



High-level analysis of possible options for a centrally organised RES PPA platform

An AFRY report to the Regulatory Authority for Energy

SEPTEMBER 2022

Disclaimer and Rights

This report has been prepared by AFRY Management Consulting (“AFRY”) solely for use by the Regulatory Authority for Energy (RAE) (the “Recipient”). All other use is strictly prohibited and no other person or entity is permitted to use this report, unless otherwise agreed in writing by AFRY.

By accepting delivery of this report, the Recipient acknowledges and agrees to the terms of this disclaimer.

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.

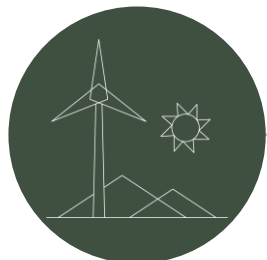
AFRY expressly disclaims any and all liability arising out of or relating to the use of this report except to the extent that a court of competent jurisdiction shall have determined by final judgment (not subject to further appeal) that any such liability is the result of the willful misconduct or gross 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 in excess of the fees actually received by AFRY for the preparation 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.

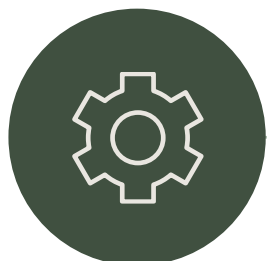
All rights (including copyrights) are reserved to AFRY. No part of this report may be reproduced in any form or by any means without prior permission in writing from AFRY. Any such permitted use or reproduction is expressly conditioned on the continued applicability of each of the terms and limitations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

STUDY OBJECTIVES

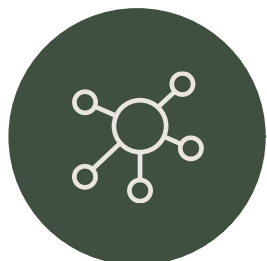
High-level analysis of possible options for a centrally organised RES PPA platform



Generation capacity from Renewable Energy Sources (RES) in Greece must **more than double by 2030** to achieve the country's climate goals. Finding a **route** in addition to the government supported Feed-in Premium (FiP) contracts is critical for the scale of rollout. However, despite the ambitious targets and an extensive pipeline of RES projects under development, the Power Purchase Agreement (PPA) market in Greece is still **emerging**, and its **development will need to be accelerated** to ensure the **RES targets are achieved on time**.

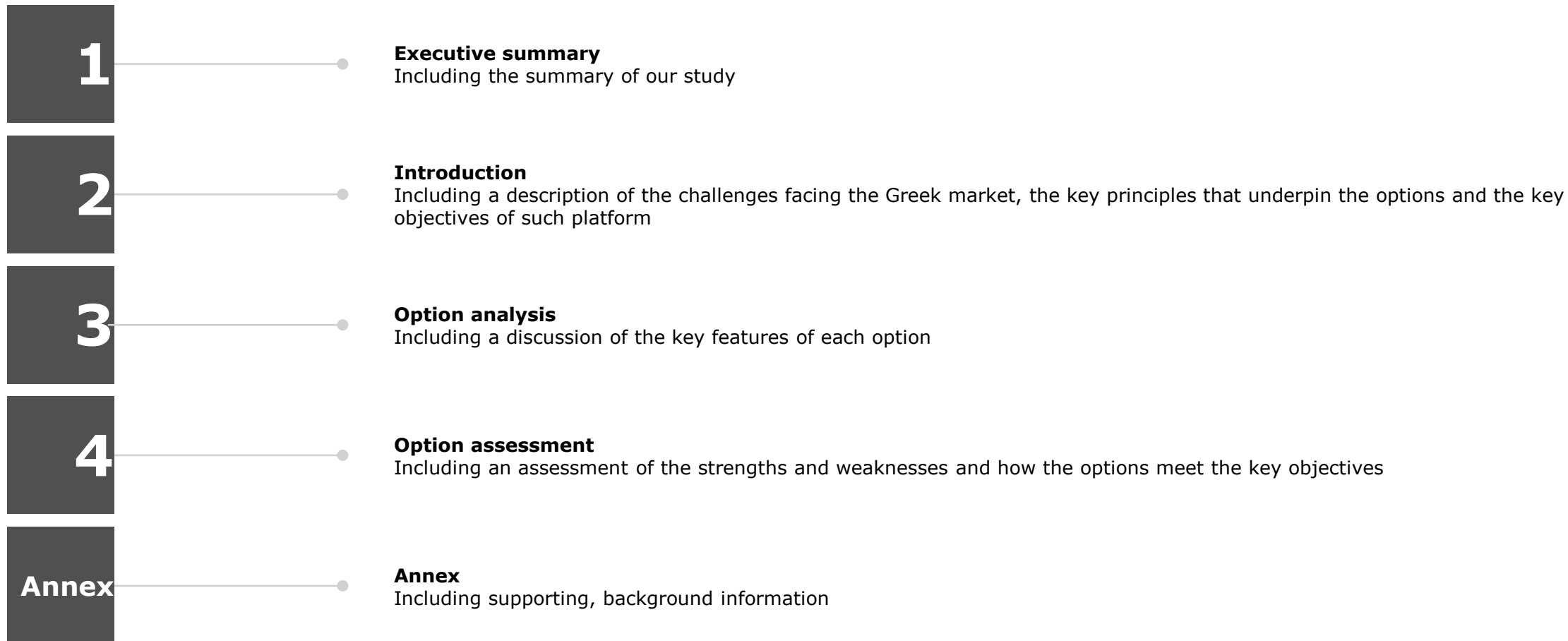


In light of these challenges, the Regulatory Authority for Energy (RAE) wishes to **explore different options around a centrally-organised PPA platform**. Participation will remain **voluntary**, and the aim will be to **support** the PPA market in Greece, create a more mature environment and overall increase market-participants' **knowledge and experience**, while enabling higher RES deployment in parallel with the established FiP support scheme.



AFRY Management Consulting was appointed by RAE to **define and assess options for a centrally-organised PPA platform**. This study describes, at a high-level, possible solutions and their **key features** and discusses the main strengths and weaknesses of each option. This study is not, however, intended to provide an in-depth analysis of each option. It also should not be seen as a wider recommendation that centrally-organised structures are a prerequisite to promote the RES PPA market. We have seen RES PPAs emerging organically in a lot of markets. Under different circumstances, however, central structures can help facilitate RES PPAs, at least at the initial stages.

High-level analysis of possible options for a centrally organised PPA platform to further promote RES in Greece



Agenda

1. Executive Summary

2. Introduction

3. Option analysis

4. Option assessment



An extensive pipeline of RES projects under development, increased 2030 targets and current limits to the availability of FiP support create an opportunity for diversified routes-to-market and risk mitigation mechanisms



CHALLENGES FACING THE GREEK MARKET

Capacity from RES in Greece must **more than double by 2030** to achieve the country's climate goals.

This can create opportunities for **diversified routes-to-market and risk mitigation mechanisms**, in addition to government supported contracts.

The development of the PPA market in Greece needs to be **accelerated to ensure the RES targets are achieved on time**.



9.8GW of RES delivered via support schemes so far



21.1GW envisaged by 2030



11.3GW the required new build with **74.0GW** under development



3.8GW to be delivered via upcoming FIP auctions with the remaining **7.5GW** needing to find alternative routes-to-market⁽¹⁾



PPA PLATFORM

The Regulatory Authority for Energy wishes to **explore different options around a centrally-organised PPA platform**.

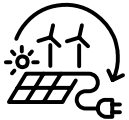
Participation will remain **voluntary**, and the aim will be to **support** the PPA market in Greece, create a more mature environment and overall increase market-participants' **knowledge and experience**, while enabling higher RES deployment in parallel with the established FiP support scheme.

1. Depending on the offshore wind target capacity, this 'gap' could be between 5.5-7.5GW

A mechanism that encourages participation in order to meet its overarching goal of enabling and accelerating deployment of RES investments



KEY PRINCIPLES OF A PPA PLATFORM



Accelerate RES deployment



Equal access to all market participants



Encourage bilateral negotiations



Allow the PPA market to mature



Voluntary



Not intervene with other initiatives or delay current negotiations

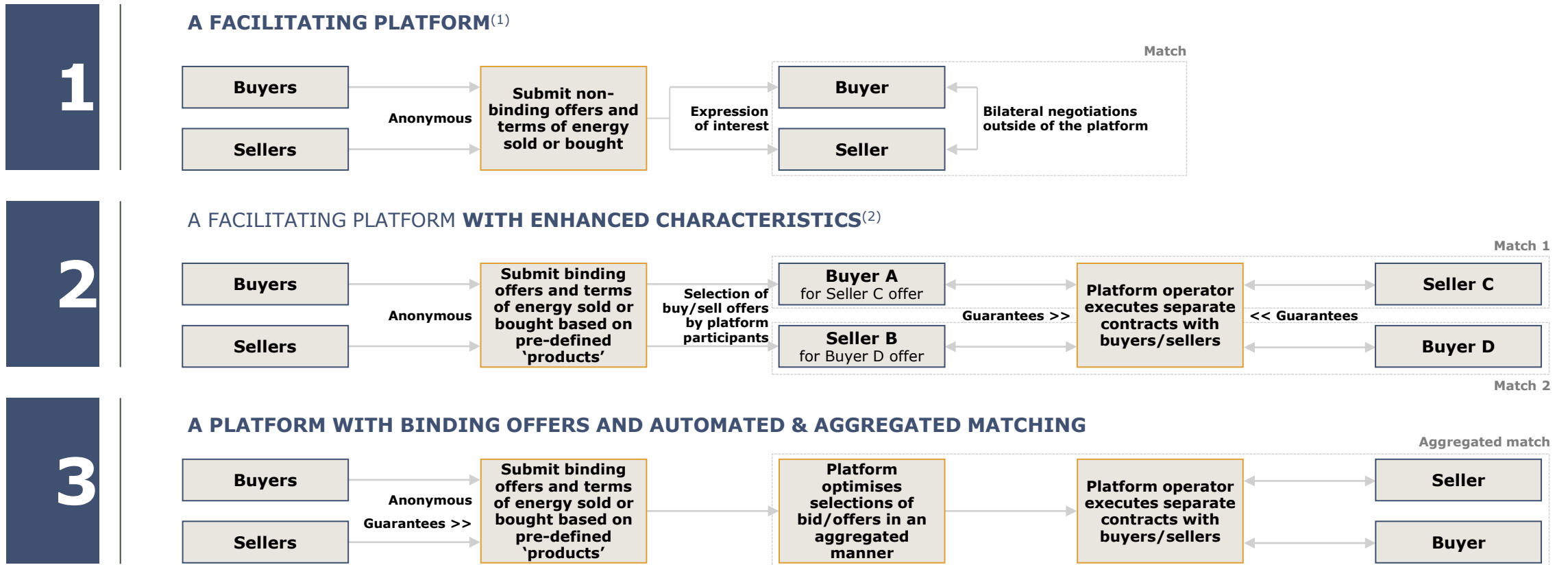


OPTIONS ANALYSED

Three options are analysed as part of this study:















Three options are explored covering a range of possible solutions – from a simpler but easy-to-implement set-up to a more complex mechanism



1. A similar solution was introduced in Italy in March 2022 – please refer to the Annex for a description. | 2. Illustration presents the enhanced elements of this option only.

Consider Option 1 as a first step, and wait for market signals to assess whether the enhanced elements of Option 2 need to be developed

OPTION		ENABLE THE PPA MARKET TO MATURE	INCREASE COMPETITION	MARKET INTERFERENCE	SIMPLICITY
1	FACILITATING	 Encouraging and promoting bilateral negotiations	 Reliant on participation – not all types of players would necessarily benefit equally	 Does not interfere with other market mechanisms or initiatives	 Simpler mechanism that can be developed in a shorter timeframe
2	FACILITATING WITH ENHANCED CHARACTERISTICS	 Can delay market-player know-how	 Enhanced features can benefit equally smaller players or players with limited experience	 The additional feature could delay current initiatives; upfront clarity on mechanics and design is needed	 Complexity could create delays
3	BINDING OFFERS WITH AUTOMATED & AGGREGATED MATCHING	 Alternative route for market players – not aimed to increase market-player know-how	 Enhanced features can benefit equally smaller players or players with limited experience	 Potentially higher chance of delaying or affecting other initiatives	 Increased complexity could create even more delays

Agenda

1. Executive Summary

2. Introduction

3. Option analysis

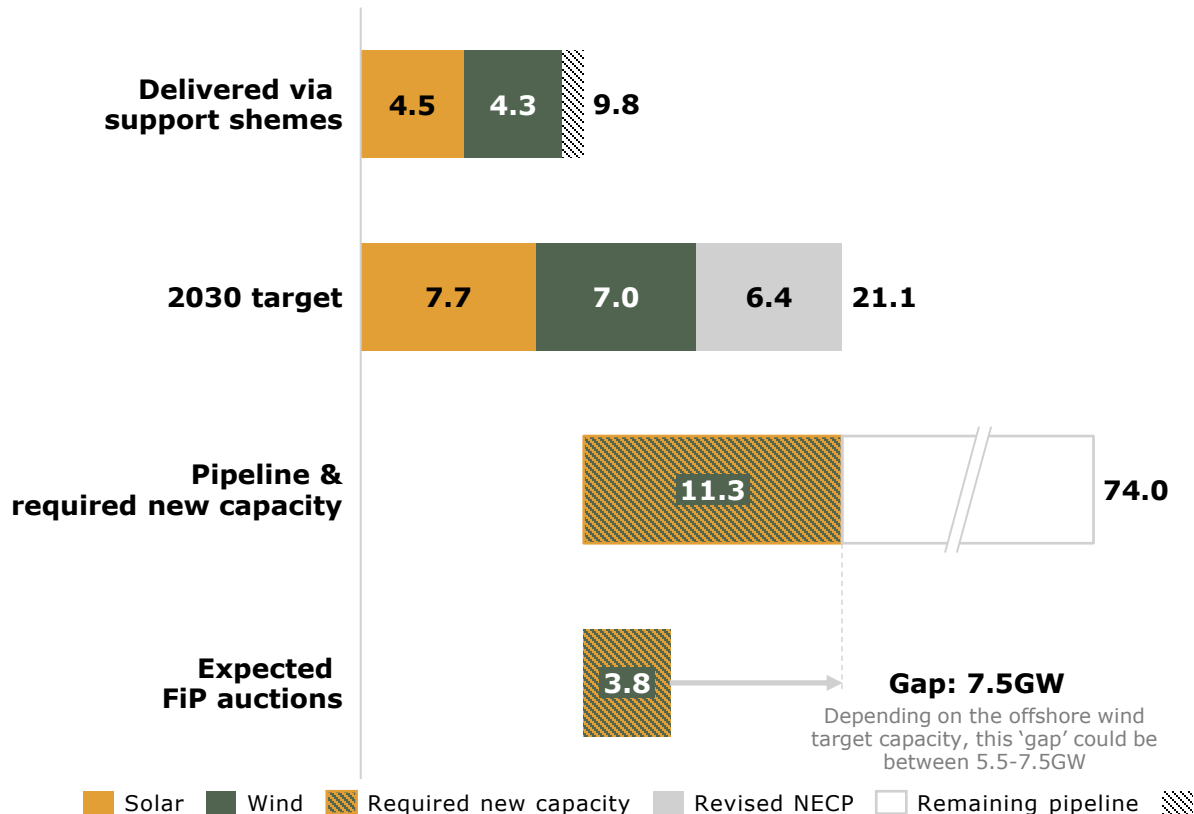
4. Option assessment



BACKGROUND

An extensive pipeline of RES projects under development, increased 2030 targets and limits to the availability of FiP support create opportunity for diversified routes-to-market and risk mitigation mechanisms

RES STATUS (GW) (1)



- Historically **government support mechanisms have facilitated the delivery of solar and onshore wind capacity.**
- With the announced RES FiP auction volumes for the next four-year period covering about 30% of the required new capacity envisaged by the 2030 RES targets and an extensive pipeline of RES projects under development, **there is opportunity for diversified routes-to-market and risk mitigation mechanisms**, in addition to government-backed contracts.
- Some other European countries have seen an **increase in the use of RES Power Purchase Agreements (PPAs)** - and in a number of these markets PPAs are considered the 'go-to' choice for generators, offtakers and financiers alike.
- Although PPAs are a '**hot topic**' in Greece and they have already started to appear, differences when compared with government-backed contracts have so far meant there is limited uptake. This could also be a result of a lack of knowledge and experience, by market participants, on the workings of PPAs.
- There is therefore a need to **improve 'knowledge and experience'** to ensure the ambitious targets are delivered. RAE is now seeking to understand how a centrally organised platform could **facilitate the PPA market** and allow it to quickly develop for the aspired RES targets to be achieved on time.

Source: "Delivered": DAPEEP, May-22 "RES Account" report, "Revised NECP targets": based on announcements. "Remaining pipeline" (RAE - production certificate list March-2022 for wind & solar) minus ("Required new capacity" and "Delivered" volumes). Analysis performed in spring 2022.

BACKGROUND

With a pipeline of 74GW and a RES target that requires an additional 11GW to be deployed by 2030, there is enough 'space' in the market for the FiP scheme and PPAs to co-exist without impacting on the upcoming auctions



GOVERNMENT SUPPORTED FiP CONTRACTS

Competitive State aid procedures, such as the FiP contracts in Greece, are a well-established means of RES deployment, providing for long-term **revenue stabilisation mechanisms**. However, there are **features that can make them 'less attractive'** to certain market participants:

(a) the timings of the FiP auctions; (b) the level of competition either driven by the different participating technologies and/ or the total volume supported; (c) reductions regarding auction ceiling prices; (d) reductions to the duration of the State Aid scheme – e.g. in the latest Spanish auctions the contract duration for onshore wind and solar PV was 12 years with a min and a max amount of energy to be delivered within this period⁽¹⁾; and (e) other features that can increase exposure to market prices – e.g. the Market Adjustment Parameter applicable in Spain.

We would, therefore, expect that market participants are looking into **more than one routes-to-market**, and, similarly to other European markets, there would be an appetite from players to **diversify their portfolios and own both regulated and unregulated assets**.



RES POWER PURCHASE AGREEMENTS

PPAs can offer an **alternative route-to-market and provide hedging against market risk**. PPAs can offer **flexible contract terms and unlock direct access to cheap green electricity** – an appealing case especially due to unprecedented high energy costs currently and ESG⁽²⁾ objectives set by larger corporates and energy consumers. At the same time, however, market participants would need to adapt to the new terms and options offered by these market-driven contracts.

As such, it is inevitable that the PPA market would need to grow in parallel to the government-backed tenders.

1. Generators can opt out (voluntarily) after producing the minimum amount of energy; they need to exit the scheme after producing the maximum amount of energy, if e.g. this maximum occurs before the end of year 12. | 2. Environmental, Social, and Governance

A well-designed PPA platform would enable the PPA market to develop, promote bankable options, and increase market-participants' knowledge and experience



KEY PRINCIPLES OF A PPA PLATFORM

RAE wishes to explore how a **centrally-organised PPA platform** could be implemented in Greece so that the PPA market can further develop and become more mature. In principle, such mechanism:

- (a) remains **voluntary** for participants;
- (b) is designed in a way that **encourages bilateral negotiations** between parties;
- (c) does not delay current or future **negotiations between parties wishing to contract RES bilaterally** and outside of this mechanism; and
- (d) does not impact on the current plans for the continuation of the RES FiP auctions or any other mechanism already under consideration (e.g. Green Pool) but should work alongside these.



CONSIDERATIONS OF POSSIBLE OPTIONS

Such platform can **range from a simple** but easy-to-implement solution **to a more 'sophisticated' but complex** solution with various technical challenges. Regardless of the option, the platform should be **non-discriminatory and offer equal access to all market participants** – e.g. large and small-scale players, and all types and categories of offtakers.

The platform should **encourage participation** in order to meet its overarching goal of **enabling deployment of RES investments**, allow the PPA market to **mature** and **increase market-participants' know-how**.

WHAT ARE THE KEY OBJECTIVES OF THE PPA PLATFORM?

A mechanism that encourages participation in order to meet its overarching goal of enabling and accelerating deployment of RES investments

KEY OBJECTIVES

PRIORITY

Increase maturity of PPA market

- The platform should provide a space that promotes and supports bilateral negotiations between sellers and buyers of all categories – in time, this will inevitably increase market players’ know-how and experience
- The proposed solution should also find a way to promote bankable options, e.g. by allowing the platform operator to monitor the PPA market without intervening while ensuring confidentiality of data and overall information provided



Increase competition

- The mechanism implemented should aim to create a more competitive PPA market that offers equal access to market participants – established as well as new or smaller players (buyers and sellers)
- It should consider all offtake categories (utilities, traders, and corporate energy consumers)
- Participation from small-scale players can be supported by allowing and/or incentivising aggregators to make use of the platform. However, regardless of the option selected, smaller-scale generators may not be competitive (due to economies of scale). To address competitiveness issues, regulatory measures, e.g. in the form of incentives or obligations, may need to be considered separately to the design of the RES PPA platform⁽¹⁾



Limited market interference

- The platform should avoid interference with current PPA negotiations between parties wishing to contract RES bilaterally – by not only setting the correct expectations upfront, but also finding a solution that can be implemented without delays
- It should not intervene with the current plans for the continuation of the RES FiP auctions or other mechanisms under consideration – but it should provide an alternative route that enables the deployment of additional RES capacity beyond the existing routes



1. For example these can include measures such as mandating consumers/suppliers to contract a certain volume with small-scale RES or provide some form of incentives for concluding PPAs with small-scale RES; an alternative route would be to make the RES FiP auctions geared towards small-scale RES, with effectively larger-scale projects moving towards the PPA route over time

Agenda

1. Executive Summary

2. Introduction

3. Option analysis

4. Option assessment



OPTIONS

Three options are explored covering a range of possible solutions – from a simpler but easy-to-implement set-up to more complex mechanisms

1

A FACILITATING PLATFORM

This is based on an **anonymous platform** that facilitates connection between parties interested in concluding RES PPAs. Bids and offers are anonymous and **non-binding**. **Negotiations are concluded outside the platform** between parties (sellers/buyers) that have expressed interest⁽¹⁾. There could be an option to include a “soft flagging” procedure, based on an algorithm that assesses bids and offers, to solely **notify** sellers and buyers of possible matches with the aim to speed up the process.

2

A FACILITATING PLATFORM WITH ENHANCED CHARACTERISTICS

This is based on a facilitating platform (as per Option 1) with **additional features**. These additional features can take the form of an *exchange* with **pre-defined, standardised contract terms and 'products'**. Participants would have the **option** to participate in an anonymous manner with bids/offers and matching, once selected and confirmed, being **binding**. This ultimately creates the need for a third-party to act as a counterparty for both sellers and buyers, and for participants to provide **guarantees or collateral** following the matching of the offers, as a way to mitigate risk for the third-party entity.

3

A PLATFORM WITH BINDING OFFERS AND AUTOMATED & AGGREGATED MATCHING

This is based on an **automated matching process** (for example via double-sided auctions) of **binding bids and offers** that require **pre-defined, standardised contract terms and 'products'**. Instead of a one-to-one matching (as per Option 2) an algorithm would be aggregating all the various bids and offers and provide a single 'optimal' solution. As above, this ultimately creates a need for a third-party to execute separate contracts with the sellers and buyers, and for participants to provide **guarantees or collateral**, as a way to mitigate risk for the third-party entity. In this option, guarantees or collateral would need to be submitted in advance so that the algorithmic solution becomes binding.

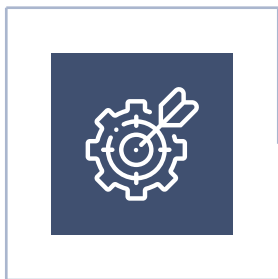
1. A similar solution was introduced in Italy in March 2022 – please refer to the Annex for a description.

SUMMARY

Option 1: Facilitating

Create a marketplace to promote bilateral negotiations

KEY CHARACTERISTICS



AIM

- Option 1 has some similarities with the Italian PPA Bulletin Board implemented in March 2022 and follows some of its key principles with some additional, optional features. Please refer to the Annex for additional information.
- The aim is to implement a centrally organised meeting place **to promote bilateral negotiations** between parties interested in the stipulation of long-term contracts for the sale of electricity from RES. Negotiations are performed outside of the platform.
- The platform operator can use the platform to **monitor** the evolution of the RES PPA market through e.g. an obligation on the participants to register the PPA information once signed (for example, this is the case in Italy). This monitoring aspect could allow the platform operator to promote **bankable solutions**, monitor the competitiveness of the market and ultimately **assess the mechanism against its objectives**.



HIGH-LEVEL DESIGN

- Participants (buyers and sellers) submit **non-binding and anonymous buy/sell offers** with the platform providing the **flexibility** to accept and register offers with **varying PPA terms**, as determined by the participants.
- Participants have the **option** to either: 1) **manually pick** from the registry; or 2) utilise an **automatic flagging** procedure to **express their interest** in buy/sell offers as relevant;
 - In the second case, the platform automatically selects a number of registrations based on specific criteria and flags them to the relevant counterparty. Flagging criteria can vary – e.g. from simply matching volume and/or price terms to more sophisticated approaches such as the type of offtaker or type of RES asset. In any case, this should remain a **simple solution**, so it does not affect or delay implementation.
- Once there is an expression of interest (from either the manual or automated procedure), parties can enter into **bilateral negotiations outside of the platform**.
- Until parties enter into bilateral negotiations, **anonymity** of parties involved, and **confidentiality** of pricing and other terms need to be maintained and ensured by the platform operator.
- There may be a requirement for participants to **register contract details** once parties sign a PPA – this can only be on the basis that confidentiality of information is maintained by the operator.

DEEP-DIVE

Option 1: Facilitating

Create a marketplace to promote bilateral negotiations

KEY CONSIDERATIONS

Participants **No restrictions** on the type of participants (sellers or buyers) to increase competition and liquidity (e.g. utilities, traders, corporate consumers, aggregators). Specifically in relation to the **aggregators’ participation**, this will allow small-scale RES projects or offtakers with limited demand to also benefit from such a platform.

PPA types & terms Physical and financial contracts. **Varying contracts terms and structures** can be accommodated (e.g. price terms: fixed-price, variable price with/without cap/floor; volume terms: as-produced, shaped, fixed; contract duration: 5, 7 or 10 years, etc.), with sellers/buyers potentially allowed to offer a range of different options. However, some **minimum requirements** can be imposed – e.g. minimum total capacity per PPA, minimum contract duration, operation date of the asset or status, etc. Terms submitted in the platform are **not binding** – with bilateral negotiations conducted outside of the platform.

Pre-qualification No need for strict pre-qualification criteria, but some type of **participation guarantees** may be required. The platform operator would need to ensure that the required, minimum information is submitted but is **not responsible for the validity** of such information. This would require time, effort and would delay the overall process⁽¹⁾.

Selection Given that the platform could offer a variety of options in relation to the PPA terms, a high utilisation could make a manual **PPA search and selection process difficult** considering the number of options available. Hence, a **simplified ‘automatic flagging’ routine** could also be implemented. This would take the form of a filtering process where, based on user input criteria, **the platform would inform users on buy/sell offers** closer to their preferences.

Treatment of information Participants will be **given access to selected information** provided as part of the process (e.g. type and size of assets, contract duration, volume terms, etc.). To streamline further the PPA selection process some **pricing information would also need to be included** with the submission. To promote competitiveness, **pricing information cannot be fully transparent**. A possible workaround would be for sellers/buyers to submit either a floor/cap price (or a price range) and the flagging procedure to utilise that information to propose potential matches.

Confidentiality The platform would need to **offer and protect anonymity** to all users during the submission stage, and until users are notified about possible matches and proceed with negotiations. From then on, negotiations take place bilaterally outside of the platform.

Monitoring In case of monitoring activities, it is expected that a level of **confidentiality would be enforced**, especially in case of selected information becoming available in the public domain.

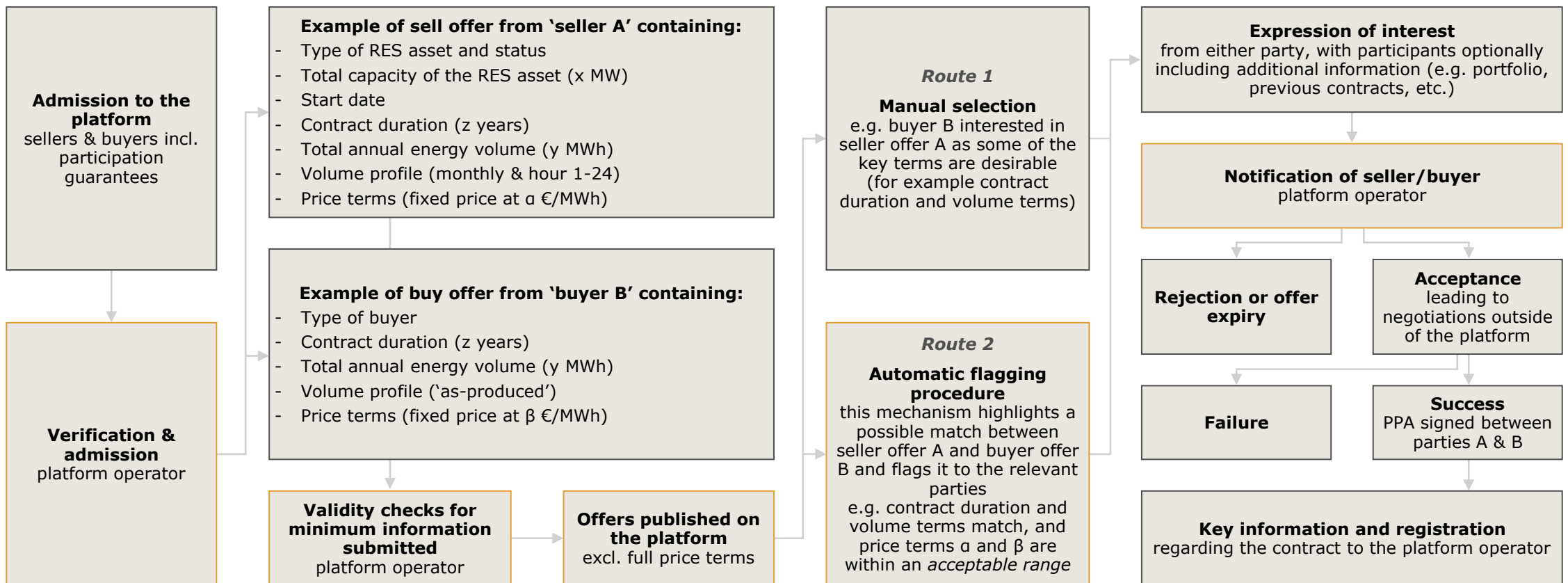
1. Given the PPAs are concluded bilaterally outside the platform, this should not create any issues.

DEEP-DIVE

Option 1: Facilitating

Create a marketplace to promote bilateral negotiations

EXAMPLE OF HOW OPTION 1 COULD WORK

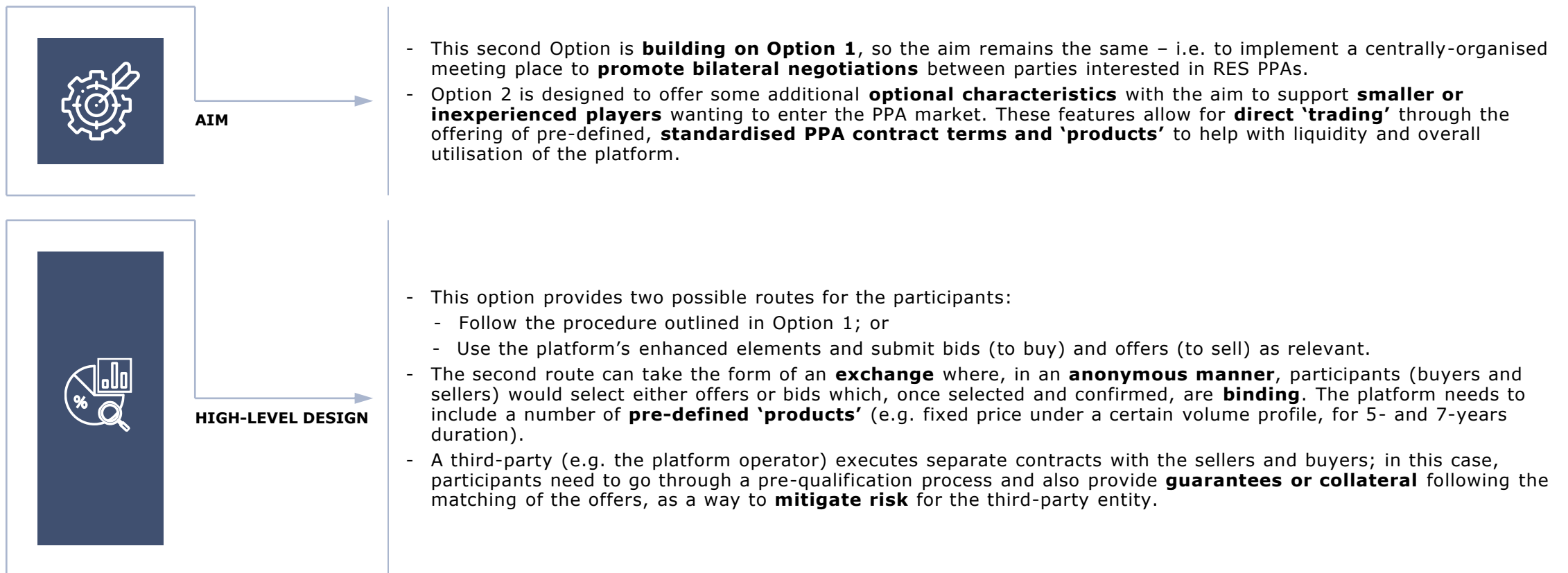


SUMMARY

Option 2: Facilitating with enhanced characteristics

Allow bilateral negotiations and simplify process for less experienced players

KEY CHARACTERISTICS



DEEP-DIVE

Option 2: Facilitating with enhanced characteristics

Allow bilateral negotiations and simplify process for less experienced players

KEY CONSIDERATIONS FOR THE ENHANCED ELEMENTS

Participants The aim of this option is to allow participation for **all types of players** - as in Option 1. However, there are some **complexities** introduced by the enhanced features and its binding nature that bypasses bilateral discussions. For example, the simplest approach would be that **only Balancing Responsible Parties** (RES producers/aggregators, consumers, suppliers and traders) **participate** as a first step (to maintain responsibilities of physical delivery of electricity). This, however, **limits eligibility** (and potentially excludes some corporate consumers) which would go against one of the main objectives of delivering such mechanism. To allow all the different types of market players to be able to participate **in this enhanced option**, solutions would need to be provided, such as: (a) establish an entity which would be responsible for managing and representing the physical volumes in the electricity markets (where this is needed – e.g. for corporate buyers); (b) or limit PPAs to financial contracts only.

PPA types & terms As in Option 1, **varying contracts terms** can be accommodated. For the enhanced element to work, however, there is a need for **predefined, standardised terms and 'products'**, to manage the number of options offered by the platform, until (at least) a certain level of **liquidity and participation is achieved**. These *for example* can include:

- **Pricing terms:** fixed price PPAs only;
- **Volume terms:** a profiling element would need to be included, which can vary based on the type of generator (wind and solar)⁽¹⁾; and
- **Contract length:** for example 5-, 7- and 10-year contracts only⁽²⁾.

Pre-qualification Increased responsibility of the platform operator to **ensure accuracy of data submitted**, ahead of entering into a contract with sellers/buyers. A process would need to be implemented that does not create unnecessary delays. This can be further supported by introducing **pre-qualification criteria** for the participants.

Platform's role and guarantees The enhanced element of the platform would effectively **act as an exchange** offering long-term products for green electricity (with the platform assuming the role of buyer to each seller and seller to each buyer, for the financial settlement of transactions (central counterparty)). As a result, **risk management becomes a key function** of the platform (e.g. **margin calls, guarantees or collateral**). As an example, EEX has recently extended its Base Load Yearly futures to **Cal+10** in an attempt to provide hedging for 'green' electricity – we do need to note, however, that these products are 'baseload' and effectively suggest a certain degree of 'merchant' (profiling) risk. However, margin requirements can place strains on (some) platform participants (especially small-scale players) and eventually hinder liquidity and limit participation.

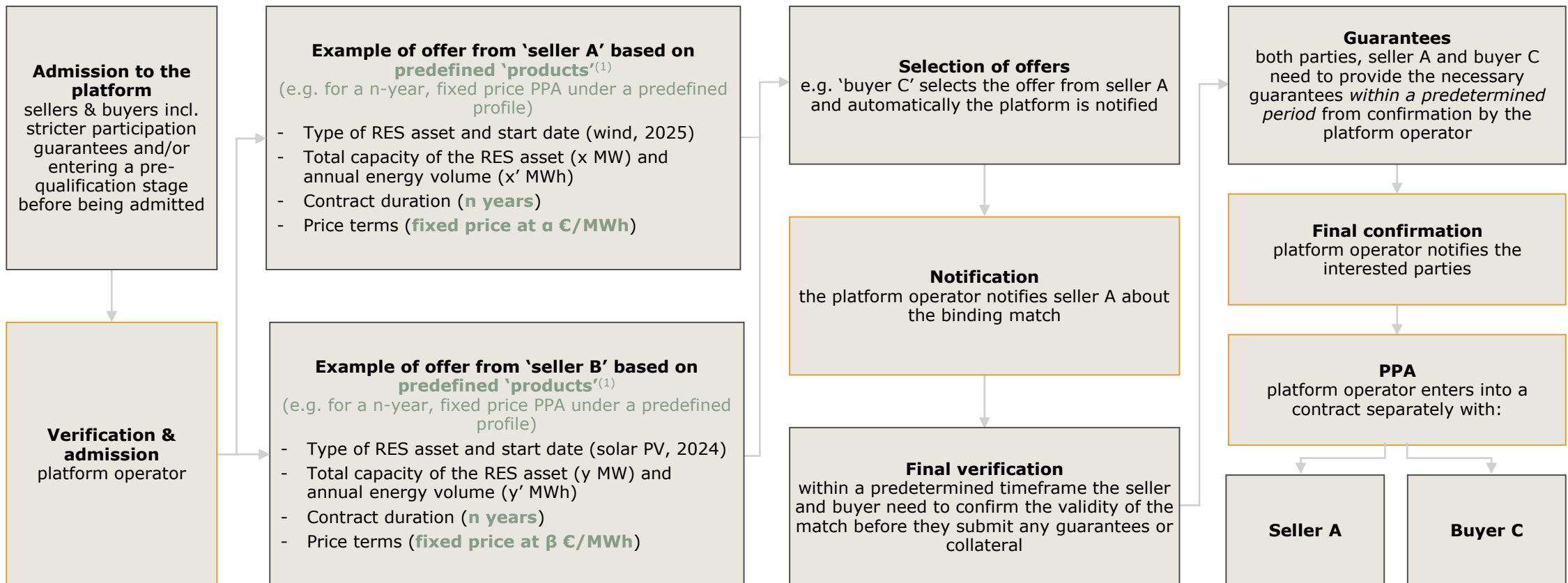
1. The need for a volume profile could potentially increase market risk to certain RES generators that need to manage their position. | 2. Durations are an example only. The key point is to offer a limited number of options in terms of contract duration (and other terms).

DEEP-DIVE

Option 2: Facilitating with enhanced characteristics

Allow bilateral negotiations and simplify process for less experienced players

EXAMPLE OF HOW THE ENHANCED ELEMENTS OF OPTION 2 COULD WORK



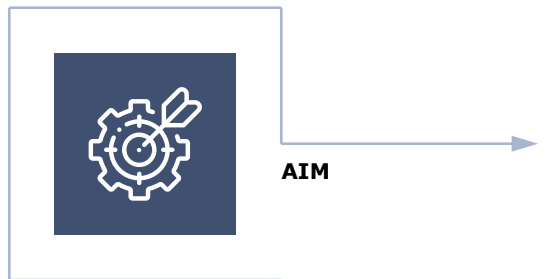
1. This example is for illustration purposes only. Offers can be submitted from sellers and buyers equally.

SUMMARY

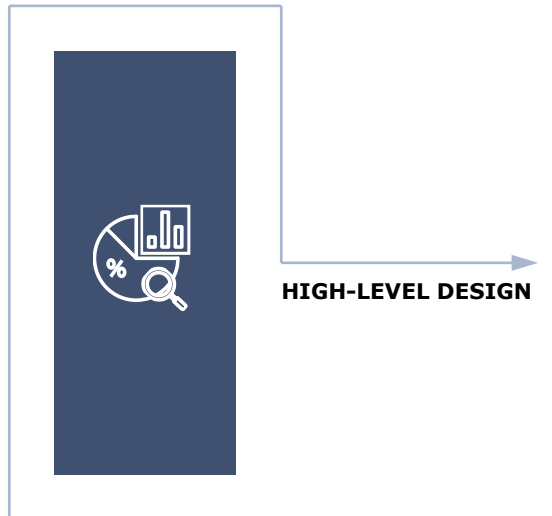
Option 3: Binding offers with automated & aggregated matching

Provide standardised PPA 'products' to accelerate RES procurement

KEY CHARACTERISTICS



- **Support smaller or less experienced** players wanting to enter the PPA market through an automated matching that needs to include **standardised** contract terms and 'products'.
- **Additionally, accelerate RES procurement** through this **automated** process that needs to include provisions to **eliminate counterparty risk** – ultimately by-passing bilateral negotiations.



- The key feature of such platform, at a high-level, is the implementation of a **binding automating matching algorithm where a third-party would be executing separate contracts** with the sellers and buyers.
- For example, such an algorithm could function as follows:
 - **Buyers** submit (anonymously) the amount of energy they wish to procure and a cap (ceiling) price;
 - **Sellers** then enter into an auction-based platform where they are offering (anonymously) the energy that they wish to sell;
 - The algorithm then (in simple terms) attempts to maximise the difference between the cap (ceiling) price submitted by the buyers and the offer prices submitted by the sellers (whilst taking into account the submitted volumes as well) – optimising effectively the overall economic surplus. Once the algorithm matches the bids and offers (in an **aggregated** way) then these would be considered **binding**.
- At its simplest, this option could be thought of as the current Feed-in-Premium scheme.
- A third-party (e.g. the platform operator) executes separate contracts with the sellers and buyers; in this case, participants need to go through a pre-qualification process and provide **upfront guarantees or collateral**, as a way to **mitigate risk** for the third-party entity.

DEEP-DIVE

Option 3: Binding offers with automated & aggregated matching

Provide standardised PPA 'products' to accelerate RES procurement

KEY CONSIDERATIONS IN ADDITION TO THE ONES PROVIDED UNDER OPTIONS 1 AND 2

- Optimisation algorithm** Implementing an algorithm for these purposes can be **challenging** due to its multivariate nature (price, generation profiling, demand profiling). 'One-to-one' matching is most likely infeasible and as a result offers from both the buy and sell side would have to be aggregated. Still perfect matching would not be possible and how this is addressed should be a key consideration in the detailed design implementation. Even with aggregation, the resulting **demand and supply curves would be three dimensional** (price, quantity and time) with the **least-cost solution being challenging to define** (with potential high number of sub-optimal solutions). The process would take an **auction-based format** trying to maximise overall economic welfare.
- Frequency** Such a platform could be very challenging to operate in a continuous manner. As a result, there would be a (limited) **number of rounds** per year when the platform operates.
- Contract types** Each auction round would need to procure one type of PPAs – either physical or financial. As per Option 2, there is a need for predefined, standardised terms and 'products'.
- RES technology** To incentivise buyers to participate in such auctions, there needs to be clarity with regards to the **profiling of the volume** they are procuring. The RES-E auctions in Mexico and Colombia provide an example of how this can be achieved in a technology-neutral set up. In Mexico, sellers receive a **small premium or discount based on the time of day they are generating** (determined by regulatory set 'hourly adjustment factors'). In Colombia, generators bid a minimum amount of packs of energy to be sold at a given price during **all hours of one of three separate time blocks** (00:00-07:00, 07:00-17:00, 17:00-00:00).

OPTIONS SUMMARY

High-level principles when considering the different options

	Option 1 FACILITATING PLATFORM	Option 2 FOCUSING ON THE ENHANCED CHARACTERISTICS ONLY ⁽¹⁾	Option 3 PLATFORM WITH BINDING OFFERS AND AUTOMATED MATCHING
What are the types of PPAs?	Physical and Financial both can be accommodated and addressed during the negotiations	Physical and Financial additional solutions may need to be provided by the platform for physical contracts with corporate buyers	Physical or Financial both can be accommodated but in separate processes
Are the offers binding?	No PPAs are agreed bilaterally and outside of the platform	Yes (for some) once offers/bids selected	Yes
Is there automated matching?	No a 'flagging' feature can facilitate search process		Yes
Do bids and offers remain anonymous?	Partially until reaching negotiations stage – i.e. after expression of interest	Yes	
Is there a need for standard terms or products?	No different types of contract and term structures can be accommodated	Yes need for pre-defined contract term structures and 'products'	
Is there a need for guarantees or collaterals?	Potentially depends on the exact solution – some type of participation guarantees may be required	Yes guarantees or collaterals, as a way to mitigate risk for the third-party entity that acts as the counterparty for sellers/buyers – although these are submitted at different stages in each Option	

1. Assessment for the enhanced characteristics only – as everything else is following the assessment of Option 1

Agenda

1. Executive Summary
2. Introduction
3. Option analysis
- 4. Option assessment**



HOW DO THE DIFFERENT OPTIONS MEET THE OVERALL OBJECTIVES?

Assessing the three options against the underlying objectives

KEY OBJECTIVES & PRIORITIES

		OPTION 1 FACILITATING	OPTION 2 FACILITATING WITH ENHANCED CHARACTERISTICS	OPTION 3 BINDING OFFERS WITH AUTOMATED & AGGREGATED MATCHING
Increase maturity of PPA market		✓ A key objective of this is to promote bilateral negotiations among all market participants which is key in creating a more mature RES PPA market	✓ The additional feature that includes an exchange with standardised term structures and contracts and a third-party entity acting as the counterparty for buyers/sellers could mean slower market-player know-how development	✗ This option primarily provides an alternative market risk mitigation mechanism, but does not necessarily increase market-player know-how
Increase competition		✓ A centralised marketplace can increase competition but not all types of players would necessarily benefit equally. Wide participation will be key for this objective. Measures can help support smaller players (e.g. participation through aggregators)	✓ Eliminating counterparty risk and offering standardised term structures and contracts could allow all participants to benefit equally, including smaller players or players (buyers/sellers) with limited market experience	✓ Eliminating counterparty risk and offering standardised term structures and contracts could allow all participants to benefit equally, including smaller players or players (buyers/sellers) with limited market experience
Limited market interference		✓ An option that, by design, does not interfere with other market mechanisms, allowing the PPA market to grow organically	✓ The additional feature that provides guarantor incentives could potentially delay current initiatives. Clarity on the required levels of guarantees or collateral that mitigate risk for the third-party entity is needed to manage such risk	✗ Interfering with the wider PPA market as it offers an alternative route that has a greater chance of delaying or affecting other initiatives

ASSESSING THE STRENGTHS AND WEAKNESSES

Option 1: Facilitating

Create a marketplace to promote bilateral negotiations

PROS & CONS ANALYSIS

- Option 1 offers a **simpler mechanism** to implement that can be developed in a **shorter timeframe**.
- It provides **flexibility** in terms of types of participants, types of contracts and it can accommodate a range of contract terms, structures and options.
- It does not interfere with the wider PPA market, current initiatives, or impact on other mechanisms (i.e. RES FiP auctions); it is designed to **encourage bilateral negotiations**.
- High utilisation can ensure a PPA market that is **maturing and growing**, while increasing market-players' **know-how and experience**.
- Through monitoring activities and requirements, the platform operator can use the information to promote **bankable solutions**, monitor the **competitiveness** of the market and overall **assess the mechanism** against its objectives.



- Regardless of the option selected, the platform operator would need to ensure that the **right incentives** are provided to market participants in order to ensure **high utilisation**.
- For Option 1, if the platform is not used more extensively, there is a **risk that only limited RES volumes are delivered** via this mechanism.
- This Option 1 does not explicitly address **issues that smaller players or less experienced sellers/buyers are facing** (e.g. counterparty risk, competitiveness of smaller-scale projects); although some **simple solutions** can be provided at least until the PPA market becomes more mature (e.g. a PPA template with options on volume/ price terms, participation through aggregators).

ASSESSING THE STRENGTHS AND WEAKNESSES

Option 2: Facilitating with enhanced characteristics

Allow bilateral negotiations and simplify process for less experienced players

PROS & CONS ANALYSIS FOCUSING ON THE ENHANCED ELEMENTS⁽¹⁾

- The enhanced elements of Option 2 can offer some **additional advantages** once implemented; it can create a route that delivers **RES volumes faster** by by-passing bilateral negotiations (though this also relies on the terms and structure of the standardised products on offer).
- It can provide an alternative route to smaller sellers/buyers or less experienced players through offering pre-defined **standardised contract terms and options, and by eliminating counterparty risk** (backed by an appropriate level of guarantees or collateral).



- The enhanced elements, e.g. the need for some form of standardisation or for an entity to act as the counterparty or to address requirements that physical contracts introduce in relation to BRPs, could **increase complexity** in terms of implementation, **delaying overall timeframes**. A way around this would be to **first implement the simpler facilitating platform (Option 1) and develop the enhanced elements at a later stage (Option 2)**, following market signals.
- Once implemented, there could be some additional upfront **administrative requirements** from platform operator (validations, pre-qualification, guarantees).
- This new route-to-market could **delay ongoing negotiations and initiatives** while market participants are waiting for its implementation. **Clarity is needed** in due course in terms of the role of the platform, its offerings, and requirements so that market participants can take informed decisions.

1. This slide lists the additional pros and cons compared to Option 1 – the majority of the items described under Option 1 are still valid here.

ASSESSING THE STRENGTHS AND WEAKNESSES

Option 3: Binding offers with automated & aggregated matching

Provide standardised PPA 'products' to accelerate RES procurement

PROS & CONS ANALYSIS

- As is the case with Option 2, Option 3 could create a route that delivers **RES volumes faster** by bypassing bilateral negotiations.
- It can provide an alternative route to smaller sellers/buyers or less experienced players through offering pre-defined **standardised contract terms and options, and by eliminating counterparty risk** (backed by an appropriate level of guarantees or collateral).



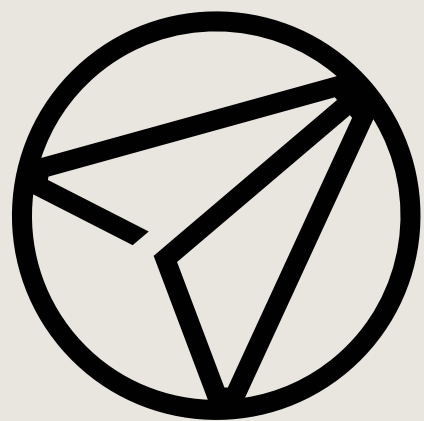
- This option primarily provides an **alternative market risk mitigation mechanism**, but it does not necessarily increase market-player know-how and it does **not create a tool for developing a fully functioning decentralised PPA market in Greece**, which is a primary objective.
- The automated matching elements, e.g. the need for some form of standardisation or for an entity to act as the counterparty or the need for an **algorithm** with increased complexities surrounding how buyers and sellers are aggregated, could **increase complexity** in terms of implementation, **delaying overall timeframes**.
- Once implemented, there could be some additional upfront **administrative requirements** from platform operator (validations, pre-qualification, guarantees).
- This new route-to-market could **delay ongoing negotiations and initiatives** while market participants are waiting for its implementation. **Clarity is needed** in due course in terms of the role of the platform, its offerings, and requirements so that market participants can take informed decisions.

RECOMMENDATIONS

Consider Option 1 as a first step, and wait for market signals to assess whether the enhanced elements of Option 2 need to be developed in order to further support the PPA market

RECOMMENDATIONS

- Option 1 is a relatively **easy-to-implement solution**, requiring less time to be fully developed – while also **meeting the core objectives** of such a mechanism. Our view is that a facilitating platform could be developed **as a first step** to gauge market interest and appetite from sellers/buyers to participate.
- Following the implementation of such solution and as part of the monitoring activities of the platform operator, there may be a **signal for the enhanced elements of Option 2 to be developed** – for example these may be necessary to unlock further RES capacity over the next 6-8 years, or consider how smaller-scale RES projects can also benefit from such a mechanism.
- Option 3 would be challenging to implement and should mainly be considered in certain markets with specific characteristic, e.g. in markets with low RES penetration levels. In our view, a solution similar to **Option 3 would not offer much benefit to the Greek market**.
- Finally, time is of essence and all stakeholders need to act fast for such a solution to produce positive results.



AFRY

ÅF PÖYRY

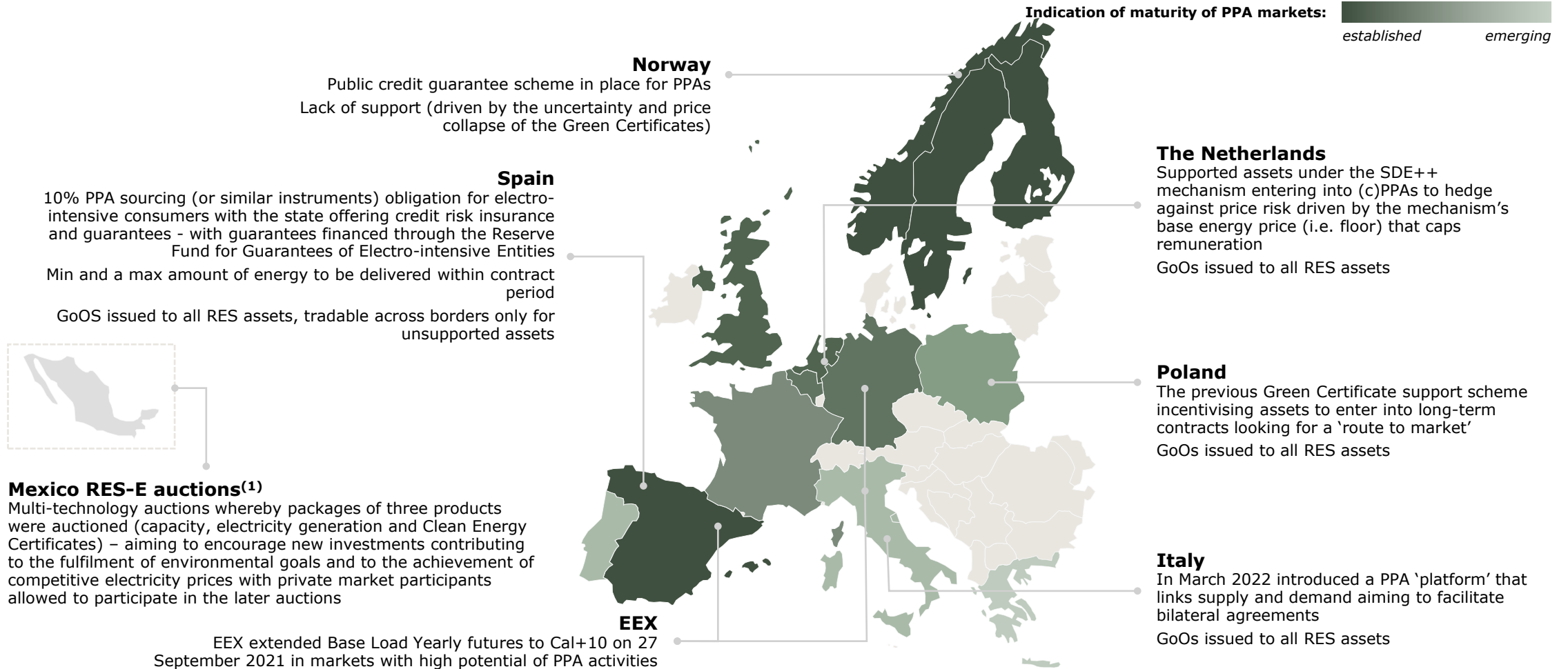
Annex

A. European overview examples

B. Example: the Italian 'PPA Bulletin Board'



Market characteristics



1. Latest RES-E auction was in 2018. The scheme was generally regarded as successful having managed to procure around 7.5GW of RES capacity (with 70% being operational).

Annex

A. European overview examples

B. Example: the Italian 'PPA Bulletin Board'

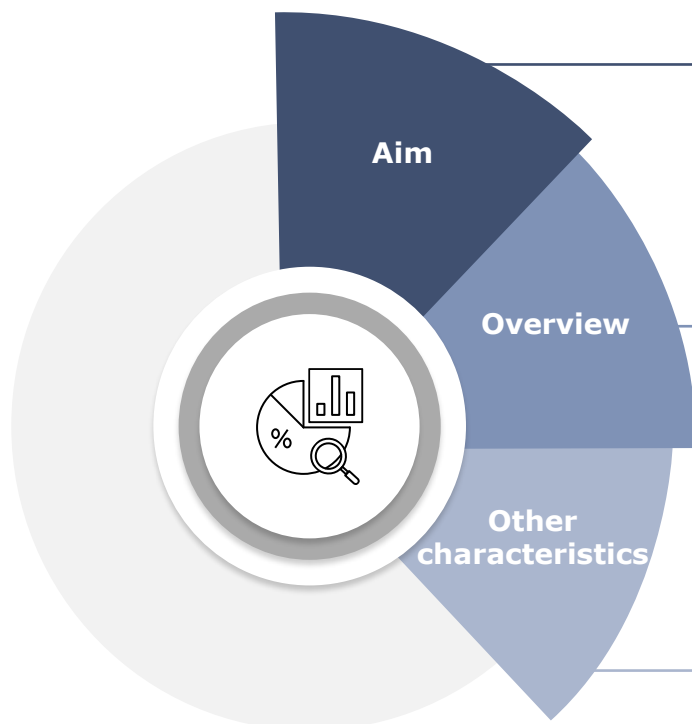


Case Study – A facilitating platform:

Example based on the Italian case

'PPA Bulletin Board' following publication of the regulation on 30 March 2022

KEY CHARACTERISTICS



AIM

- The bulletin board of long-term energy contracts from renewable sources (PPA BULLETIN BOARD) is **organised and managed by GME** (Gestore dei Mercati Energetici S.p.A)
- With the aim of **promoting the meeting between parties** potentially interested in the stipulation of long-term contracts for the sale of electricity from renewable sources, as well as to allow the fulfilment of the **obligation to register the same contracts** concluded between the participants

PPA BULLETIN BOARD

- **Notice Section:** participants interested in proposing or seeking long-term contracts for the purchase and sale of electricity from renewable sources can publish, in **anonymous and non-binding form**, their notices, respectively, of sale or purchase, while participants interested in such notices can view them and express their interest
- **Contract Registration Section:** the selling participants fulfil the **obligation** to register long-term contracts for the purchase and sale of electricity from renewable sources concluded (with GME maintaining confidentiality and publishing the information on an aggregate basis)

OTHER CHARACTERISTICS

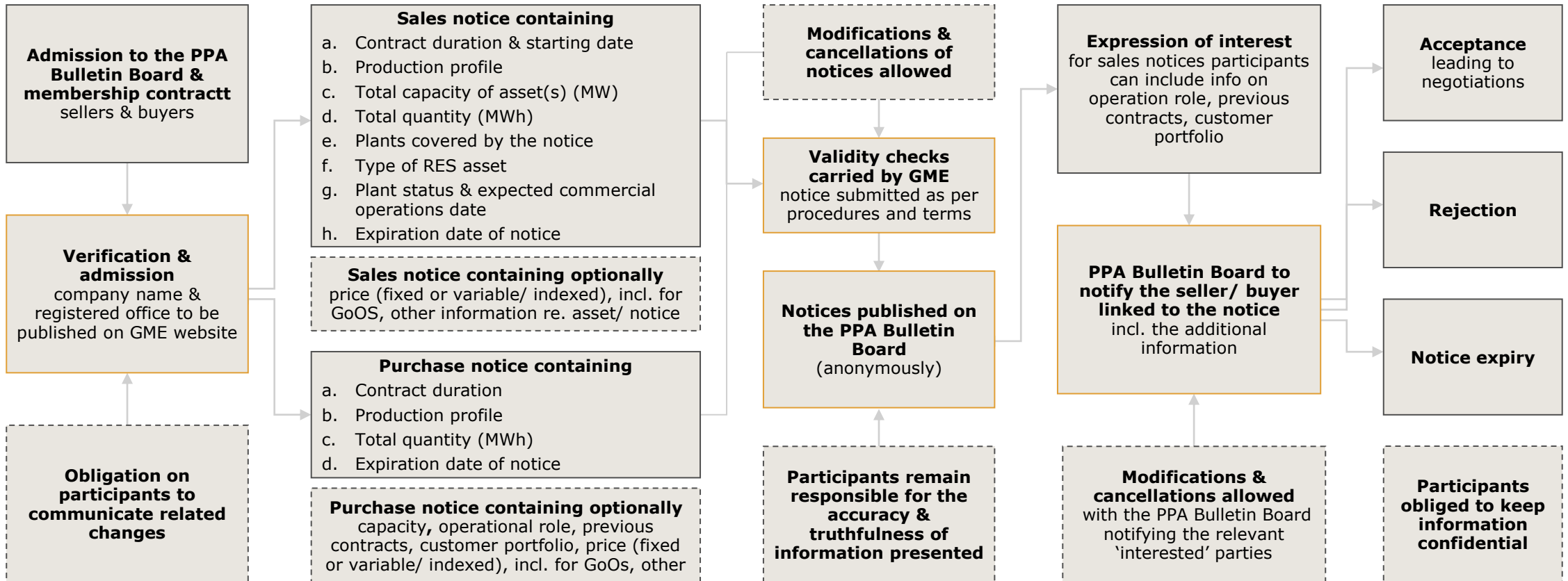
- Physical PPAs (**utility, trader and/ or corporate**) for unsupported assets with a minimum duration of **5 years**
- Total capacity of at least **1MW**
- Participants pay an access fee and a fixed annual fee to GME for the services provided⁽¹⁾

1. At the time of writing, these fees are set at zero Euros

Case Study – A facilitating platform: Example based on the Italian case

'PPA Bulletin Board' following publication of the regulation on 30 March 2022

NOTICE SECTION⁽¹⁾



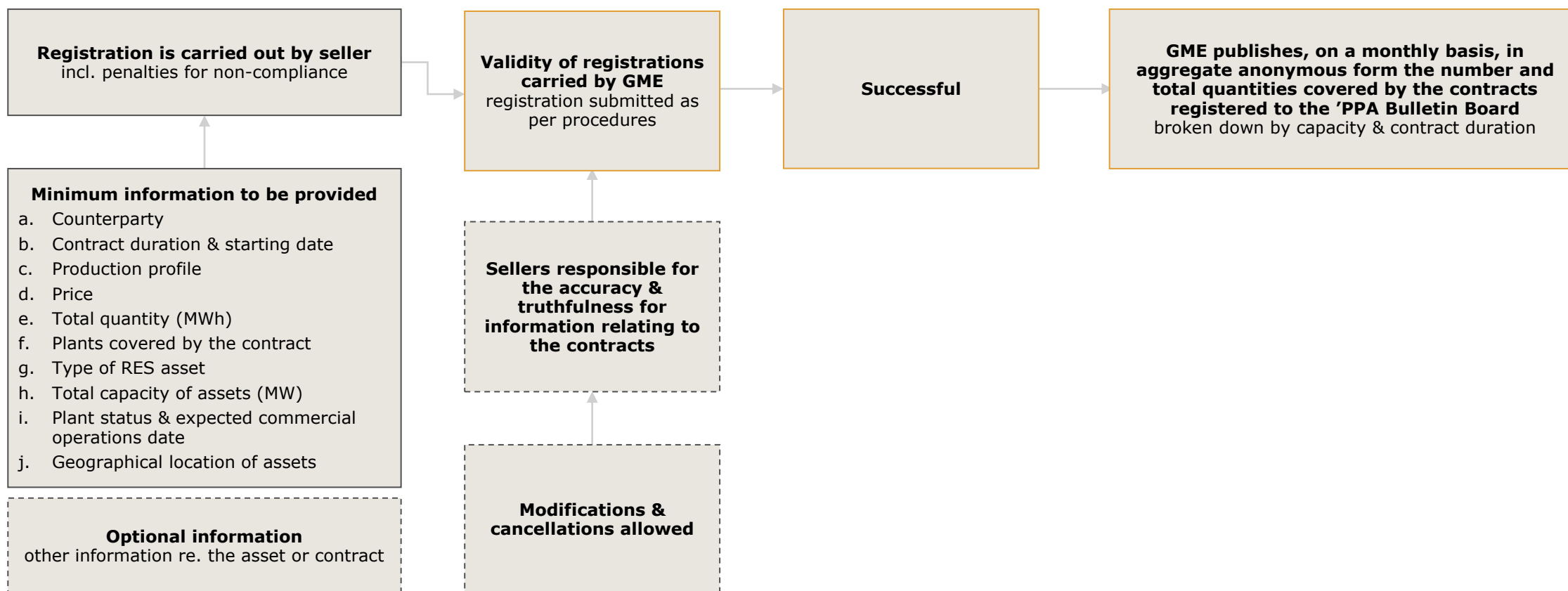
1. Based on the Technical Rules and the Regulation of the PPA Bulletin Board available on the GME website

Case Study – A facilitating platform:

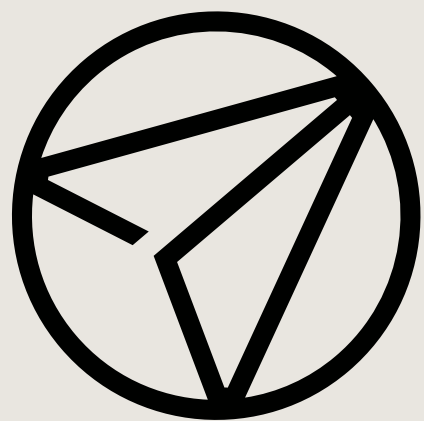
Example based on the Italian case

'PPA Bulletin Board' following publication of the regulation on 30 March 2022

CONTRACT REGISTRATION SECTION⁽¹⁾



1. Based on the Technical Rules and the Regulation of the PPA Bulletin Board available on the GME website



AFRY

ÅF PÖYRY