



RES CPPAs platform

- Benchmarking of EU benchmarking
- Greek CPPA Market estimation

October 2022



A photograph of a business meeting. A person in a blue suit is holding a silver pen and pointing at a tablet held by another person. The scene is set in a modern office with a city skyline visible in the background. A large blue circular graphic is overlaid on the left side of the image.

Scope of Work

Background - Scope of Work

This study was conducted by the Energy Sector of Grant Thornton Greece. In an environment where RES CPPAs are emerging both as a RES financing tool and as a means of energy supply or hedging tool, the Greek Energy Market Operator (“HEnEx”) has assigned Grant Thornton a study with a two objectives:

- Investigate current European CPPA markets, to assess the role of possible enablers and barriers towards CPPA uptake.
- Provide an informed estimate regarding the growth potential of the emerging Greek CPPA Market.

The present study did not look into design parameters of centrally operated platforms.

The methodology and outcomes of the two workstreams are herein provided in the form of an Executive Summary.

A photograph of two men in business attire shaking hands. The man on the left is smiling broadly, wearing a grey blazer over a blue checkered shirt. The man on the right is seen from the back, wearing a light blue shirt and glasses. The background is a blurred office environment. A large blue diagonal graphic element is on the left side of the page.

EU Benchmarking

Executive Summary

Overview

EU CPPA Market Benchmarking

In this first part of the study, we analysed and compared 5 selected countries chosen under certain criteria, in order to assess the conditions under which, in some countries a rapid development of their CPPA markets is observed, compared with others which experienced a less rapid growth.

The initial criteria for country selection were similarities regarding RES development and future targets, but eventual differentiation regarding the success of CPPA market development.

The criteria were expanded to include measures regarding CPPA promoting policies and power system indicators such as energy demand, levels of energy peaks and price cannibalization occurrences.

In the analysis we undertook a high-level assessment of the effect of six selected drivers, which are considered to play a major role in the CPPA market development.

CPPA Markets to study

Which countries were examined and why?



Italy



Spain



Romania



Poland



Germany

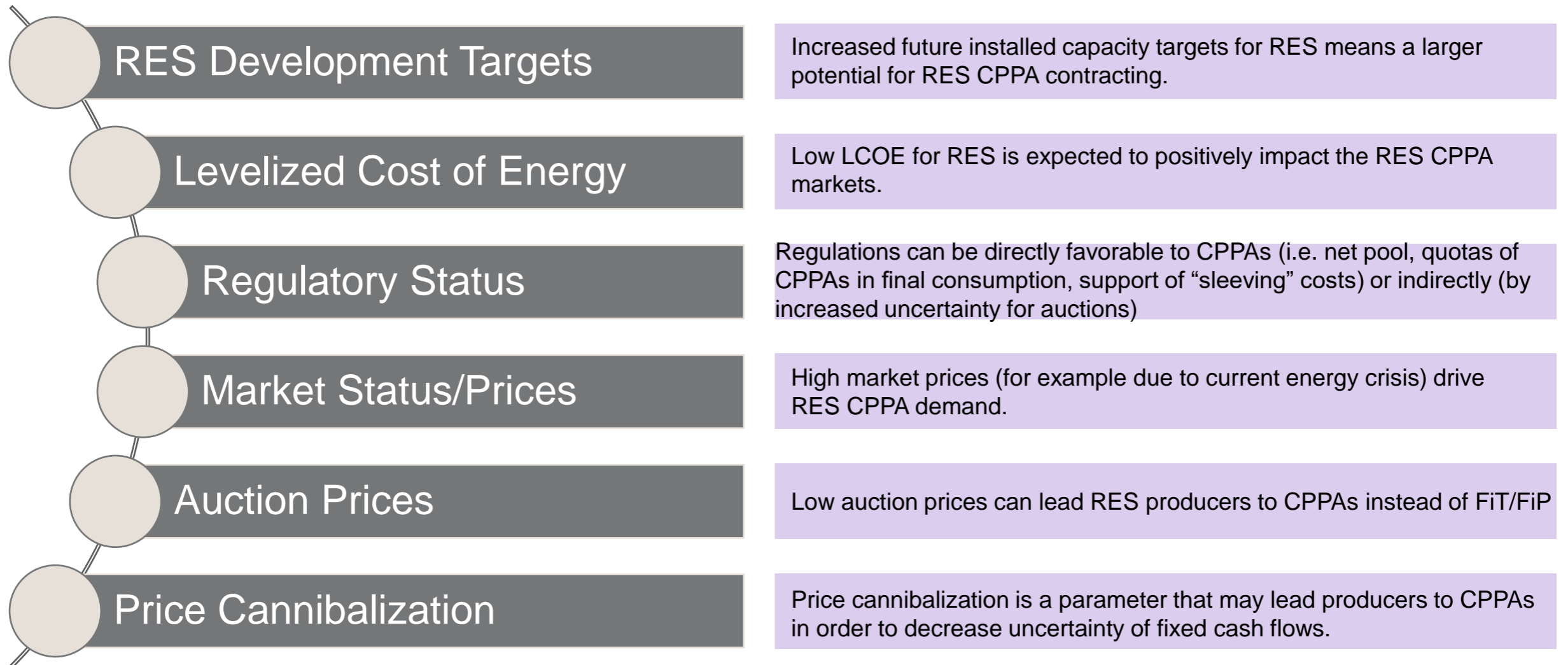
- We started our analysis comparing Italy and Spain as they present market similarities in terms of volumes of installed RES, levels of peak demand and evolution of regulatory framework and RES targets. The two countries although started from a similar initial point, they de-coupled in the evolution of their CPPA market with the second becoming a leader of the market while the first remained anchored.

- We proceeded to study Romania as a slow pacer in RES uptake. Although Romania's RES development halted after 2014, latest policy developments along with the permission of CPPAs, may trigger their uptake. Romania has also plans for a platform facilitating PPAs.

- In our study we also chose another leader in RES development to investigate (Germany), as well a smaller country with an emerging CPPA market (Poland) for further diversification

CPPA Market Drivers

What main drivers are assumed to affect the uptake of a CPPAs and how?



Italy - Overview

Executive summary of the Italian CPPA market

1. Strong policy incentives drove the development of Italian RES capacity until 2013.
2. After the halt of their increasing development due to end of high incentivizing policies, new capacity installments were mainly driven by auctions
3. In latest auctions there was very low participation due to authorization process criteria and regulatory barriers

The continuously decreasing participation in auctions could suggest a possibility of commercially viable subsidy-free RES, motivated by alternate offtake solutions, such as CPPAs.

1. Low LCOE of PV projects make them attractive to investors.
2. High energy crisis-driven electricity prices (2021 PUN: 125,46 €/MWh, 2022: 259,53 €/MWh) make CPPAs attractive to off-takers
3. Auction prices (63,61 €/MWh in FER1) being above the CPPA prices (51,5 €/MWh) make auctions more attractive to producers. Nevertheless, regulatory barriers and increasing off-taker demand can promote the CPPA market uptake.
4. The newly introduced GME Bulletin Board initiative for CPPA promotion has already 63 participants and other CPPA platforms such as LevelTen report large Italian participation (27% of total EU-participation)

The trends suggest a possible uptake in the Italian CPPA market. Nevertheless, as long as auction prices remain above CPPA prices producers will favor them less, stalling the CPPA market development.

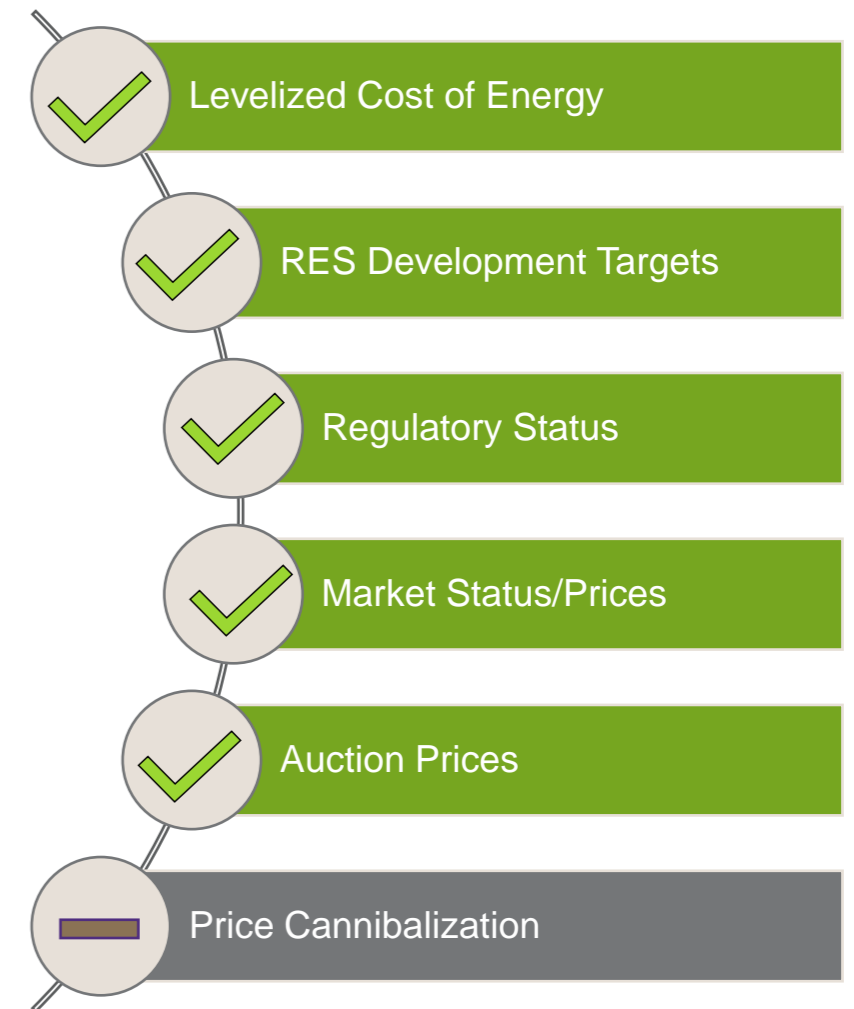


Spain - Overview

Executive summary of the Spanish CPPA market

1. Strong policy incentives drove the development of Spanish RES capacity until 2013.
2. After the halt of their increasing development due to end of high incentivizing policies, big capacity installments were realized by state-held auctions in 2016 and 2017
3. Uncertainties induced by the retroactive cuts on FITs and the absence of further state-held auctions after 2017 led project owners to seek alternative offtake structures leading to first CPPAs in 2018
4. Latest policies promote CPPAs as they motivate via fiscal incentives, large industries to cover their demand by renewable quotas contracted via CPPAs. They also increase CPPA attractiveness by covering credit risks (FERGEI) , as well as by excluding CPPA contracted energy revenues from being withheld by the clawback mechanism
5. Continuously decreasing LCOE of PV projects is making them attractive to investors.
6. High energy crisis-driven electricity prices make CPPAs attractive to off-takers.
7. Low auction prices (25 €/MWh in 2021) being below the CPPA prices (39,5 €/MWh) make the latter attractive to producers. The large oversubscription in auctions creates a big hub of possible future CPPA - contracted RES development.
8. Increase in frequency of Price Cannibalization effects further motivates producers to hedge against uncertainties using CPPAs. Nevertheless, it could pose a detrimental factor to further RES investments in extreme cases.

The quite favorable conditions in Spanish CPPA market in Spain, will enable further growth in its already leading role in EU, as the combination of high energy-crisis driven MCP prices (even after the intervention mechanism), the low RES LCOE and the regulatory promotive measures of CPPAs, has made them an attractive solution for both producers and off-takers, establishing the foundations for further market development.



Romania - Overview

Executive summary of the Romanian CPPA market

1. Strong policy incentives drove the development of Romanian RES capacity until 2014.
2. After the end of high incentivizing policies and the resulting difficulties over GCs usage, the RES market presents a stable picture related to the loss of interest of investors.
3. Latest policy amendments create an opportunity for CPPA market uptake
4. Cost competitive RES project potential makes them attractive to investors.
5. High energy crisis-driven electricity prices make CPPAs attractive to off-takers.
6. Increase in frequency of Price Cannibalization effects may further motivate producers to hedge against uncertainties using CPPAs. Nevertheless, it could pose a detrimental factor to further RES investments in extreme cases.

The Romanian CPPA market, having just emerged by its first signed contract is a market to watch. Further policy uptake actions, combined with the existing RES potential and the current market drivers (high energy prices and need for hedging in price volatility) may further facilitate its growth.

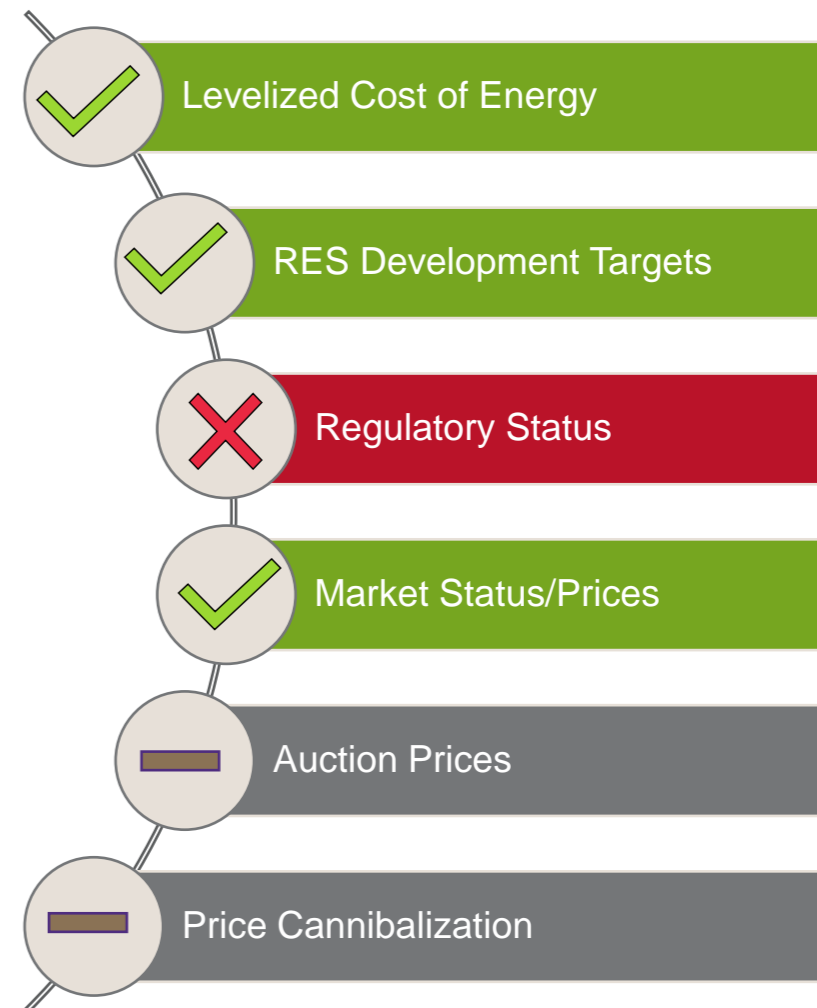


Poland - Overview

Executive summary of the Polish CPPA market

1. Policy incentives drove the development of Polish RES capacity.
2. Timely policy changes continued RES development after 2014 difficulties.
3. Continuously decreasing LCOE of RES projects makes them attractive to investors.
4. High energy crisis-driven electricity prices make CPPAs attractive to off-takers.
5. Auction prices being above the CPPA prices make the latter less attractive to producers. The latest large participation in auctions creates a favorable future for CPPAs. Recent high energy prices combined with the cessation of natural gas imports from Russia, led to high CPPA prices (high latest prices in platforms such as LevelTen), increasing sellers' profitability.

High subsidized RES environment reduces the CPPA attractiveness. Nevertheless, the decreasing RES LCOEs and the latest conditions driven by the energy crisis, are leading to high demand for RES projects (both on seller side and for off-taker), and may lead to a continuous growth for the CPPA market.



Germany - Overview

Executive summary of the German CPPA market

1. Germany has the leading role in Renewable energy development in Europe. Early policy uptake, incentivization and ambitious targets lead to successful development over the past 30 years.
2. Transition to auction schemes after 2014 let grid expansion keep up with RES development.
3. Price Cannibalization was addressed by end-consumer surcharges and incentives to power producer profile compliance. Latest moves towards subsidy free offshore developments and end user surcharge reductions indicate a favorable environment for CPPA uptake as the latter pose subsidy –free options.
4. Continuously decreasing LCOE of RES projects make them attractive to investors. In 2021 auctions, zero-subsidy projects won the tenders, indicating very low development costs and project viability by solely market participation.
5. High energy crisis-driven electricity prices make CPPA attractive to off-takers.
6. Low auction prices (40 to 55 €/MWh in 2022) falling below the CPPA prices (60 € /MWh) make the latter attractive to producers.
7. The latest policy developments (Easter package) foresee a massive renewable energy development with highly increased targets in installed capacity and final renewable electricity consumption.
8. Private Companies (such as Trianel) show interest towards small tenor CPPAs for small projects such as household rooftop PVs

Germany, being a leader in Renewable energy development in Europe, has set ambitious targets for both the near and the long-term future. The highly energy crisis driven prices, the low auction prices and the low CPPA prices, create a favorable environment for CPPA market growth. The further developments regarding subsidy – free offshore developments, along with the initiatives for end-user surcharge alleviation also support CPPA contracting. The latest increase of German market share in European CPPA contracting (ranking 5th in EU) may further continue and as well give her soon higher ranking position.



Country Comparison

How are Italy, Spain, Romania, Poland and Germany compared regarding the main CPPA market drivers?

CPPA Market Driver	Romania	Italy	Poland	Germany	Spain
Levelized Cost of Energy					
RES Development					
Regulatory Status					
Market Status/Prices					
Auction Prices					
Price Cannibalization					
Overall Assessment					

Market outlook for Greece – High level qualitative assessment

Parameter assessment for Greece

Levelized Cost of Energy	Positive
RES Development Targets	Positive
Regulatory Status	Negative
Market Status/Prices	Positive
Auction Prices	Positive
Price Cannibalization	Neutral

Recommendations

Main recommendations for the uptake of the CPPA market in Greece

1. Policy uptake in form of **fiscal incentives deriving from CPPA shares in final energy consumption** would benefit the CPPA market uptake (an example of such incentive is the 10% quota for industrial consumers in Spain).
2. Secondary mechanisms in order to support the CPPA market should be designed, especially regarding **guarantees and creditworthiness** of the off-taker (this has also been implemented in Spain with the FERGEI).
3. **RES auctions can become a barrier** for CPPA markets. Regulatory interventions reducing the volume or starting price of tenders could help in the uptake of CPPA market.
4. RES development policies should be oriented towards **subsidy-free solutions** whenever it is possible (for example policies regarding the offshore wind projects in Germany).
5. A **digital platform** that joins interested parties as well as allows the simplification/automation of CPPA contracting is expected to make CPPAs an attractive option.
6. **Standardized CPPAs contracts/products** should be designed in order to reduce contracting costs for smaller players
7. **Simplification and acceleration of permitting procedures** for new RES projects.
8. Campaigns for **the promotion of the benefits** deriving from signing CPPAs (and understanding of risks).
9. CPPAs must be also made available to small/medium sized consumers via **consumer aggregation** (multiple consumers signing a CPPA with one producer).

A background image showing a person in a blue suit holding a silver tablet and a pen, standing in front of a window with a city skyline. The image is partially obscured by a large blue circular graphic on the left side.

Greek RES CPPA Market Size Estimation

Executive Summary

Overview

Greek RES CPPA Market size estimation

In this study, we have assessed **the growth potential of the Greek RES CPPA market**. In order to do so, we first conducted an **in-depth analysis of the current RES landscape** (capacity, regulation, cost, price signals, system integration).

In order to proceed with the estimation of the mid-term PPA market size in Greece, we first identified the **RES capacity expected to be installed under the current “paradigm”** (FiT/state CfDs).

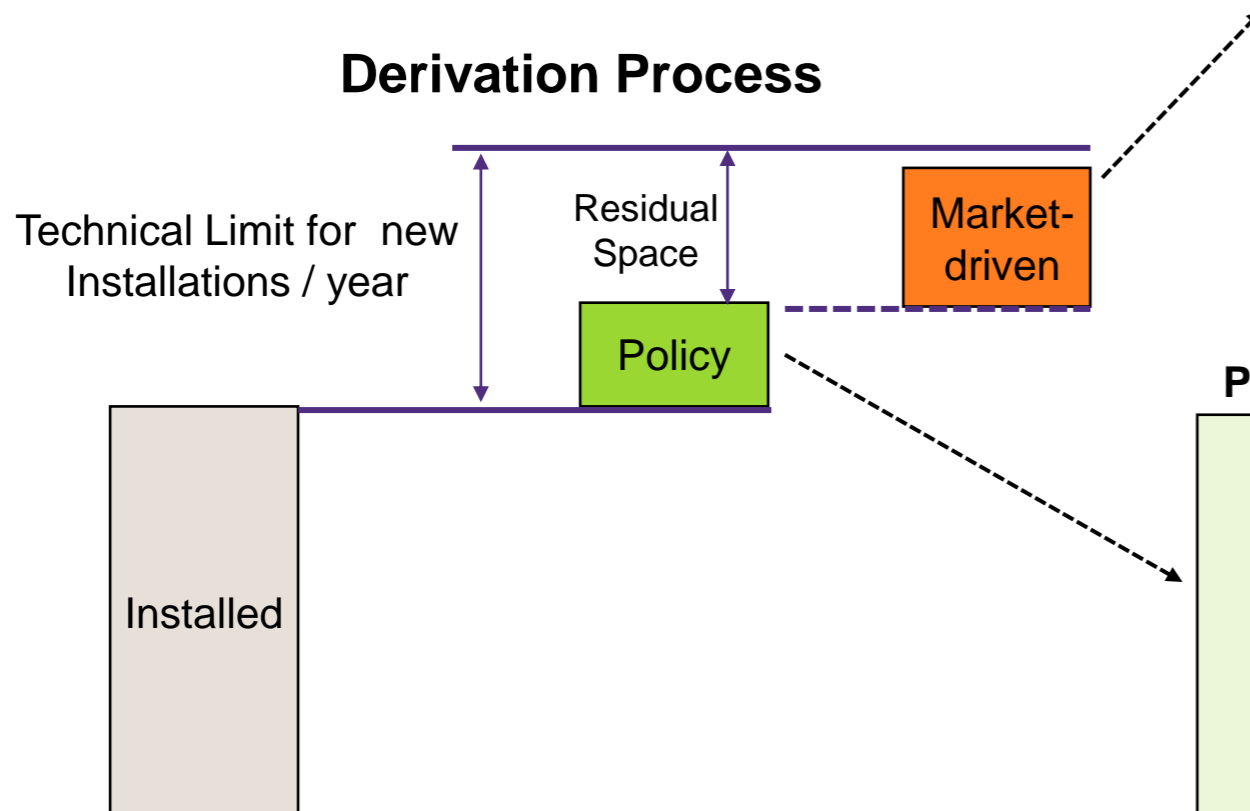
While in the 2010-2020 decade “demand” for RES was almost solely state-driven (procured auctions and/or grid enhancement), currently, an additional market demand has substantiated on top of the policy-based demand.

- To this end, we performed a **“demand-supply” assessment for the additional CPPA-driven RES**, which indicates the growth potential of the Greek RES-CPPA Market.
- A “stakeholder appetite” assessment was conducted in order to derive key variables prominent to affect the PPA market growth
 - On the supply-side, we constructed two scenarios regarding the electrical space availability & RES development stack
 - On the demand-side, we constructed two scenarios regarding the potential “PPA appetite” if involved stakeholders
- The outcome of the study was an expected low-high range regarding the growth of the Greek CPPA Market, a “most likely” projection, as well as qualitative conclusions that could/would affect the PPA market growth in Greece.

Methodology

Greek RES PPA Market size estimation

The study derived estimations of the Greek CPPA Market size for the next 5 years (upon Q3-Q4 2027)



Market-driven RES projection

Demand vs Supply (volumes)

- Demand (“D”): Stakeholder analysis indicates that **Demand** for PPAs, is directly or indirectly **bound on industrial consumers’ consumption level**
- Supply (“S”): Mostly **bound on maximum annual installation rate** (large RES potential and development stack)
- $RES_{CPPA}^{year} = \min(D_{ppa}^{year}, S_{ppa}^{year})$

Policy-driven RES projection

Small Projects (**state FiT**): Date of Final Connection terms with DSO +12-15 months

Larger Projects (**state CfD**): Date of Auction Results (2018 to 2022) + “delivery time” (depending on technology and project size).

+40 months

+12 months

Scenarios analysed

Greek RES CPPA Market size estimation

Baseline scenario

- No significant changes in regulatory framework
- International markets recoil to almost pre-covid conditions

Accelerated scenario

- RES-accelerating initiatives
 - Green Pool/shaping cost subsidization
 - (some form of) State guarantee for counter-party risk
 - Matchmaking (with or without clearance) PPA platform
 - Industrial “green-obligation” (e.g. 20%)
- Market volatility and uncertainty (including high gas prices) persist
- New market equilibrium, when achieved, far from pre-covid status

Findings (1/4)

Prospects of the Greek CPPA Market

Under the assumptions and derivation methodology of this study (both qualitative and quantitative), the PPA market in Greece is and will be closely related to the industrial demand, either directly (industrial CPPAs) or indirectly (through vertically integrated suppliers).

- This projection assumes no significant lag in the PPA market chain: timely negotiation, contract, funding, legislative applications and decisions, construction, commissioning, operation.
- The growth of the PPA Market in Greece is considered to be a certainty, regardless of international and/or national conditions:
 - The energy crisis has triggered an urgent hedging necessity on behalf of the industry. Even if the crisis completely vanishes, the initial signal has irreversibly changed the perception of both RES financing and Offtakers' portfolios regarding energy risk management.
- International experience so far has showed that, the first steps in a PPA market are made by larger Offtakers. This can either mean “large-to-large”, or “large-to-many” arrangements, depending on the country's RES-seggragation (i.e. if and how many large scale projects are available e.g. Offshore/large-scale wind).

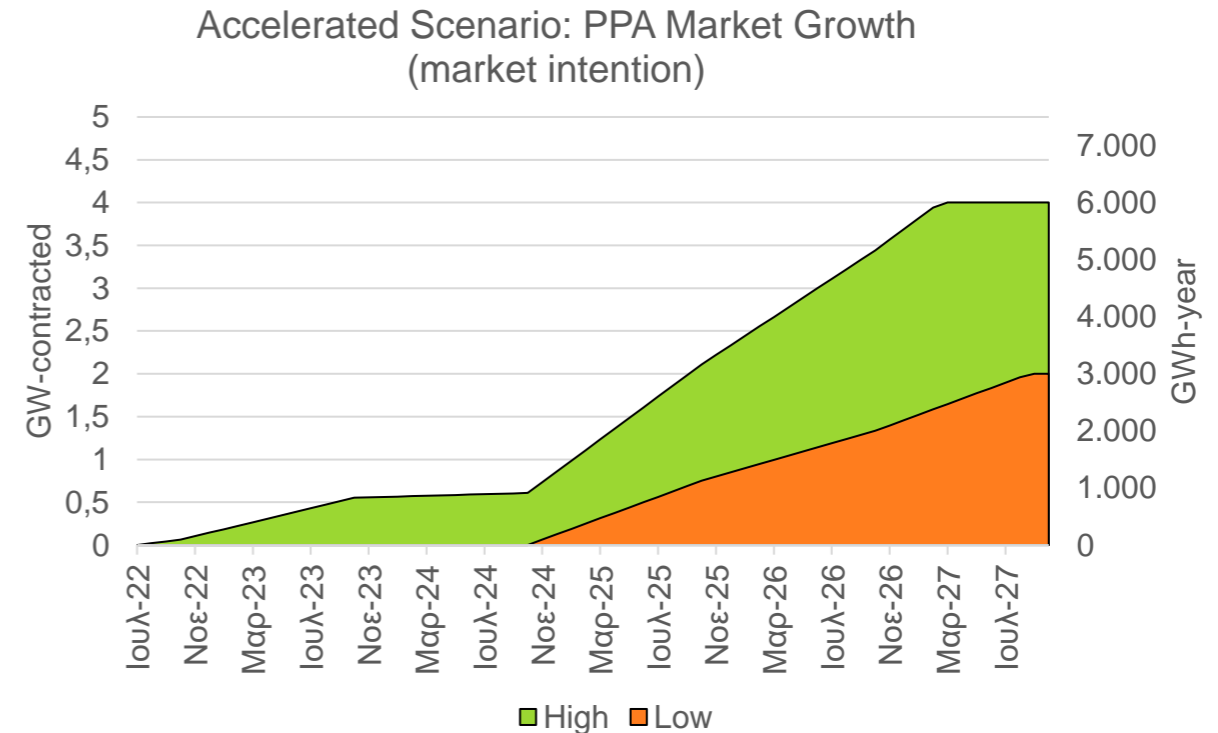
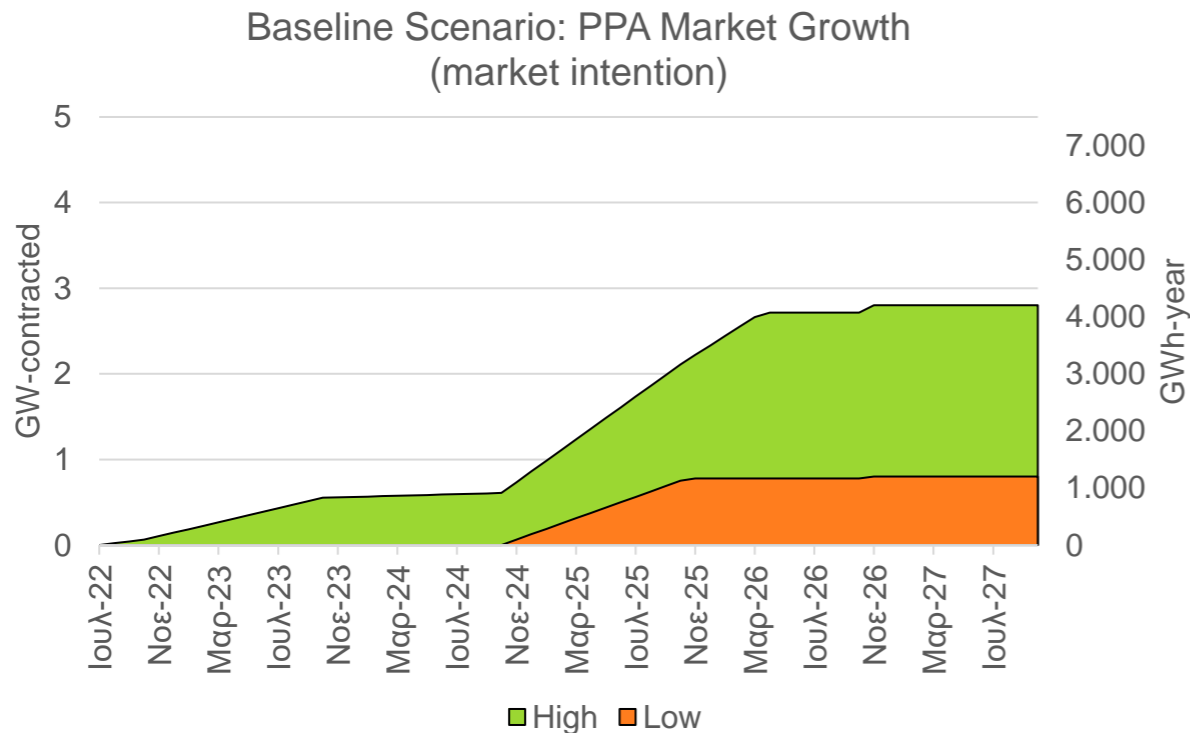
Findings (2/4)

Greek CPPA Market growth

By superimposing demand and supply on the constructed scenarios, the expected low-high range of the overall Greek PPA market is extracted, as shown in the graphs below.

These results indicate the **market's intention**, regarding PPA activation date (CoD of RES project).

- Market's intentions meaning, there is **zero lag between the date of decision over a PPA** (for an under development project), and the **date when the PPA is signed**, which in turn, provides timely funding, timely installation, commissioning, commercial operation.

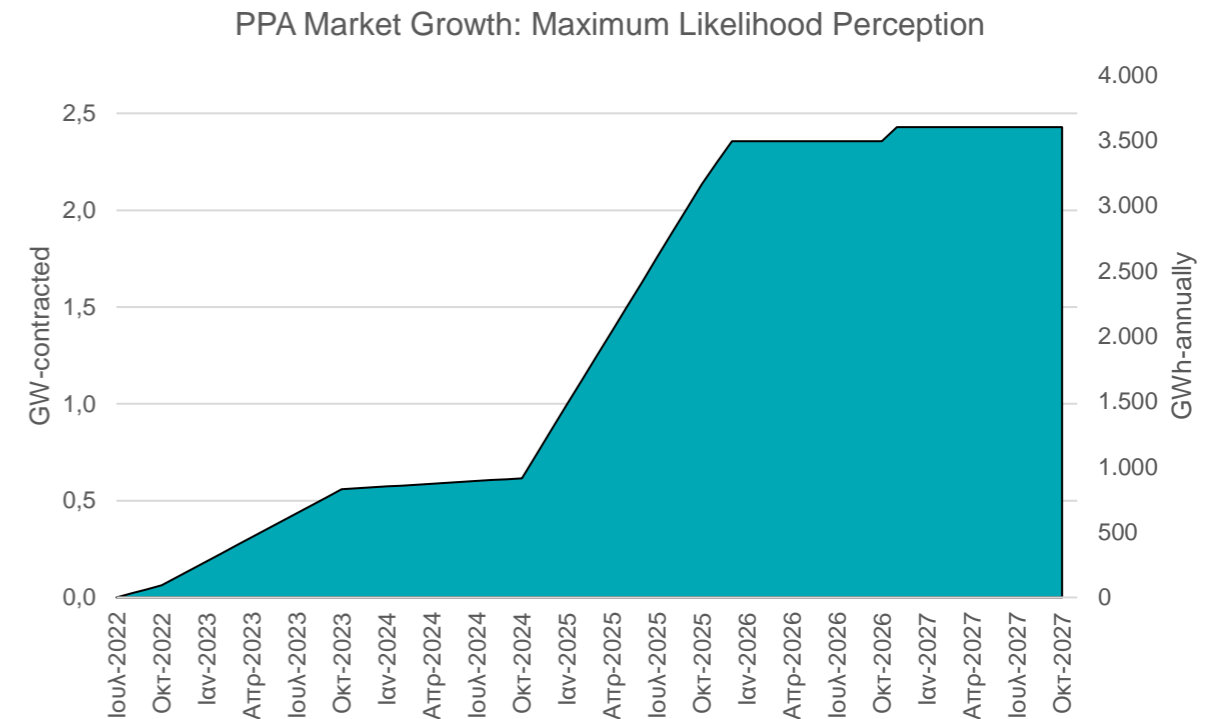


Findings (3/4)

Greek CPPA Market growth

Our “maximum-likelihood” estimation is, that the Greek PPA Market will advance towards the “high” boundary of the Baseline scenario (~ 3.6TWh annually/ ~2.4GW, by Autumn ‘27), because:

- The SARS-Cov2 Pandemic, and the energy crisis and geopolitical turmoil that followed, has triggered **semi-permanent disturbances in the natural gas supply chain**, which will not only need years to recover, but it is highly **questionable** whether it will ever achieve **pro-crisis levels**.
- The resulting high gas and power prices, will continue to push Offtakers towards entering CPPAs for a larger and larger share of their position due to the RES-to-gas price differential.
- Even when the global energy markets stabilize, certainty will be no longer a given, but rather a goal: **RES** provide secure, **low-cost, long-term energy hedging for Offtakers**.

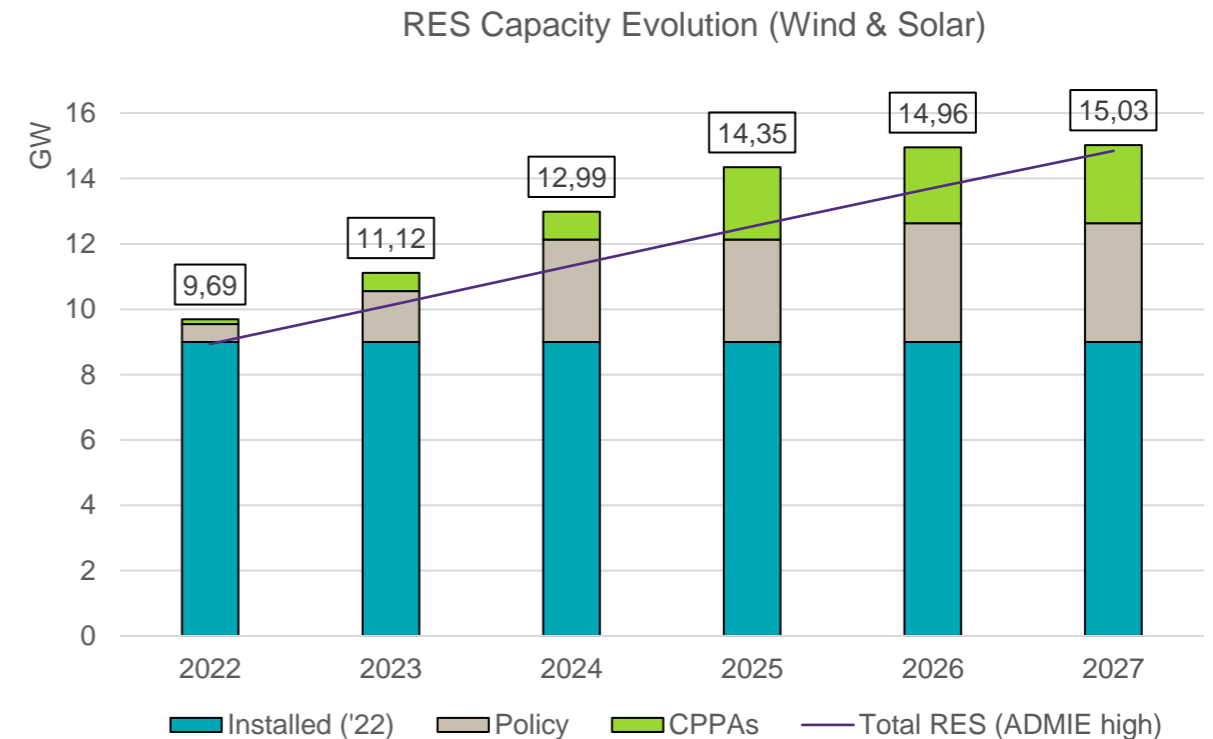
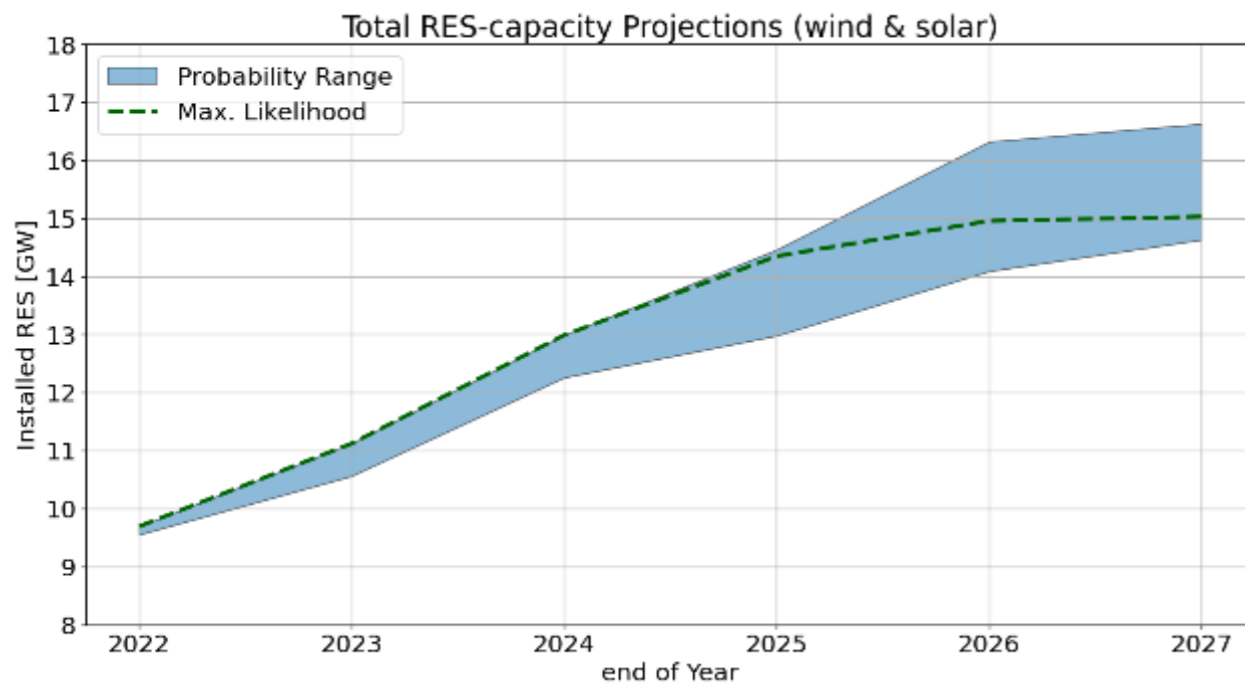


Findings (4/4)

Greek RES Installed Capacity Projections

Our “maximum-likelihood” estimation regarding policy-driven and market-driven RES development in the next 5-year horizon, results to a total **RES capacity of a little over 15GW** (wind & solar), by Autumn ‘27.

- This **discourse with the TSO’s** projections is performed as a “sanity check”, not in terms of methodological approach, but in terms of a **soft benchmark regarding grid integration feasibility.**



Conclusions

Opportunities

Initiatives such as:

- the Green Pool Aggregator,
- PPA contract standardization,
- “match-making” platforms,
- PPA-clearing platforms,

→ are worth -and require- further exploring, since they **could further accelerate** the Greek CPPA market, either by **reducing “frictions”** to an already **present market**, or by **inducing demand** to a less keen market.

→ Thus, **not only providing assisting tools for market growth**, but effectively accelerating the Green Transition and the path **towards a net-zero** electric system.



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