Department for
Business, Energy
& Industrial Strategy

Hydrogen Business Model: Expert Group meeting

Hydrogen Business Model Team

17th December 2021

Note: The content in the following slides does not represent BEIS policy, but provides ideas for discussion

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Meeting etiquette

Please can you:

- ✓ Turn off your video when not speaking
- ✓ Mute your microphone when not speaking
- ✓ Raise questions via the chat function or put your hand up

This meeting will be recorded for BEIS internal use only.

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Agenda

	Item	Time	Lead
1	**Welcome**	1:30 – 1:40 10 mins	Will Lochhead
2	**Update on progress**	1:40 – 1.50 10 mins	Carolyn Campbell
3	**Price Discovery Mechanism**	1:50 – 2:50 60 mins	Chris Thomas
4	**AOB and close**	2:50 – 3:00 10 mins	Will Lochhead

Hydrogen business model update:
Progress

Expert Group 17/12/21
Hydrogen Business Model Team

Aims of meeting

- Update Expert Group on progress since last meeting

Reminder: Hydrogen Business Model Consultation – key components

The objective of the hydrogen business model is to incentivise the production and use of low carbon hydrogen, and help us achieve our 5GW ambition by 2030. It is designed to provide hydrogen producers with revenue support to overcome the operating cost gap between low carbon hydrogen and fossil fuels in order to unlock private investment in hydrogen projects.

Approach to model design
Primary focus on mitigating two key risks:

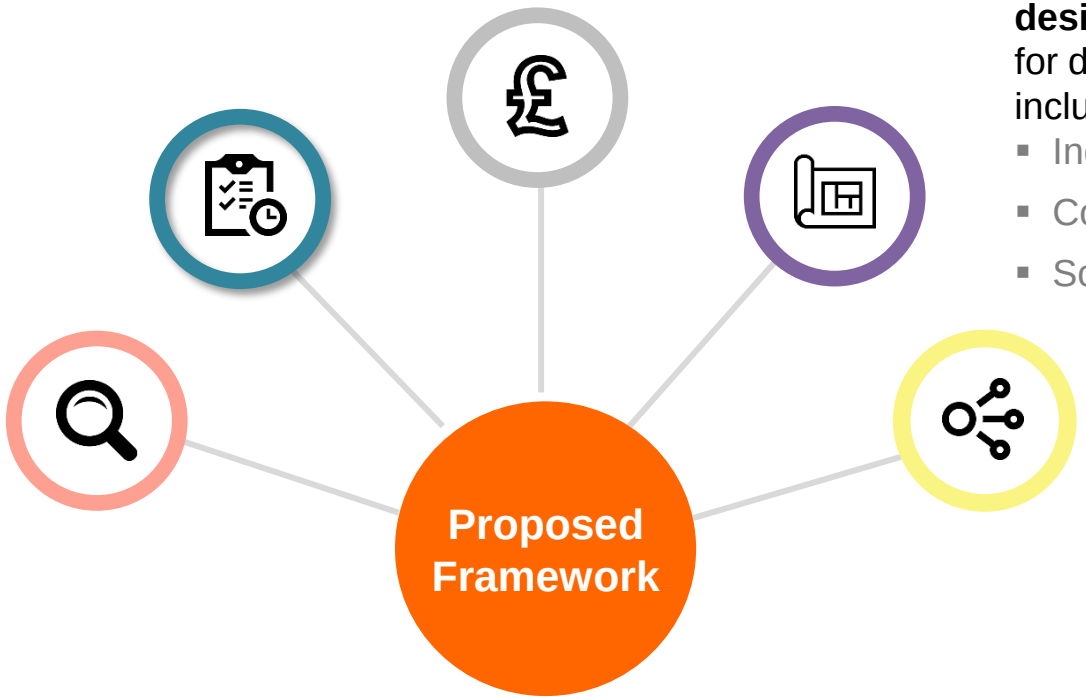
- Market price risk
- Volume risk

Scope and delivery mechanism

- Producers as recipients of subsidy
- New production that meets the 'low carbon hydrogen standard'
- Open to different production technologies and project sizes
- Open to range of end users
- Private law contract

'Minded to' positions for payment mechanism:

- Price support via variable premium
- Volume support provided indirectly via sliding scale of price support



Seeking views on options for further design features with potential variations for different production technologies, including:

- Indexation
- Contract length
- Scaling of future production volumes

Allocation to vary for:

- Projects eligible to CCUS-cluster sequencing process
- Projects not eligible to cluster sequencing (e.g. electrolytic projects)

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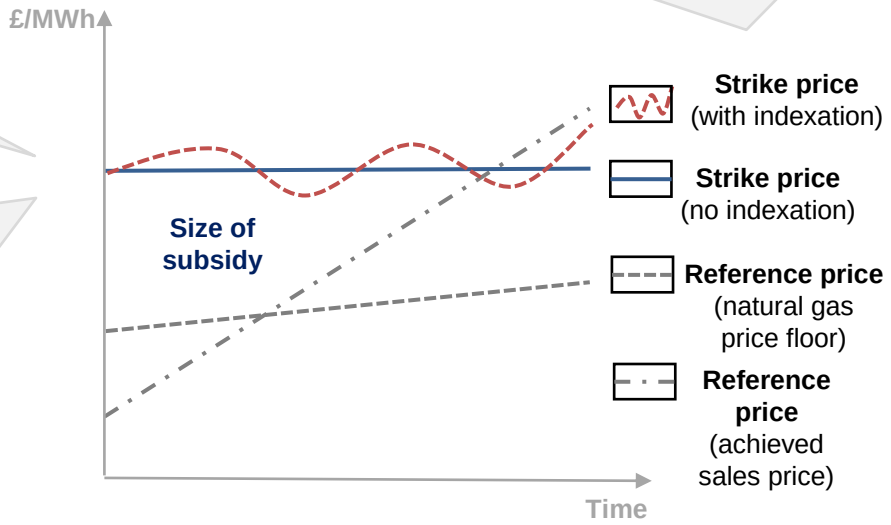
Reminder: Hydrogen business model proposed payment mechanism

STRIKE PRICE: reflects the price the producer needs to achieve to cover their costs of production and return on investment; strike price level and cost components could vary for different production technologies

INDEXATION: potential adjustment to strike price to reflect changes in production costs; approach could vary for different production technologies

REFERENCE PRICE: intended to represent the market price received by the producer; for initial projects, proposed reference price is achieved sales price with a floor at natural gas price



SLIDING SCALE VOLUME SUPPORT: variation of strike price in response to lower offtake volumes in order to help manage volume risk

PRICE DISCOVERY: potential contractual measure to incentivise producer to increase achieved sales price

MARKET BENCHMARK: propose to integrate into the reference price at the earliest opportunity for future projects

QUALIFYING VOLUMES: any variations to subsidy calculation for particular volumes of hydrogen, including: propose no payments for volumes exported; open question in consultation on options to constrain support for volumes used as feedstock; consideration of how to calculate subsidy where volumes are for producer's own use or sold to an intermediary

CONTRACT DURATION & SCALING FUTURE VOLUMES: open questions in consultation

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Reminder: Expert Group meeting overview (post consultation August 2021)

	Date	Topics
1	31 August	Consultation overviews: - Hydrogen business model - Low carbon hydrogen standard - Net Zero Hydrogen Fund
2	26 November	Business model design: sliding scale volume support (thank you for follow up input) Indicative Heads of Terms priorities Technical questions
3	13 December	Electrolytic allocation design proposals: - Eligibility criteria - Allocation process - Evaluation criteria
4	17 December	Business model design: price discovery mechanism

Hydrogen business model:
Price Discovery Mechanism

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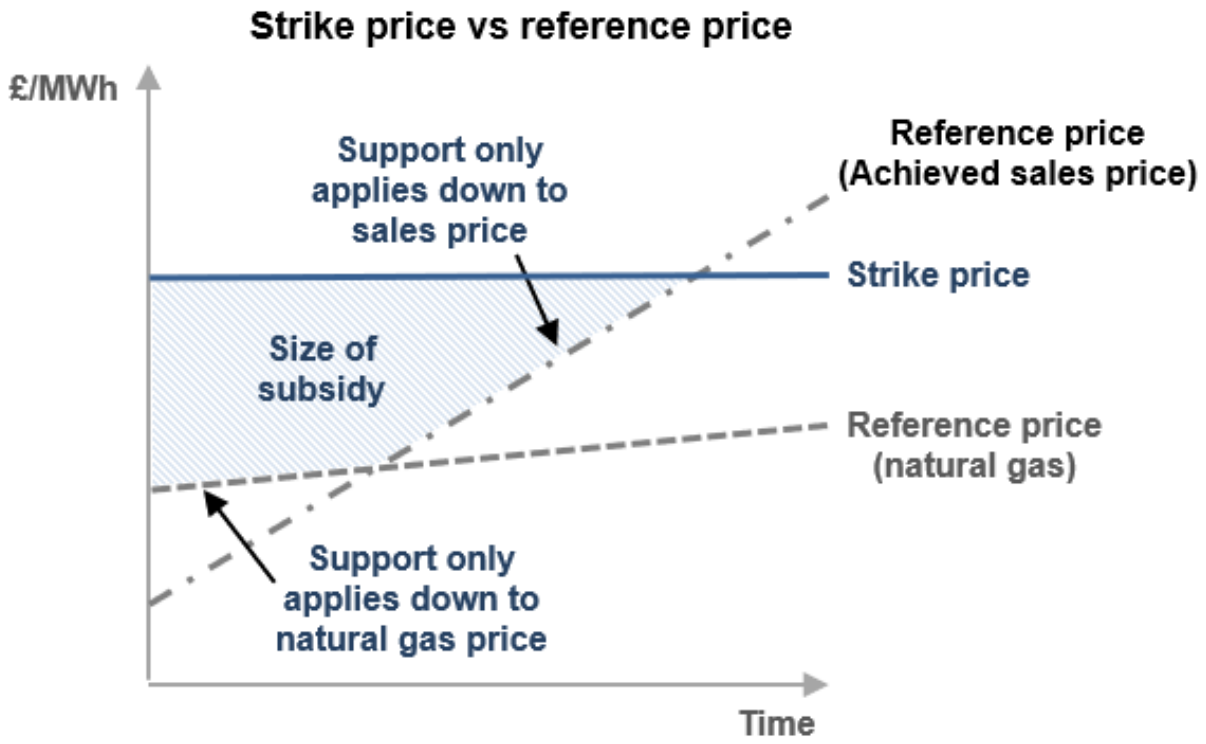
Aims of meeting

- Update Expert Group on potential design of a price discovery mechanism
- Seek feedback on next stage of design

The Basic Hydrogen BM - reminder

Price support will be delivered through a variable premium



Producer is paid a premium for low carbon hydrogen produced – calculated as the difference between the strike price and the reference price

In the absence of a benchmark market reference price for low carbon hydrogen, a proxy is required – we have proposed a combination of:

- achieved sales price as the reference price, representing a proxy for the market price of low carbon hydrogen
- natural gas price as a lower limit to the reference price

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Challenge

Producer ambivalence to higher achieved sales price	– Variable premium is determined by deducting the higher of the achieved sales price and the natural gas price from the Strike Price – As achieved sale price increases above the natural gas price, subsidy decreases – Thus a £1 gain in market revenue is offset by a £1 reduction in variable premium payments, leaving the producer ambivalent to seeking higher market revenues
Transparency leads to informational asymmetry	– Structure of the hydrogen business model is a matter of public record – Offtaker therefore knows that producer can sell low carbon hydrogen at the natural gas price
Impact on longer term price development	– If low carbon hydrogen prices are anchored at the natural gas floor, resultant benchmark will primarily reflect energy rather than decarbonisation value – This will make subsidy free low carbon hydrogen more dependent upon cost reductions rather than a price signal, which may require government intervention to persist for longer

A price discovery mechanism to reward achieving higher sales prices has already been flagged as a means to address these challenges

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Design Principles for a Price Discovery Mechanism

1 Avoid unnecessary complexity

- The more complex the mechanism, the more challenging it is for the producer to see its benefits to them
- The simpler the mechanism, the higher the potential for under/over reward

2 Restore rather than invert bargaining relationship

- Model currently provides a stronger incentive to seek higher volumes than to seek higher prices
- PDM should strengthen the latter without weakening the former to the point that higher prices are preferred to higher volumes

3 Reward effort over "rising tides"

- Lower limit to reference price creates a natural avenue for the producers' achieved sales price to capture hydrogen's energy value
- Capturing the non-energy value of hydrogen will require a greater effort on the part of the producer – and therefore should be the focus of reward

Are there other principles to which we should be adhering?

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Key Questions

What?

What is it that we will be rewarding? Exceeding a benchmark, narrowing the gap to that benchmark? What is the nature of the benchmark?

When?

How will/(should) the level of reward vary over time? Amortisation of conversion costs, effective carbon prices, broader market factors will all impact the effort required to secure higher prices

How Much?

What quantum of reward is being offered, and how will/(should) it vary with the magnitude of the gain? Should there be limits to it?

Are there other questions we should be asking ourselves?

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What? Benchmark Linkage

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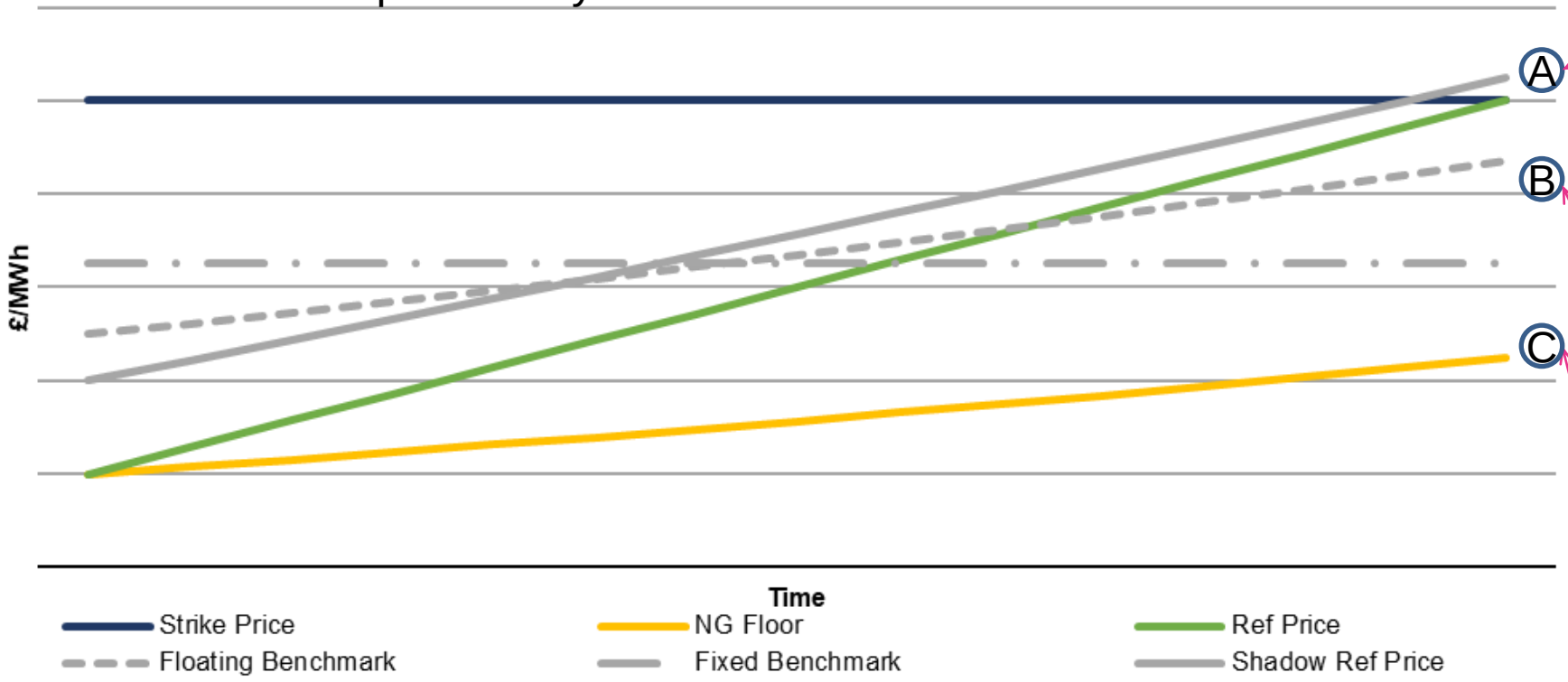

Linkage to a "shadow reference price" e.g. market average achieved sales price or natural gas + CO2 may better reflect "value"

Linkage to a floating benchmark e.g. % or £ premium to the natural gas floor value, offers simplicity, but may not track decarbonisation value

Linkage to a fixed benchmark e.g. % or £ discount to the strike price, is simple, but may run the risk of either being too hard or too easy to reach

If a reward was easy to capture, would you reflect it in your base economics?
If a reward was linked to a shadow reference price, would it influence your contracting strategy?

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What? Benchmark Relationship

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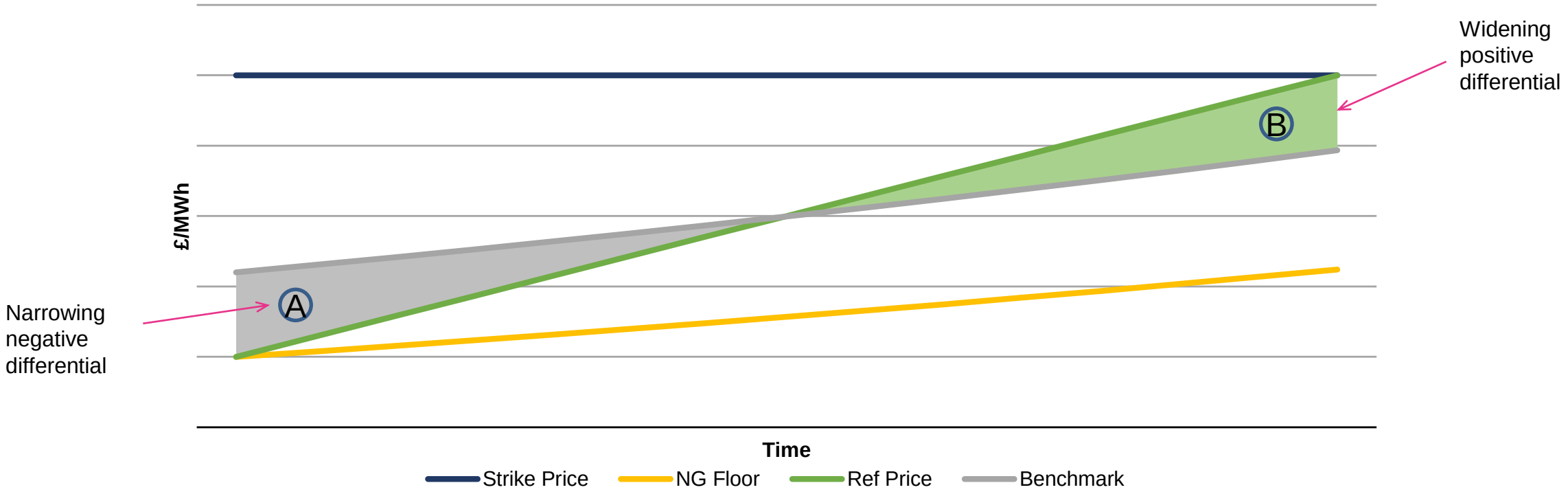

Should A and B be rewarded equally?
Should B be constrained by the strike price itself?

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When?

	Period of Contract: Early		Late	Implication for achieved sales price?
Security of Supply Risk	Higher	→	Lower	Higher
Low Carbon Hydrogen Market	Local	→	Regional	Neutral
Supportive Infrastructure	Limited	→	Prevalent	Neutral
Effective Carbon Prices	Lower	→	Higher	Higher
Offtaker Conversion Costs	Unamortised	→	Amortised	Higher
Low Carbon Hydrogen Market Price Benchmark	Nascent	→	Established	Neutral
Low Carbon Product Markets	Nascent	→	Established	Higher
Transition to subsidy free operations	Distant	→	Proximate	Higher
Existence of unsubsidised competitors	Improbable	→	Possible	Lower

How material an impact do you think the passage of time will have on price development?
Should the reward remain constant or change over time?

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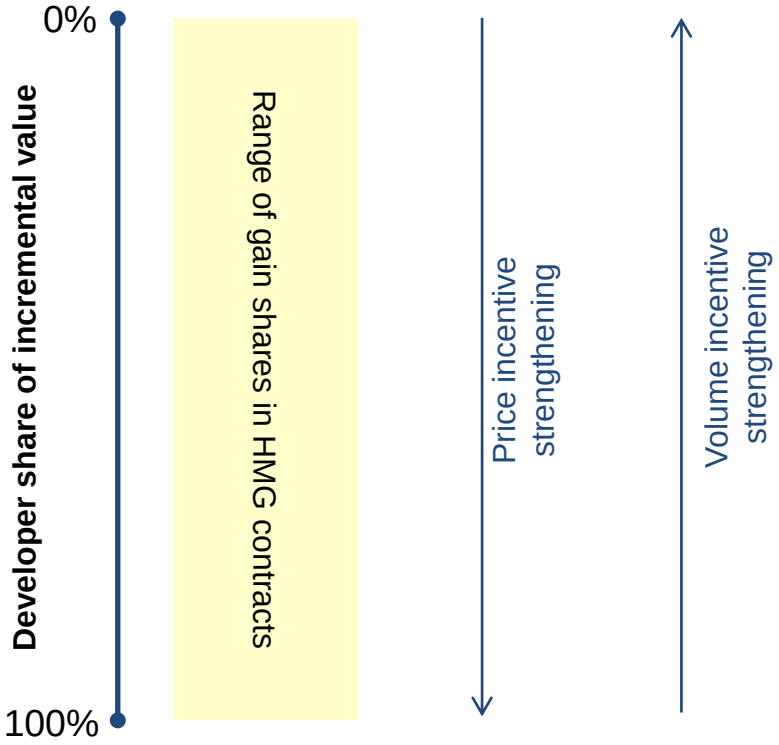
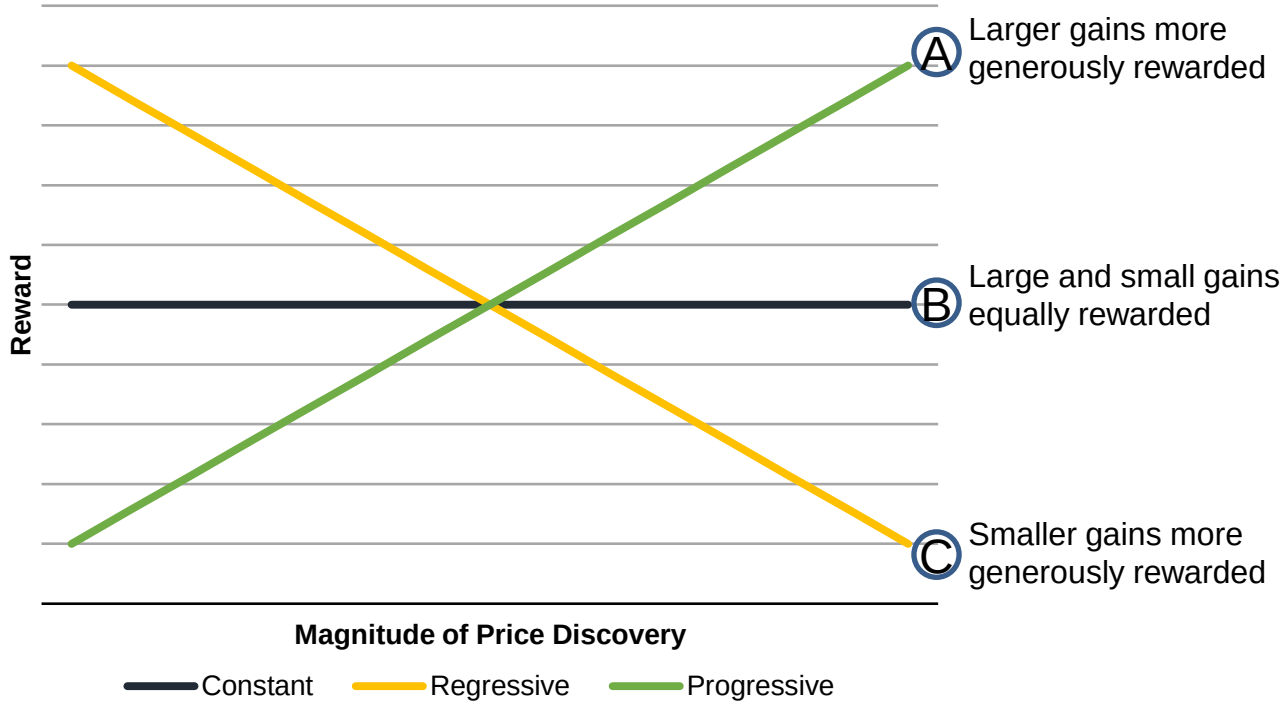
How much?

a. Magnitude of reward



b. Variation of reward with magnitude of gain



Could too strong a price incentive interfere with the broader volume incentive?
Should small gains and large gains be rewarded differently?