Department for
Business, Energy
& Industrial Strategy

HPBM – volume support through the sliding scale

Hydrogen production business model team

November 2022

Department for Business, Energy & Industrial Strategy

Agenda and aims

Agenda

Today, we will be discussing:

- Volume risk through a sliding scale
- Sliding scale top up features
- Volume risk management and mitigations

Aims

- Work together with projects, investors and other interested parties to deliver an investable and value for money hydrogen business model
- Stakeholder workshops aim to improve policy development by enabling us to test initial policy thinking with projects and potential investors
- Today we'll go through each agenda item and briefly outline what the issue is, what we're thinking and why
- We'll then invite views from you to understand the issue more as projects and investors

Note: The content in the following slides does not represent BEIS policy, but provides ideas for discussion
The session will be recorded for BEIS internal use only

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What's our starting point?
Confirmed sliding scale for volume support in the indicative Heads of Terms

What is the problem?

Previously identified need to mitigate volume risk:

- Producer is unable to sell enough volumes of hydrogen to offtakers to cover costs with reasonable confidence, beyond any mitigations that could be taken by the producer
- HMG needs to mitigate risk whilst ensuring investability for producers and value for money for HMG

Minded to position in consultation

Sliding scale mechanism:

- Producer retains volume risk, with HMG focused on stimulating hydrogen demand side, a balance encouraging a mature market
- Avoids need for HMG to take or pay for volumes as the offtaker of last resort or pay for non-production
- Distortions avoided and no requirement for HMG to create complex delivery architecture or market volumes

What detail did we include in the indicative HoT?

- If a producer's offtake volumes fall, they receive an additional amount enabling the producer to recover a greater proportion of cost of production, whilst incentivising them to produce and sell high volumes to increase revenue.
- In the event offtake volumes declined to zero there would be no support to the producer

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Volume risk through a sliding scale

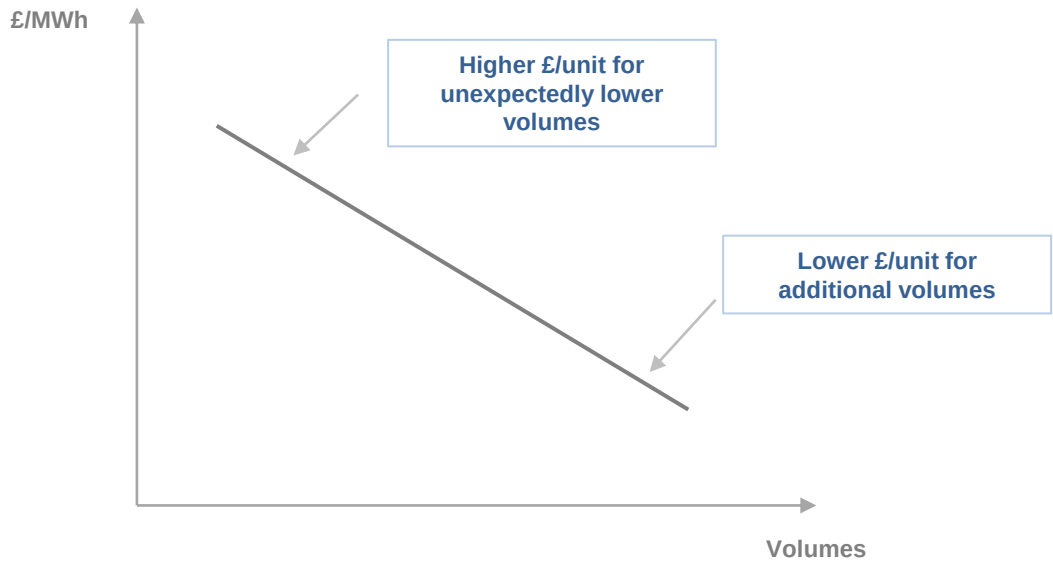
Sliding scale provides greater protection at certain points of production in comparison to a 'flat' strike price

- Through the sliding scale, the scale of losses would be lower if offtake volumes were unexpectedly lower
- This gives investors certainty of the level of revenue they receive from investing in hydrogen

How?

- If offtake volumes fall, the strike price *effectively* increases to compensate and provides additional support to producers – the sliding scale is implemented through a top up payment, the variable premium itself does not change
- When producers are successful in securing more offtake volumes, each additional volume of hydrogen sold will see revenues rise
- Initial offtake volumes enable producers to cover a greater proportion of fixed and variable costs, whilst additional offtake volumes enable the producer to achieve their target private sector return

Figure: Illustrative reprofiling of the sliding scale strike price



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Volume risk through a sliding scale: risks mitigated

Risks mitigated

To provide support for those who really need it, with less focus of the design on those who are able to sell relatively high proportions of potential volumes.

To mitigate the risk of unexpectedly lower volumes sold, but not provide full protection. Our current thinking on the 'Qualifying Event' formulation is the following.

Qualifying Event *is an event or circumstance which reduces hydrogen sales to their offtakers during the relevant billing period, that:*

1. *is beyond the reasonable control of the Producer;*
2. *could not reasonably have been avoided or overcome by the Producer;*
3. *is not due to the Producer's breach, default, fault or negligence;*
4. *which, for the avoidance of doubt, shall exclude any Producer Facility Outage Event.*

Producer Facility Outage Event *means an event where the Facility is unavailable, curtailed or derated (which, for the avoidance of doubt, shall include a Full Facility Outage Event);*
Full Producer Facility Outage Event *means an event where the Facility is fully unavailable to produce low carbon hydrogen;*

We would welcome feedback on this formulation

Risks not mitigated

- To not provide support where hydrogen offtake volumes are zero:
  - No low carbon hydrogen is sold, therefore no guaranteed decarbonisation benefits. Payments would be akin to availability payments which we have already set out are not appropriate for this stage of market development.
- Curtailments by hydrogen producers. This could include:
  - Producers deciding to not produce hydrogen, in favour of producing electricity instead.
  - Produced hydrogen being stored, not sold.

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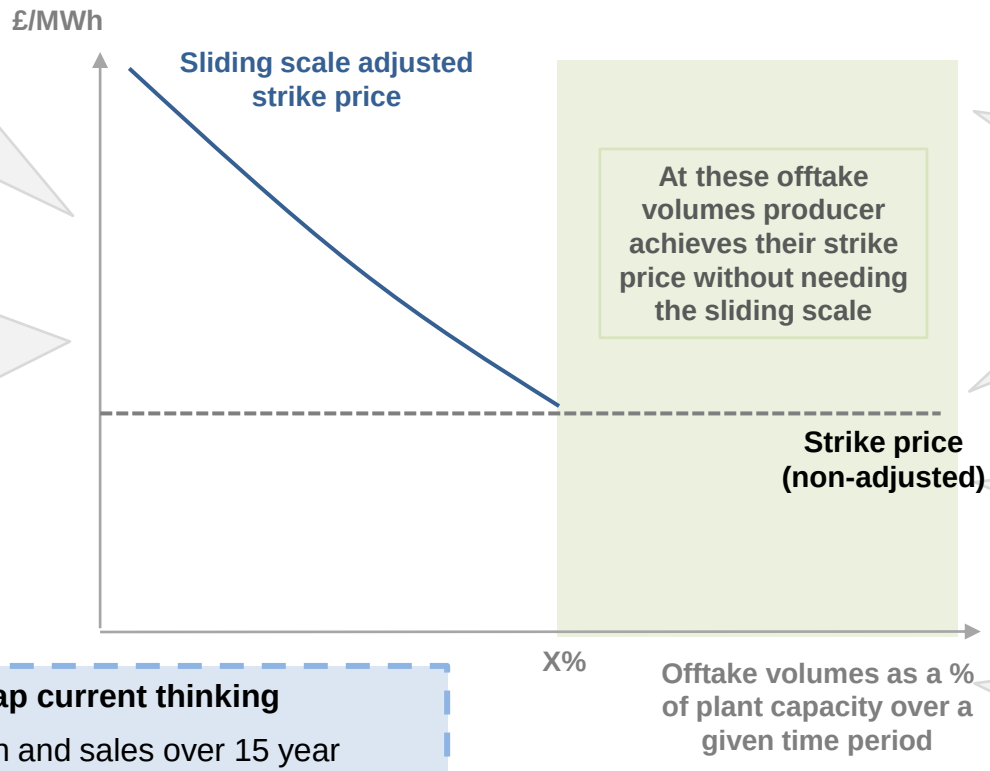
Volume risk through a sliding scale: latest thinking on design

A Calculation of payment:
- Provide sliding scale support through a separate top-up payment, rather than changing the strike price directly

B Offtake trigger point:
- [50]% of annualised volumes, pro rated and applied on a monthly basis.
- Will only assess the impact of all Qualifying Events (QE), no consideration of non-QE



C Treatment of non-HBM volumes:
- Inclusion of all volumes produced by plant, and not just the HBM-volumes

D Qualifying events:
- Producers request sliding scale top up payment on a case-by-case basis, providing evidence this is a QE

E Frequency of payments/time period:
- Monthly with no reconciliation process

F Function:
- Decision to be made. Discussed in next few slides.

Reminder: Production volume cap current thinking
- Volume cap will represent total production and sales over 15 year contract and will include both HBM and non-HBM volumes
- Volume cap will be evenly prorated over 15 years with projects able to produce how they wish over the year.
- Projects able to move volumes up to 25% above or below annual limit with no limit on carrying forward or borrowing across contract length
- Projects may be able to increase volumes above the cap through request to LCCC, with counterparty under no obligation

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Volume risk through a sliding scale: latest thinking on design

	Design element	Position	Rationale
A	Calculation of payment	• Provide sliding scale support through a separate top-up payment, rather than changing the strike price directly. • Sliding scale Top Up available throughout length of the LCHA.	• Many features of the HBM reference the strike price so simpler to calculate separately. • Logical to reduce complexity of HBM design and provide ability to phase out sliding scale for future rounds of contracts.
B	Offtake trigger point	• [50]% of annualised volumes, prorated and applied on a monthly basis. • Will assess the impact of all Qualifying Events (QE).	• Aligns with volume cap and banking approach. We expect volumes below [50]% to be beyond normal operational variability. • Deliverable by counterparty, assessing the time of an event and whether it is independent adds complexity.
C	Treatment of non-HBM volumes	• Inclusion of all volumes produced by plant, and not just the HBM-volumes	• Logical to support plant with sufficient revenue to cover costs with certainty, which would include non-HBM volumes
D	Qualifying events	• Producers request sliding scale top up payment on a case-by-case basis, providing evidence this is a QE (as per text on slide 5)	• Difficult to discern between events – onus on producer to request and then provide evidence based on definition of QEs.
E	Frequency of payments/Time period	• Monthly with no reconciliation process.	• Monthly aligns with billing period with any other time period adding complexity for the counterparty
F	Function (inc. top up features)	• Decision to be made. Discussed in next few slides.	

We would welcome feedback on these proposals

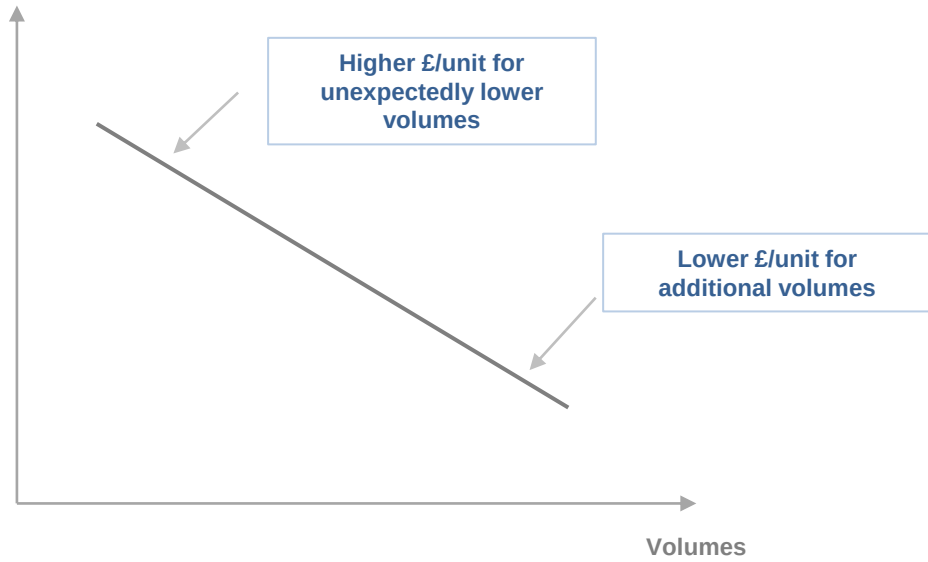
Sliding scale top up features: calculating the SS top up

SS Top Up calculation

- Top Up calculation assumptions is that natural gas and electricity are not incurred when not producing as well as other variable costs
- Revenue inclusive of SS Top Up should be increasing function to incentivise increased production
- Top Up % may be different for electrolytic and CCUS-enabled projects to reflect different cost bases

(Q) Is this anything else we should consider?

Figure: Illustrative reprofiling of the sliding scale strike price



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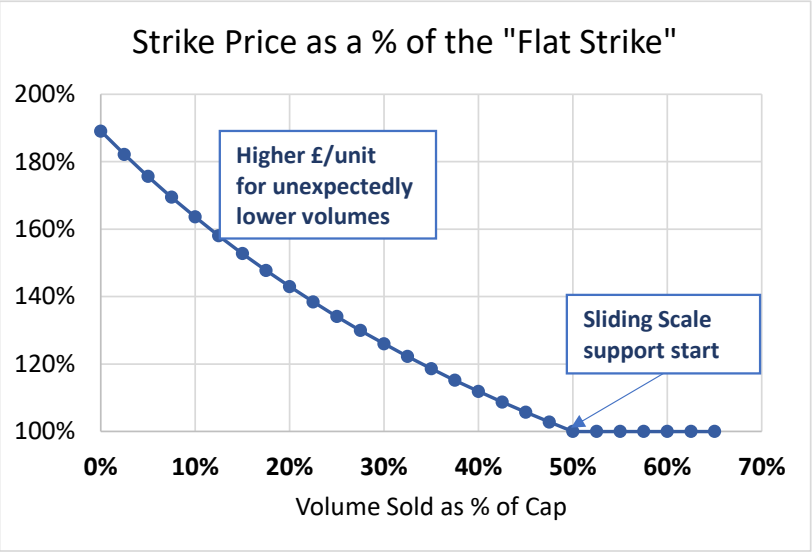
Sliding scale top up features: SS Top Up versus the strike price

Strike Price

- Many HPBM features are linked to the strike price: difference amount, price discovery incentive (PDI), and the reference price floor
- To reduce complexity, we decided to not alter the 'flat' strike price, which wouldn't change with level of volumes sold, and to introduce a top up instead

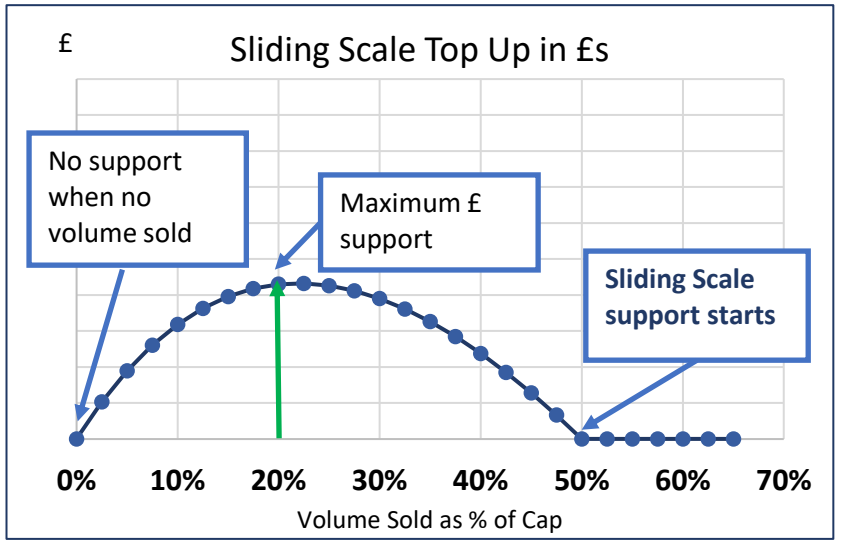


Top Up

The Sliding Scale Top Up is calculated as:

- ***SP**: 'flat' strike price*
- ***SS(Vol):** The strike price with the SS Top Up, which changes with volumes*

SS TopUp = Vol x [SS(Vol) – SP]



SP and RP dynamic with SS Top Up

- SP and RP relationship doesn't change – the difference amount is calculated as the difference between SP and RP.
- The SS Top Up is additional support on top of payment for the month (i.e. billing period).

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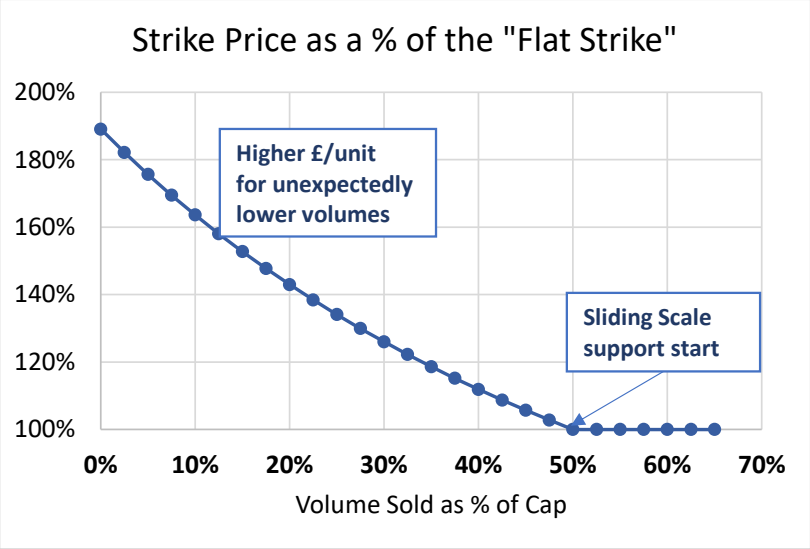
Sliding scale top up features: Example of the Strike Price and SS Top Up

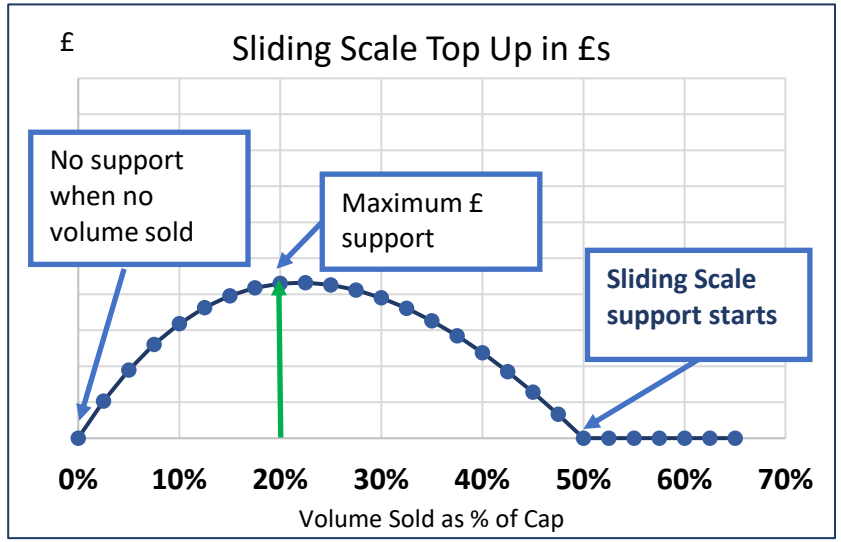
Strike Price with SS Top Up

- The strike price with the SS Top Up will be higher than the 'flat' strike price, when volumes are below the trigger point.
- We still need to decide on the shape of the strike price with the SS Top UP (discussed on slide 12)



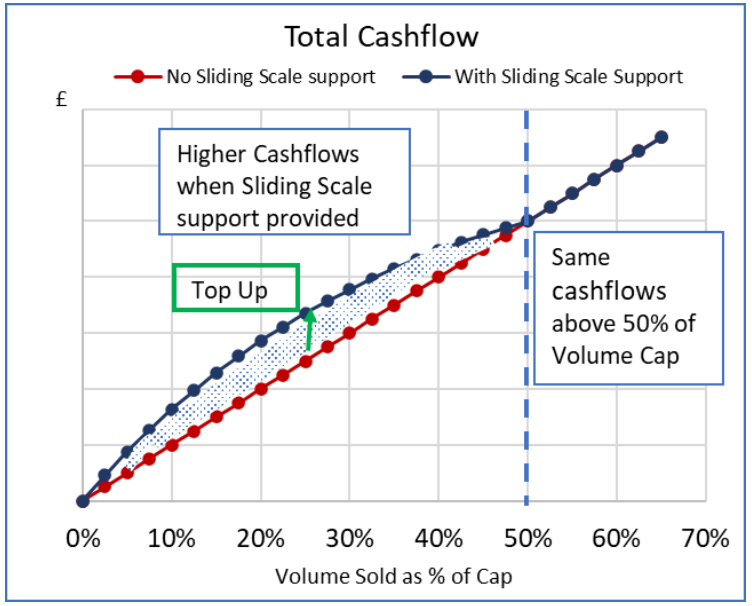
Top Up

There is no sliding scale top up (additional support) when no volumes are produced or production volumes are above the trigger point.



Cashflows

- The cashflows are the same above the trigger point of 50% with and without the sliding scale support.
- The cashflows increase when volumes sold are higher.



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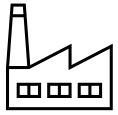
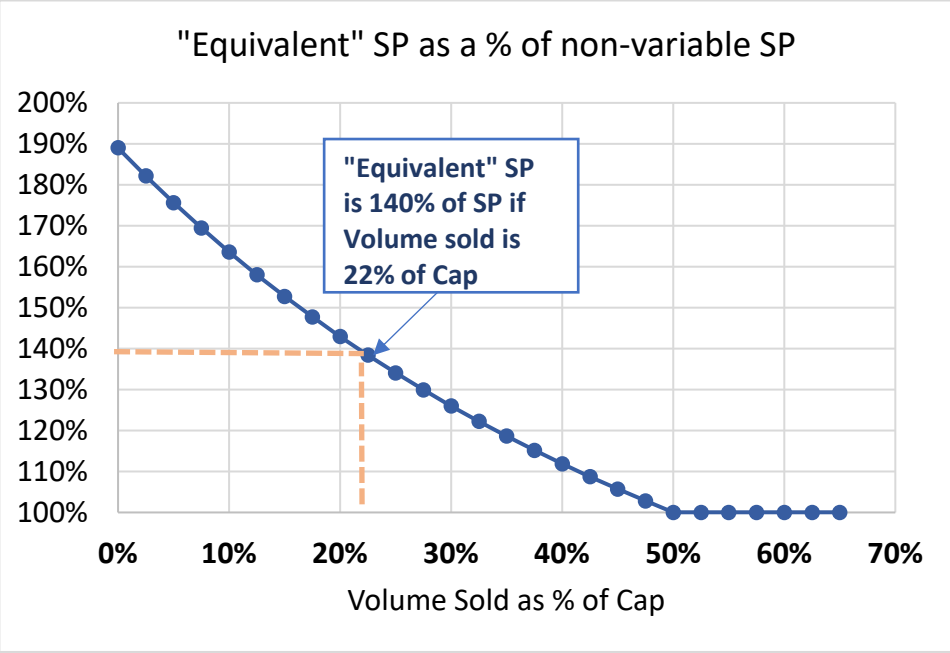
Sliding scale top up features: A worked example

Hydrogen facility description:



- Capacity: 200MW
- Annual volume cap: 1,200GWh / yr or 100 GWh / month
- Sliding scale trigger point: 50GWh / month (50% of 100GWh)
- Strike price: 100 £ / MWh
  - Gas/electricity/variable costs: 60 £ / MWh
  - "Other" strike price costs: 40 £ / MWh
- Floor price: 70 £ / MWh



Scenario:

	Jan-28	Feb-28
Price (£/MWh)	80	80
Volume Sold (GWh)	60	22
as % of Cap	60%	22%
"Equivalent" SP as % of SS SP	100%	140%
Diff Amount	60k x (100-80) £	22k x (100-80) £
(,000£)	1,200	440
PDI	10% x 60k x (80-70) £	10% x 22k x (80-70) £
(,000£)	60	22
Sliding Scale Top Up	-	22k x **40** x(140%-100%) £
(,000£)	0	352
Sales Revenue	60k x 80	22k x 80
(,000£)	4,800	1,760
Total Cashflows (,000£)	**6,060**	**2,574**

SS SP (or sliding scale strike price) here means the SP excluding gas / electricity price and other variable costs.

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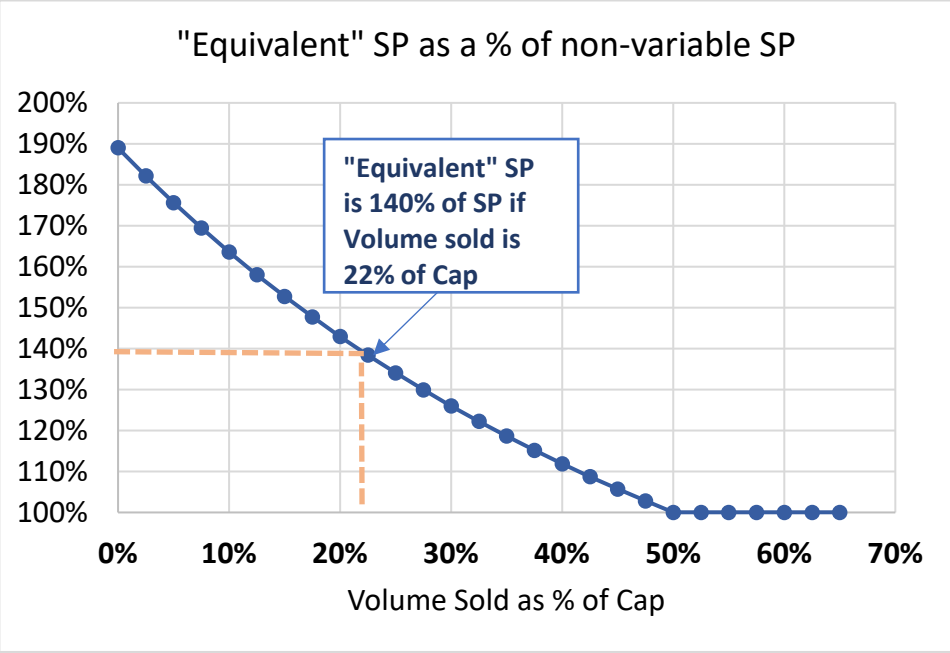
Sliding scale top up features: A worked example (2)

Hydrogen facility description:

- Capacity: 200MW
- Annual volume cap: 1,200GWh / yr or 100 GWh / month
- Sliding scale trigger point: 50GWh / month (50% of 100GWh)
- Strike price: 100 £ / MWh
  - Gas/electricity/variable costs: 60 £ / MWh
  - "Other" strike price costs: 40 £ / MWh
- Floor price: 70 £ / MWh



Scenario:

	Jan-28	Feb-28
Price (£/MWh)	120	120
Volume Sold (GWh)	60	22
as % of Cap	60%	22%
"Equivalent" SP as % of SS SP	100%	140%
Diff Amount	60k x (100-120) £	22k x (100-120) £
(,000£)	**-1,200**	**-440**
PDI	10%x 60k x(100-70) £	10% x 22k x (100-70) £
(,000£)	180	66
Sliding Scale Top Up	-	22k x **40** x(140%-100%) £
(,000£)	0	352
Sales Revenue	60k x 120	22k x 120
(,000£)	7,200	2,640
Total Cashflows (,000£)	**6,180**	**2,618**

SS SP (or sliding scale strike price) here means the SP excluding gas / electricity price and other variable costs.

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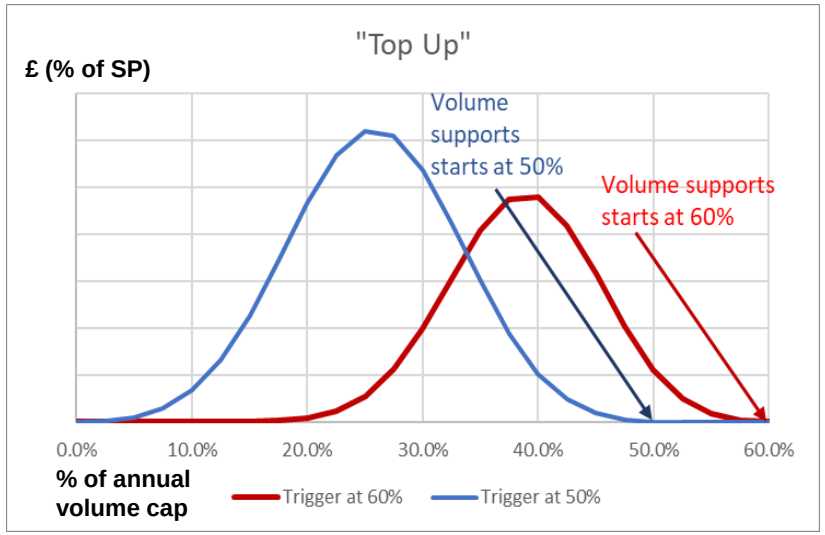
Sliding scale top up features: deciding on the trigger point, vmax, max SS top up

Trigger point, when sliding scale is triggered

(Q) What would be preferable, a or b?

a. *Volume support starting at 60% with a lower Max SS Top Up*

b. *Volume support starting at 50% with a higher Max SS Top Up*



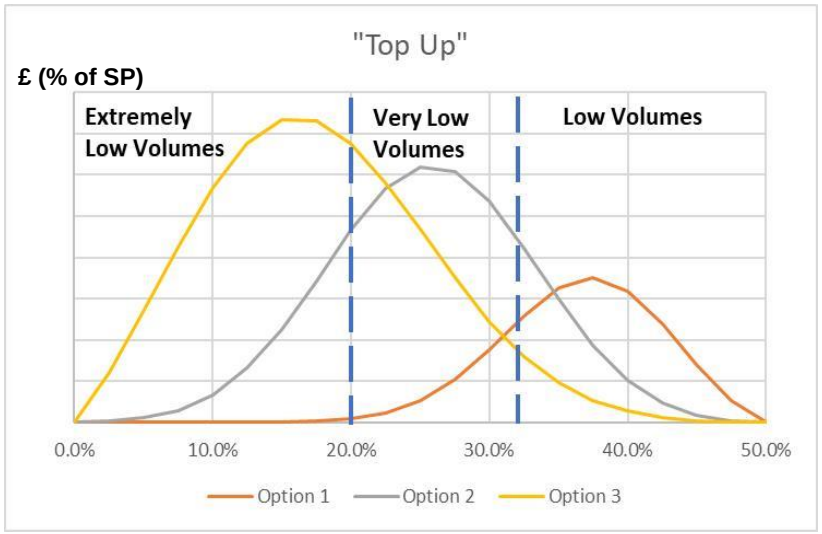
Vmax, where support is at its maximum

(Q) At what volume level would Vmax be most useful?

a. *Low volumes*

b. *Very low volumes*

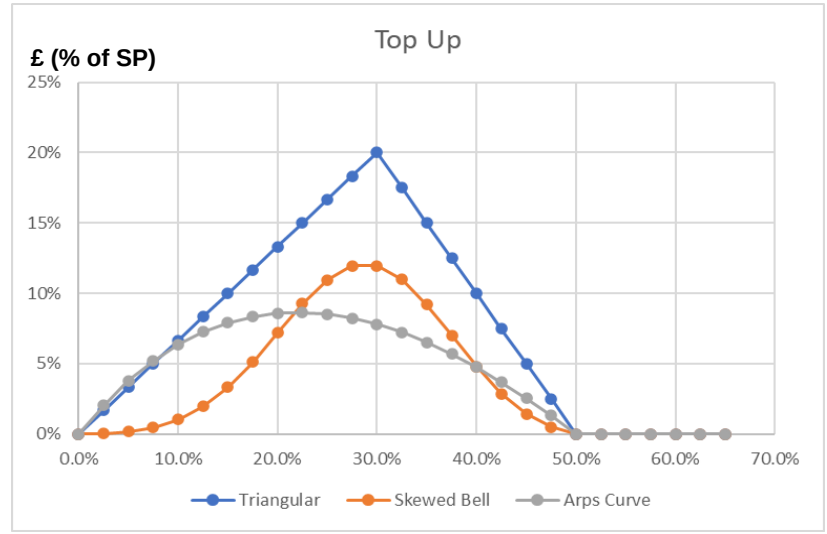
c. *Extremely low volumes*



Max Top Up, shape of sliding scale support

(Q) Would you prefer the support to be (a) spiky or (b) spread out?

Are there any considerations we should take into account (e.g. financing considerations)?



Volume risk management and mitigations

- Self-help protection are measures that a project developer could employ to reduce the demand risk associated with their project, to complement the sliding scale.
- Self-help measures are positive for market developments as they would see the projects and their offtakers manage risks without government intervention. This would support the government's objective to exit the market when it is sufficiently developed.
- There are several measures that could be taken by projects with examples on the right of the slide.

How are you mitigating volume risk?

Plant design
- Using an operationally flexible production technology to ramp up and ramp down depending on offtake requirements
- Buffer storage can help manage intermittent flows and seasonality of hydrogen. HPBM can help cover some of these associated costs.

Input energy contracting
- Sourcing flexible electricity PPA contracts to allow for production to flex with demand

Payments in lieu of offtake
- Take or pay/take and pay, or minimum revenue guarantees

Diversification of offtaker types
- Reduce dependency on a single/small number of offtakers in the event of maintenance, unexpected offtaker problems, or failure in development of specific end-use market.

Thank you and questions

Thank you for joining today's stakeholder workshop

We appreciate that you continue to provide invaluable insight and feedback on the hydrogen business model

We would value any answers you have to our questions as soon as you are able. If you have any further questions, please contact one of us directly or use the hydrogen business model inbox

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or

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Annex A: *Sliding scale design features*

Investable: Design needs to reduce offtake risk for producers, and give confidence to investors of private sector returns

Promote market development and value for money: HMG needs to achieve its ambitions of up to 10GW at lowest cost possible

Suitability across project archetypes: Design needs to be applicable to all eligible technologies and apply to different operating characteristics and sizes of projects

Suitability for future pipeline: over time volume risk is likely to fall – the design should be easily adjusted for future allocation rounds

Producers should always increase revenues with each additional volume of hydrogen produced and sold. Design should:

- Mitigate risk of unexpectedly lower volumes sold, but not provide full protection
- Only provide support for those who need it, and not affect those who are selling relatively high proportions of their capacity
- Not provide support if plant not producing

Design should account for level of volume risk over time:

- Within contract the sliding scale may be triggered less over time as market develops but remains available as a safety net in case the plant is uncompetitive
- For future allocation rounds, sliding scale can be adjusted to be less generous or removed completely

Design should be as transparent and simple as possible to understand:

- Same strike price for all volumes over a given period
- Volume support provided for all producers