



Greek PV Market Investment Opportunities



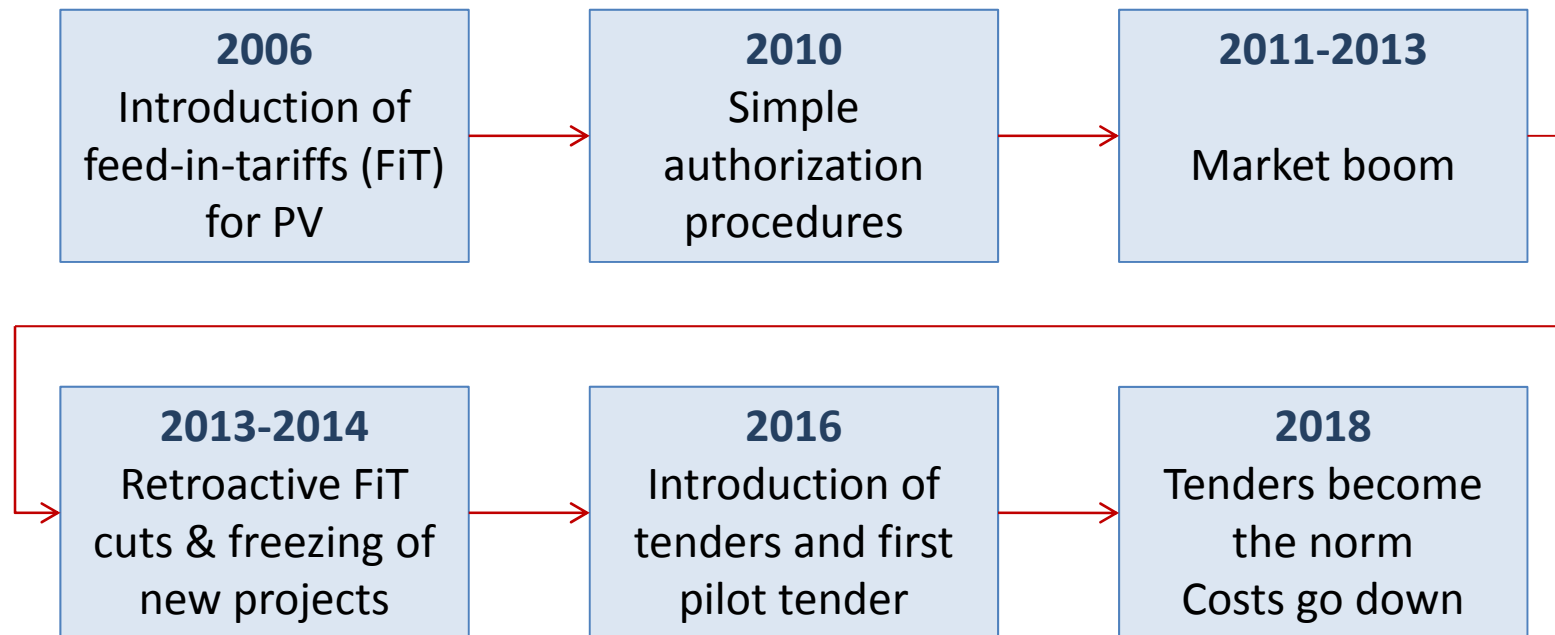
HELLENIC ASSOCIATION OF PHOTOVOLTAIC COMPANIES

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Presentation content

- Status and history of the Greek PV market
- Current developments and opportunities of the Greek market
- Impact and brief overview of the Greek tender program
- Beyond tenders: PPAs and other business models

Milestones of the Greek PV Market



Looking back before leapfrogging to the future

The old RES support scheme based on feed-in-tariffs has worked!

Greece has installed 2.6 GWp of PV with feed-in-tariffs, investing 5 billion € amidst an unprecedented economic crisis.

As a result, **7% of electricity demand in Greece is covered by PV**, bringing Greece to the **third place worldwide** with regard to PV contribution to electricity needs.

Greece also ranks **5th worldwide** with regard to **installed PV capacity per capita**.

The old RES support scheme is not appropriate any more.

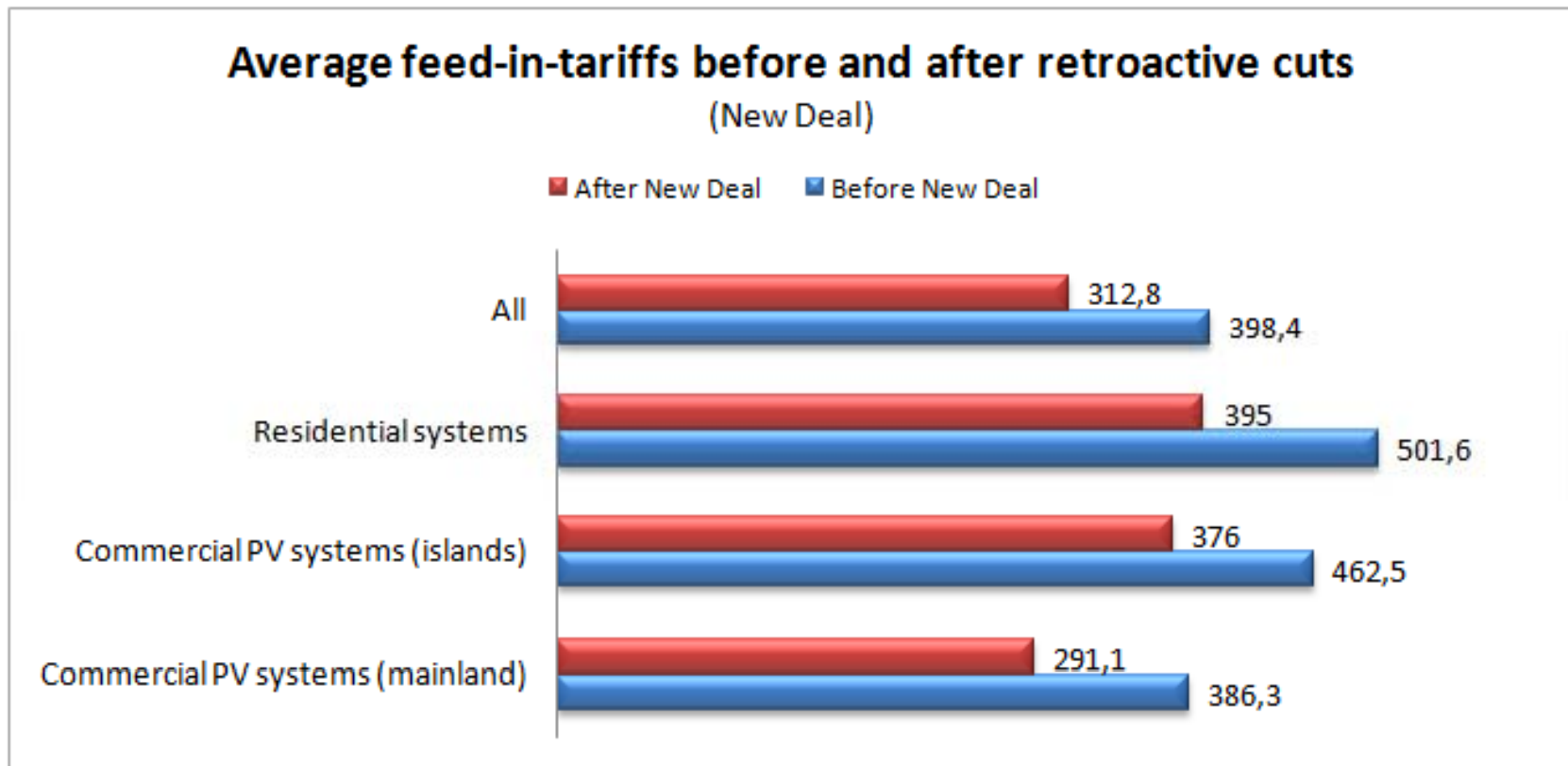
Support at original high levels was not sustainable in the long term. Drastic changes were needed.

Success with a bitter taste

A special account (RES Special Account) was created to administer the feed-in-tariff (FiT) programme whose cost amounted to around EUR 1.7 billion per year in 2014 and 2015 (with a peak of EUR 2 billion in 2013). Under the old programme (valid till August 2016), there were delays of up to eight months in the payment of FiTs to developers, and an accumulated deficit in the RES special account.

In May 2014 a revised support framework for RES was approved by the Greek Parliament. This Law (L.4254/2014), known also as the “**New Deal**”, imposed permanent retrospective/retroactive reductions in the tariffs of operating RES projects spanning all major commercial technologies (wind, PV, small hydro and biomass) in exchange for the extension of the duration of the original PPAs (albeit with lower FITs for the extended period). On average, the reductions were up to 25% for PV (depending on size, region, and date of connection), and 3% to 6% for other RES.

Success with a bitter taste



Staying alive

Despite the retroactive cuts back in 2014, **project returns remained high for asset owners, and the bankability of their projects remained intact.** In fact, even after the FiT reductions, **the PV market in Greece has the lowest non-performing loan (NPL) track record** (there are practically no NPLs in the sector).



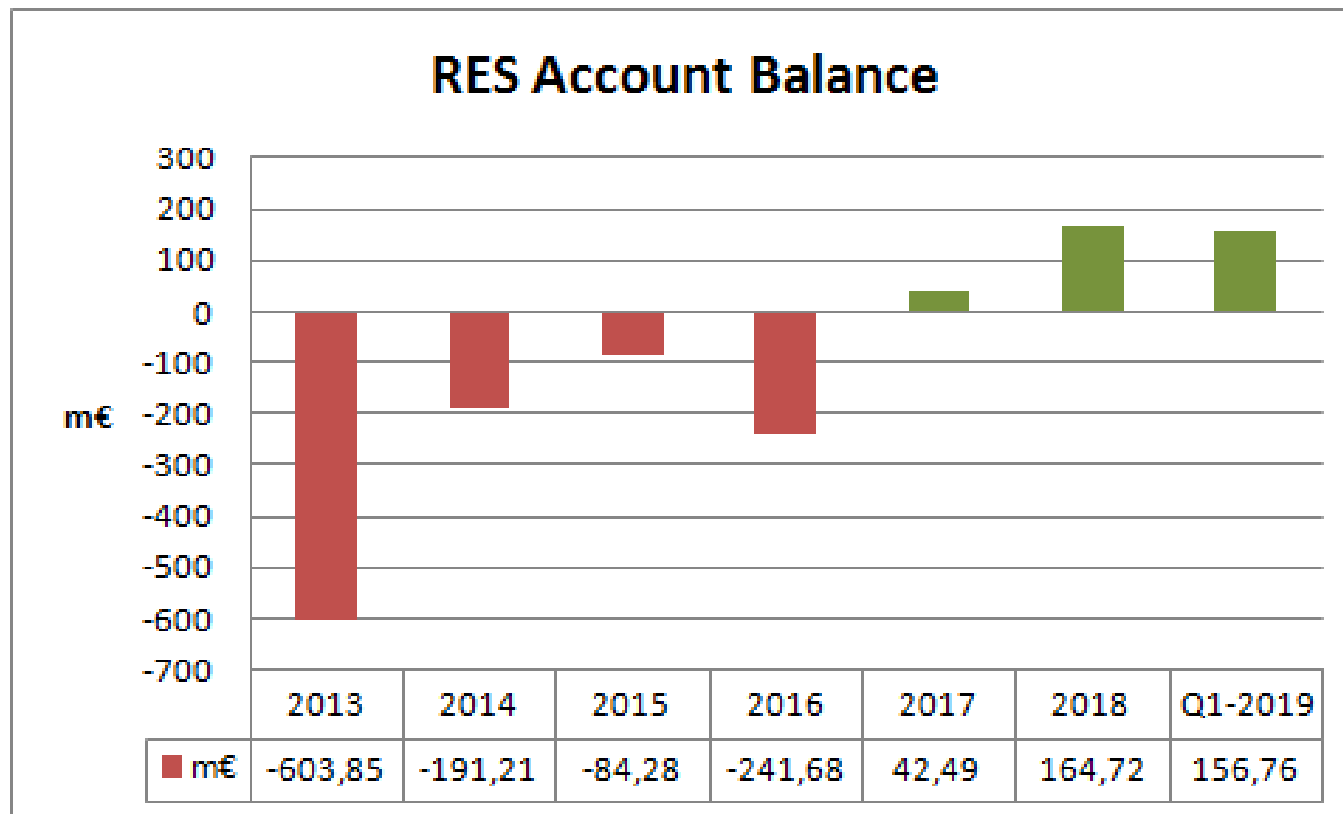
Eliminating regulatory risks

On June 16th 2016, the Greek Government agreed on a Supplementary MOU with its creditors, which tried to put an end to the previous uncertainty. According to this MOU:

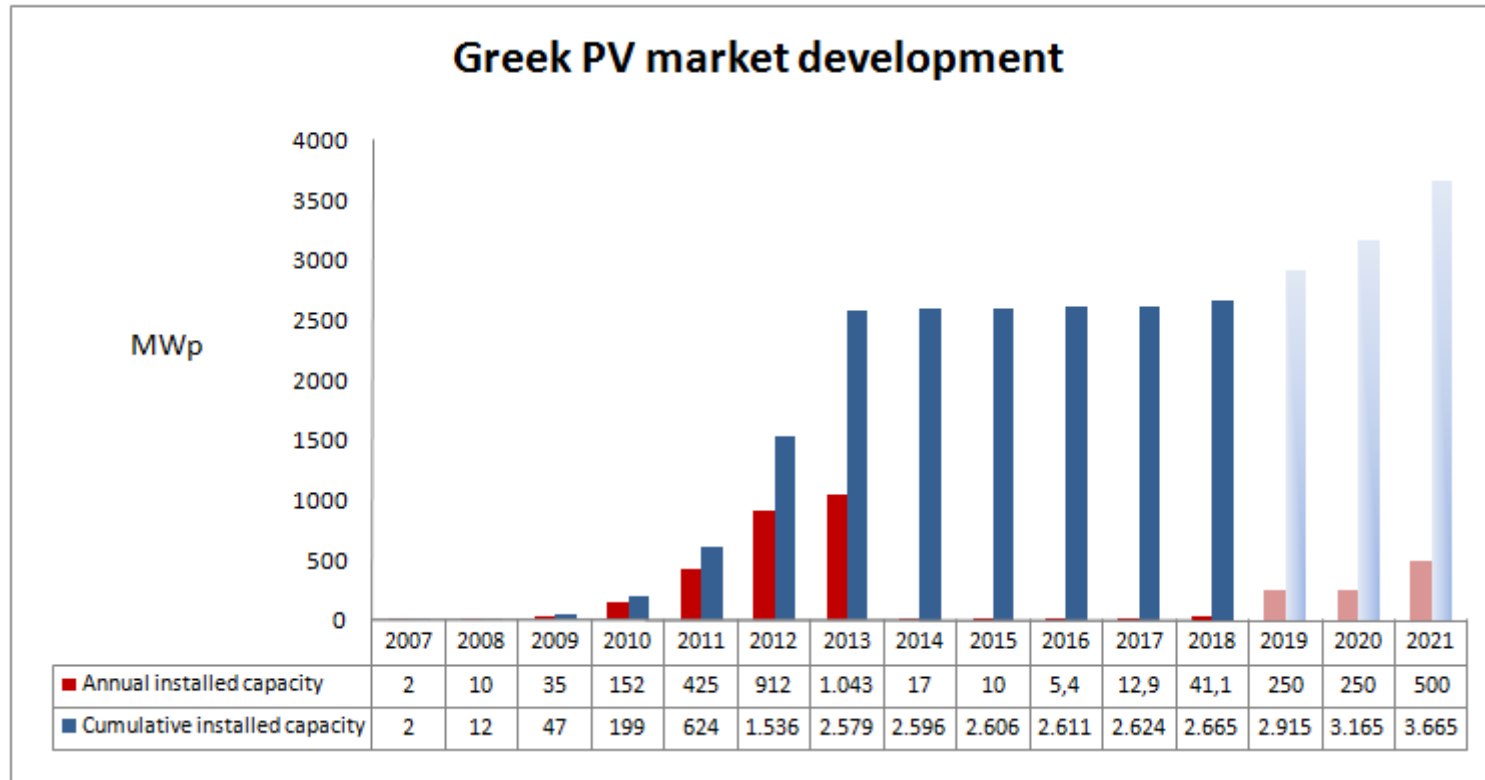
*“By June 2016, the authorities will: ... (iii) as a **milestone** amend the current legislation on ETMEAR and/or the structure of the RES account while **respecting existing contracts** in line with European Union rules, to ensure that the debt in the RES account is eliminated over a 12-months forward looking horizon (not later than June 2017); the account will be kept annually in balance onwards”.*

The RES account had indeed a **surplus** by the end of 2017 and is expected to be kept in balance from now on (a minimum surplus of 70 million € has been set as a buffer).

Leaving the problems behind



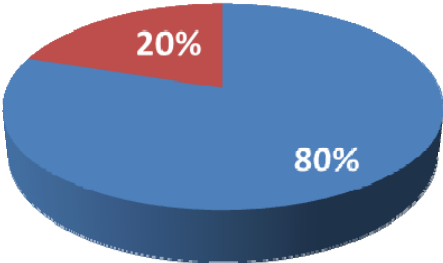
Market development



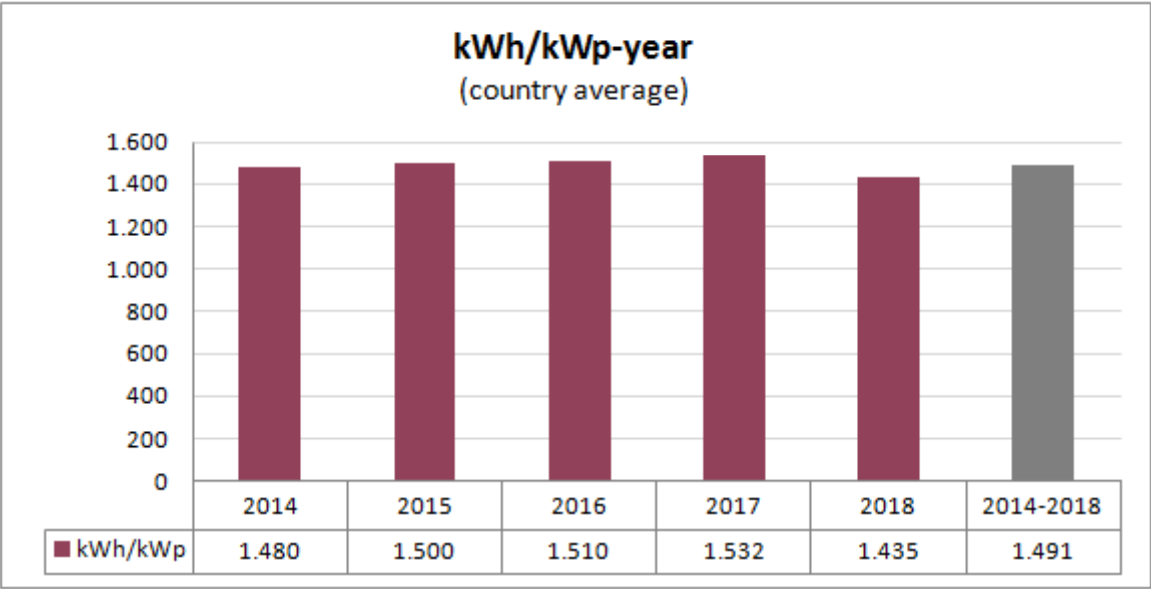
Market segments

PV categories

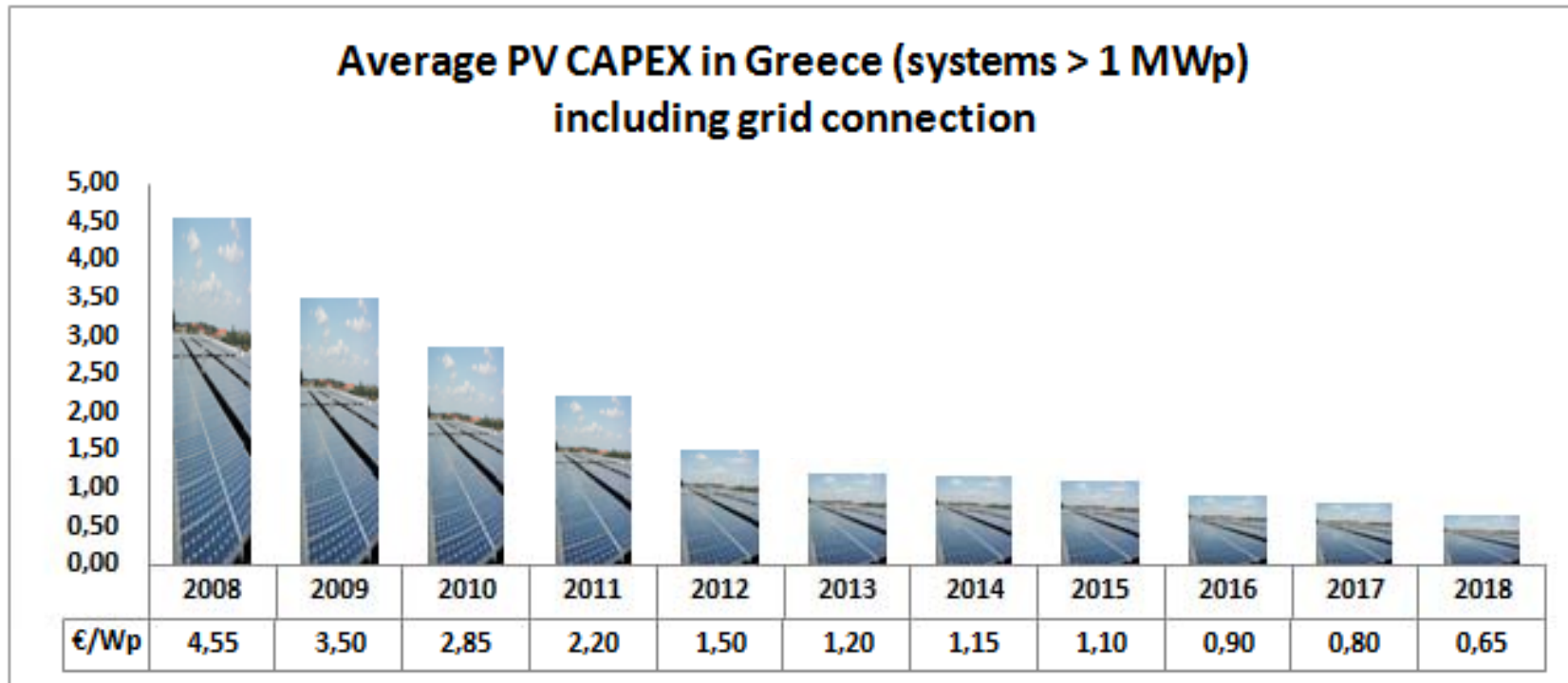
■ Ground-mounted ■ Rooftop



kWh/kWp-year (country average)



Average PV CAPEX



PV has become competitive

PV has become the least cost power option available!

The levelized cost of new PV energy in Greece is lower than the levelized cost of new lignite and gas-fired power stations. This was unimaginable a few years ago.

Greece has also a **self-consumption scheme (net-metering)** in place for residential and commercial applications systems (up to 1 MWp).



Long-term energy planning

A long-term energy planning is currently underway in Greece.

Preliminary target for cumulative PV capacity till 2030: **6.9 GWp**

This translates to an average annual market of 350-400 MWp (2019-2030).



Unfreezing the market



Auctions in place

A **new support scheme** for renewable energy, consistent with the Guidelines on State aid for environmental protection and energy 2014-2020 (and based on competitive tenders and feed-in-premiums) was introduced in 2016.

Auctions for PV		
H2- 2019	PV	430 MW
2020	PV	2019 leftover plus 300 MW
	Common PV/Wind	500 MW

Auctions results

AVG (€/MWh)	PV<1MW	20MW>PV>1MW	PV>20MW	Wind
2016-1	98,78	83,3		
2018-1	78,42	63,81		69,53
2018-2	66,66			58,58
2019-1			56,5	60
2019-2	62,78			67,32

MIN (€/MWh)	PV<1MW	20MW>PV>1MW	PV>20MW	Wind
2016-1	94,97	79,97		
2018-1	75,87	62,97		68,58
2018-2	63			55
2019-1			53	60
2019-2	61,95			59,09

As of 2019, the first two categories for PV (<20 MW) have been merged.

Auction rules

Pre-Qualification Criteria for tenders

Although in the future RES projects at an earlier stage of development might be eligible to participate in tenders, RAE (the competent authority for auctions) has ruled that, for the time being, **all project owners must have secured a Production License (required for systems >1 MWp) and a Connection Agreement or a Final Grid Connection Terms Offer, both in force.** An **environmental permit** is also needed in order to get a Grid Connection Terms Offer.

Deadlines for completion of projects

12 months for PV systems with a capacity $PPV \leq 1 \text{ MW}$

15 months for PV systems with a capacity $1 \text{ MW} < PPV \leq 5 \text{ MW}$

18 months for PV systems with a capacity $5 \text{ MW} < PPV \leq 20 \text{ MW}$

A **six month additional extension** to each of these deadlines is provided for those projects connected to the grid via a substation.

Financing PV projects in Greece

Greek Banks offer the following terms for PV financing:

- Long-term loan up to 80% of investment cost.
- Tenor: 10-14 years.
- Interest rate: euribor plus 3.5%-4% (including fees).
- Taking account of the reduction in CAPEX and OPEX, **an unlevered project IRR of 9%-10% is to be expected for 2020 and beyond, and a double-digit IRR for levered projects.**

EU Target Model, subsidy-free PV projects, corporate PPAs and storage

The **EU Target Model** will become effective in Greece as of H2-2020. PV projects will have to participate in the energy markets that will operate as of next year, and especially the Balancing Market.

When this market becomes operational, **corporate PPAs** will also become effective, opening new opportunities for PV investors, as the levelized cost of PV projects is already competitive to wholesale prices. Many industrial consumers are looking forward for this new business model.

The other market which will be of particular interest after 2020 is the **PV plus storage market**. There are already many applications for hybrid projects in the non-interconnected islands, but there is certainly a need for in front of the meter projects in the mainland as well. The regulatory framework for storage will be finalized in 2020.

Is there a secondary PV market in Greece?

Not really...

- There are no large PV portfolios in Greece. Asset ownership is highly dispersed.
- There is no willingness to sell operating PV plants.
- There are a few transactions however but this is not a key issue for the market.

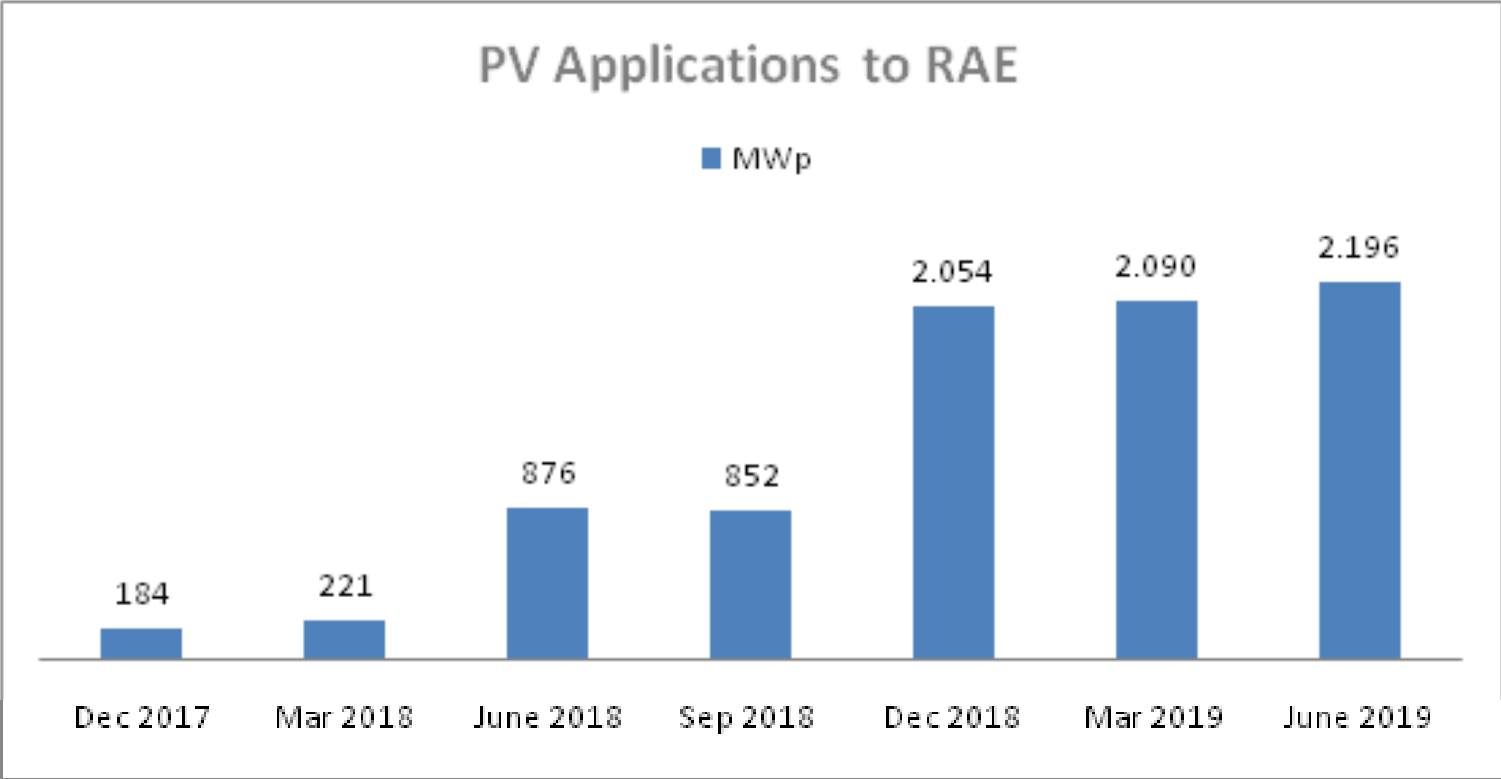
It is hard to even find mature licensed projects in order to participate in the auctions.

Most realistic path: develop own projects from scratch.

The current pipeline of PV projects

PV applications to RAE		
ROUND	#	MWp
Dec 2017	15	184
Mar 2018	27	221
June 2018	77	876
Sep 2018	93	852
Dec 2018	140	2.054
Mar 2019	170	2.090
June 2019	126	2.196
	648	8.473

The current pipeline of PV projects



Positive changes on the way?

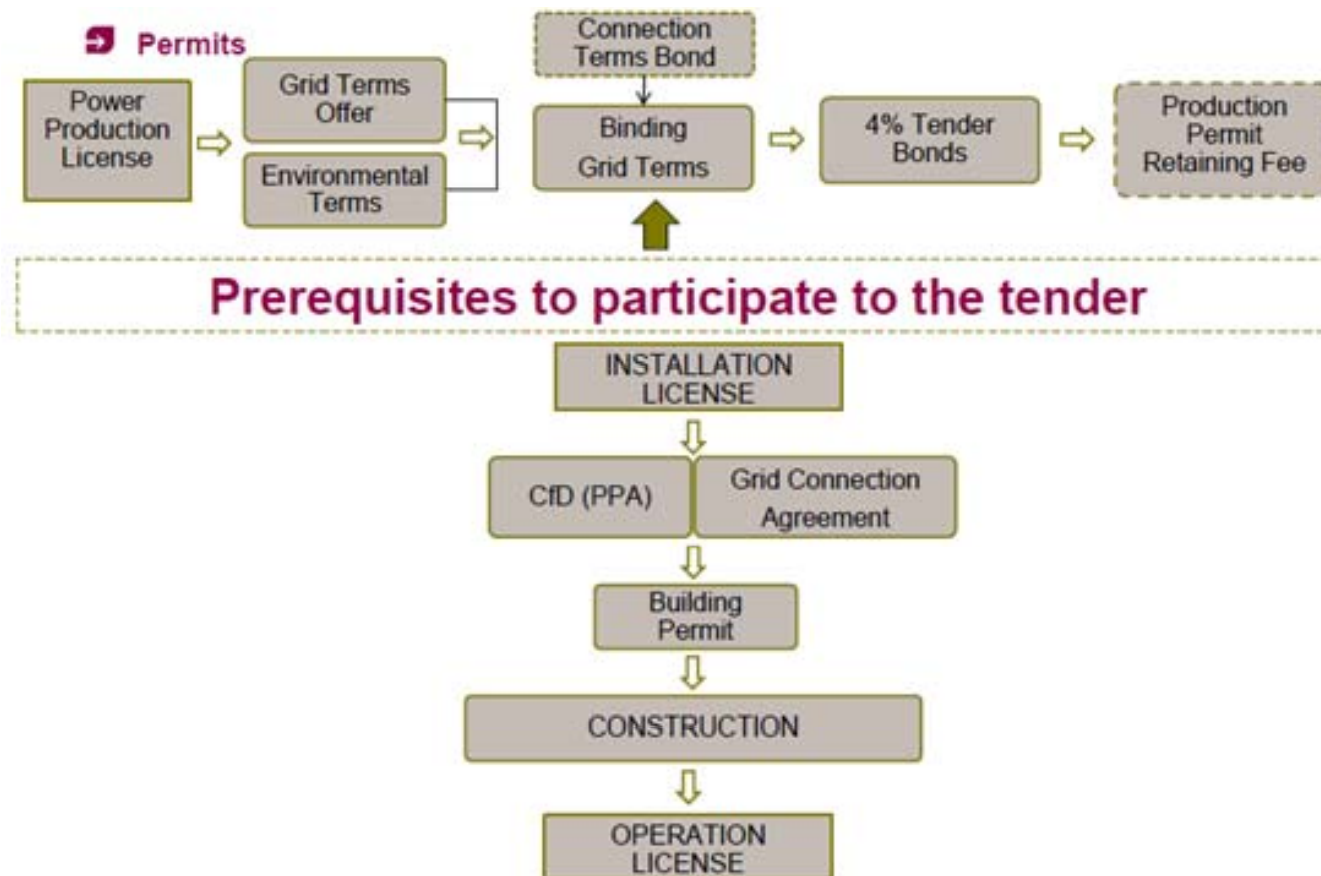
The long-term energy plan foresees measures for the simplification of authorization procedures.

Market proposals:

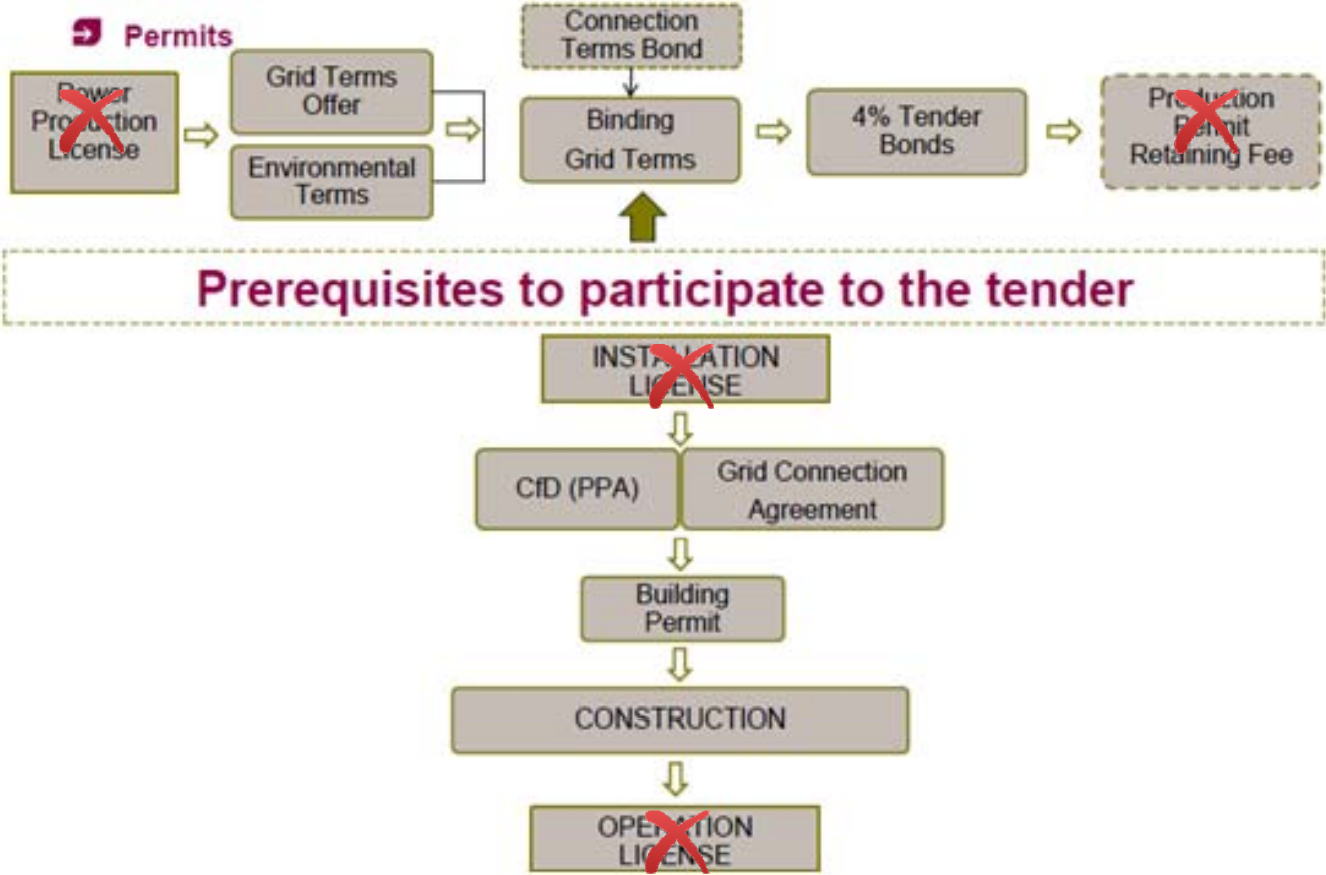
No real need any more **for** issuing a **'Production License'** and, consequently, **'Installation'** and **'Operation'** permits. The new auction scheme procedures can guarantee any needed controls by competent authorities. Abolishing these unnecessary permits will save time (at least 2 years) and money for investors and will improve effectiveness and productivity of regulatory authorities. The same is true even if one decides not to participate in auctions but rather participate in the wholesale market or sign private PPAs.

Streamlined environmental permitting based on existing 'Standard Environmental Terms' valid for all PV power stations. A 'Declaration of Conformity' to these standards would suffice. This again would save time and money. **Land use issues** should also be resolved, lifting unnecessary obstacles for PV deployment.

Current PV authorization scheme



Proposal for a simpler authorization scheme



The most valuable asset

Greece produces mounting systems and trackers, transformers, cables, telemetry software and communications equipment needed for PV deployment.

The most valuable asset however is the **experienced companies and staff with know-how in developing and delivering PV projects**. Greek PV companies are currently active in Turkey, Romania, Bulgaria, Italy, US, Latin America, Australia, Africa and the Middle-East.



