

Athens 30 Nov – 1 Dec 2023

RENEWABLE ENERGY INVESTMENT & ASSET MANAGEMENT CONFERENCE 2023

RENEWABLE ENERGY
INVESTMENT & ASSET MANAGEMENT
CONFERENCE

REIA 2023

30 Nov – 1 Dec 2023, Athens

brought to you by The Voice of Renewables

www.reiaeurope.com

#reiaeurope



Greek RE market and investment climate updates

Dr. Stelios Loumakis

PhD Engineer NTUA

Chemical Engineer NTUA

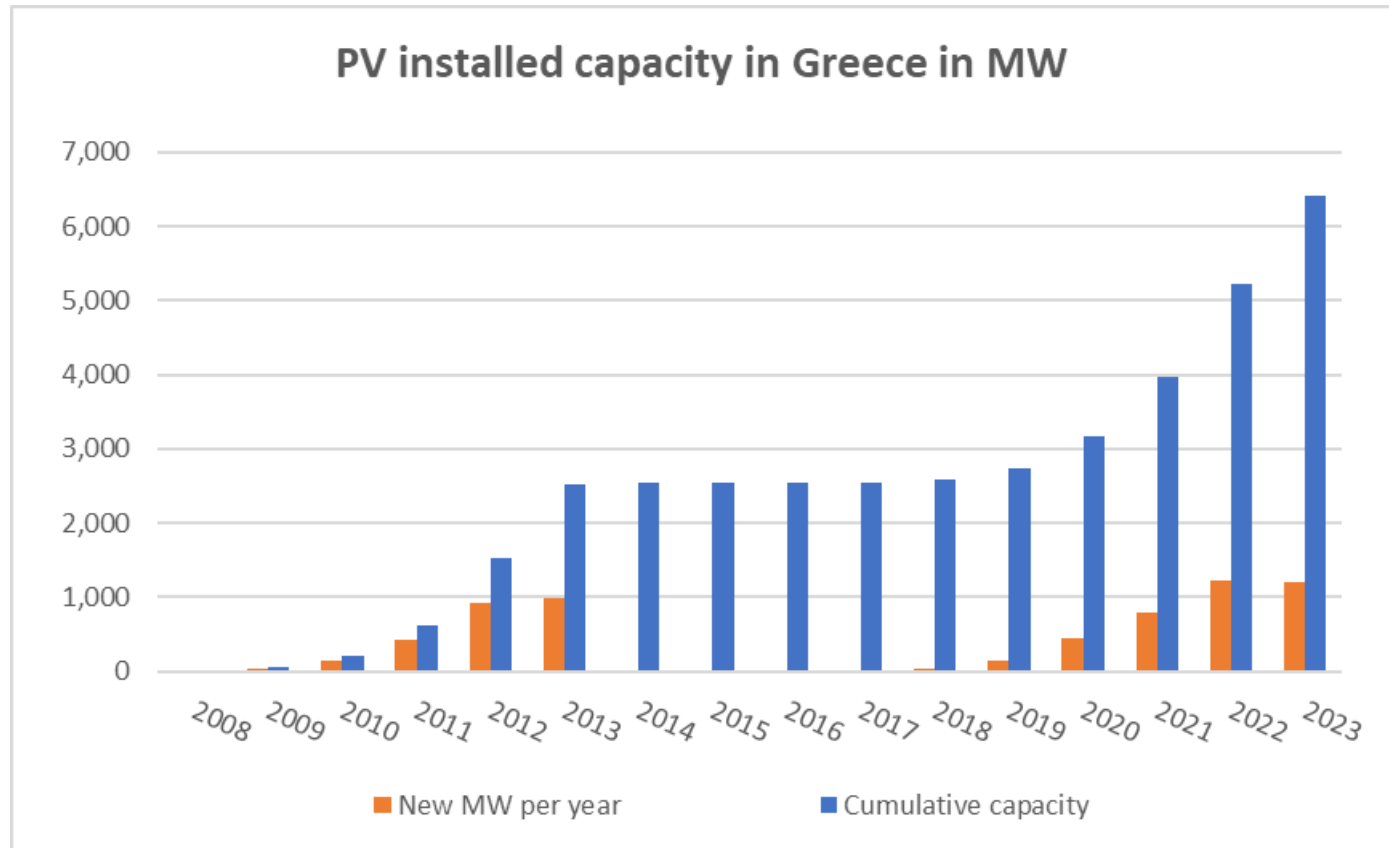
MBA, University of Portsmouth UK

President of the Hellenic Association of Photovoltaic Energy Producers (www.spef.gr)

steliosloumakis@gmail.com



PVs in Greece



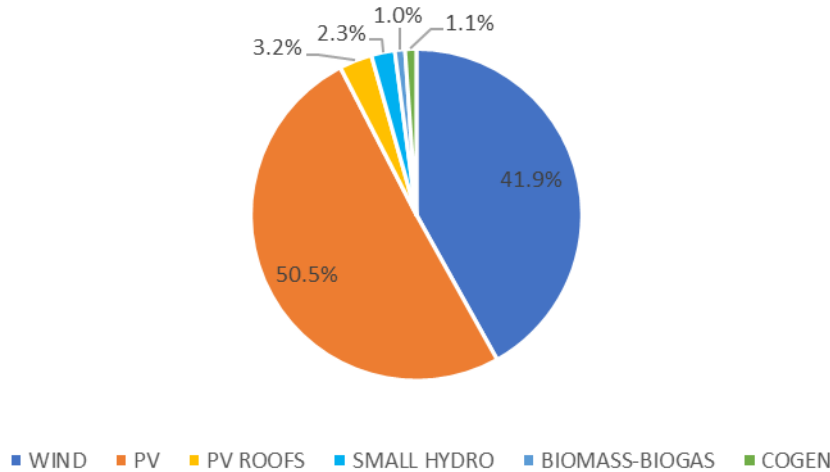
*2023 estimate

The PV market after its collapse during 2013 due to financial reasons in the RES Account, it started again after 2018.

RES Capacity and Energy Shares in Greece



Installed Capacity Shares



~21 TWh of RES production -2023

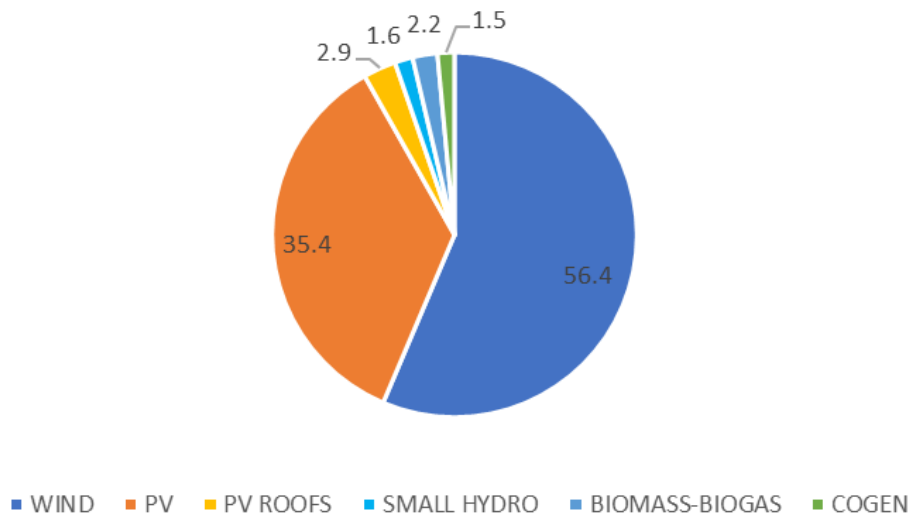
~12 GW RES capacity in operation

Plus, another ~15 GW in issued connection terms

Plus, another ~35-50 GW waiting for connection terms

Plus, a program of 2 GW of residential PVs

Energy Produced Shares



In terms of energy, RES + Big Hydro have reached 50% of total electricity consumption in Greece. Power demand in real time terms in Greece is aprox. between 6 -9 GW.

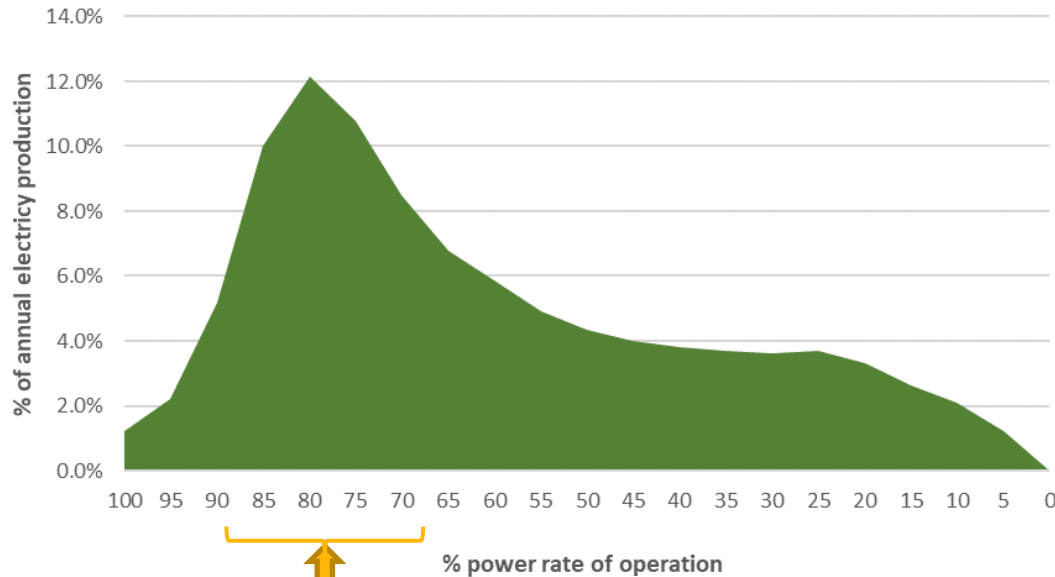
According to new NECP the RES target for 2030 is 23.5 GW plus 3.8 GW Big Hydro.

Today's RES + Con. Terms + resid. PVs > NECP 2030 Target and consumption

PV electricity production distribution Vs operation % rate (SPEF Study)



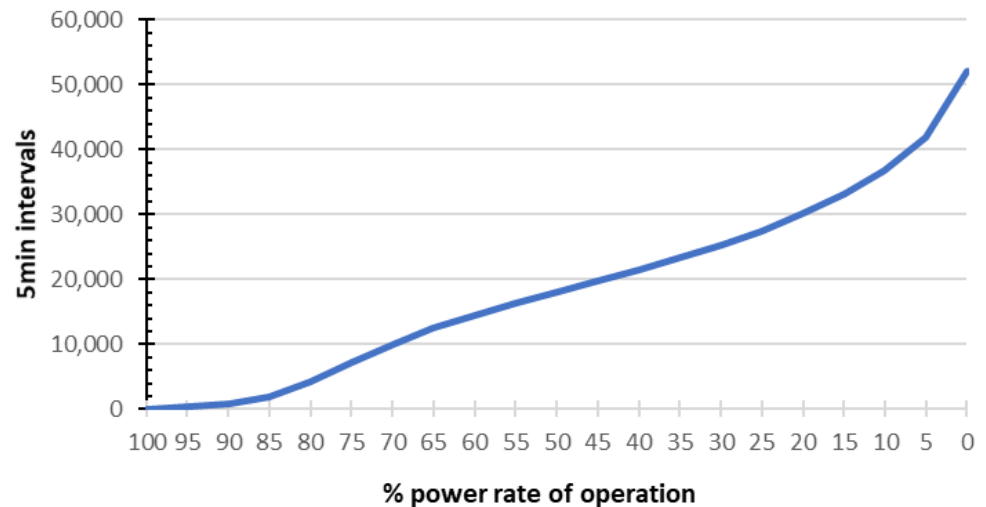
Typical PV electricity production



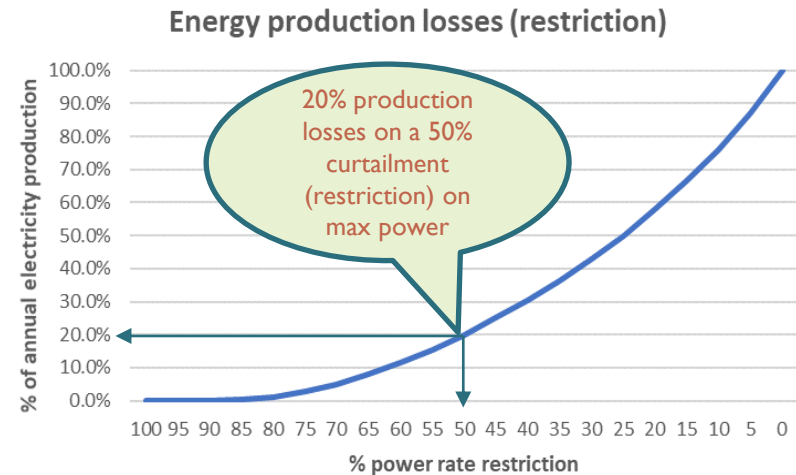
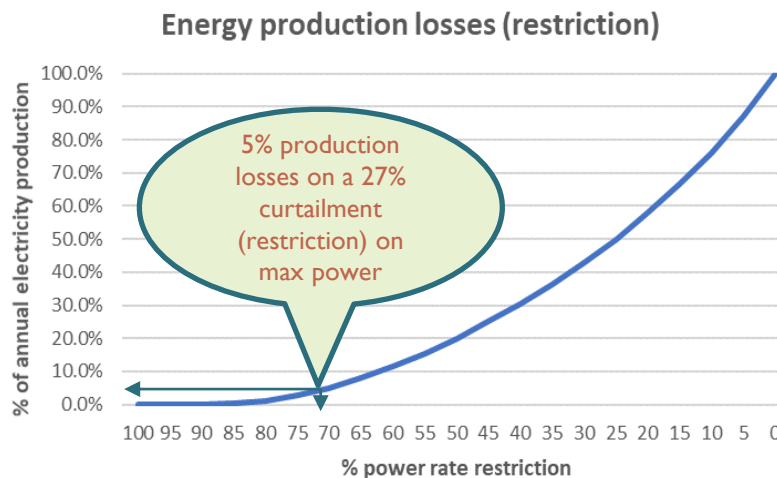
Most of annual electricity production of a typical PV plant*.

*Typical PV plant means fixed basis, 25° inclination and 1,500 MWh/MW specific annual production

Number of 5 minute intervals of typical PV operation



Energy production losses Vs % power rate restriction (curtailment) in a typical PV plant in central Greece



Blue curves are from a SPEF study based on real production data of PV plants in Central Greece and represent energy production losses at different restriction rates varying from 0 – 100%.

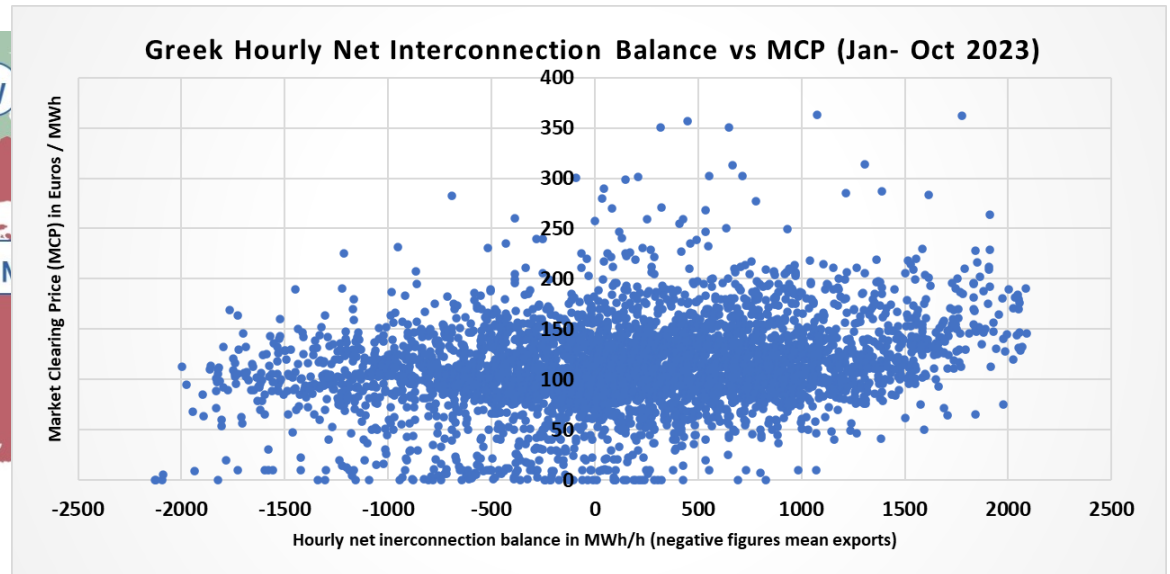
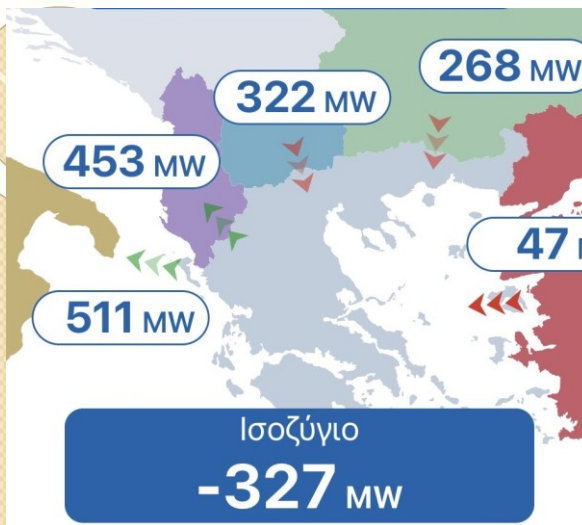
The Ministry of Energy aiming to exploit electrical space in the grids, has introduced -for new connection terms issued after law 4951/2022, a restriction of PV operation at -27% of its maximum, leading to an annual energy losses of 5%.

The Ministry of Energy has announced that for new connection terms in PV plants restriction rate (curtailment) will increase at 50%, leading to an annual energy production loss of 20% and will be combined with increased tariffs.

As an alternative a BESS (battery storage) unit of at least 1 hour capacity can be combined to save the energy loss.

However, it seems that curtailments are more cost effective than BESS in most of the cases and especially in small-medium sized projects.

Can electricity exports be the way to go for overcapacity



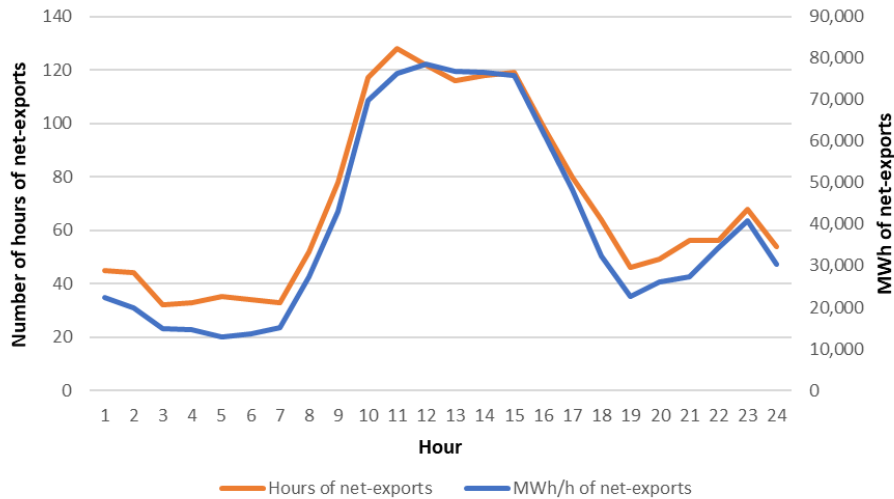
SPEF study

1. During Jan-Oct 2023 Greece, by processing the hourly data from the ADMIE database, Greece showed a net export balance of interconnections within 175 days out of a total of 304 in the period and in this case in 1,678 of them.
2. For the sake of completeness, the diagram also shows the net import hours during these 175 days.

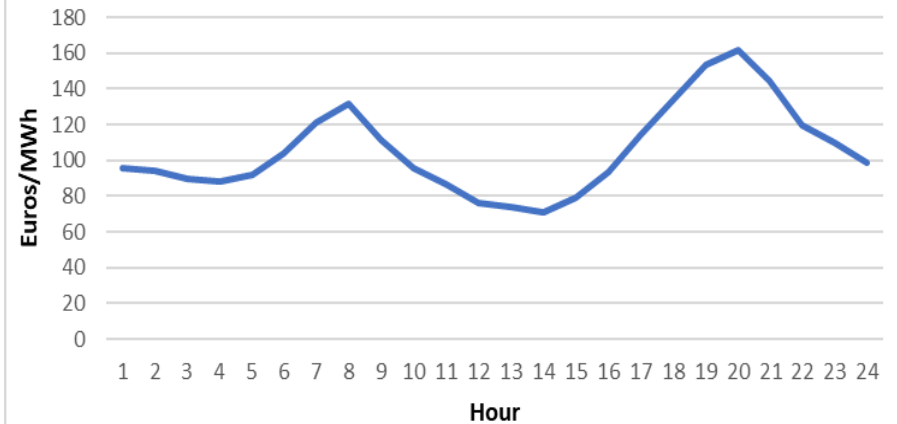
The profile of Greek net-exports Jan-Oct 2023 (SPEF study)



Hourly Net-Exports Profile Jan - Oct 2023

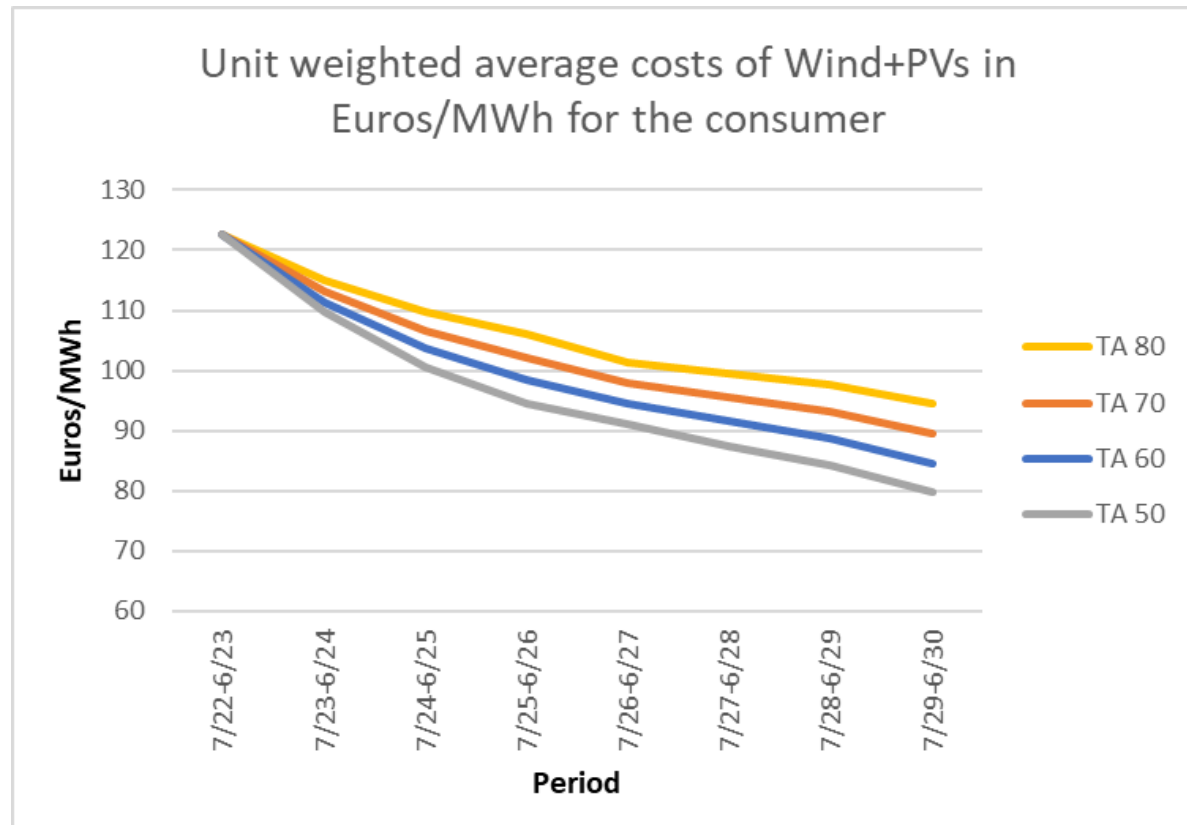


Hourly weighted average unit price per MWh of net-exports



Jan - Oct 2023	Hourly net-exports
Total net-exports MWh	962,125
Value of total net-exports	94,669,431
Weighted average unit price of net-exports in Euros/MWh	98.40

Evolution of unit cost of Wind+PV for the consumer



According to NECP plan for 13.4 GW totally PVs plus 9.5 GW totally Wind farms in 2030 and for different scenarios of remuneration prices (TA) for new entrants.

Higher remuneration tariff (TA) scenarios incorporate curtailment cost or BESS.

Challenges and opportunities

- In most of the cases a battery storage (BESS) system of an adequate capacity (i.e. 2 hours capacity at $\geq 50\%$ of the nominal power of the PV plant), doubles the cost of the overall installation CAPEX. This means that at operational level and if there is no state aid for the CAPEX of the BESS, a need for doubling the Tariffs arises (at least for non vertical players).
- Without BESS, a curtailment rate of 50% of maximum PV power leading to annual energy production loss $\sim 20\%$, seems more cost effective than BESS. An increase in tariffs of 25% can financially fully offset the 20% loss of the curtailment. However, curtailments cannot help to energy shifting.
- Electricity exports constitute a policy of national and energy independence, however, economic conditions are crucial for their mid- to long-term sustainability and benefit of the relative investments.
- Net exports of the period Jan – Oct 2023 with an average income of 98.4 euros/MWh do not appear to cover the fundamental costs of the period's electricity generation from RES (122 Euros/MWh) nor from conventional electricity from thermal units (>150 euros/MWh).
- Merit-Order-Effect with the “zero” pricing in the wholesale market of RES operating under FIT, FIP, CfD or PPA schemes will continue to cannibalize market clearing prices, more aggressively compared to the reducing cost of RES, posing this way barriers to exports and RES.

Challenges and opportunities

- The mismatch between the actual cost of electricity production and prices in the wholesale markets due to RES, is a European regulatory challenge and not only Greek. Storage facilities can help mitigating it, but BESS cost is still too high.
- Vertical players combining production and retail at a balanced mixture, enjoy best protection against wholesale market risks (curtailments, negative prices etc), since they practically sell their electricity production to final consumers at retail prices, that are offering much higher margins.
- Vertical players are neutral against negative wholesale prices (they just reverse a cashflow that in any case equals to zero when the mixture between production and retail is balanced), while for simple producers consist the ultimate barrier that oblige them to stay out of the market.

RENEWABLE ENERGY INVESTMENT & ASSET MANAGEMENT CONFERENCE

REIA 2023

30 Nov - 1 Dec 2023, Athens

brought to you by The Voice of Renewables

www.reiaeurope.com

#reiaeurope



Thank you!

Dr. Stelios Loumakis

PhD Engineer NTUA

Chemical Engineer NTUA

MBA, University of Portsmouth UK

President of the Hellenic Association of Photovoltaic Energy Producers (www.spef.gr)

steliosloumakis@gmail.com