites if a subsidy is in place
Capacity Market engagement	Allow access to the CM, do not allow access to the CM				CM participation should not be allowed for subsidised assets (and vis versa)
Reliability	Turn down during stress events, turns down/delivers during set period, no reliability requirements				Whilst beneficial to the network, reliability requirements may be seen as too challenging for investors, so are unlikely to be viable for inclusion in the subsidy at least initially

Source: Cornwall Insight

Security of supply (6/6)

Figure 32: Key questions – Security of supply

Consideration	Key questions
Integrating storage/Co-location	• Key elements to look at include what is the likely number of co-located storage assets in the NI market and what are the additional benefits from co-location. Additionally, what benefit will these co-located assets provide to the SO – if it is high, then risks from co-location may be less of a concern
Ability to control inputs	• The ability by the regulator to control the parameters of the subsidy are likely to be beneficial but may be negatively viewed by developers of assets which do not benefit/are hindered in obtaining a subsidy due to the inputs. The key consideration will be to determine what is the acceptable level of control which can be applied in the subsidy scheme • What options should the government/regulator/SO have to control results in the auction? • Should individual targets for specific technologies be applicable? If so, what kind of targets would work – capacity caps, budget caps or alternatives?
Flexible markets – Engagement	• Key considerations will be, as with the previous consideration, the potential level of benefit provided from subsidised assets. Additionally, however, it will be important to consider what restrictions are currently in place and what changes will need to be in place to allow assets to participate in flexible markets without achieving additional revenue
Flexible markets – Requirement	• Key will be in determining if assets in the subsidy could provide a suitable level of benefit for the SO, and if there is scope for suitable benefit to be achieved, either via the subsidy or via another mechanism (such as the BM)
Capacity Market Engagement	• This consideration will depend entirely on if there is any perceived benefit for the subsidised assets engaging in the BM, compared to the cost of allowing CM participants to engage in the subsidy scheme
Reliability	• Generators are unlikely to like having to provide any certainty in this regards, so considerations will be required around what level of reliability is required without reducing participation levels in the subsidy

Source: Cornwall Insight

International Interaction (1/4)

1) Integrating offshore technologies and interconnection

Considerations: How the scheme allows (or does not allow) offshore projects to engage in the market will also be crucial, potentially allowing more cost-effective use of existing infrastructure. This will, however, also depend on the types of technology which are likely to take part in the scheme. This approach impacts the level of competition and, therefore, the potential costs to consumers of the scheme.

It will be important to consider if any restrictions should be placed on power from a subsidised site being traded across both the existing Moyle interconnector and future interconnectors which may be built. This could be a political issue, as it could be argued that power provided to the GB market is not beneficial for NI and should not therefore receive support.

Possible approaches: In regards to interconnection with offshore networks, it will be important to consider if offshore networks should be treated as a separate class or incorporated into another class of assets. Fixed and floating offshore wind are classified as separate entities, with separate budgets, in the GB system, which provides scope for more diversity of generation mix in the future and allows for the less established floating wind assets to compete against other more expensive technology types. However, this does mean that costs to consumers per MWh produced by subsidised assets are more expensive than they would be if wind assets were all classified as a single technology. It will also be important to determine how, if at all, interconnection to GB and RoI assets can take place. This may allow for savings on costs but could also mean that the power is utilised in other markets.

2) Interaction with SEM

Considerations: Due to the nature of SEM, with a single electricity market being in place for the NI and RoI markets, considerations around how the scheme will impact/will be impacted by SEM will be crucial. This may impact consumers and the cost of the scheme. It will also potentially be administratively important.

Possible approaches: Restricting the consumption of power to just the NI market means that the consumers paying for the scheme receive the benefit. However, the current arrangement of the SEM market means that any limitations on the trading is likely to be very difficult. The NI market adds additional complexity through the set up of the market, with the wholesale power market being linked to the RoI market via SEM, but with the supply market being separated. This may mean there are concerns from stakeholders in the RoI market that unsuccessful implementation of the NI subsidy could negatively impact SEM prices.

Additionally, the connectivity between the NI and RoI markets mean competition risk increases; failure to properly implement similar pricing approaches may result in one scheme being more favorable than the other, leading to oversaturation of one market and under utilisation of the other. This is especially likely if there is any sort of cross pollination of the schemes.

International Interaction (2/4)

3) Interaction with EU policy

Considerations: Through the use of SEM, the NI market is exposed to some EU policies despite the UK having left the EU. This will therefore be an important consideration for the new scheme, with discussion required around how to make sure that the obligations required from the EU under SEM are maintained and to prevent any legal challenges which could result.

Possible approaches: There are likely to be a number of pieces of EU policy which will need to be maintained as a result of the SEM market. How these approaches are incorporated in the subsidy will be important. Concerns have already been expressed about the lack of representation that NI citizens have in relation to the management of their electricity network as a result of the UK leaving the EU but SEM remaining in place. This concern will therefore need to be considered and mitigated as far as possible in relation to the possible NI subsidy scheme.

5) Engagement with GB and RoI assets

Considerations: It will be important to consider if or how GB and RoI assets could be included in the subsidy scheme. This is unlikely to be viable given the nature of the scheme, but should be considered, and clear indications that it is not possible need to be stated.

Possible approaches: Whilst allowing GB and RoI assets to engage in the subsidy may increase competition, it is likely to cause significant political, regulatory and trading complications, so it is expected that this approach will not be considered further. Greater connectivity between the GB scheme and the NI scheme may lead to additional cost savings and greater efficiencies in delivery of the schemes. However, by connecting to the GB scheme in any way, the DfE may have less control over the scheme and the associated levers used to attempt to meet their decarbonisation targets. This may also lead to wider concerns of lack of control, such as socialisation of costs across both schemes. How markets interact and what approaches can be utilised to potential impact costs will be important.

Also, Renewable Energy Guarantees of Origin (REGOs) in the NI market can potentially be used in the GB market, and vice versa. As a result, if the impact on subsidy levels in one market is impacted by REGO certificates but not in the other market, this could lead to a shift in the REGO market with suppliers shifting how they trade the certificates.

6) Export allowed

Considerations: It is important to consider if power from subsidised assets could be sold to the GB market, and if this would be allowed under the scheme, given that it can be argued NI consumers are paying for the decarbonisation of the GB market.

International Interaction (3/4)

Possible approaches: There is the possibility to allow assets to export power to the GB market via the existing Moyle interconnector, as well as through potential future interconnectors. This has the benefit of increasing the potential value of the power produced, but also has a questionable impact on the benefits of the scheme, as it means that the GB market receives the susbsidised power.

Figure 33: Consideration RAG rating – International Interaction

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Integrating offshore technologies with interconnection	Allow offshore assets as separate classes, allow as part of wider technology classes, don't allow				Separate classes should be used, if possible, but will depend on the structure of the scheme, how the different markets in the NI, GB and RoI markets react and what technologies are included
Integration with the SEM	Allow assets to trade power in the RoI market, limit scope to trade power				The scheme will have to function with SEM due to the nature of the assets and how power is traded in Ireland
Integration with the EU Policy	Various, driven by requirements from SEM and RoI connectivity				The scheme will have to consider engagement in the EU as part of the existing SEM arrangements
Engagement with GB and RoI assets	Allow GB assets to engage, don't allow GB assets to engage in subsidy				If possible RoI assets should not be able to engage in the NI scheme, so careful consideration around how to make sure this is the case is important
Export allowed	Allow power to be exported to the GB market, don't allow power to be exported to the GB market				This is likely to be a political issue for the DfE to consider, and should have minimal impact on the actual delivery of the scheme

Source: Cornwall Insight

International Interaction (4/4)

Figure 34: Key questions – International Interaction

Consideration	Key questions
Integrating offshore technologies with interconnection	• Three elements need to be considered; (1) Determine the likely size (if at all) of offshore technologies in the NI market. (2) Then, determine what infrastructure is/will be in palace of the GB and RoI market which can be utilised by NI. (3) The final element to consider will be if there is any benefit in combining/separating offshore technologies
Integration with the SEM	• Key will be determining how trading can and will take place in regards to the SEM market
Interaction with EU policy	• The key question will be in regards to determining what the requirements/obligations are for connectivity with the EU as a result of SEM
Engagement with GB and GB assets	• Considerations around the GB market are likely to be limited, so the main consideration will be around if the DfE want to ask this question to the market
Export allowed	• It is essential to assess the benefit (or lack therefore) of exporting power to the GB market

Source: Cornwall Insight

Other considerations (1/5)

1) Defining impacted supply arrangements

Considerations: Consideration will need to take place assessing what contracts are impacted by the supply arrangements. For example, considerations will be required on elements such as if vulnerable customers are exempt from the scheme and what constitutes a vulnerable customer.

Possible approaches: Consideration will also need to take place to consider parties which are exempt from any charges. Vulnerable customers could be removed from having to pay the charge. This protects them from higher electricity bills or taxation, but means that the overall cost for the scheme is higher for the other consumers. If an approach in relation to vulnerable customers is undertaken, a strict definition on vulnerable will be required, to make sure that there is clarity in regards to when the fee is charged.

It will also be important to determine how the schemes would be paid for under this approach. Forecasts place the population of NI in fuel poverty as being ~10% more than the rest of GB. Removing such as significant number of consumers from this process may, therefore, lead to additional costs for those who are left to pay for the scheme. It is therefore important that the DfE find a suitable balance.

2) Charge avoidance

Considerations: Similar to defining the impacted agreements, consideration will be required in regards to if there are any ways in which the charge for the scheme can be avoided. In addition, considerations for cost avoidance by the suppliers should be considered.

Possible approaches: Many subsidy schemes have a charge avoidance approach in the scheme for some consumers. Elements such as submitting GoOs or REGOs remove the charge associated with the subsidy, and a similar tax avoidance scheme was in place for the Climate Change Levy (CCL) scheme under the Levy Exemption Certification scheme. This approach can be beneficial for generators (both subsidised and unsubsidised), as it creates additional market value, but also means that the costs of scheme may not be picked up by all consumers. It is particularly likely that entities which are in a position to purchase these certificates or benefit from the avoidance approach are larger corporates, so the level of cost avoided is greater.

There are a high number of electricity suppliers in the NI market, relevant to the size of the market. If payment for the scheme is via a levy, the large number of suppliers is likely to increase the total cost to consumers if the supplier defaults on meeting any of their obligations under the subsidy (such as has been seen in the GB market with a number of suppliers failing to pay their obligation under the RO). It also potentially reduces the chances of a supplier failing to meet their requirements as less pressure is placed on a small number of entities.

Other considerations (2/5)

3) Legal

Considerations: The impact of producing a new scheme should be considered, particularly in relation to the additional legal requirements which need to be put in place. How the scheme is implemented, in regards to the required legislative approach or if an alternative implementation process is required, should be considered.

Possible approaches: The legal work which goes into the development of the scheme will be important. New legislation is likely to be required, which outlines the scheme and provides a suitably robust legal position. Consultations and analysis will need to be undertaken to justify the approaches taken, and there will need to be suitable resources to manage and mitigate any legal challenges to the scheme.

4) Workload

Considerations: Implementing a new subsidy scheme will require a considerable amount of work, requiring new approaches and clear guidance for participants. How this workload is administrated will be important.

Possible approaches: There will be a significant amount of workload associated with the development of the scheme, with policy and methodology publications needing to be produced to provide consumers with the details they require in order to engage in the scheme. This will be an important consideration for the DfE.

5) Innovation considerations

Considerations: As well as the considerations around the involvement of technologies which are less established and emerging in the market, considerations should be made about what future technologies may need to be included in the auctions. The development of technologies such as Hydrogen electrolysis or Carbon Capture Utilisation and Storage (CCUS) will likely require subsidy support and consideration should be given at this stage on if provisions should be made to include these technologies in the future and, if so, how.

Possible approaches: Considerations should be made about what possible future developments can be introduced into the scheme, such as whether potential future technologies (i.e., CCUS) have access to the scheme. This will be driven by the requirements in the market, but any possible changes in the scheme will need to be forward facing, so as not to impact already contracted/successful assets and therefore impact investor confidence. As discussed above, incorporating new technologies is likely to be a challenge due the different funding approaches required for these technologies, and a number of different approaches have been undertaken in other markets in regards to providing subsidies for these technologies.

Other considerations (3/5)

6) Future changes

Considerations: Consideration should be undertaken to determine how the scheme might need to change in order to allow for suitable deployment in the future and to avoid the scheme needing to be scrapped in the short term as it fails to meet either new objectives or react to changes in the market.

Possible approaches: There are also a number of possible changes which will impact the scheme in the future, so as much thought will be required on future proofing as possible. This includes discussions around whether new technologies can be added to the scheme (and, if so, how) as well as whether there is scope to change how pricing of the subsidy takes place. Additionally, it will need to be considered if new processes can be included in the scheme and, if so, how. This could include consideration around what parameters can be changed from one allocation round to the next and how decisions on these allocation rounds are made. Also, consideration should take place in regards to if there is scope for making wider amendments, such as amending the structures of any contracts put in place, and how to amend penalties. The more flexibility there is in amending these levers, the more security the scheme will have in being able to respond to changes in the market in the future. This is likely to prevent consumers being exposed to significant costs and provide additional protections to the network. However, it is also likely to create additional uncertainty for investors, and elements such the grandfathering of existing contracts will be important, to make sure that only new projects are impacted by changes.

Other considerations (4/5)

Figure 35: Consideration RAG rating – Other considerations

Consideration	Main possible approaches	Requirement?	Importance to subsidy?	Significance to market?	Likely best option(s) for the NI market
Defining impacted supply arrangements	No avoidance, vulnerable customers avoid charge				Vulnerable customers should be protected. Defining a vulnerable customer is, however, complex and difficult
Charge avoidance	No avoidance, REGO/GoOs scheme, alternative certifications scheme, alternative notification scheme				We believe no avoidance of the cost should be included. These elements are likely to be traded by larger corporations as they are better placed to purchase and trade any suitable certificates.
Legal and legislation	Various, driven by legal requirements				We expect these elements to be considered once the subsidy strategy has been agreed
Workload	Various, driven by the agreed make up of the scheme				We expect these elements to be considered once the subsidy strategy has been agreed
Innovation considerations	Various, driven by expected future changes				Regular (every year, every two year etc) consultations should be held to discuss changing possible approaches which can then be implemented (as per the future changes approach)
Future changes	Various, driven by expected future changes				Scope for amending the scheme should be wrapped into the relevant legislation. This should be wide enough to allow for the DfE to make significant changes if required

Source: Cornwall Insight

Other considerations (5/5)

Figure 36: Key questions – other considerations

Consideration Class	Consideration	Key questions
Scheme financing	Defining impacted supply arrangements	• A key consideration in this arrangement will be determining if there is any risk to the scheme if the cost was removed from certain parties. The impact on the remaining parties who are now paying more should be assessed. Key will also be providing a clear definition of impacted/exempt parties
	Charge avoidance	• Key will be determining the risk to the project if payment can be avoided, as well as making sure there is complete clarity on how these avoidance approaches can be implemented. It should also be considered if the benefiting parties are likely to be those in most need of support
Legal/admin	Legal and legislation	• It is important to determine what level of legal work is required and what resources are available to provide these services
	Workload	• This should be driven by the DfE and other stakeholders, and considered once the full details of the possible subsidy scheme structure become clear
Evolution	Future changes	• This will depend on the results of the consultation, as there are a number of possible approaches which can be considered, but the key objective will be making sure that the scheme is flexible enough to allow future developments but not so flexible it loses benefits for investors

Source: Cornwall Insight

Investor impacts (1/2)

A key consideration is also around the structure of the subsidy payments and its impact on investor confidence. The way the subsidy is structured, and the risks involved weighs into investor confidence and therefore the investability of the scheme. The overall subsidy structures are broken down below:

Strike price/Clearing price

The strike price approach provides long term security for the investors, so provides a high level of comfort. Examples include the CfD scheme in GB, RESS in RoI, the Dutch subsidy scheme and FiT and FiP based schemes such as in Germany

FiT/FiP/Fixed fee

A fixed premium or fee has a higher investor upside, as they get a fixed fee based on their expected development (capital) and operation costs and then from any additional market revenues over and above the fixed subsidy fee. For example investors under Ireland's REFIT scheme have had windfall gains with the high market prices recently. However this provides limited scope for consumer protection when market prices are high

Contract for Difference

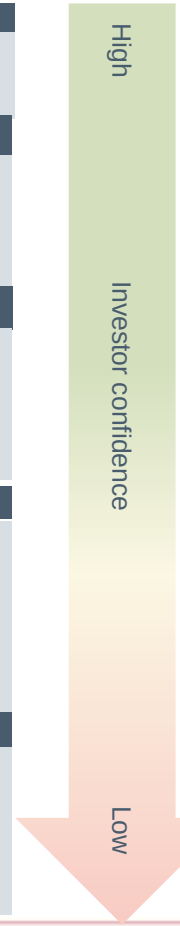
GB and RoI, both follow this method, where the investors/developers are paid at a strike price and do not gain any additional benefits from the market prices being higher, or vice versa. This creates price certainty for generators provided they either have "firm" grid access (i.e. they will not be curtailed) or they are compensated if they are curtailed. The treatment of indexation is also key; if strike prices are fixed and not inflated, generators are exposed to indexation risk. With appropriate risk allocation, CfDs can be effective at driving investor confidence, but there are design nuances to be carefully considered

Capital and operational payments

A fixed payment is made with a view of covering capital and operational costs for the assets and provides some security to developers. Fixing the costs (both capital and operational) at early stages may mean that the fixed costs are not able to meet site needs during build and operation stages. However this is not greatly different from the approach towards capex and opex projections used by developers in a strike price based auction/award process. There are limited examples of schemes using this method of subsidy payment, however as an example, it is part of the Administrative Strike Price calculation (the maximum price an asset can bid) in the GB CfD scheme

Certification based schemes

This includes both legal and price risks for investors and as such needs a focus on precautionary limitations, especially around the oversupply of certificates. The suppliers acting as a middle layer for award of certification poses legal risks while price risks also exist as payments under the certification approach not only rely on the market value of the certificates but the level of demand required for generators. However, despite the risks a large number of investors did engage in the RO scheme in the GB market



Investor impacts (2/2)

The strike price-based subsidy fee, whether a fixed fee (FiT/FiP) or a CfD, have been most popular and seen the most success in generating investor interest in the countries studied. However, while considering these subsidy structures it is important to understand some other aspects that will be impacted by this choice:

Figure 37: Investor impact considerations

Subsidy structure	Investor considerations	Consumer protection	Administrative costs
Fit/FiP/ Fixed fee	• Investor confidence in this structure will be high as the projected costs for developing an asset under the subsidy scheme will be covered and any market gains will be a bonus • Looking at historical trends such as the German FiT scheme, the subsidy structure attracts varied investment sizes, with a slight bias towards small assets, especially if there is no auction involved. Auction processes is generally a deterrent for smaller assets/investors	**Low-Medium** • The fixed fee will de-risk the investor for both capital costs and operational costs, which will be passed on to consumers. If market prices are high, consumers will be exposed to this as an additional cost • Consumers will also bear the full burden of additional market gains that these investments may gain due to bullish trends in energy markets, under a 2 way CfD such as the GB CfD or Irish RESS this will not be the case	**Medium** • Costs will be incurred for setting cap price/administrative price for procurement scheme • Windfall gains which impact consumers may need a measure put in place to redirect. Example: Ireland recently placed a tax on windfall gains for renewable assets who will primarily be those under the Renewable Energy Feed-in Tariff (REFIT) scheme
Contract for Difference	• Investors face certain risk as they have to factor in unknowns such as future market trends and costs to build and operate their asset • Schemes based on this structure have been successful in generating investor confidence in GB and the Netherlands while also achieved a downward trend in strike prices which has provided lower costs to consumer	**High** • Can minimise the burden on consumers in adding renewable capacity on the grid, especially if the risks outside of the developer/investors control can be de-risked within the scheme structure. For example: grid related risks, inflation risk, etc	**Low-Medium** • Costs will be incurred for setting cap price/administrative price for procurement scheme

Source: Cornwall Insight

It is therefore important for to consider what types of investors will be engaging in the subsidy scheme as this will have an impact on the required structure of the scheme. Determining the level of comfort they require in regards to risk and rate of return will impact the level of engagement and competition in the scheme. It will also be important, however, to consider how the requirements of investors will impact on consumers and a suitable level of balance between investor confidence and consumer protection will be required. This will need to be carefully considered as part of the development process for the scheme.

Mandatory subsidy schemes (1/3)

The DfE have indicated they are interested in investigating the possible implantation and impact of a mandatory subsidy scheme. The details of such an approach would, as with all the other elements discussed, depend on the approaches taken but the key factors which the DfE have suggested would be included are:

- A focus on consumer protection by moving the subsidy away from a market linked price
- A price focused on recovery of capital and operational costs

This would allow more protection to consumers, as it means that the costs of the schemes would be established when the subsidy was awarded (subject to inflation) and changes in market prices would not impact the costs to consumers. As more assets were deployed in this structure, the more protection consumers in the NI market would have under the scheme as a higher percentage of operating assets would not be impacted by market prices.

Additional considerations the DfE have suggested would be considered include allowing existing operational assets (such as merchant and CM assets) into the scheme, providing longer term contracts and allowing contracts to be repowered once they came to an end (if certain eligibility criteria had been met). The other key considerations already discussed in relation to the subsidy scheme (such as whether prices should be based on a competitive auction in which generators submit their own cost forecasts or fixed rates determined by the regulator or DfE) would still, however, need to be considered and would be crucial in making sure the scheme is economically viable.

Most other markets do not require renewables to engage in the subsidy, with many markets such as the GB CfD (and previous subsidies of the RO and FiT) being optional. However, UK Government has considered moving merchant and RO-subsidised assets onto CfDs in a response to high market prices – which would in effect be a mandatory CfD scheme. Similar elements are seen in the German and Italian markets. Many of these markets have historically sort to reduce subsidies and increase merchant only assets in order to reduce consumer costs for decarbonisation, so a mandatory approach has been uncommon. However, in a high-price context, some jurisdictions are considering mandatory CfD-like structures as an approach to reduce the impact of high prices being paid to merchant renewables.

It is important to consider the impact this possible approach may have on investors. There are a number of key considerations which will be important for investors to consider, including:

- **Opex pricing** – As discussed in the Investor impacts section, a focus on pricing being based on the asset's capital and operating costs will mean that investors will see a different level of risk associated with the pricing process. Theoretically, the removal of market elements reduces risk, but some uncertainties (such as operational costs and replacement technology costs) remain. However, the overall reduction in risk is likely to provide investors with sufficient confidence, as long as pricing is at a suitably high level
    - The GB FiT showed that fixed prices could provide sufficient revenue certainty for reasonably large generators (up to 5MW) with payments not based on market rates (although assets could also obtain a merchant payment for export under the scheme)

Mandatory subsidy schemes (2/3)

- **Asset end of life –** The approaches put forward by the DfE are likely to provide additional benefits to investors by providing more certainty at the end of the life of the asset. Longer duration agreements allow the investors to have more certainty on their possible interest repayments, whilst having the possibility of an additional/secondary payment coming into effect once the first subsidy ends means they have more revenue certainty than they do under most subsidies, where they must consider a "merchant tail" in which they receive market prices. This may make obtaining financing for the project easier and could, in turn, lead to lower prices
    - How much this benefit is achieved and manifest however will be dependent on the details of the subsidy; if the duration of the contract is not sufficiently long or the level of price certainty provided post contract end is not clear or sufficient, the benefit will be minimal
- **Revenue reduction –** Some generators which are already operating in the NI market or SEM market may see their revenue reduce if they are able to achieve a higher price in the merchant market/CM then they would be paid under the subsidy. This is likely to be a concern for investors. Additionally, some older assets may have different revenue requirements than new build technologies due to changes in capital costs. This means that a pricing approach which is suitable for a new asset may not be appropriate for an older asset. This could lead to stranded assets which are no longer economically viable, and would require a significant amount of effort from the regulator to mitigate
- **Optionality** – Whilst good for consumers, a focus away from market rates may not be suitable for some developers. Investors are likely to be interested in establishing what options, if any, would be available away from the subsidy if market prices change in order for them to obtain competitive advantages and increase revenues. Removing their ability to do this may prevent certain developers from engaging in the scheme. However, this will depend on the attractiveness of the prices achieved in the subsidy
- **Project sale potential** – Many developers will sell projects at a "shovel-ready" stage to investors and having more certainty of a subsidy allows them to do this earlier. Developers may, therefore, favour this approach, depending on the size and scale of the subsidy
- **Administration uncertainty** – If an investor or generator has to engage in an application/auction process, this adds complexity which may make asset development more challenging. It would therefore be important for the DfE to consider how to monitor this process
- **Additional possible impacts –** There are a number of additional possible impacts which may be significant depending on the arrangement of the scheme, such as**:**
    - **Price certainty** – If the asset has more price certainty at the early stage of develop as a result of a mandatory subsidy being in place, this will reduce development risk and may increase the level of assets deployed. This would, however, depend on the structure of the subsidy

Mandatory subsidy schemes (3/3)

- **Competitive tensons** – If the scheme allows for unlimited applications, then this would remove competitive tensions from the subsidy, potentially reducing the level of innovation employed by generators. In contrast, if the subsidy was based on an auction and only successful assets were eligible for development, this may increase competition. However, a mandatory scheme would in effect place a regulatory restriction on the level of renewable generation deployed. A mandatory structure may, therefore, not be seen as the best approach in relation to meeting net zero objectives
- **Technology** – This approach may favour new technologies which are still establishing how to obtain funding; many of these early schemes are pilot schemes which may not expect to obtain a subsidy due to the experimental nature of the technology. Support being made mandatory for these assets may make wide-scale deployment of these technologies easier
- **Development certainty –** Mandatory subsidies could either increase or decrease the number of assets being developed; if there is certainty of a subsidy at a suitable rate then more assets may be developed speculatively, increasing competition and development pipeline benefits. However, if there is less certainty of a subsidy and the ability for the asset to be deployed on a merchant basis is removed, this is likely to discourage a number of possible developers from engaging in the market. This, in turn, will likely lead to less competition in the subsidy scheme and/or fewer projects coming forward

We consider that a mandatory approach may place unnecessary burden on both the market and the DfE, which could outweigh the benefit of the approach. A certification or FiT approach in which the DfE can monitor applicants and approve them can provide the same level of visibility of the market, but does not place additional obligations on a generator which is not in a position to easily engage in the scheme. Additionally, making payments to generators when they would develop the scheme regardless may be seen as uneconomical use of finances as it makes payments for assets which do not require support. If the scheme is mandatory to all parties this may make either managing project costs or encouraging competition more challenging for the DfE, as there is an additional barrier for investors to consider.

It may therefore be politically difficult to justify this approach, particularly if only certain types of applicants are given the subsidy (such as if all assets of a certain technology achieve a subsidy at the expense of another technology type). As with all elements discussed in this report, the details of the subsidy considered will also drive the potential impact of the subsidy being mandatory.

Further investigation will be required to determine if a mandatory subsidy scheme is viable for the NI market. Assessment of what the potential benefits of the scheme would be compared to a non-mandatory scheme will be important, as there are potential risks if a mandatory scheme is implemented. Wider legislative and regulatory questions, such as what impact a mandatory scheme could have on SEM, will also need to be considered. Additionally, there are questions in relation to how this approach would impact on system security, such as if such an approach changes how schemes operate in the CM. All these factors need to be investigated in more detail if a mandatory scheme is being pursued.

Consumer cost considerations

One important consideration will also be how costs are passed to consumers. There are a number of approaches which would mean that costs are past directly to consumers through the agreed payment method of the scheme (through taxations or levy's). However, there are a number of approaches which mean, whilst the cost to consumers of the scheme would be lower and they are provided more protection, the costs may be passed to them in another method.

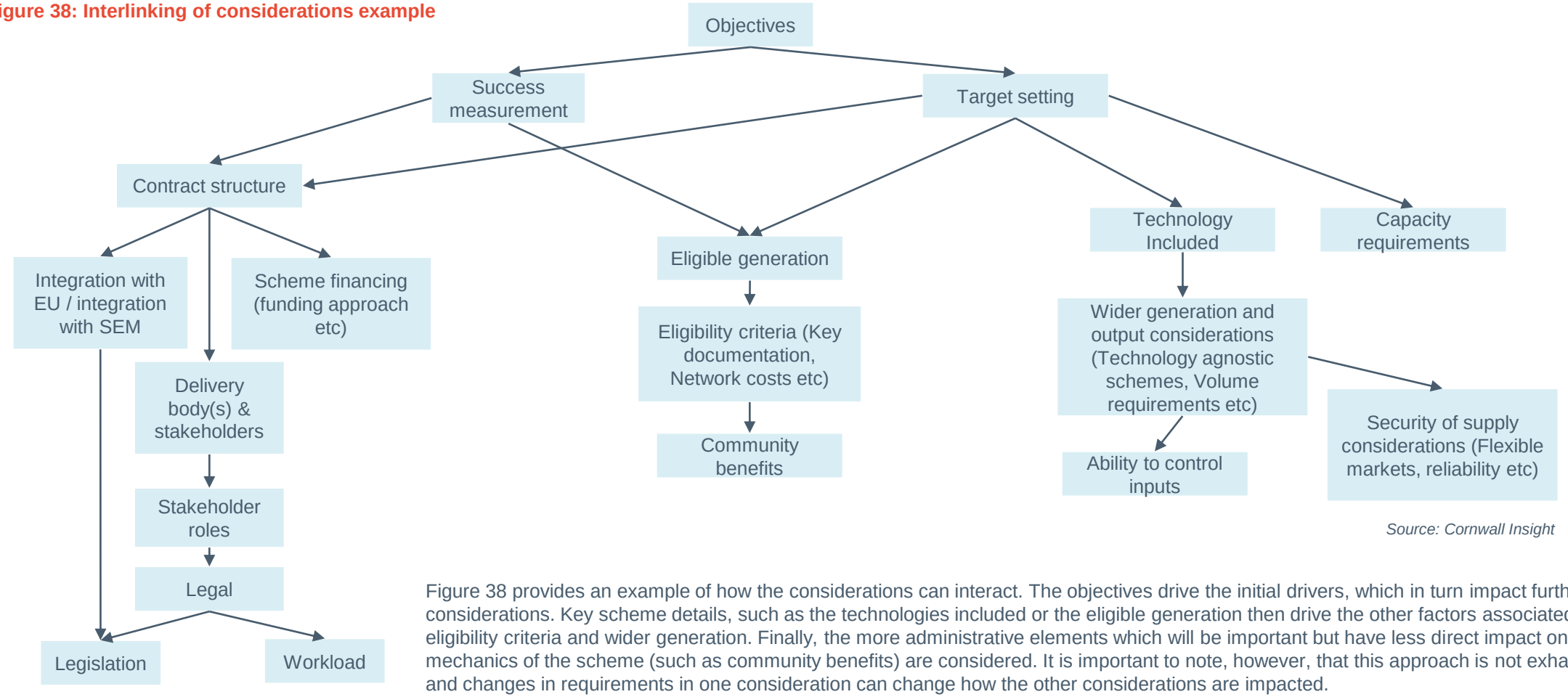
- **Performance related considerations** – setting volume requirements may mean there is more certainty that a generator will produce, providing more certainty in meeting the objectives of meeting the NI net zero targets. This should, theoretically, also prevent any additional costs for consumers as it does not require the generator to deliver any additional approaches but only to deliver the agreed level of power. However, the additional operational risk for generators may result in them having to increase the price they receive in the auction, impacting consumer costs
- **Network event related payments** – not making payments to generators for constraint issues and not allowing them to achieve additional benefits from providing balancing services means that the costs to consumers should be lower in regard to the direct cost of managing the scheme. However, there are two ways this may lead to additional charges:
    - Generators may need to increase their submitted/achieved subsidy price to account for the risk of their generation being reduced more than expected due to constraints
    - The increased lack of system security may lead to higher costs for the SO in managing the network. This cost would be passed to consumers

It is therefore important for the DfE to consider both the direct costs (those associated with operating the scheme) and how they will vary as a result of the possible approaches taken in the auction, but also consider the indirect costs, which impact the wider network and are past through to the consumer not through the subsidy but through other means.

Further assessment will therefore be required.

Interlinking example

Figure 38: Interlinking of considerations example



Source: Cornwall Insight

Figure 38 provides an example of how the considerations can interact. The objectives drive the initial drivers, which in turn impact further considerations. Key scheme details, such as the technologies included or the eligible generation then drive the other factors associated with the eligibility criteria and wider generation. Finally, the more administrative elements which will be important but have less direct impact on the mechanics of the scheme (such as community benefits) are considered. It is important to note, however, that this approach is not exhaustive and changes in requirements in one consideration can change how the other considerations are impacted.

Appendix 2 – International Markets

Great Britain - overview

The main subsidy scheme in GB is the Contract for Difference (CfD) Feed-in Tariff scheme which was designed to incentivise investment in secure, low-carbon generation – enabling affordable power for consumers.

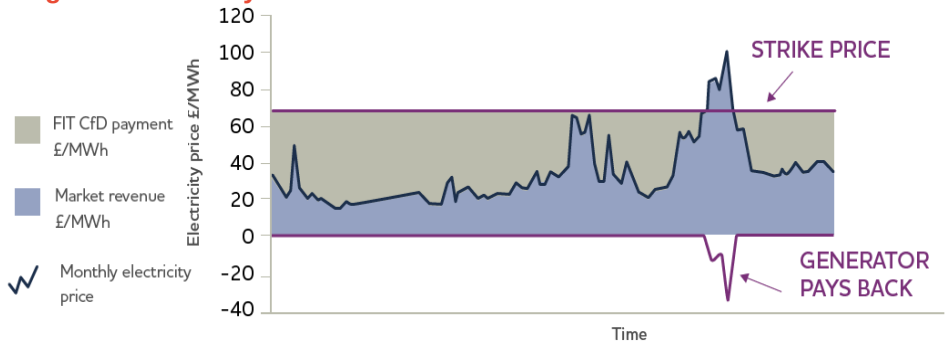
The purpose of the CfD scheme is to provide long term support to low carbon generators, allowing investment to come forward at a lower cost of capital. This is intended to provide financial certainty, stability of revenues, and deliver new investment at lower cost to consumers. The scheme is based on 15-year private law contracts between renewable/low-carbon generators and the Low Carbon Contracts Company (LCCC), which is a private company backed by government and which acts as the CfD contract counterparty. There are a number of additional bodies that have responsibilities under the CfD Scheme.

The scheme involves a two-way payment process, whereby generators receive (or payback) a £/MWh value based on the difference between:

- The wholesale **Market Reference Price**: the published (achieved) price in the market, and
- The **Strike Price**: the price achieved in the allocation process

The cost of the CfD scheme is met by all licenced GB electricity suppliers via a quarterly supplier obligation levy set by the LCCC. This is in turn recovered by suppliers from their customer base.

Figure 39: CfD Payment Structure



Source: EMR

Technologies are split into different pots, with the technologies included in each pot changing between Allocation Rounds (or ARs), with the last AR having three pots (a less established technology pot, an established technology pot and an offshore wind pot). Each pot has its own budget and/or capacity target, with assets in each pot competing with other technologies in their pot, but not against assets in other pots.

Initially, the details of all applicants are assessed and, if the budget or capacity target is not breached, all sites get a default strike price (the Administrative Strike Price, or ASP). If the budget or capacity is breached, an auction is held in which parties submit their own strike price and contracts are awarded based on cost effectiveness until the capacity or budget caps are breached. In each AR, technology specific parameters are also set, including maximum capacities or budgets (which mean that some technologies can only compete for a certain part of the overall pot budget) or minimum budgets (which essentially forces a proportion of the pot budget to be used on a particular group of technologies, regardless of price). Prices are set for each pot, and are on a pay-as-clear basis.

ARs have historically been held every two or three years but the government expect to be running auctions every year from March 2023. Consultations are held between each AR and major changes to how the scheme operates (such as changing pot arrangements) are possible. A significant number of stakeholders are involved in the process, with the Department for Business, Energy and Industrial Strategy (BEIS) setting budgets and consulting on changes, National Grid acting as the delivery body, Ofgem acting as a dispute resolution body, the LCCC acting as the contract manager and EMR Settlement providing payments.

Republic of Ireland - overview

The **Renewable Electricity Support Scheme (RESS)** was set up in 2020 to help Republic of Ireland achieve its 2030 renewable electricity target of 80%. The technology specific targets, set to reach this goal while utilising the country's natural resources adequately and revised in line with the Climate Action Plan (2021) and the Sectoral Emissions Ceilings (2022), are:

- Onshore wind: Up to 8GW
- Offshore wind: 7.6 GW
- Solar: 3 GW

The RESS auctions are a contract for difference (CfD), referred to as a two-way Feed-in Premium (FiP), and are settled on a pay-as-bid basis. The Day Ahead Market (DAM) price on the SEM (Single Electricity Market) forms the market reference price and projects are paid as per the differential between their bid price and the market reference price.

The RESS auction structure has evolved with each auction round. To date there have been two rounds of RESS auctions; RESS 1 in 2020 and RESS 2 in 2022. RESS 1 had a pot structure where each pot had a maximum capacity which could be allocated under it. It had a pot for 50% community owned projects of up to 5MW, a pot for solar projects and an all projects pot which was technology agnostic, i.e. solar projects and community projects could be considered under the all projects pot along with onshore wind projects on a cost basis if they did not win a contract under their specific pots. RESS 2 introduced the Evaluation Correction Factor (ECF) which is a technology specific multiplier, used to account primarily for the reliability benefit differences, which is applied to the offer prices for each technology eligible to participate, in this case, solar photovoltaics (PV), onshore wind and battery hybrids. Both RESS 1 and RESS 2 had a separate pot for community projects. RESS 1 stipulated that projects had to be at least 50% community owned to qualify for the pot while RESS 2 stipulated that projects had to be 100% community owned to participate in the community pot. From RESS 3 onwards there will be no community specific pot. RESS 3 is expected to be held in H2 2023, and the consultation for the terms and conditions has been published in October 2022. There are separate auction round(s) being held for offshore wind projects, with the first round, ORESS 1 (Offshore wind Renewable Electricity Scheme), scheduled for H1 2023.

The RESS auctions to date have had a subsidy support period of 15 years, but for ORESS 1 and possibly for RESS 3 this is being extended to 20 years, pending EU level state aid clearance. The RESS subsidy is funded through the Public Service Obligation (PSO) levy, which is recovered through consumer's electricity bills and is settled through electricity suppliers. It is calculated and certified annually by the CRU (Commission for Regulation of Utilities), and for the period between 1 October 2022 and 30 September 2023 it will be a credit of €89.10 for domestic customers, due to the high wholesale electricity prices on the SEM in the past year.

RESS 1 had lower competition than expected, with 82% of the capacity that entered the auction winning contracts. Additionally, RESS 2 saw higher prices than expected with an average bid price of €97.87/MWh in the all projects pot, when the price cap was set at €120/MWh. There have also been fall outs of projects from RESS 1. In line with these auction level trends, there have been significant changes made to the terms and conditions for ORESS 1 and these changes are set to be included in the RESS 3 consultations by the policy maker, the Department of the Environment, Climate and Communications (DECC). These changes are driven by the bidders and investors attaching a high level of risk to bidding into the RESS auctions, which has translated to high RESS bid prices as compared to other comparable markets. The key reasons for this is the lack of indexation, inadequate compensation (market based or auction based) for dispatch-down and the merchant tail; all factors which a developer cannot manage or accurately estimate in the long term.

The Netherlands - overview

The Dutch renewable energy subsidy scheme (SDE++) is a one-way contract for difference (CfD), pay-as-bid scheme that compensates the difference between cost price of the technology (base price) and the market value of the product that the technologies deliver (market price). The scheme was initiated in order to reduce carbon emissions by 49% by 2030 and promotes the large-scale roll-out of technologies for renewable energy production, stimulates competition, and offers long term security for investors. From 2021 the scheme has evolved to include carbon reducing technologies. Technologies are no longer judged on generated renewable energy but on the basis of avoided tonnes of Carbon Dioxide (CO2) emissions. The SDE++ scheme will run from 2021 to at least 2025 with a budget of €25bn.

The subsidy is apportioned across technology categories (electricity, sustainable heat, green gas, and CO2 reduction technologies) with the subsidy period running for 12-15 years (technology dependant). Renewable electricity generation technologies are 15 year schemes.

The subsidy granted is the maximum amount that will be received over the term. The maximum amount is determined by the project capacity and production. Production is capped based on a maximum number of full-load hours for each technology (the max number of production hours at the rated output for each year for which the project receives a subsidy). The actual subsidy amount received is the difference between the price offered by a successful beneficiary in the competitive process (the application amount) and the correction amount.

A correction amount is calculated annually, and represents the revenue or avoided costs of the project, e.g. from the sale of electricity. There are different correction amounts depending on the beneficiary type; for electricity production the correction price is the average market price. The subsidy is therefore a variable premium.

Noticeable eligibility requirements include making sure that the asset is sufficiently market ready, has sufficient potential for CO2 reduction and the applicant must provide a feasibility study (which includes a financial plan for the site and confirmation that sufficient equity capital is in place for the asset to be developed).

Additionally, price structures are very granular, with prices split for different technology types and additionally separated based on other factors, such as capacity or wind speed (for onshore wind sites).

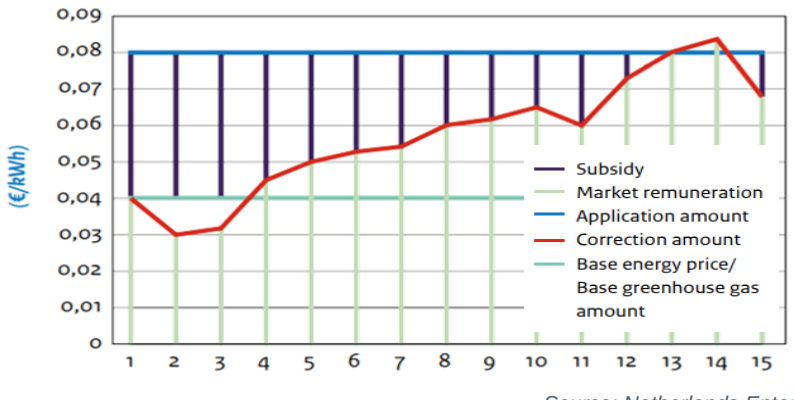
The application process consists of annual auctions, consisting of five phases. Each phase has a cap which increases in each phase. Applicants submit a bid during the applicable phase until the relevant budgets have been breached. The assessment period is 13 weeks (with a further 13 weeks being added if required). Technologies with greatest CO2 reduction at lowest price have greatest chances for success of receiving the subsidy. Since 2021, budgets have been assessed against the subsidy requirement per tonne of CO2 reduction.

Payment under the scheme is made using the following formula:

*Maximum SDE++ subsidy = (application amount – base energy price or base greenhouse gas amount) * production or CO2 reduction*

At the end of every calendar year, the subsidy is adjusted based on actual production of CO2 reduction and a final correction rate.

Figure 40: SDE++ Payment Example



Source: Netherlands Enterprise Agency

Germany - overview

Established in 2000, Germany had a government-set feed-in tariff (FIT) for 20 years in place for new renewable assets. However, this has since been modified through several amendments, specifically the Renewable Energy Sources Act (EEG) 2014 which specified the transition to an auction-based system to allocate 20-year feed-in premiums (FIPs) for assets with capacities exceeding 750kW (>150kW for biomass), and was completed following the implementation of the EEG 2017.

The FIP scheme provides a range of subsidies for renewable technology classes, including solar, onshore wind, offshore wind, biomass and (more recently) green hydrogen. They also have separate auctions for innovative and multiple-technology assets, such as a joint onshore wind and solar auction and for projects which include storage.

Hydroelectricity, geothermal, and mine gas were originally planned to receive subsidies but have since been excluded from the auction system because of the prospect of insufficient competition (they are however still eligible for FITs). Following the EEG 2017, Germany has promised to support renewable energy installations of solar PV and onshore wind in other EU Member States. Therefore, 5% of the annual subsidy volume is to be allocated to cross-border auctions to foster greater regional cooperation with Germany's "electricity neighbours".

The EEG allocates subsidies, volumes and capacity targets, based on a technology-specific basis. FIPs are competitively determined in auctions for installed generation capacity (in kW) and are paid per generated electricity unit (ct/kWh), where the award price equals the bid price (i.e. pay-as-bid pricing rule).

Whilst the auction mechanism initially saw success, the capacity of assets (particularly onshore wind assets) bidding into recent auctions has been low. This has led to increased prices with the price cap being achieved. The drivers for these high prices include elements associated with the scheme (such as the removal of generous community participation rules) and other challenges (such as the ease in which onshore wind environmental permits could be acquired).

To address some of these shortfalls, the EEG Easter Package Reform, adopted in July 2022, has expanded the volumes to be allocated for technologies up to 2030, as outlined in Figure 41. Transmission System Operators (TSOs) were originally in charge of delivering subsidy payments through the EEG surcharge – a levy applied to end consumers' electricity bills. The recent reform eliminated this to alleviate the cost burden given sharp rises in energy costs.

The German government will now fund the loss of revenue obtained by TSOs from the Energy and Climate Fund (EKF). The fund has been raised to over €170 billion and will pay for itself in 2023 out of its own income and reserves.

Figure 41: Auction volumes and tender volumes for Germany to 2030

Technology	Volumes to be allocated per annum (GW)							Generation capacity by 2030	Auctions per year
	2023	2024	2025	2026	2027	2028	2029		
Onshore wind	12.8	10	10	10	10	10	-	115 GW	3-4
Offshore wind	8-9	8-9	3-5	3-5	4	4	4	30 GW	1-2
Solar PV	6.5	9	11-22	11-22	11-22	11-22	11-22	215 GW	3-4
Biomass/ biomethane	0.6	0.5	0.4	0.3	0.3	0.3	-	8.4 GW	1

Source: Gleiss Lutz

Italy - overview

Italy has introduced a wide variety of renewable electricity support schemes since 1991 and utilised feed-in tariffs, tradable certificates, premium tariffs, self-consumptions initiatives, tax benefits and auction-based schemes. Italy organised its first renewable auction in 2019 with 9 separate auction rounds to date. State Aid clearance was cleared by the European Commission for its auction-based scheme in June 2019, approving €5.4 billion support. At the time, seven auction rounds were scheduled between 2019 and 2021 with predefined auctioned capacity.

The auction scheme is differentiated for sites that are above 1MW, and those that are below 1MW. Above 1MW plant are placed into an auction, and below 1MW go through "registration" which is still a competitive process. Multiple technologies are able to compete within an auction, and like other European schemes, they are divided into technology "baskets" and only compete within their basket.

Multi-technology auction baskets are separated into solar PV & onshore wind (Category A), hydroelectric and waste gas treatment (Category B) and plant refurbishment for all but solar PV (Category C). The auctions are pay-as-bid, price only, multi-unit tenders, where the form of support is a two-sided sliding premium (i.e. a CfD).

In >1MW auctions, the bid is based on a price reduction relative to a predefined basket or technology specific reference price, so the bid is not the actual support price received. Therefore, generators are competing to offer the greatest discount relative to the reference price to win in the tender (i.e. they bid a % reduction to the reference price). Italian auctions have a minimum price limit (i.e. a floor price), where generators are not allowed to offer a discount of more than 70% relative to the reference price, although this can increase up to 90% in later auction rounds. Support is given to generators for 20 years for all technologies except hydro, which receives 30 years of support.

In Italian auctions dates have been pre-decided, along with the planned auctioned capacities and ceiling prices. There is an additional rule that non-allocated capacities must be tendered in the subsequent auction round on top of the originally planned capacities. It is argued this led to significant undersubscription and resulted in high prices being achieved.

The small-scale auction ('registry') and large-scale auctions differ in several ways. The registration (i.e. small-scale) procedure is a multi-criteria auction, where the actual price is one of the lowest ranking criterion. Locational and other technical specifications are more important, leaving generators with limited opportunity for price competition. There is also an additional technology basket in the registration scheme for rooftop PVs.

Italy's €191.5 billion recovery and resilience plan was endorsed by the European Commission in June 2021, which includes measures to promote the use of renewable energy sources, including hydrogen. Furthermore, Italy implemented the EU Renewable Energy Directive (RED2) via a new decree that effectively extends the Renewable Energy Sources (known as the FER) 1 decree allocating support to renewables via the auction mechanism. This has led to the commencement of further auctions, an 8th and 9th, both of which were held in 2022. Italy have also been making several changes to national planning rules to enable more renewable plants to get built.

Auctions for Renewable Energy Support II (AURES II) conducted a review of the Italian renewable auction scheme for the first five actions. It found that Italy designed a complex renewable auctions support system that is far from ideal. It said most of the technology baskets both in small and large size auctions were heavily undersubscribed, which resulted in high prices (which were close to the ceiling price) being awarded. This is a potential signal of inefficient support allocation and leaves most tendered capacities unawarded.

Scheme evolution – GB

There are significant lessons which can be learnt in relation to the possible subsidy scheme for the NI market based on the key drivers for the development of the schemes in other markets, and the key changes which have occurred during the life of the schemes. It is also important to consider why these changes took place and if similar changes may be foreseeable for the NI scheme.

- One of the main drivers for the development of the CfD scheme was the higher-than-expected costs incurred in the Renewable Obligation (RO) scheme (the previous subsidy). A higher level of applicants to the RO scheme as a result of a greater than expected reduction in capital costs of onshore wind and solar projects resulted in costs within the wider Levy Control Framework (LCF) being much higher than expected. This cost was past to consumers. One of the main drivers for the introduction of the CfD scheme was therefore continuing to encourage investment in renewables but at a lower cost to consumers without impacting investor confidence
- Changes to the scheme since have focused on utilising the pot structures to change the targets of the scheme. Most noticeable was the separation of offshore wind from being part of a wider Pot 2 for less established technologies in the 2017 auction (AR2) into a separate Pot 3 in the 2019 auction (AR3). This allowed offshore wind to achieve its own separate price and no longer required offshore wind assets to compete with other technologies. This approach was driven by the Offshore Wind Sector Deal which imposed a target of 30GW of offshore wind being deployed by 2030. The British government were therefore able to shape the future allocation rounds to meet targets. Budgets have also changed in auctions to account for further changes in targets, with a high budget of £210mn per annum put in place for offshore wind assets for the 2022 auction (AR4) as a result of targets being pushed to 50GW by 2030. Similar has been seen for fueled sites, with certain technologies (such as Biomass Conversion) being removed between allocation rounds
- Another significant change to the scheme was the introduction of non-payment at times of negative pricing. Original contracts had no limitation of assets generating during negative price periods, so assets were incentivised to generate even at times of over-supply in the market, exacerbating system operation costs with no impact on their payments. Changes were made to the contracts in which assets did not receive payments if there were 6 hours of negative price periods in a given day. This was subsequently changed for AR4 to no payment being made for any periods in which market prices were negative
- Another significant change to the scheme was the removal of Pot 1 technologies. For AR2 only Pot 2 (for less established technologies) and for AR3 only Pot 2 and Pot 3 (for offshore wind) were eligible. Pot 1 technologies (established technologies including onshore wind and solar) were removed, so these technology types were unable to get a subsidy. This, however, led to a legal challenge from a wind developer which resulted in the government re-introducing Pot 1 for AR4. This is important, as it also highlights that there is the potential that some elements may be forced onto the DfE through legal risk
- These elements are important for the DfE to consider, as it shows that lack of limitations on deployment levels, whilst leading to high decarbonisation, can also cause considerable overspend for consumers. Robust measures will therefore need to be in place to prevent over deployment. Additionally, It shows the flexibility of the scheme in setting auction parameters, and that suitable arrangements could necessitate the DfE to adapt the scheme to meet future deployment requirements (due to elements such as legislative changes)

Scheme evolution – RoI

- Auction outturn was higher than the cost expected pre-auction for RESS 1 and 2 due in a large part to the risks (noticeably dispatch down risks such as curtailment, constraint and balancing) that investors needed to build into their prices but could not manage, which were reflected in the high bid prices. This is despite some compensation for curtailment within the contracts if an asset is curtailed 10% or more of the time for 2 consecutive years. The RESS 3 T&Cs consultation has indicated that availability compensation may see changes to address the existing risk. An Unrealised Available Energy Compensation (UAEC) is under consideration for RESS 3 to de-risk participant exposure to uncertainty surrounding oversupply and curtailment
- Inflation risk in Ireland was not built into the RESS 1 and 2 auctions by way of indexation, exposing investors to risk in the long term, making them err on the side of caution and build in a buffer for unexpected or maximum levels of inflation in the future. Recently announced offshore subsidy scheme (ORESS) terms and conditions have introduced partial indexation. It is also being discussed as part of the RESS 3 consultation
- Similarly, the support period of the scheme is under discussion in order to reduce the risk of merchant tail, as the lifetime of technology (20-25 years) is longer than the scheme support period. Subject to state aid approval the support period will be extended to 20 years. Similar timeframes are in discussion for RESS 3
- In RESS 1 and RESS 2 there was a pot for community owned projects. In RESS 1 a Renewable Energy Community (REC) had to own 51% of Community-led project(s). In RESS 2 this was raised to 100% ownership by RECs. It is proposed to remove this initiative from the RESS 3 auction as it has become clear that the current scheme incorporates significant challenges and the RESS process is better suited to commercial developments. The Small Scale Generation scheme (SSG) is more aligned to the community participation and will be launched in 2023 for generation schemes between 6.1 and 50 kWe
- In 2020 solar was a nascent industry in Ireland while onshore wind was well established. For RESS 1 there was a solar specific pot so that solar projects were not competing with onshore wind projects. However, it could still compete in the “All projects” pot which included onshore wind projects as well. The solar pot achieved a similar but cheaper price compared to the ‘All Projects’ category, assuaging worry on its inability to compete. This was reflected in the removal of the standalone solar preference category and adoption of an Evaluation Correction Factor (ECF). The ECF is a multiplier that aims to create a level playing field for all technologies to compete; the basis of the ECF is ensuring reliability of the grid rather than just balancing the playing field on a cost basis. The RESS 3 consultation proposes to retain ECFs
- Learnings from the RESS scheme focus on apportioning of risk, whereby loading of risk onto generators with no protection from constraints and curtailment, or provision of indexation has proven instrumental in driving prices higher. Steps to mitigate these risks are the dominant theme in RESS scheme evolution, with partial indexation and UAEC under consideration for further scheme iterations. These themes will also be important for the DfE to consider

Scheme evolution – the Netherlands

- The SDE++ scheme was developed in 2020 as an amendment and improvement to the existing SDE+ scheme, with the intention of broadening the purpose of the scheme to allow for a reduction of CO2 emissions. This was in reaction to legislative changes looking at achieving a target of 49% reduction in CO2 emissions in the Netherlands by 2030. The majority of the auction parameters used in the SDE+ were carried over to the new scheme, but with a focus on granting subsidies on avoided tons of CO2 emissions (not on renewable energy generated). The scheme also aims to complement EU Emissions Trading System (EU ETS), as the Dutch government is incentivised to promote engagement in the subsidy
- The move to a CO2 based view under the SDE++ process allows the implementation of several different categories within a known and trusted structure. This supports the potential implementations in regards to additional CfD pots for alternative technologies. However, a large amount of development work is still required, and questions remain about the risk associated with this approach
- The SDE+ scheme also allowed for amendments in timelines, with the late 2019 auction being implemented to allow for assets which had seen delays in achieving planning or grid connections to participate in the scheme
- Additional changes to the scheme included the potential for payments to be reduced in line with the value of Guarantees of Origins (GoOs) in the market, with the suggestion that prices should only be reduced if GoO prices increased above a certain level. This potentially adds complexity, however, as there is limited visibility in regards to the value of GoOs
- One significant change was the move in 2021 to partition between electricity, sustainable heat, green gas, and CO2 reduction technologies in order to be able to provide support to technologies which are often not subsidised as the result of competition in regards to cost effectiveness
- The scheme also allows for extensions to various elements which may be technology specific, such as the 2022 scheme extending the allowed construction timeframes for geothermal projects and Carbon Capture and Storage (CCS) projects
- There is therefore a large amount of potential lessons to be learnt from the scheme, including how to ccalculate CO2 costs for established renewable/low-carbon generators and what the possible approaches are for integrating GoOs and EU ETSs into a scheme

Scheme evolution – Italy and Germany

Italy

- Exact dates, planned auction capacities, and ceiling prices were defined for the first auction (FER1), to provide investor confidence, with a rule that non-allocated capacity must be tendered in the subsequent round on top of the planned capacity. This led to significant undersubscription inflating prices towards ceiling prices. As capacity remained after all seven of the originally planned auctions this additional capacity was entered into a further, unplanned, 8th auction round, with scope for another should there still be unassigned capacity
- Undersubscription in the initial auction setup was also attributed to a difficult regulatory framework and ambiguity on the authority of local councils. To combat this and expedite the process, the scheme has developed a centralised platform to simplify authorisation and administrative procedures
- The scheme introduced prioritisation of innovative plants with higher generation costs, promoting entry and awarding of subsidies to technologies which may struggle to compete on cost alone
- A method of monitoring and control was introduced, allowing for tariff decreases over time should technologies develop, and their costs decrease. In an earlier scheme this was not considered, and incentives remained unadjusted while costs fell dramatically (70% between 2008-2012). This resulted in a costly scheme that raised consumer energy bills
- This schemes learnings lie in the commitment and definition of capacity volumes and its rollover if unassigned, this had major impacts on competition and drove prices higher. Insufficient competition determining subsidy viability is an important consideration. Similarly allowance for subsidy changes over time in response to different stimuli (in this case technology costs decreasing) are an important consideration. Key lessons from the Italian market for the DfE are therefore that committing to scheme parameters (including budgets) early in the process can lead to the scheme being unsuccessful due to lack of competition

Germany

- The EEG scheme was financed from levies on domestic energy bills until July 2022. This was removed and is now paid for by the federal government out of the Energy and Climate Fund (EKF). Included in legislation were guarantees that suppliers decrease prices for consumers to receive tangible relief on energy bills considering the energy crisis
- EEG amendments in 2014 initiated the transition to an auction system for most technologies and the phase out of the feed-in premium (FIP) system. This transition was completed following the implementation of EEG 2017 and aimed to increase the volume of renewable assets in line with the Climate Action Programme 2030
- Innovation auctions switched from a fixed to floating market premium as the fixed premium did not work well. These auctions promote innovative technologies e.g., inclusion of innovative concepts in hydrogen-based electricity storage, combined with wind or solar installations
- The Energy Surcharge Act introduction in Easter Package (2022) removed surcharges on self-consumption and direct delivery behind the grid connection point. This reduced the amount of red tape and made self-supply a much more attractive option
- The limitations of the fixed premium is an important lesson for the DfE, as it shows that a level of flexibly in approach, particularly pricing, will be required

GB CfD historic scheme costs (1/2)

- The figures below show historic scheme costs of the GB CfD, dating back to 2016-17
  - The top figure is showing costs on a £/MWh basis as charged to licensed electricity suppliers by the LCCC. These include costs recovered for generator payments but exclude the LCCC's operational costs
  - The bottom figure is showing total payments made to generators under the scheme
- Costs began low as little capacity was operational under the scheme; however, payments made to individual generators were high due to both relatively high strike prices awarded to assets early in the scheme and amid lower wholesale power prices (compared to 2022 levels), resulting in greater top-up payments
- Although strike prices were typically lower for projects that were awarded contracts in later allocation rounds, supplier/ consumer costs went up with increased capacity under the scheme, and with exceptionally low wholesale prices in 2020
- Lower supplier/ consumer costs have been seen in 2021 and 2022 amid a sharp rise in wholesale power prices, meaning that generators are either receiving less top-up payments or even paying money back under their contracts

Figure 42: GB CfD outturn costs, on a £/MWh basis as charged to electricity suppliers

£/MWh	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Q1	0.003	1.529	2.859	5.125	9.596	6.308	0.695
Q2	0.003	1.358	3.859	6.248	8.782	2.946	-5.939
Q3	0.127	2.238	3.665	6.697	9.161	-1.796	
Q4	0.985	2.384	3.909	7.842	7.695	-1.863	
Annual	0.394	1.841	3.506	6.549	8.750	1.068	-2.579

Source: LCCC data, Cornwall Insight analysis

Figure 43: GB CfD outturn costs, total payments made to generators under the scheme

Payments (£)	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Q1	2,533	138,484,767	244,460,786	326,323,534	525,401,595	389,623,949	43,082,348
Q2	206,675	93,880,849	253,390,402	384,012,286	517,075,826	174,051,779	-358,925,648
Q3	10,328,422	184,194,667	290,636,224	503,928,202	658,492,558	-133,770,300	
Q4	81,583,345	127,404,701	191,483,014	595,211,822	566,851,254	-140,689,734	
Annual	92,120,975	543,964,985	979,970,425	1,809,475,845	2,267,821,234	289,215,694	-315,843,300

Source: LCCC data, Cornwall Insight analysis

GB CfD historic scheme costs (2/2)

- The figures below show historic scheme costs of the GB CfD, dating back to 2016-17, by technology type
  - The top figure is showing total costs by technology based payments made to each generator operational under the scheme
  - The bottom figure is showing total payments made to generators under the scheme on a per MW operational capacity basis
- Costs per technology are a function of the strike prices achieved, the overall output levels of individual assets (which may vary seasonally, and year-on-year), and total capacity of each technology awarded agreements under the scheme
- Offshore wind appears to have relatively high costs, owing to higher levels of output compared to onshore wind and solar PV technologies, combined with much greater capacity levels accredited to the scheme. Strike prices awarded to earlier offshore wind assets were also relatively high, above those for onshore wind and solar PV at the time, although offshore wind strike prices have come down significantly in the latest auctions
- As with overall scheme costs on the previous slide, total costs rise as more capacity is accredited to the scheme, and as wholesale prices decreased amid the COVID-19 pandemic. However, costs fell as underlying wholesale power prices rose in 2021 and 2022
- Regarding £/MW costs, these have also fluctuated significantly with changes in underlying wholesale prices, with very high prices as of late resulting in payments being made back from assets under the scheme

Figure 44: GB CfD outturn costs, total payments made by technology type

Cost (£)	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23 (to date)
Biomass Conversion	91,768,752	247,306,765	380,220,678	442,329,223	582,975,874	290,955,027	-55,471,033
Energy from Waste with CHP	0	0	0	0	5,420,503	2,218,173	-7,128,088
Offshore Wind	0	295,846,853	587,598,214	1,276,978,305	1,596,734,500	81,098,355	-194,950,490
Onshore Wind	0	0	11,253,983	88,777,442	81,131,202	-84,154,239	-55,873,865
Solar PV	352,223	811,367	897,550	1,390,874	1,559,155	-901,622	-2,419,825

Source: LCCC data, Cornwall Insight analysis

Figure 45: GB CfD outturn costs, total payments made per MW operational capacity by technology type

£/MW	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23 (to date)
Biomass Conversion	142,277	383,421	361,499	420,549	554,270	276,628	-52,740
Energy from Waste with CHP	0	0	0	0	120,456	49,293	-158,402
Offshore Wind	0	300,991	375,484	404,483	459,376	19,174	-46,091
Onshore Wind	0	0	32,158	147,808	124,964	-129,620	-86,061
Solar PV	29,499	35,524	39,297	60,896	68,264	-39,476	-105,947

Source: LCCC data, Cornwall Insight analysis

Forecast GB CfD costs

- GB CfD scheme costs are forecast by the LCCC for the two front quarterly obligation periods. LCCC also provides an advanced forecast for a further six quarters. These are displayed in the figure opposite
- Costs are forecast to remain negative for the foreseeable future amid high prevailing wholesale power prices, and as more CfD plant commission that have lower strike prices than those that commissioned early in the scheme
- Cost vary on a quarterly basis depending on projected generation levels, which is in turn impacted by seasonal load factors and any new plant commissioning
- Overall forecast negative costs are estimated to decline in 2024 as underlying wholesale power prices are expected to fall from their current levels
- We have also provided the forecast cost on a £/MW basis. This has been calculated using the expected future capacity deployed under the scheme in each quarter, as provided in the LCCC's updated CfD register

Figure 46: GB CfD forecast total payments made to generators, taken 1 December 2022, and estimated £/MW costs

Quarter	Total forecast cost (£)	Forecast cost (£/MW)
Q4 2022	-£729,480,000	-£110,684
Q1 2023	-£2,213,630,000	-£276,612
Q2 2023	-£1,800,265,306	-£212,819
Q3 2023	-£1,086,868,242	-£128,484
Q4 2023	-£2,356,127,393	-£272,443
Q1 2024	-£1,616,830,967	-£168,910
Q2 2024	-£970,390,758	-£96,728
Q3 2024	-£516,000,318	-£45,940

Source: LCCC, CI analysis

Historic RESS costs

- Each year, the Commission for Regulation of Utilities (CRU) publishes the Public Service Obligation (PSO) levy for the period 1 October to 30 September the following year
  - The PSO levy is charged or credited to all electricity final customers to fund schemes designed by the Irish Government in support of national policy objectives. Over a number of years, the PSO has encompassed several schemes, and currently supports the Renewable Electricity Feed-In Tariff (REFIT) and the Renewable Electricity Support Scheme (RESS), which provides support payments to suppliers to contract with eligible renewable generation projects
- For the first time in many years, due to unprecedented and sustained levels of wholesale electricity prices, the PSO levy for the 2022-23 year has been set at a negative rate
  - The primary driver of this comes from expected negative RESS payments due to high underlying wholesale power prices. The CRU's 2022-23 indicative benchmark price (with a Wind-weighted Benchmark Price €330.23/MWh and Solar-weighted Benchmark Price €332.66/MWh) is higher than the Strike Price of all RESS units that have made ex-ante submissions for the PSO Year 2022-23
  - Based on the CRU's current 2022-23 PSO levy calculation, a number of these projects will owe monies to the PSO levy ex-ante in the 2022-23 PSO year. As a result, the 2022-23 net ex-ante payments under the RESS scheme are -€313.95 million
  - We note that RESS payments within the PSO levy are set ex-ante, and are subject to a reconciliation which is factored into future PSO levies
- For 2021-22, although the overall PSO levy was positive overall, the ex-ante RESS contribution was negative, set at -€6.27mn

Figure 47: Ex Ante RESS costs within PSO levy

Year	Ex Ante RESS costs within PSO levy	Source
2022-23	-€313,950,000.00	2022-23 PSO Final Decision Paper
2021-22	-€6,270,000.00	2021-22 PSO Decision Paper

Source: CRU

Ireland – lessons (1/2)

Figure 48: Lessons learned from international markets – Ireland

Class	Key differences to GB	Lessons
Scheme purpose	• Similar to the GB CfD, RESS design is to encourage investment in renewable technologies. Ireland is working towards a specific target capacity, with a specific number of rounds planned for RESS and ORESS	• The RESS scheme had specific rounds planned to reach its 2021 goals, but with increased targets to be met, ORESS 1 Rmax reflected the entire pipeline eligible to bid in rather than the initially planned auction capacity. • Adapting auction quantities and competition ratios may be necessary over time, and clarity on the driver or target for the auction's existence needs to be clear, so that it can inform the scheme
Structure of the scheme	• RESS is technology agnostic, for onshore wind, solar and hybrid (battery) plants, with an ECF correcting the bid prices based on the relative system value/reliability benefit. RESS 1 has a pot for solar PV and till RESS 2 there was a pot for community owned projects. From RESS 3 onwards technology level pots are not expected • Offshore wind has a separate auction round (ORESS) • The auctions are pay-as-bid with an auction level price cap	• Northern Ireland is a constrained area and needs to ensure that the right technology mix wins contracts, so a pot system or an ECF option can be considered • A pay-as–bid structure negates the risk of a higher burden on consumers, if the marginal bid is a relatively higher bid
Generation and output	• The ECF has been introduced to ensure that the reliability of the grid is maintained with the right mix of projects winning contracts, rather than the purpose of the pot structure which was to encourage nascent technologies • For ORESS and possibly for RESS 3 onwards, all dispatch down for system curtailment and oversupply reasons will be compensated	• Full compensation for curtailment and oversupply related dispatch down to ensure that bid prices are not inflated with bidders factoring a risk premium into their bids, to manage the risk of revenue loss due to dispatch down during the support period
International Interaction	• RESS projects are Republic of Ireland (RoI) specific, despite the Clean Energy Package (CEP) directing EU member states to encourage cross-border projects. However, Ireland has no interconnectivity to mainland Europe at present and this is less key, for near term RESS rounds	• Northern Ireland is a part of the SEM but is also governed by UK legislation. This may make it difficult for it to have a joint support scheme with GB or Ireland, as there will be considerations on the other side which may have to be accounted for
Evolution	• There has been significant changes, both implemented and proposed, in the RESS auction structure. The pot system has been dissolved, with a specific auction for offshore wind implemented. Partial indexation, a longer support period, full compensation for dispatch down due to system curtailment and oversupply are some of these changes	• Industry buy in at the outset to understand risks to developers that will drive up bid prices and may cause extreme bidding behaviour needs to be understood and accounted for at the outset to avoid frequent scheme changes. This drives up the cost of capital as the risk factor perceived for the scheme is considered higher, when there is lack of certainty around terms and conditions and continuity

Source: Cornwall Insight

Ireland – lessons (2/2)

Figure 48 (cont.): Lessons learned from international markets – Ireland

Class	Key differences to GB	Lessons
Eligibility criteria	• For RESS, projects need to be shovel ready and have to be included in the ECP (Enduring Connection Policy) process • ORESS projects need to have approved MACs (Maritime Area Consent), but do not need to be shovel ready, for round 1 • In RESS 2 community projects needed to be 100% community owned • All projects have to contribute to a Community Benefit Fund	• Allowing extension of project start date due to judicial reviews for planning process for a new technology, for example offshore wind. In Ireland it is not allowed for ORESS and is a risk for developers • Consider a community buy in to lower the risk of objections at a community level
Security of supply	• No specific penalties, or charges on non provision of contracted volumes • ECF exists with an objective of ensuring overall security of supply, for example, by assigning a higher reliability factor to hybrid technologies in a wind heavy system • Bid bonds exist to ensure projects awarded a contract are build and to the timelines committed under RESS	• RESS 3 is considering a lock-in period to prevent project fall outs, such as those seen in RESS 1 • Bid bonds need to be adequate in impact whereby foregoing it would have to be a considered decision for the developer
Scheme Financing	• The scheme is financed through the PSO levy which is charged to every electricity customer through their supplier. The CRU sets the overall levy on a yearly basis	• Costs ultimately borne by the consumers, and there is annual visibility into the levy from CRU
Legal/admin	• The DECC is responsible for the auction structure and terms and conditions • EirGrid (the TSO) operates the auctions including qualifications	• Clear view of roles and responsibilities with no shift in them over rounds. In ORESS the responsibility for building offshore network in round 1 is the responsibility of the developer and later shifts to EirGrid the TSO, who will be the ultimate owners of the offshore grid. There is lack of clarity around handovers, timelines, etc. adding to risks and therefore costs

Source: Cornwall Insight

The Netherlands - lessons

Figure 49: Lessons learned from international markets – The Netherlands

Class	Key differences to GB	Lessons
Scheme purpose	The goal of the SDE++ scheme is to reduce CO2 and greenhouse gas emissions by 49% by 2030 through promoting the large-scale roll out of technologies for renewable energy production, increase CO2 reduction, stimulate competition and offer long term security for investors. 12-to-15-year terms – renewable energy generations projects are 15-year terms	
Structure of the scheme	• SDE++ is a one-way CfD, with a planned number of rounds ending in 2025. Pay-as-bid scheme under capped auction tiers • Projects can compete based on avoided CO2 tonnes • Applications made under a phased opening – 5 phases with increasing subsidy intensity (€65 – €300 / tonne CO2) • The SDE++ contains as an additional safeguard in the form of technology specific base amounts above which the technology concerned cannot bid	• Integration of Carbon avoidance into application criteria and not primarily based on cost has allowed more costly, less mature technologies to be more competitive – technologies that lost out in previous scheme versions (SDE+) • Tiered application process based on subsidy intensity. The Netherlands has demonstrated based on previous tender rounds that this incentivises applicants to bid their true costs and that they generally submit bids below the phase amount or the technology specific base amount
Generation and output	• Budget apportioned to diff technology categories – includes refurbishment / replacement of wind farms • Banking of production allowed which affords flexibility over term of subsidy – the overall number of production hours eligible for subsidy remains capped – the cap forms basis for the calculation of the technology specific base amount • No subsidy for curtailment – if curtailment occurs the generator has to ask the TSO for compensation, handled outside of the SDE++ scheme • In renewable electricity producing technologies no subsidies will be paid for hours in which the day ahead price is negative whenever negative prices persist for at least 6 hours	• Subsidy available for refurbishment of wind farms and not only new installations – consideration for NI as commercial onshore wind farms will be nearing or are at end of life (with the earliest installed in 1995, turbine lifetime 20-25 yrs)
International Interaction	• The Netherlands is in the process of developing cooperation mechanisms with other Member States to enable foreign projects to compete within the scheme • Subsidy for offshore wind due in 2025. The scheme will initially be open to projects physically located in the Netherlands. However, the Netherlands will leave scope in the national law for extending the scheme to other Member States	

Source: Cornwall Insight

Germany – lessons (1/2)

Figure 50: Lessons learned from international markets – Germany

Class	Key differences to GB	Lessons
Scheme purpose	• Germany's renewable energy sources act (EEG) was designed to provide feed-in-premium (FIP) and feed-in-tariff (FIT) subsidies to increase the volume of renewable assets • The scheme came into force on 1 April 2000 and has been modified through several amendments • Its purpose is to ensure that renewable energy accounts for at least 80% of Germany's gross electricity consumption by 2030	
Structure of the scheme	• Unlike GB's CfD, auctions are designed based on technology, with separate auctions for onshore wind, solar PV, biomass and offshore wind (the latter prescribed by the Offshore Wind Energy Act, or WindSeeG) • Sliding FIPs are competitively determined in auctions for installed generation capacity (kW) and are paid per generated electricity unit (ct/kWh), where the award price equals the bid price (i.e. pay-as-bid pricing rule) • For some technologies, auctions occurred up to 6 times per year with tender volumes differing depending on the auction round, however these targets have since been reduced to around 3-4 per year • Hydroelectric power, geothermal, sewage gas and other technologies are not eligible to participate in auctions due to insufficient competition. Instead, they are eligible for feed-in-tariffs (FITs)	• Whilst the auction mechanism initially saw success, the capacity of assets bidding into recent auctions has been undersubscribed due to the frequent nature of auctions and the fixed tender volumes requiring allocation • This led to increased prices with the price cap being achieved. The drivers for these high prices include elements associated with the scheme (such as the removal of generous community participation rules) and other challenges (such as the ease in which onshore wind environmental permits could be acquired) • Germany has now made several amendments to national planning rules, for example, to expand solar PV adjacent to motorways. Amendments to the EEG have accompanied these reforms, for instance reducing some auctions from 6 to 3-4 per year to ensure a pipeline builds for sufficient competition
Generation and output	• Generation capacity volumes are apportioned differently depending on technology category • Like GB's scheme, auction budgets and parameters are set for each auction as and when they are held	• Altering auction quantities, capacities and generation targets may be necessary over time
International Interaction	• Following the EEG 2017, Germany is developing cooperation mechanisms with other EU Member states by allocating 5% of the annual subsidy volume to cross-border installations of solar PV and onshore to foster greater regional cooperation with Germany's "electricity neighbours"	• Lessons to be learnt from cooperation include cost efficiency (deploying them where RES potential is high), more competition (especially for small Member states) and policy/knowledge transfer
Evolution	• The EEG has evolved across numerous amendments, particularly the EEG 2014 which witnessed the transition from a FIT to FIP-by-auction system, based on technology type	• Adapting the structure of renewable energy support schemes alongside corresponding auction tender volumes, capacities and auction rounds may be necessary to ensure a scheme delivers its purpose

Source: Cornwall Insight

Germany – lessons (2/2)

Figure 50 (cont.): Lessons learned from international markets – Germany

Class	Key differences to GB	Lessons

Eligibility criteria	• Units must have a capacity above 750 kW to be eligible for competitive auctions or above 150 kW for biomass. Below this, renewable assets can be eligible for FITs with a digression mechanism
	• Realisation times differ by technology but generally have a penalty-free period between 18 and 24 months
	• The most recent update of the WindSeeG also outlines further eligibility criteria for offshore wind assets depending on the following:
	  • Qualitative criteria include the use of green electricity in asset production and the conclusion of a power purchase agreement (PPA)
	  • Whether the site is pre-developed and pre-surveyed by state authorities
	  • Alternative criteria for non-pre-developed sites also award contracts to those who pay the highest price
		• Penalty-free period for realization is designed to ensure that companies holding tenders do not delay construction, since after this period they face penalties and may risk having their subsidy allocation withdrawn
		• WindSeeG legislation for non-pre-developed sites allows for negative bidding since there is no cap on how much someone is permitted to bid. This has exacerbated the issues wind farm developers are already facing due to rising input costs

Security of supply	• Successful bidders are fully exempted from grid connection costs, which were originally financed by the EEG levy but are now funded by the EKF • Innovative tenders allocate volume for projects which integrate technologies and/or have storage capacity, working together to stabilise the power system and ensure security of supply • Green hydrogen is also available for tenders post-2022	• To ensure security of supply, schemes may have to evolve by introducing new subsidies/auctions which incorporate storage, innovative tenders and new technologies
Scheme Financing	• Subsidies used to be paid for by transmission system operators (TSOs) financed by the electricity consumers via a surcharge or levy on their electricity bills • However, in light of recent surges in energy prices, this surcharge was abolished in the most recent German Energy Reform Bill (the Easter Package) in July 2022 • Under EEG 2023, the scheme will be financed by the German government from the Energy and Climate Fund (EKF) which is being expanded to create the Climate and Transformation Fund (KTF). • The fund has been raised to over 170 billion and will pay for itself in 2023 out of its own income and reserves	• The levy was in place for over 20 years but became controversial since it accounted for 10-20% of consumers' electricity bills • This surcharge burdened energy-intensive small or medium-sized enterprises (SMEs) since large businesses were generally exempt from the EEG levy, sometimes forcing them to relocate or close entirely • After its removal, effective from 1 July 2022, primary relief has been provided to SMEs and German households, given that it is expected to save the average family around 200 euros per annum
Legal/admin	• Federal Network Agency shall conduct the auction announcement (including bid deadline, volume, and maximum value) and the award procedure for each auction for each form of energy • Scheme financing has changed since the Easter Package	• Whilst the parameters of each auction alter depending on the round, the role and responsibility of the Federal Network Agency is clear by ensuring these parameters meet the allocated tender volumes per year

Source: Cornwall Insight

Italy – lessons (1/2)

Figure 51: Lessons learned from international markets – Italy

Class	Key differences to GB	Lessons
Scheme purpose	• The FER Decree (Renewable Energy Sources) is a decree that aims to support the production of electricity from plants powered by renewable sources of various kinds (photovoltaic, wind, hydroelectric and gas) in line with the European targets for 2020 and 2030, through the definition of incentives and methods of access that promote effectiveness, efficiency and sustainability of both environmental and incentive charges	
Structure of the scheme	• They have a separate "auction" for >1MW assets, known as the "registration" process for <1MW assets – the latter is still competitive based on specified criteria but not a traditional descending clock auction. This enables <1MW sites to also receive support • Capacity targets were decided for multiple auctions at scheme inception, with unallocated capacity rolled forwards to future auctions • Participants bid a discount to a pre-defined reference price, rather than bidding in the price they wish to receive. The also have floor prices under which participants cannot bid below • Auctions were frequent – 7 auctions across 2019-2021 • Pay as bid	• Heavily undersubscribed auctions led to prices achieved at or close to the reference prices (i.e. the highest prices you can bid) • The pre-set dates and capacity targets, alongside the roll-over of unused capacity to future auctions, was understood to contribute to the undersubscribed nature of the auctions. Targets did not reflect the pipeline of assets eligible • The floor price has been criticised as it limits the price reductions that participants can bid in the auction in the case of a high number of participants • In the multi-criteria auction procedure (less than 1 MW) competition does not necessarily reduce prices because the ranked criteria are in strict hierarchical order. This means that those power plants meeting specific criteria are not incentivised to submit competitive offers • Too frequent auctions did not allow the pipeline to build sufficient levels of competition • Low administratively set ceiling prices for some technologies (Hydroelectric, and plants based on waste gas from purification processes) were attributed to low competition also • Italy have been making several changes to national planning rules to enable more renewable plants to get built
International Interaction	• The auctions are cross-border, open to any EU member state or third country with a free trade agreement. However, only those power plants physically able to transfer their electricity to the Italian system are eligible	• In practice however, cross border projects have never participated in the Italian auctions

Source: Cornwall Insight

Italy – lessons (2/2)

Figure 51 (cont.): Lessons learned from international markets – Italy

Class	Key differences to GB	Lessons
Evolution	• Due to the fact that auction capacity targets were set for seven auctions in advance, with timings set and little time between each auction, there was little scope to make changes between auctions	• Some changes have since, in 2021 and 2022, been progressed in terms of planning procedures and amid the implementation of the RED 2 decree, although the 8th and 9th auctions held after these have continued to see prices close to the ceilings • A new decree is expected and may make more fundamental reforms
Eligibility criteria	• Refurbishment plants have their own technology pot, Category C • Gaining all the necessary planning permissions can prove very challenging in the Italian market • Aggregated assets are allowed to participant within certain defined criteria, allowing smaller units to participate in the >1MW auction	• Onerous planning rules has led to a smaller pipeline of eligible assets and undersubscribed auctions. AURES II, who reviewed the scheme's first five auctions, identified several regulatory, administrative and auction design elements for the pervasive undersubscription of the auctions. First, there are many regulatory barriers present in the county. The permit granting procedure is lengthy and cumbersome according to the market participants • Additionally, Italian regulation forbids the installation of ground mounted solar PV plants on agricultural lands, which significantly reduces available sites for PV. It is important to note however, that the Italian government announced new regulatory measures in August 2021, and renewable deployment has since risen
Security of supply	• A Capacity Market scheme was implemented into legislation shortly before the FER decree for renewable auctions • The "Capacity Market Decree" of 28 June 2019 was implemented, a mechanism by which Terna procures capacity through long-term procurement contracts awarded through competitive bidding	

Source: Cornwall Insight

Appendix 3 – Microgeneration, other considerations

Microgeneration

The incorporation of microgeneration into the scheme is an important consideration, as there are likely to be a number of differences between how microgeneration and larger scale generators engage in the subsidy. Microgenerators, likely to be funded by individuals/small-scale companies, will require different funding approaches to large-scale consumers. Microgenerators are likely to use pure equity arrangements or bank loans, as opposed to the more complex debt funding approaches used by large corporates. Additionally, whilst commercial considerations such as rate of return and agreement life are still important for microgeneration sites, the financial incentive for deploying the asset may be driven by onsite considerations, such as energy independence or reducing electricity bills. It is therefore important to consider the key questions of what level of microgeneration should be allowed into the scheme and if the scheme should incorporate a different approach for microgeneration.

The different markets considered all have a variety of different approaches in how they include microgeneration in the subsidy support scheme:

- **GB –** The CfD scheme does not have limits on some technologies but places limits on technologies which used to have support under the Feed-in Tariff (FiT) scheme, resulting in technologies such as solar, onshore wind and remote island wind sites having to have a minimum capacity of 5MW to participate in the scheme. The FiT scheme has been removed, so new assets under this capacity currently receive no subsidy. They do have certain options for merchant agreements guaranteed under the Smart Export Guarantee (SEG), but this provides limited revenue certainty
- **Ireland** – The Microgeneration Support Scheme (MSS) is designed to provide direct payments for new solar PV assets under 6kW, whilst the Small-scale Generation Scheme is a FiP for certain solar assets between 6.1kW and 50kW in capacity
- **Germany** – Microgenerators of wind cooperatives (BEGs) under 18MW are included in the subsidy but have preferential rules apply to them. These approaches were originally successful, but the level of assets applying since 2018 has reduced
- **Italy** – Smaller projects (under 1MW, or under 200kW for wind) received a FiT from 2008, avoiding having to participate in an auction. Assets also benefited from tax credits. Since 2019, however, separate auctions have been applicable
- **The Netherlands** – Direct limitations are placed on the size of assets eligible for the subsidy in certain cases, and assets require a large-scale grid connection. Other limitations linked to size (such as wind speed) may also be applicable for certain assets. A number of alternative schemes (including the Energy Investment Allowance, or EIA) are available.

The NI market potentially has more small-scale assets than these other markets, and therefore there is more benefit from incorporating smaller scale assets into the scheme. However, how this is done is crucial so needs careful consideration.

Asset size

One key element associated with microgeneration will be the size of microgenerators. Setting a minimum size for microgenerators is crucial if alternative pricing approaches are going to utilized for these assets compared to larger generators. However, determining a suitable size cut off for the microgeneration will be challenging, as there will be a number of factors which impact the key considerations.

- **Purpose** – the purpose of microgenerators is likely to be different to larger assets, being more aimed at cost reduction than on obtaining revenue
- **Developer type** – microgenerators are more likely to be developed by domestic consumers
- **Market demand** – the level of certain asset sizes in the market will likely have an impact on what is viable under the subsidy and what approach should be taken. Additionally, this will also impact the likely level of competition and consumer costs
- **Technology considerations** – different technologies are likely to have different views on what constitutes a microgenerator/ what is not eligible for a subsidy. In the 2022 SDE++ for example, a minimum capacity of 15kW is applicable for solar PV assets, whilst hydropower is limited by the relevant fall height of water
- **Subsidy purpose** - key to determining what is a microgenerator/small-scale generator in the scheme will also be the purpose of the subsidy scheme. A focus on helping to reduce domestic costs will encourage a smaller scale of assets to be involved in the scheme than a focus on economies of scale or consumer upside

If microgeneration is to be considered differently in the subsidy, we believe a figure of 50kW is a reasonable starting capacity for the NI scheme, due to its use in the market previously. This capacity is known to legacy developers under the RO so may provide additional benefits. It would allow focus on the domestic market and provides plenty of scope for larger developments before this threshold is reached, but does not reduce the level of competition for larger assets which may participate in the scheme. Larger figures such as 1MW assets may increase economies of scale, but the size and nature of the NI market means this cap may limit the engagement of a number of viable assets.

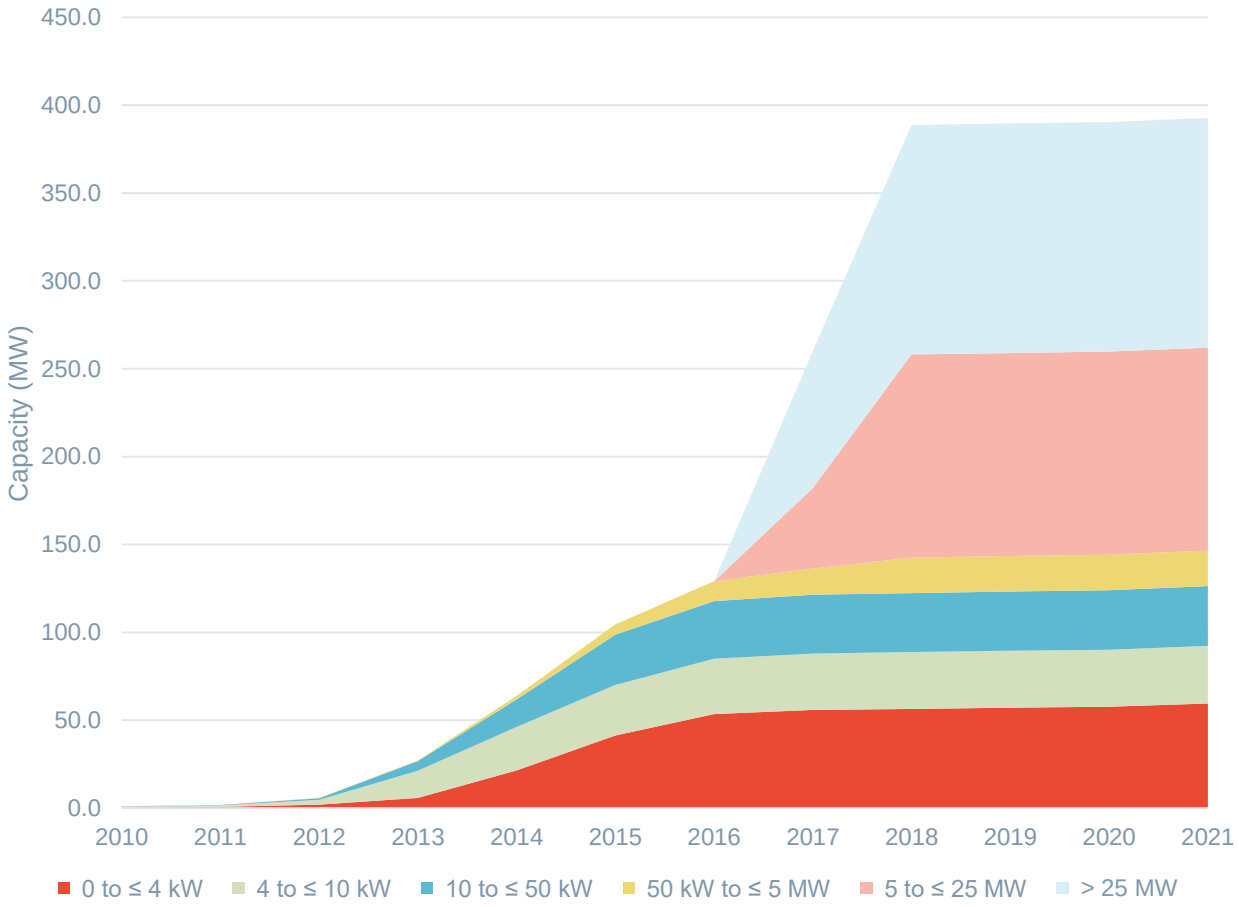
Alternatively, a tiered structure could be applicable, such as the structure deployed in the GB Feed-in Tariff scheme, in which a number of tariff bands are produced with a variety of capacity levels (such as the three tariffs for AD assets of between 0 to 250kW, over 250kW to 500kW and over 500kW to 5MW). This allows for more detailed price calculations, but adds complexity to the scheme and as discussed previously, potentially reduces competition. This approach also allows for a focus on different technologies, reducing price risk but reducing competition. A large part of the capacity which is suitable for use when discussing microgeneration will depend on the details of the NI market.

It is therefore important for the DfE to consider the potential size of the market for microgenerators in NI and the potential number of sites which are likely to be deployed in the market in the future. Analysis, where possible, should be undertaken to determine the scale of the market. The number of potential assets will have an impact on the subsidy scheme, as the number of potential microgenerators will impact the cost of the scheme and also the potential for the NI market to reach its decarbonisation targets.

Requirement

- Another key question will be if microgeneration assets require a subsidy scheme. As already discussed, the nature of microgeneration assets mean that they have different financial requirements compared to commercial developers. This means that the level of certainty of payment they require may be lower and therefore subsidy free deployment may be more viable. This will be an important element for the DfE to consider on as part of the process
- However, evidence from the market indicates that microgenerators still require some support. Analysis for the GB government shows that the level of solar deployed at microgeneration capacities has been low since the removal of the RO in NI. This is shown in the graph
- Considerable deployment took place between 2012 and 2016 with the RO scheme being in place. Large increases in larger scale (5MW plus) assets is seen after this date, but deployment of assets under 5MW was minimal
- General trends saw the cost of solar panels reduce during this period as well, which would make the case for deploying them easier. The evidence suggests, however, that the expected benefits were still not sufficient to encourage subsidy free microgeneration to be deployed, despite these reduced costs. Geopolitical events in 2021 and 2022 have also meant that the costs of solar panels have increased again, making subsidy free deployment more challenging
- This indicates that support is likely still required for the NI scheme, at least for solar assets. However, this is not confirmed and careful consideration will be required in regards to the extent of the support which is required for microgeneration assets as failure to provide support when required may result in low deployment but providing subsides when not required will result in unnecessary costs to consumers

Figure 52: Historic deployment figures – solar PV, NI market



Source: BEIS, compiled by Cornwall

Separate payments (1/2)

There are likely to be a number of differences between how microgeneration and larger scale generators engage in the market, and therefore how the scheme needs to be structured. Examples of these possible different approaches and considerations are shown in the table opposite.

Microgenerators, likely to be funded by individuals/small-scale companies, will require different funding approaches to large-scale consumers. Microgenerators are likely to use pure equity arrangements or bank loans, as opposed to the more complex debt funding approaches used by large corporates. Additionally, whilst commercial considerations such as rate of return and agreement life are still important for microgeneration sites, the financial incentive for deploying the asset may be driven by onsite considerations, such as energy independence or reducing electricity bills. It is therefore important to consider the key questions of what level of microgeneration should be allowed into the scheme and if the scheme should incorporate a different approach for microgeneration.

It is therefore important to consider if there is a requirement for microgenerators to receive a separate payment structure or subsidy approach. As discussed above, many markets have separate subsidies for microgenerators. Equally, there is scope that microgeneration is incorporated into the scheme, but given the different drivers for deployment it should be ringfenced in some manor (such as utilising its own pot structure).

We believe a separate scheme allows for greater focus on the market, and evidence from other markets shows that separate schemes are likely to be required to increase deployment. However, there are a number of key considerations in relation to separate payments, discussed on the next page.

Figure 53: Microgeneration and Large investor consideration comparisons

Consideration Type	Large Investor	Microgenerator
Allocation Type	Comfortable with **auctions** in other markets	Likely to require **application process**
Timing of the subsidy	Comfortable with **annual auctions** in other markets	Likely to require a subsidy which allows **continuous applications**
Price sources	Comfortable with CfD/FIP which tops up payments and is based on a **variable/market linked pricing**	Likely to require a **fixed rate**
Technologies included	Willing to investigate and develop **less established technologies**	Likely only interested in **established technologies**
Eligible generation	Likely looking to **export**	Potentially more interested in **onsite generation**
Bid bonds	Whilst unlikely to be keen, they have been shown to be **willing to provide bonds** in other markets	Likely to be **unwilling to provide** any sort of security payments
Community	Likely **from outside local community**, so will need to manage relationships	Likely **part of community**
Corporate PPAs (CPPAs) and part merchant	**Possibly will want to leverage** the contract to obtain additional benefits	**Unlikely to be interested** in CPPAs or part merchant arrangements
Reliability/ reacting to wholesale prices/ providing flexible services	Whilst not likely to be keen to provide these services, they are **probably capable of changing operating approaches in response to market signals**	**Likely to be unable to respond to market signals,** due to lack of control or lack of visibility

Source: Cornwall Insight

Separate payments (2/2)

- **DfE engagement** - By setting up a separate payment for microgenerators, this allows for the DfE to encourage microgenerators and to account for their different funding requirements compared to larger assets. It also allows smaller scale consumers and community projects to obtain the decarbonisation benefits of the scheme
- **Pay structure flexibility** - Separate payments for microgeneration assets allows for the pay structures to be more carefully targeted and shaped to promote decarbonisation whilst not discouraging different types of generators. Payment structures which are not likely to be viable for large asset can be viable for microgenerators, such as grant payments
- **Lack of economic efficiencies** - A focus on larger generators may allow more economies of scale and therefore mean costs to consumers for decarbonisation will be lower. A focus on larger scale assets means that there is likely to be more efficient use of the relevant budget, with the cost per capacity of renewable assets deployed being higher for large assets than for microgeneration assets
- **Administrative burden** - Introducing a separate pricing approach will also likely increase administration, and potentially lead to negative impacts on the level of competition
- **Lack of decarbonisation** - If the payment required for microgenerators is overcalculated and the payment for large-scale assets is underestimated, this will lead to microgenerators obtaining most of the associated budget. This will potentially mean decarbonisation is reduced. Microgenerators may also only look to offset their electricity bills and not worry about Internal Rate of Return (IRR)
- **Less equitable** - Focusing on microgeneration may also be less beneficial as those who likely benefit from the approach will be more wealthy members of society who are able to pay the required pre-development costs of the scheme required to be eligible for the subsidy and who are more likely to be able to meet the relevant capital costs for development. Supporting these generators through payments made by less economically secure electricity users is inequitable as poorer members of society pay to provide high returns to those who can afford to develop the asset. This was a criticism of the GB Feed-in Tariff scheme
- **Wider considerations** - There are also a number of wider considerations in relation to microgeneration, such as if onsite consumption is eligible for the scheme; microgeneration assets are more likely to utilise generation onsite and thus there is an argument that the full decarbonisation impact of this approach is not felt by consumers

Appendix 4 – List of abbreviations

List of Abbreviations

Abbreviation	Meaning	Abbreviation	Meaning	Abbreviation	Meaning
£/MWh	Pounds per Megawatt Hour	**ECF**	Evaluation Correction Factor	**MWh**	Megawatt hours
ACT	Advanced Conversion Technology	**EEG**	Renewable Energy Sources Act (German Translation)	**N2EX**	N2EX Auction Platform
ARs	Allocation Rounds	**EfW**	Energy-from-Waste	**NI**	Northern Ireland
ASP	Administrative Strike Price	**EIA**	Energy Investment Allowance	**ORESS**	Offshore wind Renewable Electricity Support Scheme
AURES II	Auctions for Renewable Energy Support II	**EKF**	Energy and Climate Fund (German Translation)	**PPA**	Power Purchase Agreement
BEGs	Microgeneration of Wind Cooperatives	**EMR Settlement**	Settlement Service Provider for GBs CfD scheme	**PSO levy**	Public Service Obligation levy
BEIS	Department for Business, Energy and Industrial Strategy	**EPEX**	European Power Exchange	**PV**	Photovoltaics
BM	Balancing Market	**EU**	European Union	**RAG assessment**	Red, Amber, Green assessment
BSC	Balancing Settlement Code	**EU ETS**	EU Emissions Trading System	**REC**	Renewable Energy Community
CCA	Curtailment Compensation Arrangement	**FER**	Renewable Energy Decree	**RED2**	EU Renewable Energy Directive
CCL	Climate Change Levy	**FIP**	Feed-in Premium	**REFIT**	Renewable Electricity Feed-In Tariff
CCS	Carbon Capture and Storage	**FIT**	Feed-in Tariff	**REGO**	Renewable Energy Guarantees of Origin certificates
CCUS	Carbon Capture Utilisation and Storage	**GB**	Great Britain	**RESS**	Renewable Electricity Support Scheme
CEP	Clean Energy Package	**GoO**	Guarantees of Origin	**RO**	Renewable Obligation
CfD	Contracts for Difference	**H2**	Hydrogen	**RoI**	Republic of Ireland
CM	Capacity Market	**HECHP**	High Efficiency Combined Heat and Power cogeneration	**SDE+**	Stimulation of Sustainable Energy Production
CO2	Carbon Dioxide	**IRR**	Internal Rate of Return	**SDE++**	Sustainable Energy Transition subsidy scheme (Dutch Translation)
CPI	Consumer Price Index	**KTF**	Climate and Transformation Fund (German Translation)	**SEM**	Single Electricity Market
CPPA	Corporate Power Purchase Agreement	**kW**	Kilowatt	**SEMO**	Single Electricity Market Operator
CRM	Capacity Remuneration Mechanism	**kWh**	Kilowatt hours	**SEMOpx**	Single Electricity Market Operator power exchange SONI/EirGrid
CRU	Commission for Regulation of Utilities	**LCCC**	Low Carbon Contracts Company	**SO**	System Operator
ct/kWh	cent per kilowatt	**LCF**	Levy Control Framework	**Solar PV**	Solar Photovoltaics
DAM	Day Ahead Market	**LCOE**	Levelised Costs of Energy	**SSG**	Small Scale Generation scheme
DECC	Department of the Environment, Climate and Communications	**LEBA**	London Energy Brokers' Association exchange	**TSO**	Transmission System Operator
DfE	Department for the Economy	**MSS**	Microgeneration Support Scheme	**UAEC**	Unrealised Available Energy Compensation
DS3	Delivering a Secure, Sustainable Power System	**MW**	Megawatt	**W2E**	Waste to Energy