



# AFRY

## Making Future



# Stability market design – Design options and assessment

Annex report to National Grid ESO

MARCH 2022

## INTRODUCTION

# DISCLAIMERS AND RIGHTS

NOTHING IN THIS REPORT IS OR SHALL BE RELIED UPON AS A PROMISE OR REPRESENTATION OF FUTURE EVENTS OR RESULTS. AFRY HAS PREPARED THIS REPORT BASED ON INFORMATION AVAILABLE TO IT AT THE TIME OF ITS PREPARATION AND HAS NO DUTY TO UPDATE THIS REPORT.

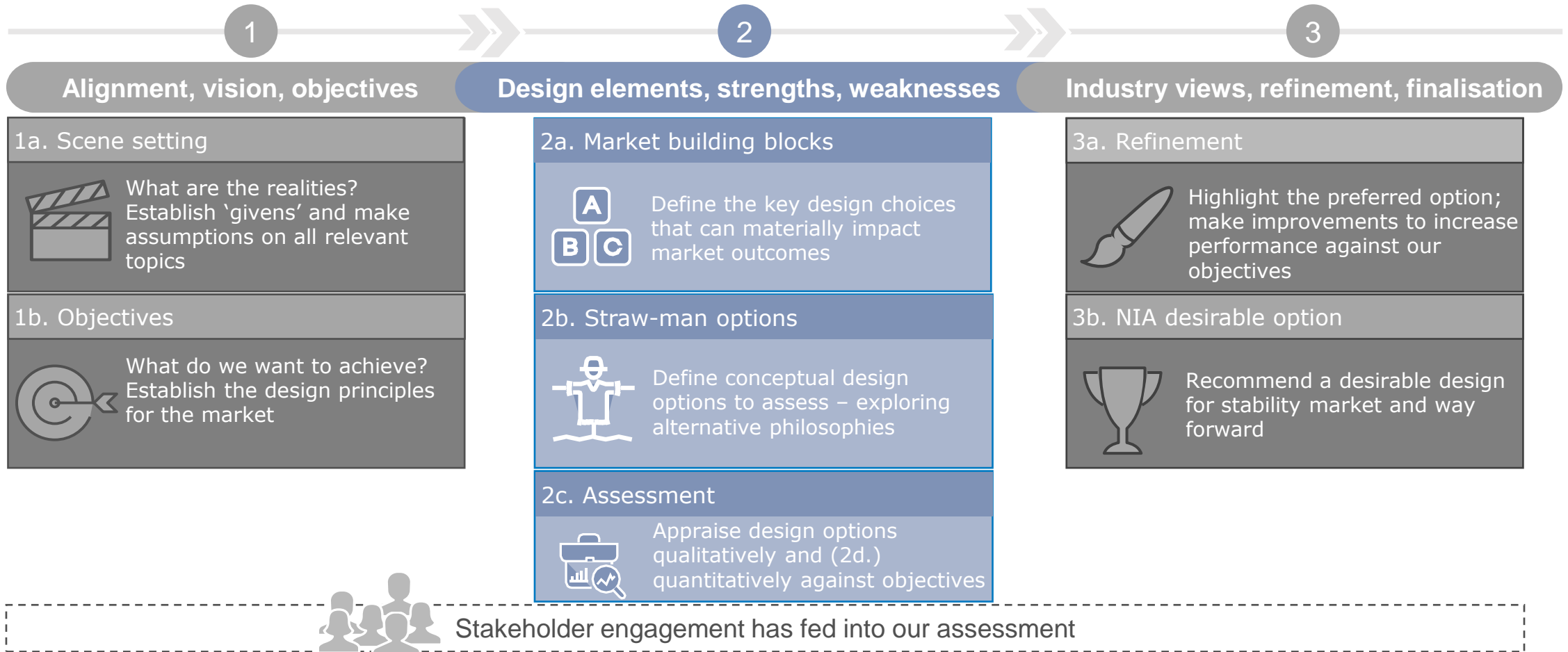
AFRY makes no representation or warranty, expressed or implied, as to the accuracy or completeness of the information provided in this report or any other representation or warranty whatsoever concerning this report. This report is partly based on information that is not within AFRY's control. Statements in this report involving estimates are subject to change and actual amounts may differ materially from those described in this report depending on a variety of factors. AFRY hereby expressly disclaims any and all liability based, in whole or in part, on any inaccurate or incomplete information given to AFRY or arising out of the negligence, errors or omissions of AFRY or any of its officers, directors, employees or agents. Recipients' use of this report and any of the estimates contained herein shall be at Recipients' sole risk.

AFRY expressly disclaims any and all liability arising out of or relating to the use of this report except to the extent that a court of competent jurisdiction shall have determined by final judgment (not subject to further appeal) that any such liability is the result of the wilful misconduct or gross negligence of AFRY. AFRY also hereby disclaims any and all liability for special, economic, incidental, punitive, indirect, or consequential damages. **Under no circumstances shall AFRY have any liability relating to the use of this report.**

All information contained in this report is confidential and intended for the exclusive use of the Recipient. The Recipient may transmit the information contained in this report to its directors, officers, employees or professional advisors provided that such individuals are informed by the Recipient of the confidential nature of this report. All other use is strictly prohibited.

All rights (including copyrights) are reserved to AFRY. No part of this report may be reproduced in any form or by any means without prior permission in writing from AFRY. Any such permitted use or reproduction is expressly conditioned on the continued applicability of each of the terms and limitations contained in this disclaimer.

# This annex focusses on Phase 2 of the overall project



STABILITY MARKET DESIGN

## Contents

1. Building blocks and options
2. Strawman options
3. Assessment of strawman options

STABILITY MARKET DESIGN

# 1. Building blocks

# In the market design process, the design is first broken down into the constituent parts ('building blocks')

## Building blocks principles

The design is segmented into its constituent parts – referred to as the 'building blocks'. The building blocks serve as the basis around which a coherent/internally consistent design is constructed.

The building blocks give an insight into, and facilitate, the critical decisions about the market design, breaking down the design features in 'discrete' components (albeit there are limitations to this as there are interactions that cannot be isolated).

Crucially, building blocks are selected based on whether or not design choices will have a material impact on potential providers, the buyer of the services, and ultimately – market outcomes.

## A 'perfect world'

The building blocks are an initial step in addressing the objectives and challenges of a potential market.

When framing the problem, we can think about the challenge in terms of a 'perfect world' i.e. where a single omnipotent actor responsible for the energy system has perfect knowledge and perfect foresight. In this world, perfect decisions on investment, and perfect operational decisions are made.

The building block choices are defined to mimic the set of decisions, taking into account the realities of the energy system of today, through offering discrete and reasonable choices.

# In the market design process, the design is first broken down into the constituent parts ('building blocks')

## Essentials building blocks

These are the critical dimensions of a potential market.

The essential building blocks are the constituent parts required to achieve the purpose of the market and represent the main philosophy of the market design.

They illustrate the key design choices in terms of delivering appropriate investment at the right times, delivering appropriate deployment of the resources in conjunction with other services such as energy.

Timeframe		
Timing/time horizon for procurement		
Short-term	Long-term	Combination
Eligibility		
Eligibility and treatment of existing / new providers		
Technology specific	Technical rules	Existing New
Pricing mechanism / dispatch incentive		
Basis for pricing on capability and/or activation		
Capability payment	Time of day payment	Notice period pricing

Location and National specification		
Locational granularity of product and procurement		
Fixed v Dynamic zones	Locational asset requirements	Effectiveness factor
Bundling		
Extent of bundling across product procurement & pricing		
Separate	Bundled procurement Separate pricing	Bundling w other products/services
Product definition		
Key characteristics of product/service		
Standard Bespoke	Reservation Activation	Market time Unit (e.g. SP)

## Secondary & additional building blocks

These are the 'mechanical' dimensions of the design and come as a natural extension of the essential building blocks.

The additional building blocks are envisaged to be broadly uniform (across design options), facilitating the objectives of the market. The high-level market design has primarily focussed on the essential building blocks

- Performance standards
- Requirement determination
- Requirement signalling
- Non-delivery consequences
- Stacking

- Measurement & verification
- Price controls (caps and floors)
- Competition thresholds
- Results release



# Essential building blocks of the market design and choices under each building block

## Timeframe building block

Background

*Time at which procurement decisions are taken*

<p><b>A</b> Motivation</p> <p>A market should support system security in both the short and the long run. The timeframe is essential because it determines the market’s ability to drive long term investments while at the same time supporting NGENSO’s need for critical short-term planning in an economical efficient way.</p>	<p><b>B</b> Respecting existing investments (market-route)</p> <p>A market should not put existing projects at a disadvantage – the aim should be to align incentives for new and existing investments alike.</p>	<p><b>C</b> Respecting existing investments (closure decision)</p> <p>A market should be operating when providers are making key decisions about the asset: maintenance, closure or refurbishment.</p>	<p><b>D</b> Supporting efficient future investments</p> <p>New stability providers will need to emerge to ensure stability requirements are met in the future.</p> <p>A long-term market, typically 1+ year ahead, should facilitate economically efficient alternatives to building new TO owned grid assets.</p>
---	---	--	--

## Options

Key Choices

<p><b>1</b> LT procurement</p> <p>Long-term supply commitment - could be similar duration to asset lifetimes.</p> <p>One-off or infrequent auctions.</p> <p>Quantity supplied is defined (could be contingent, rather than just fixed) and can be predicted by suppliers.</p>	<p><b>2</b> ST procurement</p> <p>Short timescale for supply commitment.</p> <p>Repeated auctions, where quantity to be procured is known for each auction and price determined in each auction.</p> <p>Suppliers face future quantity and price risk.</p>	<p><b>3</b> LT + ST procurement</p> <p>Mix of short and long-term procurement.</p>
---	--	--

# Essential building blocks of the market design and choices under each building block

Background

## Pricing building block

*How participants are remunerated*

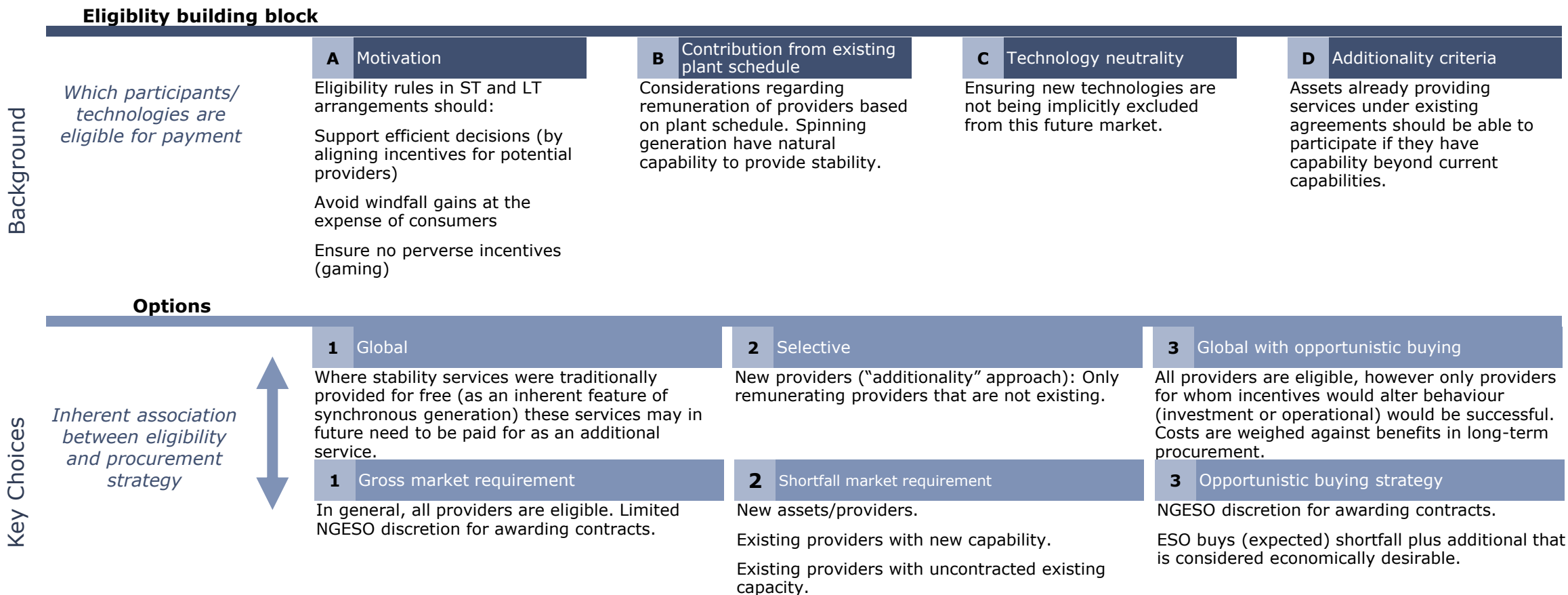
A Motivation	B Capability, activation, delivery	C Payment structure	D Mechanism
The approach for structuring the payment comes down to risk management practices and deciding where the risk lies in each option (payment structure) and who takes the risks. Trade-off with complex payment structures and level of details.	There are different timescales (at least 3 natural timescales related to capability, activation and delivery) and a lot of options on whether it is left to the market to set prices or for prices to be set administratively.	The approach for structuring the payment comes down to risk management practices and deciding where the risk lies in each option (payment structure) and who takes the risks. Trade-off with complex payment structures and level of detail.	Pay as bid v pay as clear.

Key Choices

## Options

1 Contractual utilisation price + availability price	2 Activation price determined later (outside of contract)	3 Availability only price
Auction determines the availability price, with the utilisation price set in the contract.  The supplier can anticipate this price when deciding to make themselves available or not. However, requires suppliers to take view on future requirements.	Auction determines the availability price, but utilisation price is set outside of supply contract.  The buyer must take view on future quantities to be provided but suppliers also need to take a view on future utilisation price.	Seller must implicitly price in any potential utilisation costs into availability price.

# Essential building blocks of the market design and choices under each building block



# Essential building blocks of the market design and choices under each building block

## Bundling building block

Background

*Bundling of procurement*

### A Motivation

With three stability services to be procured (potentially) on a long-term basis, some suppliers could supply more than one service, with cost synergies. If each service had a separate bid, synergies could not be expressed.

Bidders will face aggregation risks if they assume they win will contracts for multiple services but win only some of them.

## Options

Key Choices

### 1 Individual stability services

Separate procurement for the relevant stability services.

Separate procurement (potentially at different times) for the three relevant stability services (inertia, SCL, dynamic voltage support).

### 2 Fixed ratios

Services are procured in a bundle, with a pre-defined ratio between the services that providers must adhere to. A single price is offered for the bundle.

### 3 Combinatorial auction

There are possible cost synergies in providing different stability services.

The approach aims to express the synergies through packages of services. Each bid is made for a package of services (quantity for each service, with a single price offer for the package).

Multiple approaches in this setup that providers could take.

# Essential building blocks of the market design and choices under each building block

Background

## Locational specification

*Static vs. dynamic effectiveness factor & regional vs. national market*

A Motivation	B National vs. regional markets	C Effectiveness factors
<p>Issue of inertia becoming a potential locational issue in the future. There is a locational characteristic for inertia and potential for procurement at both national and locational level.</p> <p>SCL and dynamic voltage are considered regional.</p>	<p>In practice, GB is physically divided in more or less separate regions due to effectiveness constraints. However, some units contribute to multiple regions. Choice is to treat each region separately or to do a combinatorial market.</p> <p>If treated separately, question of National vs. Regional markets comes down to trade-off between simplicity &amp; operational effectiveness vs. ability to tailor products, timings and services for each region separately.</p>	<p>SCL and dynamic voltage are highly locational. Voltage cannot travel great distances in the grid and is constrained by distance over cables, voltage levels, transformer equipment and potential outages.</p> <p>Needs are regional, and for each region, the effectiveness of each plant differs by location.</p> <p>Effectiveness factor aims to capture changes in physical conditions that define effectiveness.</p> <p>The true effectiveness factors are incredibly dynamic in each operational hour and cannot be accurately reflected in forward procurement.</p>

Key Choices

## Options

1 National & regional procurement	2 Co-procurement by region	3 Procurement through individual effectiveness factors
<p>SCL and dynamic voltage are considered to be regional with similar effectiveness for each provider across the region (and interaction between neighbouring regions). Inertia initially considered national. Procurement for all GB run in a single round.</p>	<p>Procurement for each region independently (could be at different times), no interaction considered between regions (except for providers that have already been procured from previous rounds).</p>	<p>Each provider is given a specific effectiveness factor (price/volumes scalar) for each of the services. Procurement for all GB run in a single round.</p>

# Essential building blocks of the market design and choices under each building block

Background

## Product definition & contract type

*Consideration of obligations, conditionality, delivery windows and other features tied to service provision*

### A Barriers to entry

Services need to be suitable for existing and new technologies  
Services need to be flexible enough to factor in both LT and ST providers

### B Flexibility

Services need to be flexible enough to allow a range of participants

- One provider may decide to provide a capability that will require oversizing (require investment decision) and provide a lot of the service
- Other providers may only be able to provide x so decide to provide x
- Other providers will choose a different combination

Key Choices

## Options

### 1 Simple procurement

In simple procurement, discrete products which do not overlap exist (except between short and long term where applicable). Commitments are firm and generally governed by baseload for long term or by more granular with-in day 'windows' for short term.

### 2 Complex procurement

Multiple conditional contract types exist with different structures *in addition to* simple products including: **shape** where long term commitments vary by time of day or year (firm); **ESO call options** where availability is guaranteed but utilisation is only delivered when option is exercised by ESO (firm); or **provider put options** where providers have the right to provide the service at a pre-agreed price but not the obligation to be available/deliver (non-firm)

# Essential building blocks of the market design and choices under each building block

## Non-performance building block

Background

*Consideration of consequences to non-performance*

### A Background

Non-performance here is defined as when:  
 Market participant fails to comply with a stability dispatch instruction because the unit is unable to deliver its services in accordance with its availability contract; or  
 Provider fails to become available in accordance with contract

### B Penalties

The penalty should motivate compliance, while at the same time not create such a risk for providers that it prevents them from participating in the market.  
 Non-firm contracts are without any liability to NGESO, thus the assumption is that non-payment will be used. The other options are for firm contracts only.

## Options

Key Choices

### 1 No payment

Non-performance is only penalised in form of no payment (can be utilisation, availability, or both).

### 2 No payment and fixed penalty

In addition to not receiving payment, contract holder is penalised in form of a financial penalty more severe than non-payment (multiplier), contract termination, or by other means (could be a mix based on severity).

STABILITY MARKET DESIGN

## 2. Strawman options



# We have combined the building blocks in 4 potential solutions (straw-man options) to explore and assess the merits of potential design decisions

**All straw man options include Pathfinders (1,2,3) and the BM**

*All exclude direct TO participation*

*All envisage a national market for inertia and regional procurement for SCL & DVC*

**A**  
**Short-term (only)**  
New ST market. No new Pathfinders.

**B**  
**Long-term (only)**  
A new LT market arrangement replaces the Pathfinder arrangements.

**C**  
**Evolution**  
New ST market alongside continued Pathfinders, run at ESO discretion.

**D**  
**Revolution**  
Introducing a new ST market + new LT market arrangement run at scheduled intervals

<b>Timeframe</b>	<b>Lead time</b>	Day-ahead*	T-1 Year T-4 Years	ST: Day-ahead* LT: ad-hoc	ST: Day-ahead* LT: T-4 + T-1
	<b>Frequency</b> Baseload/firm	Daily	Annual	ST: Daily LT: ad-hoc	ST: Daily LT: Annual
	<b>Contract duration</b>	Hourly / Half-hourly / EFA block	1-15 years	ST: Hourly / Half-hourly / EFA block LT: ad-hoc/10y	ST: Hourly / Half-hourly / EFA block LT: 1-15 Years
<b>Product</b>	<b>Contract type</b>	Simple	Complex	Simple	Complex
	<b>Complex contract</b>	No	Call option Put option Shape products	No	Call option Shape products
<b>Pricing</b>	<b>Pricing Mechanism</b>	Pay-as-clear	Pay-as-bid	ST: pay-as-bid Pathfinder: pay-as-bid	ST: pay-as-bid LT: pay-as-bid
	<b>Payment type</b>	Availability (£/SP)	Availability (£/SP) Utilisation (£/MWh)	ST: Availability (£/SP) LT: Availability (£/SP) + Implicit utilisation (£/MWh)	ST: Availability (£/SP) LT: Availability (£/SP) + Utilisation (£/MWh)
<b>Eligibility</b>	<b>New &amp; Existing</b>	All	New	ST: all LT: "Additionality" (for new prov.)	All
	<b>In-merit &amp; Out-of-merit</b>	All	Not applicable in LT	ST: out-of-merit	ST: all
	<b>Procurement strategy</b>	Gross	Opportunistic	ST: Shortfall LT: Opportunistic	ST: Gross LT: Opportunistic

Note: \*daily procurement at day-ahead, after the DA energy markets and interconnection capacity allocation as interconnector position influences total stability requirement.



STRAWMAN OPTIONS - OVERVIEW

		A: ST-only	B: LT-only	C: Evolution	D: Revolution
Timeframe	Lead time	Day-ahead	T-4 Years T-1 Year	Pathfinder: ad-hoc ST: Day-ahead	LT: T-4 + T-1 ST: Day-ahead
	Frequency	Daily	Annual	Pathfinder: ad-hoc ST: Daily	LT: Annual ST: Daily
	Contract duration	Hourly / Half-hourly	1-15 years	Pathfinder: ad-hoc/10y ST: Hourly / Half-hourly / EFA block	LT: 1-15 Years ST: Hourly / Half-hourly / EFA block

Strawman A introduces a short-term (ST) stability market procuring at day-ahead (DA) stage, after the DA energy markets and (ideally) after interconnection capacity allocation.

Future stability Pathfinders are discontinued once the ST market is in place.

Timing allows participants to trade out energy consequences in intraday market - to be in position (available) in real-time.

Close to real-time market accommodates participation from weather-dependent providers, and provides a ST route-to-market for OMW active power providers (for discrete stability services).

The LT procurement reflects the need for incremental investment (& need for investment decisions to be taken in LT timeframes to ensure adequate capability).

Annual LT market takes place of future stability Pathfinders.

Market procures with flexible lead times to accommodate for different technology characteristics.

Agreement lengths vary depending on the provider's characteristic and ability to demonstrate clear value for money.

Continued Pathfinder rounds to procure capability (and incentivise investment) from providers who can commit in advance and have high availability. LT nature provides revenue certainty, key enabler for high Capex providers such as Synch Comps.

A ST stability market is introduced. This can be expected to be procuring at DA.

Pathfinder agreement lengths vary depending on the provider's characteristics and ability to demonstrate clear value for money.

The LT procurement reflects the need for incremental investment (& investment decisions taken in LT timeframes to ensure adequate capability).

Annual LT market takes place of future stability Pathfinders.

ST market provides close to real-time stability procurement (expected to be procuring at DA stage, for firm availability).



STRAWMAN OPTIONS - OVERVIEW

	A: ST-only	B: LT-only	C: Evolution	D: Revolution
<b>Contract type</b>	Simple	Complex	Simple	Complex
<b>Complex contract</b>	No	Call option (Firm) Put option (Non-firm) Shape products (Firm)	No	Call option (Firm) Shape products (Firm)
<b>Market Time Unit (MTU)</b>	Half-hour			
<b>Obligations</b>	100% availability	Completion milestones Firm products: 95% min availability Non-firm products: no min availability	Pathfinder (LT): 90% availability ST: 100% availability	Completion milestones Pathfinder: 95% availability ST: 100% availability
<b>Unavailability consequence</b>	Firm penalty	Firm products: non-payment, penal beyond availability requirement Non-firm products: non-payment	Pathfinder (LT): non-payment ST: firm penalty	Firm products: non-payment, penal beyond availability requirement Non-firm products: non-payment

ST market procures for 100% availability, meaning that contracted providers can be called at any point on the basis of this availability requirement.

A non-performance penalty is in place ensuring delivery of obligations when required. By firm penalty we mean a reduction of payments to the provider in excess of the payments received for the given settlement periods.

Under a LT-only arrangement we present a complex set of contracts with built-in flexibility. This is because a LT-only arrangement would otherwise not facilitate the participation of certain technologies.

Simplistic contracting methods such as baseload contracts aren't suitable for all provider types.

Complex contracting options offer routes to market for a broad range of technologies, however due to forecast error risk management this will always be imperfect for both providers and ESO.

Firm and non-firm contract types are offered. The 'call' option is aimed at providers who can commit in advance with high availability but high marginal cost of availability. The 'put' option is aimed at providers who cannot commit in advance (e.g. weather dependent) but require some revenue certainty.

Firm penalties are in place for 'firm' providers that do not meet their obligations, as under the ST-only option. For the flexible contract types there is no minimum availability requirement and therefore the penalty is passed through as a non-payment.

Continued pathfinders maintain their current approach – procuring for high availability products (90% availability), and non-performance penalty regime. The non-performance regime includes foregoing the payment when not available & a rebate mechanism to clawback money if average availability falls below a certain threshold (90%).

ST market procures for 100% availability, meaning that contracted providers can be called at any point based on this availability requirement.

Firm penalty has the same meaning as under the ST-only option.

This is a model intended to provide the widest flexibility to providers and ESO alike – and in addition to operating in multiple timeframes, we complement it by introducing a complex set of contracts with built-in flexibility. This is aimed at enabling choice, for example intermittent providers can choose to commit in ST timeframes or in the LT with a conditional, flexible contract.

Firm penalties are in place for providers that do not meet their obligations, with firm penalty having the same meaning as under the ST-only option. For the flexible contract types there is no minimum availability requirement and therefore the penalty is passed through as a non-payment.

New-build service providers are subject to additional obligations such as completion milestones (like those applied in the Capacity Market today).



STRAWMAN OPTIONS - OVERVIEW

	A: ST-only	B: LT-only	C: Evolution	D: Revolution
<b>Pricing Mechanism</b>	Pay-as-clear	Pay-as-bid	Pathfinder (LT): pay-as-bid ST: pay-as-bid	LT: pay-as-bid ST: pay-as-bid
<b>Payment type</b>	Availability (£/SP)	Availability (£/SP) Utilisation (£/MWh)	Pathfinder (LT): Availability (£/SP) + Implicit utilisation (£/MWh) ST: Availability (£/SP)	LT: Availability (£/SP) + Utilisation (£/MWh) ST: Availability (£/SP)
<b>Bundling</b> (inertia, SCL, DVC)	Individual prices per product	Firm products: LT: Package price Non-firm products: Individual prices	Pathfinder (LT): Package price ST: Individual prices	LT: Package price ST: Individual prices
<b>Price regulation</b>	Price cap	TO alternative	Pathfinder (LT): TO alternative ST: price cap	LT: TO alternative ST: price cap

Market has a single clearing price with a pay-as-clear mechanism.

The ST market only remunerates for availability (participants must price in any utilisation costs). At the day ahead stage, the utilisation volume is known with a reasonable degree of certainty, providers that are accepted are expected to be instructed to provide stability services.

Contracts are awarded for individual products.

Locational market power (especially in ST markets) may require regulatory protection. Under this model this protection takes the form of a price cap.

Providers submit an availability and a utilisation price in the LT market.

We recognise LT contracts place a risk that is difficult to manage for providers that incur energy costs in order to be available. The utilisation payment is intended to provide a mechanism to manage this risk. Our thinking is to structure products that can help manage this risk such as a 'baseload LT contract with short-term buyback' or follow Pathfinder 1's approach in remunerating energy consumption with the imbalance price.

The price setting is based on a pay-as-bid mechanism, aimed at facilitating transparency.

Providers can submit bids for a package of services in a 'bundled' format. Under a bundled bid, the provider offers a package of services with determined quantity & availability for each service, and a single price offer.

Regulatory back-stop in the LT market: TO asset solution depreciated over 10yr time horizon.

Pay-as-bid is consistent with current Pathfinder arrangements.

The ST market only remunerates for availability (participants must price in any utilisation costs).

Under the LT market there is an availability and utilisation payment. We recognise LT contracts place a risk that is very difficult to manage for providers with energy costs in order to be available. The utilisation payment is intended to provide a mechanism closer to real-time to manage this risk - Our thinking is to structure products that can help manage this risk such as a 'baseload LT contract with short-term buyback' or follow pathfinder 1's approach in remunerating energy consumption.

Regulatory back-stop in the LT market: TO asset solution depreciated over 10yr time horizon. The ST market retains a price cap.

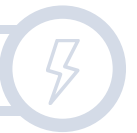
Providers submit an availability and a utilisation price in the LT market.

We recognise LT contracts place a risk that is difficult to manage for providers with energy costs in order to be available. The utilisation payment is intended to provide a mechanism to manage this risk. Our thinking is to structure products that can help manage this risk such as a 'baseload LT contract with short-term buyback' or follow Pathfinder 1's approach in remunerating energy consumption with the imbalance price.

The price setting is based on a pay-as-bid mechanism, aimed at facilitating transparency.

Providers are able to submit bids for package of services in a 'bundled' format. Under a bundled bid, the provider offers a package of services with determined quantity & availability for each service, and a single price offer.

Regulatory back-stop in the LT market: TO asset solution depreciated over 10yr time horizon. The ST market retains a price cap.



STRAWMAN OPTIONS - OVERVIEW

	A: ST-only	B: LT-only	C: Evolution	D: Revolution
<b>New &amp; Existing</b>	All	New	Pathfinder (LT): "Additionality" (for new prov.) ST: all	All
<b>In-merit &amp; Out-of-merit</b>	All	Not applicable in LT	Not applicable in Pathfinder (LT) ST: out-of-merit	ST: all
<b>Procurement strategy</b>	Gross	Opportunistic	Pathfinder: Opportunistic ST: Shortfall	LT: Opportunistic ST: Gross
<b>TO participation</b>	Only commercial providers	Only commercial providers	Pathfinder: all Only commercial providers	Only commercial providers

All providers are eligible to participate.  
 All providers that are providing the service are paid the clearing price.  
 ESO procures for the whole market requirement. This is a model where all providers can bid and everyone providing stability on the day, up to the requirement, is remunerated.  
 Procuring for the gross market requirement means both in-merit and out-of-merit are eligible to participate and be remunerated.  
 BM is used only for unexpected events.

This model follows an opportunistic buying strategy. This mandates the procurement of new capability (following the additionality criteria) to meet expected shortfalls (as a minimum), and retains the flexibility to procure additional services if it is economical to do so against the ST alternative (in this case the expected BM costs).  
 The BM continues to be available – with the opportunistic buying it is used as a cost-minimization strategy, as well as solution of last-resort to meet operational needs if conditions change.  
 In terms of in-merit vs out-of-merit providers - the procurement in LT timeframes means this distinction is not applicable.

This model follows an opportunistic buying strategy. This mandates the procurement of new capability (following the additionality criteria) to meet expected shortfalls (as a minimum), and retains the flexibility to procure additional services if it is economical to do so against the ST alternative.  
 In the short-term the shortfall is always bought (not assessed against costs in BM timeframes which can be uncertain at the DA stage). Not all providers are paid.  
 The BM continues to be available – as solution of last-resort to meet operational needs if conditions change.

Global eligibility means all providers & technologies (new & existing, marginal & part of energy market plant schedule) can participate.  
 The LT market remains opportunistic, ESO buying where they think it is a cheaper solution than the alternative costs faced in short-term markets.  
 The ST market reverts to gross procurement, buying provision to cover the whole requirement stack, and paying for everything not already contracted in the long-term (whether they would have been providing stability regardless or not).  
 BM is used only for unexpected events.

STRAWMAN OPTIONS - OVERVIEW

		A: ST-only	B: LT-only	C: Evolution	D: Revolution
Other key considerations	Product ratio	Not applicable (separate products)	Firm products: user-defined Variable availability products: separate	Pathfinder (LT): ESO-defined ratio ST: separate products	LT: user-defined ST: separate products
	Product bidding	Separate bids per product	Firm products: Mutually exclusive bids (with different product ratios) Non-firm products: separate bids	Pathfinder (LT): site-specific bid ST: separate products	LT: Mutually exclusive bids (with different product ratios) ST: separate bids
	Bundling (inertia, SCL, DVC)	Separate	Bundled possible	Pathfinder (LT): bundled possible ST: separate	LT: bundled possible ST: separate

Separate procurement for the three relevant stability services (inertia, SCL, dynamic voltage support).  
SCL and dynamic voltage are considered regional. Inertia is currently national (but there are some locational considerations e.g. if all providers were in a similar region).

Bundled bids: providers offer services as desirable for them with user-defined product ratios (lending itself more to pay-as-bid). Each bid is made for packages of services (quantity & availability for each service, with a single price offer for the package).  
Multiple bids (varying units of ratio) being accepted on a bundled basis, then deconstructed algorithmically for transparency.  
For the conditional products (non-firm), products are not bundled as provision is uncertain in advance. Providers bid separately for the products.

LT can lend itself better to bundled procurement. ST has more accurate visibility on requirements, so procuring for discrete and separate products desirable.

LT can lend itself better to bundled user-defined products with variable ratios of provision.

STABILITY MARKET DESIGN

## 3. Assessment of strawman options

Qualitatively, strawman D is most favourable. Removing some of the complexity of this option will make it more practical and transparent

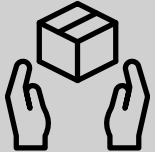


	Assessment	System stability & security	Cost-efficient	Zero-carbon	Investable	Transparent	Technology neutrality	Practical	Enduring	Freedom of Choice
<b>A</b> ST (only)	ST-only benefits from operating close to real-time but <b>fails to promote investment</b> . This is critical in ensuring cost-efficiency and system stability									
<b>B</b> LT (only)	LT-only performs poorly – the <b>lack of ST mechanisms</b> exposes ESO and providers alike to critical risks									
<b>C</b> Evolution	Evolution strikes a <b>balance</b> between desirable outcomes and the scale of change from required from the status quo									
<b>D</b> Revolution	Revolution scores the highest overall but lacks <b>practicality</b> – a crucial weakness, particularly if benefits are marginal									
<b>Legend</b>	Strong performance vs. objective	Good performance vs objective. Few gaps remain	Intermediate performance vs. objective. Some gaps identified	Poor performance vs. objective. Many critical gaps identified	Fails to meet objectives. Critical gaps identified					



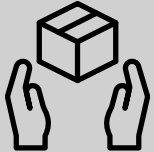








# LT-only & ST-only limit choice in critical timeframes, can expose the system to shortages and might threaten system security if forecasting is poor

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>System stability &amp; security</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Recurring &amp; systematic:</b> requirements determination can help ESO and participants to understand market dynamics and plan accordingly.</li> <li>- <b>Broader access to resources:</b> short-term market gives a route for providers that cannot be instructed by traditional means (e.g. BM) potentially increasing the volume accessible close to real-time.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>ST-only solution perceived as less 'investable':</b> no explicit long-term incentive to guarantee capability is in place for market to procure services from.</li> <li>- <i>While the ST arrangement may enable better forecasting from providers &amp; ESO, it does not ensure capability required will be in place. There may be instances where there is insufficient capability, even in the BM.</i></li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>LT market ensures adequate capability is in place:</b> to meet forecasted stability requirements. Operating in investment timeframes gives enough lead time for investment decisions.</li> <li>- <b>Wide product suite enables flexibility:</b> to meet variable conditions under the variable system conditions, though limitations to these products exist.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>LT-only procurement exposes market to variable requirements and forecast errors:</b> LT-only procurement means there are limited stop-gap solutions closer to real-time if conditions change (BM, energy market trading).</li> <li>- <i>Product-suite and multiple contract structures provide some options to manage these risks, but are not a perfect solution.</i></li> <li>- <b>Procurement volume:</b> larger share of procurement from non-firm products can mean over/under-provision in real time.</li> <li>- <b>Eligibility restricted to new providers</b> may lead to unintended consequences of existing plants (needed to meet requirements) closing and expose ESO to shortages close to real-time.</li> </ul>




# Hybrid market timeframes give choice in critical timeframes, incentivise wider participation reducing risks for the buyer and provider

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>System stability &amp; security</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>– <b>Ensures adequate capability is in place</b> to meet forecasted stability requirements. Pathfinder arrangements operate in investment timeframes (LT), ST market provides an additional solution in case conditions change.</li> <li>– <b>Broader access to resources:</b> short-term market can give a route for providers that cannot be instructed by traditional means (e.g. BM) potentially increasing the volume accessible close to real-time.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Infrequent, non-systematic nature of Pathfinder procurement:</b> does not oblige ESO to make regular forecasting and requirement determinations. It increases the years relying on infrequent forecasts and requirement determinations.</li> <li>– <i>This can increase exposure to forecast errors and variability in requirements. Irregular procurement does not require recurring and systematic assessments. Situations of system shortage can arise.</i></li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>– <b>Hybrid market timeframe mitigates issues of under- and over-procurement.</b> LT market ensures capability is in place to meet forecasted requirements. ST market provides a stop-gap solution in case conditions change (close to real-time, accurate forecasting, minimise role of BM in managing stability).</li> <li>– <b>All providers</b> are eligible for participation and remuneration under both LT &amp; ST arrangements. Provides revenue/volume signalling to existing providers (who may otherwise decide to decommission) to remain open.</li> <li>– <b>Systematic and recurring LT market</b> obliges SO to make forecasting, requirement determinations. This acts to ensure a higher degree of certainty for market providers and forecasting in requirements. Mitigates exposure to forecasting errors.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Unintended consequences of global eligibility:</b> Limited incentives for existing participants to innovate / improve their assets through additional investment. May be desirable to incentivise innovation to mitigate future system challenges.</li> </ul>



# Revolution best ensures the provision of services to maintain system stability and security

Objective	Model	Score	Justification
<p><b>System stability &amp; security</b></p> 	 <p>Short-term (only)</p>		<ul style="list-style-type: none"> <li>– ST-only performs poorly as there are no explicit arrangements to guarantee adequate capability is in place. It exposes ESO to critical risk in ensuring system security as the arrangements may fail to incentivise investment in capability needed to meet requirements.</li> </ul>
	 <p>Long-term (only)</p>		<ul style="list-style-type: none"> <li>– LT-only displays an intermediate performance and is an improvement to the ST-only.</li> <li>– Operating in investment timeframes can incentivise adequate capability is in place and the product-suite enables flexibility in managing potential risks of shortages close to real-time. However, this does not provide a perfect coverage and ESO remains exposed to changes in requirements and forecast errors under given circumstances, with limited stop-gap solutions close to real-time.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Evolution performs well. The hybrid market timeframes provide improvements to maintain system stability and security by mitigating the risks related to the ST-only and LT-only solutions. However, reliance on infrequent Pathfinder procurement in LT timeframes may increase exposure to forecast errors.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Revolution displays a strong performance against the objective. The multiple market timeframes and products give ESO flexibility to meet variable system needs, and the recurring, systematic nature of both market timeframes strengthens the robustness of requirement determinations mitigating forecast uncertainties.</li> </ul>










# ST-only and LT-only arrangements are exposed to issues of over and/or under-procurement

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Cost-efficient</b></p> 	 <p><b>Short-term (only)</b></p>	<ul style="list-style-type: none"> <li>– <b>Close to real-time procurement</b> promotes better accuracy, mitigating over/under-procurement particularly if requirements are variable and volatile.</li> <li>– <b>Close to real-time procurement</b> removes some of the availability risk that weather-dependent providers face. It incentivises wider participation and competition from potentially lower-cost solutions.</li> <li>– <b>Gross market requirement</b> incentivises existing provision (that is needed to meet requirements) to stay open. This can minimise reliance on new, incremental capability, which is expected to be more expensive than procuring from existing providers.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>ST-only procurement</b> exposes ESO to under-procurement which can lead to scarcity and extreme pricing. There are no explicit arrangements to guarantee capability. It may lead to expensive stop-gap actions (BM or other last resort actions).</li> <li>– <b>Participants may attach risk premium to a new ST-only market</b> and the volume &amp; price uncertainty can lead to more expensive bids (example of scarcity rent manifesting in energy ST market). The presence of a <b>single buyer</b> may exacerbate the perceived risk premia under this ST-only arrangement. This may only apply in initial stages of market launch, as impact diminishes over time with market maturing.</li> <li>– <b>Gross market requirement</b> is more expensive than procuring only for the shortfall.</li> </ul>
	 <p><b>Long-term (only)</b></p>	<ul style="list-style-type: none"> <li>– <b>Shortfall market requirement</b> demonstrates value for money by only remunerating for provision not already present. It provides incentives for behaviour changes.</li> <li>– <b>Wide product-suite</b> gives ESO choice in determining preferred ratio to meet requirements at least-cost. Choice of products gives flexibility to ESO, meaning it can determine most cost-efficient procurement mix. Range of contract structures can help to mitigate and manage risks for participants.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>LT-only procurement exposes market to forecast error.</b> Can lock ESO into cost-inefficient outcomes of over-procurement and scarcity/extreme pricing with under-procurement. Complex contract types with built-in flexibility provide some options to manage these risks but are imperfect.                         <ul style="list-style-type: none"> <li>– <b>Over-procurement:</b> If too much non-firm provision shows up in real time.</li> <li>– <b>Under-procurement:</b> May require ESO to over-rely on expensive call option contracts (typically providers with high short-run marginal costs).</li> <li>– <b>LT risks:</b> Difficult for providers to manage operational costs over duration of a LT contract – may translate into additional risk premia and costs.</li> </ul> </li> </ul>

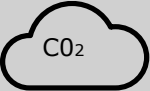


# Operating in LT and ST market timeframes promotes cost-efficient outcomes by managing volume risk whilst broadening participation & competition

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Cost-efficient</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>- <b>Hybrid timeframe (volumes)</b> - close to real-time procurement under the ST market promotes better accuracy, mitigating over/under-procurement particularly if requirements are variable and volatile. The Pathfinders operate in investment timeframes, incentivising new capability if needed to meet requirements, mitigating shortages and extreme pricing close to real-time.</li> <li>- <b>Hybrid timeframe (participation)</b> encourages wider participation and, therefore, drives costs down. LT timeframe offers secure route for new build. ST accommodates existing providers and/or those providers who cannot commit ahead.</li> <li>- <b>LT procures for new capability</b>, due to the top-up approach, incentives are only offered in exchange for additionality.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>The infrequent, ad-hoc nature of Pathfinders</b> may adversely impact bid costs and participation of potential providers.</li> <li>- <i>Frequent nature would enable providers to participate with multiple projects over time, build supply chains (take advantage of technology learnings). These are cost benefits that are not incentivised to be realised with the ad-hoc procurement.</i></li> <li>- Infrequent nature means there are limited opportunities for participation, some suitable, cost-efficient solutions could miss out.</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>- <b>Global eligibility &amp; hybrid timeframe</b> incentivises wider participation and competition. The ST arrangements reduce availability risk compared to a LT procurement for intermittent providers. LT procurement operating in investment timeframes enables new capability, if required, which mitigates scarcity &amp; extreme pricing close to real-time.</li> <li>- <b>Hybrid timeframe, wide product-suite &amp; contract structure</b> means ESO has flexibility to meet requirements at least-cost. ST &amp; LT procurement work to balance over &amp; under-procurement. ESO is flexible to procure its desired volume from the LT &amp; ST market timeframes. Choice of products gives flexibility to ESO, which can determine most cost-efficient procurement mix. Range of contract structures can mitigate and manage risks.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Gross market requirement</b> means that providers present as part of an existing market schedule (e.g. energy) will be remunerated which can be inefficient if incentives do not alter behaviour.</li> </ul>

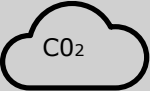


# A hybrid timeframe is optimal to ensure cost-efficient provision of services over single timeframe solutions

Objective	Model	Score	Justification
<p><b>Cost-efficient</b></p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– Short-term only solution performs poorly. It fully exposes ESO to variable requirements with potentially limited and expensive options in the BM and no other option to procure additional new capability to meet requirements. It also procures for the whole requirement stack which is expected to be more expensive than procuring for just the shortfall</li> <li>– Providers may perceive additional risks with future volume &amp; price uncertainty, attaching risk premium which can manifest as expensive bids</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– The LT-only market displays a better performance. It procures only for the shortfall only, providing incentives for changes to behaviour. The suite of products available under this arrangement gives choice to ESO &amp; providers in mitigating LT risks</li> <li>– However, relying entirely on the LT can still lock ESO in to inefficient outcomes in certain circumstances, exposing it to variability in requirements, resulting in over-procurement and/or scarcity with resultant extreme pricing. Providers are exposed to energy and operational risks in LT timeframes and embed a high risk premium to participate</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– The hybrid approach performs well as it provides more flexibility in managing risks and meeting stability requirements. The ST market allows ESO to access shaped requirements, mitigating the risk of cost-inefficient contracts, and the Pathfinder (in the LT) ensures “new” capability is in place if is required, managing the risk of scarcity &amp; extreme pricing close to real time</li> <li>– However, the ad-hoc nature of Pathfinder procurement may impact cost and participation of providers. It may not enable providers to build a pipeline of projects over time or take advantage of technology learnings, for example</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Revolution also displays a strong performance due to its hybrid approach in the timeframe of procurement, wide choice of products and contract structures, and systematic/recurring nature of procurement. The combination of these factors is expected to enable ESO to meet requirements efficiently</li> <li>– The key drawback to this approach is gross requirement setting in the short-term market where payments may be made to providers although the incentives created do not alter the behaviour of those providers</li> </ul>

# LT-only solution may lock ESO into sub-optimal carbon-intensive provision and rely on carbon-emitting stop-gap solution through the BM

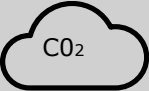








Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Zero-carbon compatible</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>A dedicated market with appropriately designed features can lead to efficient outcomes enabling accelerated system decarbonisation.</b> Accelerated decarbonisation can arise as a result of the other objectives of this market such as cost-efficiency and system security. The market with the right features can decrease reliance on expensive and carbon-intensive stop-gap solutions via the BM.</li> <li>- <b>Lowers barriers to entry for clean generation.</b> ST procurement offsets the majority of the availability risk for weather-dependent (RES) providers.</li> <li>- <b>ST-procurement and limited duration contracts avoid lock-in</b> with sub-optimal carbon-emitting providers. Recurring procurement helps ESO to procure most modern, clean technology.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Scarcity and limited options close to real-time</b> may force ESO to take sub-optimal stop-gap actions (e.g. through the BM or what’s available on the day, which may be carbon intensive).</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>A dedicated market with appropriately designed features can lead to efficient outcomes enabling accelerated system decarbonisation.</b> Accelerated decarbonisation can arise as a result of the other objectives of this market such as cost-efficiency and system security. The market with the right features can decrease reliance on expensive and carbon-intensive stop-gap solutions via the BM.</li> <li>- <b>Lowers barriers to entry for clean generation.</b> Procurement via non-firm products offers a route-to-market for providers (RES, weather dependent) subject to availability risk.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>LT procurement and long contract duration</b> can lock-in ESO with sub-optimal carbon emitting providers.</li> <li>- <b>Procurement of call options</b> can risk striking contracts with sub-optimal carbon-emitting providers. (typically for providers who can commit in advance but have high short-run marginal costs, such as thermal generators).</li> <li>- <b>No option to rely on ST procurement.</b> Relying entirely on LT procurement may lead ESO to miss out on more efficient, modern and carbon-friendly providers.</li> </ul>

LT markets reduce reliance on carbon-intensive stop-gap solutions, and ST enables ESO to contract zero-carbon technologies (that may not be there in the LT)




Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Zero-carbon compatible</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>- <b>A dedicated market with appropriately designed features can lead to efficient outcomes enabling accelerated system decarbonisation.</b> Accelerated decarbonisation can arise as a result of the other objectives of this market such as cost-efficiency and system security. The market with the right features can decrease reliance on expensive and carbon-intensive stop-gap solutions via the BM.</li> <li>- <b>Hybrid timeframe enables choice</b>, limiting potential lock-in with sub-optimal carbon emitting providers in LT timeframes and mitigating ST shortage/reliance on sub-optimal carbon alternatives in real-time (e.g. through the BM). The ST market also lowers barriers to entry for clean generation by removing some of the LT availability risk faced by weather-dependent providers.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>ESO may need to take sub-optimal stop-gap actions</b> close to real-time (e.g. through the BM or what is available on the day, which may be carbon-intensive).</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>- <b>A dedicated market with appropriately designed features can lead to efficient outcomes enabling accelerated system decarbonisation.</b></li> <li>- <b>Lowers barriers to entry for clean generation.</b> The short lead time of the procurement offsets the majority of the availability risk for weather-dependent (RES) providers.</li> <li>- <b>Hybrid timeframe enables choice</b>, limiting potential lock-in with sub-optimal carbon-emitting providers in LT timeframes and mitigating ST shortage/reliance on sub-optimal carbon alternatives in real time (e.g. through the BM).</li> <li>- <b>Multi-year agreements tied to provider's characteristics</b>, including emissions limit criteria.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>ESO may need to take sub-optimal stop-gap actions</b> close to real-time (e.g. through the BM or what is available on the day, which may be carbon intensive).</li> <li>- <b>Procuring for the gross market requirement</b> means there will be some carbon-emitting providers being contracted. This can lead to unintended consequences by enabling carbon-emitting provision to remain online longer than desired.</li> </ul>



# ST market timeframes promote zero-carbon compatible solutions, though performances are not too dissimilar

Objective	Model	Score	Justification
<p><b>Zero-carbon compatible</b></p> 	 Short-term <i>(only)</i>		<ul style="list-style-type: none"> <li>Option performs well as it avoids lock in with sub-optimal carbon provision and the ST, close to real-time procurement maximises chances of procuring the most modern, zero-carbon compatible technologies (of the future). However, can lead to sub-optimal carbon actions if shortages occur.</li> </ul>
	 Long-term <i>(only)</i>		<ul style="list-style-type: none"> <li>LT-only performs less well, as it is viewed as least flexible design option in terms of zero-carbon compatibility. It risks locking ESO in with sub-optimal carbon provision in LT timeframes, limiting chances for ESO to make use of provision from most efficient, zero-carbon compatible technologies in the market closer to real-time.</li> <li>All other design options have ST option to procure from most "modern" / zero-carbon compatible technologies.</li> </ul>
	 Evolution		<ul style="list-style-type: none"> <li>Evolution displays a good performance as it limits participation of carbon-emitting providers in the Pathfinder and ST arrangement maximises the chances of procuring the most efficient, zero-carbon compatible technologies close to real-time (which may otherwise not be available in the LT market).</li> </ul>
	 Revolution		<ul style="list-style-type: none"> <li>Revolution performs well building on the benefits shown under A and C. It demonstrates similar advantages from the ST market arrangements in procuring the most efficient, zero-carbon compatible technologies close to real-time.</li> </ul>










# Short-term only markets may fail to deliver investment signals as a standalone solution. LT-only presents risks that may inhibit investment

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Investable</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>– <b>Granular and continuous price signals</b> in a ST market can incentivise generators to invest in flexible assets.</li> <li>– <b>An enduring, transparent ST market</b> (with some LT requirement signals) can incentivise some (but not all) incremental investment.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Single buyer risk:</b> Providers are exposed to large volume risks as ESO is free to buy as much or as little as required. Volume requirements are subject to changes over time and location. A short-term only market fully exposes providers to changeable counterparty needs with no option to sell products to a third party.</li> <li>– <b>Allocation of risk:</b> principles state that the party most able to bear a given risk should carry its exposure. Deviation from these principles is common, but can result in significant levels of risk premia for providers. ESO has greater visibility of future needs (albeit imperfect). If the perceived risk of uncertainty to investors is too great, reward offered by the market will be unattractive to investors. With a ST-only market, providers face the risk of stranded assets if needs change.</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>– <b>Long contracts &amp; lead time:</b> Incentivise investment for providers who can commit in advance and require revenue certainty (e.g. high capex) with LT firm procurement. Lead time gives sufficient opportunity for investment decisions to be made and assets realised.</li> <li>– <b>Freedom in product type:</b> Availability uncertainty for some providers means a ST mechanism is needed to some extent, which leads to the idea of a firm / non-firm LT market.</li> <li>– <i>Firm: Incentivise investment for providers who can commit in advance and require revenue certainty (e.g. high capex).</i></li> <li>– <i>Non-firm: Incentivise investment for providers who cannot commit in advance but require "some" revenue certainty to recover "some" incremental investment.</i></li> </ul>	<ul style="list-style-type: none"> <li>– <b>Long term risks:</b> It may be difficult to reflect characteristics of different resource types. e.g. challenge to account for energy costs at multi-years ahead timeframes.</li> <li>– <b>High exit barriers:</b> LT-only arrangements may not be compatible with investment by providers given uncertainty regarding the operation of a new market and risk of locking themselves into LT contracts.</li> </ul>

# LT markets reduce price and volume risks, long duration contracts further reduce providers' risk

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Investable</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>– <b>Long contracts &amp; lead time:</b> Incentivise investment for providers who can commit in advance and require revenue certainty (e.g. high capex) with LT firm procurement. Lead time gives sufficient opportunity for investment decisions to be made and assets realised.</li> <li>– <b>Established arrangements:</b> Pathfinders are building a track-record and continuing this approach helps mitigate uncertainty for providers.</li> <li>– <b>ST market incentivises investment for providers who cannot commit in advance</b> by removing the availability risks present in forward procurement, but are crucially only investible if incremental investment is relatively small.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Volume uncertainty:</b> Pathfinders are not a formal market (or enduring LT solution) and risk being seen as a “fix” to operability needs. Pathfinders have frequency &amp; volumes uncertainty (no LT visibility or earlier signalling to facilitate efficient investment).</li> <li>– <b>Availability risks:</b> Long term investment has a route-to-market in this arrangement. However, barriers exist for smaller investments for non-firm providers (such as grid-forming intermittent assets) who cannot meet current availability criteria without substantial additional investment (e.g. storage).</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>– <b>Long contracts &amp; lead time:</b> Incentivise investment for providers who can commit in advance and require revenue certainty (e.g. high capex) with LT firm procurement. Lead time gives sufficient opportunity for investment decisions to be made and assets realised.</li> <li>– <b>Greater freedom in form of long-term contract</b> (subject to market being liquid enough) lowers barriers to entry.</li> <li>– <b>ST market incentivises investment for providers who cannot commit in advance</b> by removing the availability risks present in forward procurement, but are crucially only investible if incremental investment is relatively small.</li> <li>– <b>Gross requirement in the ST market.</b> Gives greater confidence in residual value after LT contract ends.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>No track-record:</b> Investors face difficult choices as to whether participation in a market will yield returns sufficient to cover investment costs and provide an adequate rate of return to meet cost of capital thresholds (hurdle rates).</li> <li>– <b>Unintended consequences of global eligibility:</b> limited incentives for existing participants to innovate / improve their assets through additional investment.</li> </ul>




# 'Revolution' provides best balance across decisive factors influencing investability

Objective	Model	Score	Justification
<p><b>Investable</b></p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– Short-term markets may fail to deliver efficient investment signals as a standalone solution.</li> <li>– A short-term only market fully exposes providers to changeable counterparty needs with no option to sell products to a third party.</li> <li>– Providers have little visibility over future needs. With a short-term only market, providers (sellers) face the risk of stranded assets if needs change, a risk they are not optimally positioned to bear.</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– High exit barriers: LT-only contracts present lock-in risks for providers who may be lacking confidence to participate in a new market.</li> <li>– Entry barriers: LT-only procurement presents risks &amp; difficulties to accurately reflect characteristics of different resource types. E.g. challenge to account for energy costs in years-ahead timeframes.</li> <li>– Freedom in form of long-term contract (firm, non-firm, baseload, shape) provides some risk mitigation for participants.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Pathfinders' multi-year contracts &amp; lead time provide investment signals for providers who can commit in advance and require revenue certainty (e.g. high capex) with remuneration for firm availability.</li> <li>– Established nature of PF arrangements and track-record, helps mitigate uncertainty for providers. However, fundamental LT volume uncertainty remains as Pathfinder are not a formal market (or enduring LT solution) and risks being seen as a "fix" to operability needs.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Long contracts &amp; lead time: Incentivise investment for providers who can commit in advance and require revenue certainty (e.g. high capex) with LT firm procurement. Forward market for availability reduces price and volume risk.</li> <li>– Greater freedom in form of long-term contract (subject to market being liquid enough) lowers barriers to entry.</li> <li>– ST market incentivises investment for providers who cannot commit in advance (by removing the availability risks present in forward procurement) but require "some" revenue certainty. The gross requirement in the ST market also gives greater confidence in residual value after LT contract ends.</li> </ul>










# ST-only is more transparent in nature, operating closer to real-time

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Transparent</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>– <b>Close to real-time total requirement</b> procurement is highly transparent.</li> <li>– <b>Separate products</b> means individual bids and discrete service prices which is most transparent.</li> <li>– <i>Envisage design features to facilitate transparency will be uniform for all strawman options, following best-practice features. Relevant features to facilitate include requirement signalling, successful bidding information, service value transparency to the degree possible.</i></li> </ul>	<ul style="list-style-type: none"> <li>– <b>Low explicit visibility of long-term needs and value:</b> whilst requirements can be signalled, a long term price cannot easily be 'discovered' as no formal procurement process in place.</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>– <b>Frequency of procurement:</b> recurring/systematic procurement can inherently make the arrangements more transparent (requirement determinations, results sharing).</li> <li>– <i>Envisage design features to facilitate transparency will be uniform for all strawman options, following best-practice features. Relevant features to facilitate include requirement signalling, successful bidding information, service value transparency to the degree possible.</i></li> </ul>	<ul style="list-style-type: none"> <li>– <b>LT timeframe only</b> means providers are unable to recognise prevailing value of the service at a given point in time.</li> <li>– <b>Complex suite of products</b> makes it difficult for providers to disaggregate and understand value of services across contracts.</li> <li>– <b>LT timeframe procurement process</b> can be complex with significant lead times and high duration pre-qualification stages exposing participants to uncertainty throughout the contracting period/process.</li> <li>– <b>Bundled bids in LT market (with user-defined ratios for 3 stability services) make it a complex arrangement,</b> assessment relies on complex winner determination algorithm selecting feasible outcome with lowest costs. This arrangement can inhibit price transparency.</li> </ul>




# Recurring & systematic market procurement conveys more transparent processes

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Transparent</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>– <b>Close to real-time partial requirement</b> allows providers to recognise prevailing value based on underlying system conditions.</li> <li>– <i>Envisage design features to facilitate transparency will be uniform for all strawman options, following best-practice features. Relevant features to facilitate include requirement signalling, successful bidding information, service value transparency to the degree possible.</i></li> </ul>	<ul style="list-style-type: none"> <li>– <b>LT timeframe procurement process</b> can be complex with significant lead times and high duration pre-qualification stages exposing participants to uncertainty throughout the contracting period/process.</li> <li>– <b>Bundled bids in LT market (with user-defined ratios for 3 stability services) make it a complex arrangement,</b> assessment relies on complex winner determination algorithm selecting feasible outcome with lowest costs. This arrangement can inhibit price transparency.</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>– <b>Close to real-time partial requirement</b> allows providers to recognise prevailing value based on underlying system conditions.</li> <li>– <b>Frequency of procurement:</b> recurring/systematic procurement can inherently make the arrangements more transparent (requirement determinations, results sharing).</li> <li>– <i>Envisage design features to facilitate transparency will be uniform for all strawman options, following best-practice features. Relevant features to facilitate include requirement signalling, successful bidding information, service value transparency to the degree possible.</i></li> </ul>	<ul style="list-style-type: none"> <li>– <b>LT timeframe procurement process</b> can be complex with significant lead times and high duration pre-qualification stages exposing participants to uncertainty throughout the contracting period/process.</li> <li>– <b>Bundled bids in LT market (with user-defined ratios for 3 stability services) make it a complex arrangement,</b> assessment relies on complex winner determination algorithm selecting feasible outcome with lowest costs. This arrangement can inhibit price transparency.</li> <li>– <b>Complex suite of products in LT market</b> makes it difficult for providers to disaggregate and understand value of services across contracts.</li> </ul>

# 'ST-only' presents the most transparent market arrangement for participants

Objective	Model	Score	Justification
<p><b>Transparent</b></p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>- The ST-only solution is transparent partially due to the gross nature of the requirement. The close to real time procurement, recurring procurement, and separate prices for products covering short periods of time mean more visibility for providers. However, in the absence of long term price signals there is no opportunity for long-term price discovery – TO assets may be needed for which there is no 'like-for-like' benchmark in this world.</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>- This option performs less well due to the reliance on LT market timeframes. LT-only participation relies on decisions made with large lead times, with high uncertainty and little visibility for providers. Multiple, complex products can make assessment of prices less transparent.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>- Evolution displays an intermediate performance. The Pathfinder provides sub-optimal transparency, large procurement lead times provide little certainty and visibility for providers, which is also exacerbated by the infrequent nature of Pathfinders. Close to real-time price signals improve transparency as providers are able to understand value based on prevailing system conditions. Long term timeframes means there is some price discovery for long-term solutions.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>- Good performance. The systematic, recurring/predictable nature of this market arrangement helps convey transparent outcomes. Close to real-time price signals improve transparency as providers are able to understand value based on prevailing system conditions. However, complex product-suite can make assessment processes less transparent.</li> </ul>

# The nature of ST-only and LT-only will inevitably have weaknesses in unbiased facilitation of technologies with different cost structures










Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Technology neutrality</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>All capacity (new &amp; existing)</b> providing stability can participate.</li> <li>- <b>All plants (in-merit and out-of-merit)</b> are eligible.</li> <li>- <b>ST timeframes</b> accommodate participation from providers with uncertain availability.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>ST-only market solutions presents narrower route-to market framework</b> for dedicated stability participants, for whom stability would be the primary revenue stream.</li> <li>- <b>Dedicated providers</b> such as synchronous condensers have high capex costs and would benefit from volume and price certainty – ST market tends to favour providers with high variable and low fixed costs.</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Complex contracting structure</b> can facilitate providers with different characteristics. Non-firm product removes the availability risk for weather-dependent or high opportunity cost provider.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Eligibility (new &amp; existing non-BMUs only):</b> existing BMUs are not eligible to participate, which could have unintended consequences for plant closure decisions.</li> <li>- <b>Non-firm product</b> likely to be of low value, which makes it difficult for non-mechanical storage providers to participate. Call option also makes it difficult due to challenges with state of charge management.</li> </ul>






# Hybrid market timeframes give providers freedom of choice between committing in LT and ST timeframes

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Technology neutrality</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>- <b>ST timeframes</b> accommodate participation from providers with uncertain availability.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Pathfinders follow selective approach based on current "additionality criteria"</b>. Where only new capability is eligible to participate.</li> <li>- <b>Market requirement in ST market is for shortfall only</b>, therefore only out-of-merit plants are eligible.</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>- <b>All capacity (new &amp; existing)</b> providing stability can participate.</li> <li>- <b>All plants (in-merit and out-of-merit)</b> are eligible.</li> <li>- <b>ST timeframes</b> accommodate participation from providers with uncertain availability.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Choice between long-term and short-term procurement volumes</b> can influence market outcomes, difficult to remain wholly neutral.</li> </ul>

# 'Revolution' provides the most expansive and technology neutral approach

Objective	Model	Score	Justification
<p><b>Technology neutrality</b></p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– Expansive eligibility design features aim to enable new/old and in-merit/out-of-merit plants to participate. However, a ST-only market does not promote a credible route for investment in technologies with high capex that require volume and price certainty (e.g. synchronous condensers).</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– Intermediate performance. While features seek to enable accommodate for a wide pool of technologies (such as providers with low availability certainty), eligibility design features restrict participation excluding existing BMUs.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Intermediate performance. Eligibility design features restrict participation under the PF and the ST market only procures for the shortfall, inherently excluding participation from 'in-merit' providers.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Option presents the most technology neutral approach, enabled by the hybrid timeframes and expansive eligibility design features.</li> </ul>










Automated processes are more compatible with the ST-only solution but require complex implementation, the LT-only option can benefit from synergies with today’s Pathfinder arrangements

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Practical</b></p> 	 <p>Short-term <i>(only)</i></p>	<ul style="list-style-type: none"> <li>- <b>A short-term market running daily is more suitable for automation.</b> It needs to cover shorter timeframes and can act to offset the complex nature of processes such as requirement determinations of SCL.</li> <li>- <b>Pay-as-clear single products:</b> marginal pricing may be simpler to run. May require less complex arrangements and processes (e.g. does not have to rely on complex winner determination algorithm selecting feasible outcome with lowest costs).</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Complex nature of requirement determination</b> means a ST market can be potentially difficult to operate. This is subject to how variable requirements are on a day-to-day basis.</li> <li>- <b>Requires new systems and processes to be implemented.</b> Current practices for requirement determinations are time-consuming, resource-intensive and would not be practical for a ST, daily market.</li> <li>- <b>Separate procurement may be inefficient.</b> If there is a high degree of overlap &amp; interaction between three services, running procurement separately may require additional assessments (e.g. interaction of procurement across 3 services).</li> </ul>
	 <p>Long-term <i>(only)</i></p>	<ul style="list-style-type: none"> <li>- <b>Formulation of new processes may be less resource-intensive</b> than for the ST-only market (at least initially) as ESO would not be starting from a zero-base.</li> <li>- <b>Today’s requirement determinations for SCL are likely to be more compatible</b> with the procurement lead times under this LT market arrangement.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Complexity of requirement determinations</b> more resource-intensive for procurement to cover multiple years, more uncertainties to account for.</li> <li>- <b>Wide product-suite with complex products</b> can add to operational difficulties. For example, processes such as economic efficiency assessments, requirement determinations &amp; forecasts, as well as contract management and monitoring, can be more challenging with a range of different contracts types.</li> </ul>




# Hybrid market timeframe arrangements are a larger deviation from today, expected to require complex implementation and operation

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Practical</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>- <b>Continued arrangements under PF.</b> Today’s requirement determinations processes are compatible and can be carried over under this arrangement.</li> <li>- <b>The short-term market running daily is more suitable for automation.</b> It needs to cover shorter timeframes, and can act to offset the complex nature of processes such as requirement determinations of SCL.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Pathfinder arrangements are complex to run.</b></li> <li>- <b>Facilitating and managing multiple market timeframes</b> is more resource-intensive than ST-only and LT-only.</li> <li>- <b>Complex nature of requirement determination</b> means a ST market can be potentially difficult to operate. This is subject to how variable requirements are on a day-to-day basis.</li> <li>- <b>Requires new arrangements to be implemented.</b> Current practices for requirement determinations are time-consuming, resource-intensive and would not be practical for a ST, daily market.</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>- <b>Most flexible contracting options,</b> therefore least likely to require intervention in the face of uncertainty.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Facilitating and managing multiple market timeframes</b> is more resource-intensive than ST-only and LT-only.</li> <li>- <b>Requires new arrangements for both ST and LT market.</b> This is time-consuming, resource-intensive and costly to ESO.</li> <li>- <b>Complexity of requirement determinations</b> more resource-intensive for procurement to cover multiple years, more uncertainties (for the LT market timeframe).</li> <li>- <b>Wide product-suite with complex products</b> can add to operational difficulties. For example, processes such as economic efficiency assessments, requirement determinations &amp; forecasts, as well as contract management and monitoring, can be more challenging under a range of different contracts types.</li> </ul>




Revolution represents the largest deviation from current arrangements, requiring implementation and operation of both ST and LT markets

Objective	Model	Score	Justification
<p><b>Practical</b></p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– It is a large deviation from today’s arrangements, effectively moving from the Pathfinder arrangements to a ST market, as well as procuring for the gross requirement. However, it needs to cover a smaller timeframe and is more suitable for automation.</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– The LT-only option performs well. A LT-only procurement can carry over processes from today’s Pathfinder arrangements. However, the nature of a LT-only procurement means certain processes - such as requirement determinations - are more complex as they need to cover multiple years, and more uncertainties.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Evolution is less practical than a LT-only. It is able to take advantage of carrying over current Pathfinder arrangements however, these remain complex processes to maintain and operate. It has an additional market timeframe to implement and operate but there’s less onus on the ST market compared to the ST-only option.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Revolution performs poorly as it will need to implement, maintain and operate new arrangements for both the LT and ST market timeframes. Procuring for the gross requirement adds volume to processes which can be more time-consuming &amp; resource-intensive.</li> </ul>










# Enduring markets require a balance in operating between LT and ST timeframes to promote effective investment and operation

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Enduring</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Compatible with the ever-greater levels of renewables expected in the future.</b> The ST market removes some of the availability risks faced by weather-dependent technologies and/or technologies with high opportunity costs.</li> <li>- <b>Global eligibility and procuring for the gross market requirement</b> give volume certainty, particularly to existing, in-merit providers who may be incentivised to remain open to offer stability services through this route.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Lacking explicit investment signals:</b> fundamentally the ST-only market solution lacks arrangements to procure capability in "investment" timeframes.</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Regular, systematic procurement</b> of stability services provides a LT vision for participants.</li> <li>- <b>Wide product suite and contract types</b> accommodate participation from a range of providers with different technology characteristics.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>A LT-only arrangement is less compatible with highly unpredictable requirements.</b> The lack of alternative stop-gap solutions and reliance on BM near real-time makes it a less enduring arrangement.</li> <li>- <b>It is less adaptable if conditions change</b> and future system challenges evolve. LT-only and long contract durations give rise to problems of lock-in.</li> <li>- <b>LT-only arrangement</b> may be less compatible if changes to rules and regulations are desired. For example, in the event grid forming kit becoming standardised for all technologies there could be grounds for making it part of the grid code, implementing a mandatory stability capability.</li> </ul>

# Choice in market timeframe and products enable flexibility in the arrangements to adapt to future challenges

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p style="text-align: center;"><b>Enduring</b></p> 	 <p style="text-align: center;">Evolution</p>	<ul style="list-style-type: none"> <li>- <b>Hybrid market procurement timeframes accommodate technologies and their characteristics.</b> For example, the ST market is an arrangement more compatible with the ever-greater levels of renewables expected in the future.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Ad-hoc nature of Pathfinder</b> stops short of incentivising providers to participate with multiple projects over time, build project pipelines.</li> </ul>
	 <p style="text-align: center;">Revolution</p>	<ul style="list-style-type: none"> <li>- <b>Hybrid market procurement timeframes accommodate technologies and their characteristics.</b> For example, the ST market is an arrangement more compatible with the ever-greater levels of renewables expected in the future.</li> <li>- <b>Range of contract types</b> more compatible to meet variable and less predictable requirements, gives ESO flexibility to meet requirements under evolving system conditions.</li> <li>- <b>Recurring procurement nature of LT + ST market</b> provides an enduring LT vision for market participants (a LT vision compatible with typical lifetime of assets). Signals a degree of price and volume certainty for potential participants.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Unintended consequences of global eligibility:</b> Limited incentives for existing participants to innovate / improve their assets through additional investment.</li> </ul>

# 'Revolution' provides a LT vision for providers and flexibility to adapt to future challenges for ESO

Objective	Model	Score	Justification
<p><b>Enduring</b></p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– ST-only performs poorly as it exposes market and system to issues of uncertainty and lacks options to meet evolving conditions. It has issues of compatibility with 'investability' and market investment cycles.</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– LT-only has key gaps in ensuring the arrangements can meet future challenges, whilst contracts can be structured around known technologies, it does not necessarily facilitate all new technologies and presents largest risk of lock-in for ESO.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Evolution displays an intermediate performance. Ad hoc procurement nature sub-optimal to provide an enduring LT vision for market participants (a LT vision compatible with typical lifetime of assets).</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Revolution performs well compared to the other options as it provides most choice to ESO and technologies to adapt and meet evolving requirements in the future.</li> </ul>












# LT-only & ST-only options can result in limited choices for ESO

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Freedom of choice for ESO</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Short-duration contracts</b> avoid lock-in for ESO in inefficient contracts if outturns materially deviate from forecasts.</li> <li>- <b>Global eligibility</b> widens participation and choice for ESO.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Daily procurement limits ESO's flexibility</b> on how much in advance it wishes to secure provision for anticipated requirements.</li> <li>- <b>ST-only means ESO has limited options to hedge</b> its provision ahead of time. Over-reliance on DA market exposes ESO to risks of shortages.</li> <li>- <b>Gap between the ST market (at day-ahead) and real-time</b> results in reliance on BM if conditions change during this timeframe.</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Wide suite of products</b> gives choice and flexibility to ESO in making most efficient decisions.</li> <li>- <b>Mix of Firm &amp; Non-firm products</b> accommodates technologies with different characteristics.</li> <li>- <b>Opportunistic buying strategy.</b> ESO retains flexibility on procuring beyond the shortfall volume, if it is economical to do so against the counterfactual cost in the ST alternative (i.e. the BM)</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Limited stop-gap solutions</b> in case system is exposed to changes in requirements in ST timescales. ESO must make use of today's tools to manage changes in requirements.</li> <li>- <b>Annual (and multi-year) contracts</b> can lock ESO in inefficient contracts.</li> <li>- <b>Gap between long term procurement and real-time</b> and reliance on BM if conditions change during this timeframe.</li> </ul>

# Combination of LT & ST markets enable wider participation, increasing the choice of provision, multiple contract types further increase ESO’s choices

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Freedom of choice for ESO</b></p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>– <b>Short-duration contracts</b> in ST market avoid lock-in with inefficient contracts.</li> <li>– <b>Pathfinder enable ESO flexibility</b> in choosing when to procure for stability services as needs arise.</li> <li>– <b>Hybrid market procurement timeframes</b> accommodate different technologies and their characteristics, in particular accommodating for the ever-greater levels of renewables expected in the future. Enables wider participation and pool of choice for ESO.</li> <li>– <b>Opportunistic buying strategy.</b> ESO retains flexibility on procuring beyond the shortfall, if it is economical to do so against the counterfactual cost in the ST alternative (i.e. the BM).</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Ad-hoc nature of Pathfinder can limit ESO’s choice of providers</b> – suitable assets may miss out if timeline is not compatible with Pathfinder procurement.</li> <li>– <b>Gap between the ST market (at day-ahead) and real-time</b> results in reliance on BM if conditions change during this timeframe.</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>– <b>Hybrid market procurement timeframes</b> accommodate different technologies and their characteristics, in particular accommodating for the ever-greater levels of renewables expected in the future. Enables wider participation and pool of choice for ESO.</li> <li>– <b>ST procurement</b> provides a stop-gap solution in case system is exposed to changes in requirements in ST timescales.</li> <li>– <b>Wide product suite,</b> contract types give ESO choice in meeting variable requirements at least-cost. Products also give providers’ flexibility to participate, widening participation and choice for ESO.</li> <li>– <b>Opportunistic buying strategy.</b> ESO has flexibility to procure beyond shortfall (if economical against the counterfactual cost).</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Annual (and multi-year) contracts</b> can lock ESO into inefficient contracts. Though role of LT is expected to be less prominent in this strawman compared to strawman B.</li> <li>– <b>Gap between the ST market (at day-ahead) and real-time</b> results in reliance on BM if conditions change during this timeframe.</li> </ul>




# 'Revolution' & 'Evolution' provide ESO with a strong degree of flexibility and ongoing choice

Objective	Model	Score	Justification
<p><b>Freedom of choice for ESO</b></p> 	 <p>Short-term (only)</p>		<ul style="list-style-type: none"> <li>– ST-only performs poorly – short-duration contracts and a wide pool of participants to choose from give ESO freedom of choice. However, ESO is restricted to operate in ST market timeframes and limited opportunity to trigger investment.</li> </ul>
	 <p>Long-term (only)</p>		<ul style="list-style-type: none"> <li>– LT-only performs poorly as being limited to LT timeframes &amp; LT contracts leaves ESO with the limited choice and highest risk of lock-in.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Evolution displays a strong performance thanks to the hybrid timeframe approach. The flexibility to operate in LT and ST enables choice of technologies and flexibility in meeting requirements. Furthermore the ad-hoc nature of Pathfinder lets ESO choose when to intervene as needs arise.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Revolution performs equally as well as Evolution. In this arrangement, the combination of multiple procurement timeframes (both recurring in nature), and the diverse product-suite maximise choice in meeting requirements.</li> </ul>










# LT-only contracts can be difficult to price for providers that face volatile costs, but a ST-only market increases providers' 'single buyer' risk exposure

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Freedom of choice for providers</b></p> 	 <p>Short-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Short-duration contracts</b> avoid risk of lock-in of providers in inefficient contracts, particularly if there is a trade-off with provision of other services or with other commercial activities (such as energy trading).</li> <li>- <b>Global eligibility</b> widens choice for pool providers able and wanting to participate.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Single buyer risk:</b> Providers are exposed to large volume risks as ESO is free to buy as much or as little as required. Volume requirements are subject to changes over time and location. A short-term only market fully exposes providers to changeable counterparty needs with no option to sell products to a third party.</li> <li>- <b>Price &amp; volume visibility is limited</b> and may not be compatible for high capex / low variable cost providers.</li> <li>- <b>Separate products</b> means that providers are unable to offer synergies where they arise, providers face aggregation risk.</li> </ul>
	 <p>Long-term (only)</p>	<ul style="list-style-type: none"> <li>- <b>Mix of Firm &amp; Non-firm products</b> compatible with technologies with different characteristics, in particular accommodating for the increasing levels of renewables &amp; storage expected in the future.</li> <li>- <b>Bundled &amp; user-defined firm products enable widest participation</b> where providers can choose the combination of services they wish to supply, benefiting from potential cost synergies available.</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Obligations to commit to a contract</b> and possibly a price ahead of time. Limiting commercial decision options in ST/ real-time. Long term contracts for providers which also have an energy cost for availability will be an unpalatable risk for some providers.</li> <li>- <i>No secondary trading for LT contracts envisaged – difficult to implement given locational nature of services.</i></li> <li>- <b>Participation restricted</b> to new (BMU &amp; non-BMU) &amp; existing non-BMU providers only.</li> </ul>

# Combination of LT & ST markets increase choice, multiple products further increase choices for providers

Objective	Model	Strengths in facilitating objective	Shortfalls in facilitating objective
<p><b>Freedom of choice</b> for providers</p> 	 <p>Evolution</p>	<ul style="list-style-type: none"> <li>– <b>Hybrid market timeframe</b> widens choice for participants in terms of how and when to participate. Also best facilitates technology types with different cost structures (high variable + low fixed vs. low variable + high fixed).</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Single buyer risk:</b> Providers are exposed to large volume risks as ESO is free to buy as much or as little as required. Volume requirements are subject to changes over time and location.</li> <li>– <b>Ad-hoc procurement of Pathfinder</b> restricts flexibility of providers wishing to participate. I.e. providers’ ability to participate is limited to when Pathfinder are held. There are limited opportunities for participation, some suitable, solutions may miss out.</li> <li>– <b>Separate products</b> in ST means that providers are unable to offer synergies where they arise, providers face aggregation risk.</li> </ul>
	 <p>Revolution</p>	<ul style="list-style-type: none"> <li>– <b>Hybrid market timeframe</b> widens choice for participants in terms of how and when to participate. Also best facilitates technology types with different cost structures (high variable + low fixed vs. low variable + high fixed).</li> <li>– <b>Wide and diverse-product suite</b> (with a range of contract lengths) gives providers choice on the scale of their commitments.</li> </ul>	<ul style="list-style-type: none"> <li>– <b>Single buyer risk:</b> Providers are exposed to large volume risks as ESO is free to buy as much or as little as required. Volume requirements are subject to changes over time and location.</li> <li>– <b>Separate products</b> in ST means that providers are unable to offer synergies where they arise, providers face aggregation risk.</li> </ul>

# Multiple market timeframes and contract types give providers most freedom of choice under options C and D

Objective	Model	Score	Justification
<p><b>Freedom of choice</b> for providers</p> 	 <p>Short-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– ST-only shows a relatively poor performance – providers are less exposed to LT operational risks and have more choice of when to participate with recurring procurement and short-duration contracts. However, ST-only market does not provide a credible route for investment in technologies with high capex that require volume and price certainty (e.g. synchronous condensers), limiting the choice of appropriate technologies for potential providers.</li> </ul>
	 <p>Long-term <i>(only)</i></p>		<ul style="list-style-type: none"> <li>– LT-only scores poorly for providers, as long term contracts can lock in providers to obligations and potentially volatile costs.</li> </ul>
	 <p>Evolution</p>		<ul style="list-style-type: none"> <li>– Evolution displays a strong performance due to the combination of LT and ST market timeframes, giving choice to providers. However, the ad-hoc nature of Pathfinder limits providers participation to when these procurement processes are run and may result in suitable providers missing out.</li> </ul>
	 <p>Revolution</p>		<ul style="list-style-type: none"> <li>– Strong performance with procurement under multiple timeframes, multiple contract types. These maximise choice for providers in when and how they wish to participate.</li> </ul>



# AFRY

## Making Future