

Mapping of national investment needs for achieving green transition needs by 2030 and the catalytic role of the RRF Loan Pillar

Insights on RES generation and storage



Introduction

The announcement of the tentative targets of the NECP in January 2023 sets the technical and economic framework under which the Greek energy domain will be examined in the following years. A review of the preliminary figures included in the new NECP emphasizes the importance of green transition and renewable energy while indicating the necessity of increasing investment activity and utilizing the full range of investment tools available in Greece in order to achieve national and EU energy related targets.

The Recovery and Resilience Fund (RRF) is one of the most important investment tools in the effort of the country to reduce its dependency on fossil fuels and move to a new reality, where the energy mix will be dominated by Renewable Energy Sources (RES) supported by flexible energy storage units while integrating electrolyzers for the production of green hydrogen, without neglecting the crucial role of transmission and distribution networks.

The crucial role of the RRF for RES development can be easily demonstrated by assessing its participation in the development of PV and Wind projects until now. The scheduled RES capacities (considering the latest published information of ADMIE and DEDDIE) are estimated at 6 GW for PVs and 1.7 GW for Wind projects. The RRF supports 46.6% of the scheduled PV capacities and 29.7% of the scheduled Wind capacity through loans. In parallel, the RRF supports investments in other RES forms (biomass, biogas, small hydro) as well as the 680 MW hydro-pumping station of Amphilochia which is the largest investment in energy storage systems for Greece. This project is supported both with grants (38.5% of investment) and loans (11.5% of the investment).



At the same time, the RRF fully supports investments in battery energy storage systems (both utility scale and small scale) with total capacities that could reach 1,200 MW. This outlook underlines the value and power of the RRF as an investment tool capable of achieving the energy transition, especially considering the fact that it also includes support for the development of electricity grids which is a prerequisite for increasing RES penetration while assuring security of supply.

Furthermore, in order to achieve the tentative 2030 targets set by the new NECP, a total additional (on top of the existing) capacity of 24.3 GW of RES, Storage and Electrolyzers needs to be installed. Considering that some of these projects have already been scheduled for development, it is estimated that another 2.9 GW of PV and 0.85 GW of Wind will need to be developed. These projects alone have CAPEX needs of approximately 2.97 bn euros. Investment needs are further increased when accounting for the 2030 target of 2.7 GW for offshore wind, which require approximately 4.86 bn euros in terms of CAPEX. In addition, another 3.08 bn euros are required to reach the tentative 2030 target of 5.6 GW battery energy storage. Thus, the total investment needs for 2030 are estimated close to 15.5 bn euros accounting also for hydro generation, hydro-pumping, electrolyzers etc.

The RRF is a well-tested investment tool that can be used for achieving the tentative 2030 targets set by the new NECP. These targets formulate a huge investment plan of up to 15.5 bn euros which may even be increased to 20.2 bn euros when accounting for scheduled RES projects that have not yet received RRF support. The full utilization and further development of this tool is a challenge for Greece, since it can guarantee the country's green transition, reduce dependency on natural gas and increase security of supply.



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Methodology



The present analysis focuses only on the generation side and does not provide insight on transmission and distribution needs.

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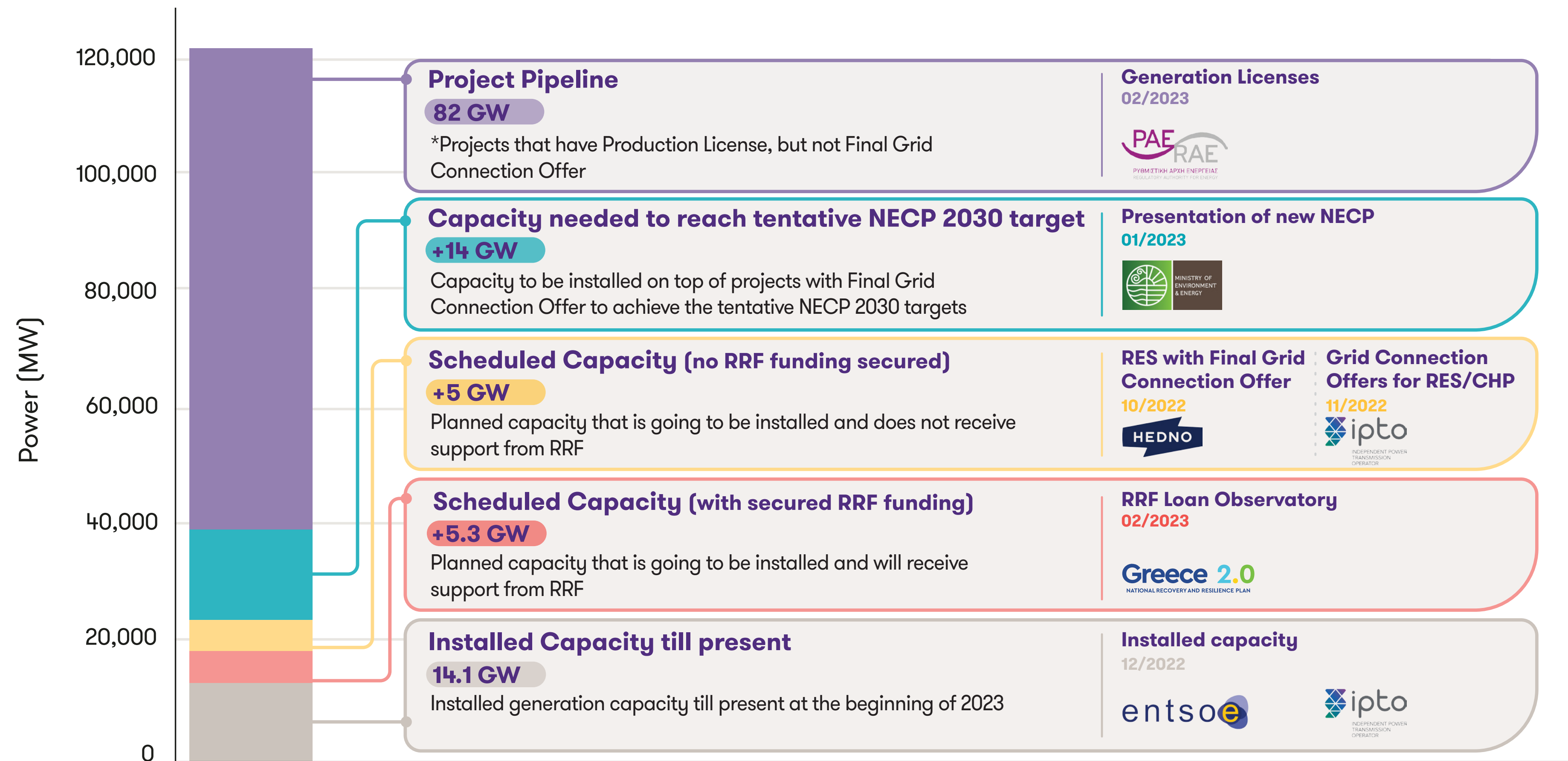
Detailed analysis

	Installed Capacity (MW)	Scheduled Capacity (MW)	RRF funding of scheduled capacity		Needs to reach NECP 2030 target (on top of scheduled capacity)	CAPEX assumption (€/kW)	Required CAPEX to reach NECP 2030 target (on top of scheduled capacity)
 Solar	5,150	6,040	46.6% / 2.81 GW	Loans (and grants for small PVs)	+ 2,910 MW	700	2.04 bn €
 Wind	4,516	1,738	28.5% / 517 MW	Loans	+ 846 MW	1,100	0.93 bn €
 Batteries	-	1,200	100% / 1200 MW	Grants	+ 4,400 MW	700	3.08 bn €
 Hydro-pumping	700	680	90% / 680 MW *Amphilochia	Loan and grant	+ 1,120 MW	1,800	2.02 bn €
 Offshore wind	-	-	-		+ 2,700 MW	1,800 @2030	4.86 bn €
 Other RES	590	324	5.1% / 16.7 MW	Loans	-	1,900	-
 Hydro	3,170	272	-		+ 558 MW	1,800	1 bn €
 Electrolyzers	-	20	100% / 20 MW	Grants	+ 1,180 MW	800	0.94 bn €
 P2X	-	-	-		+ 300 MW	2,200	0.66 bn €

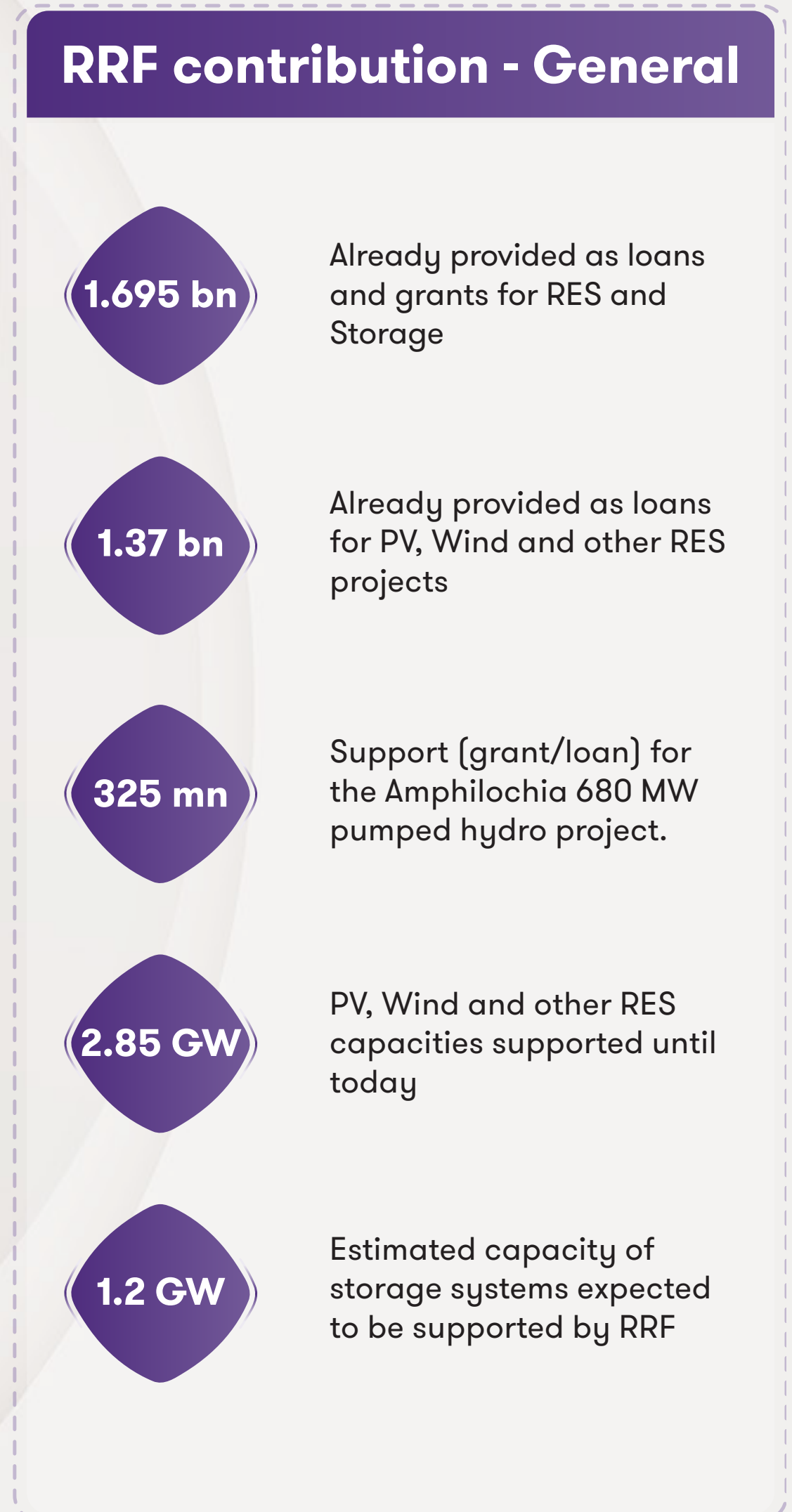
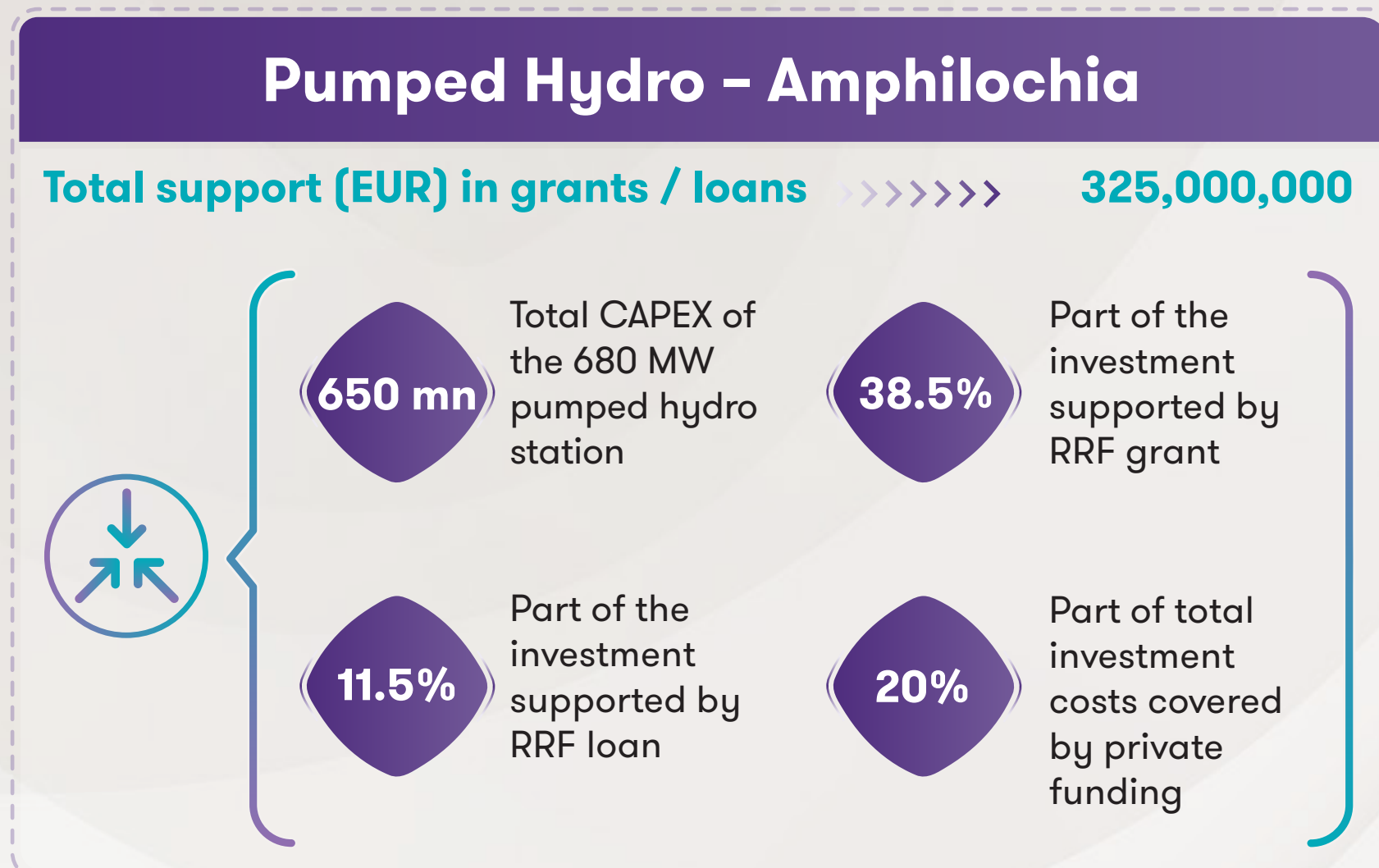
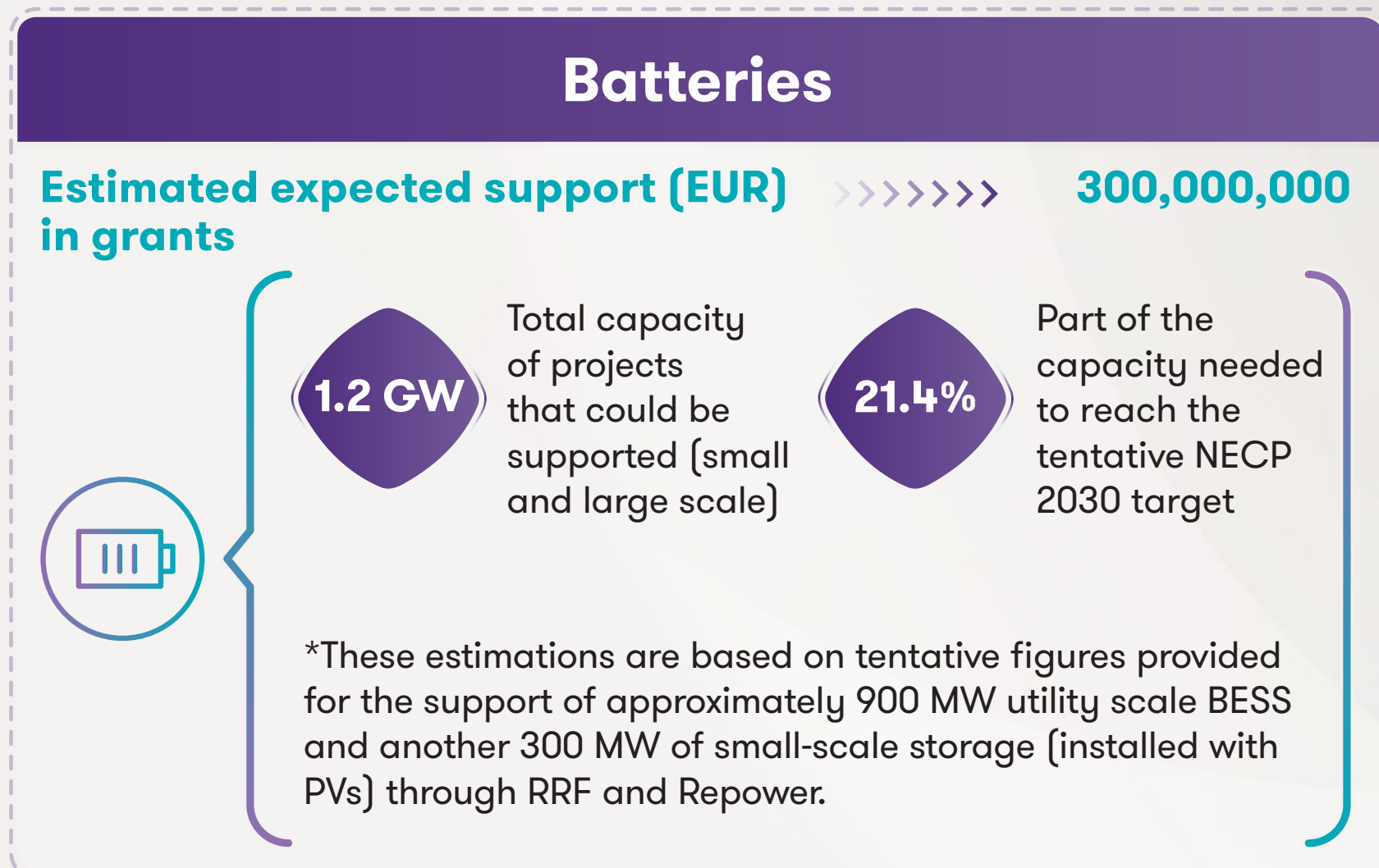
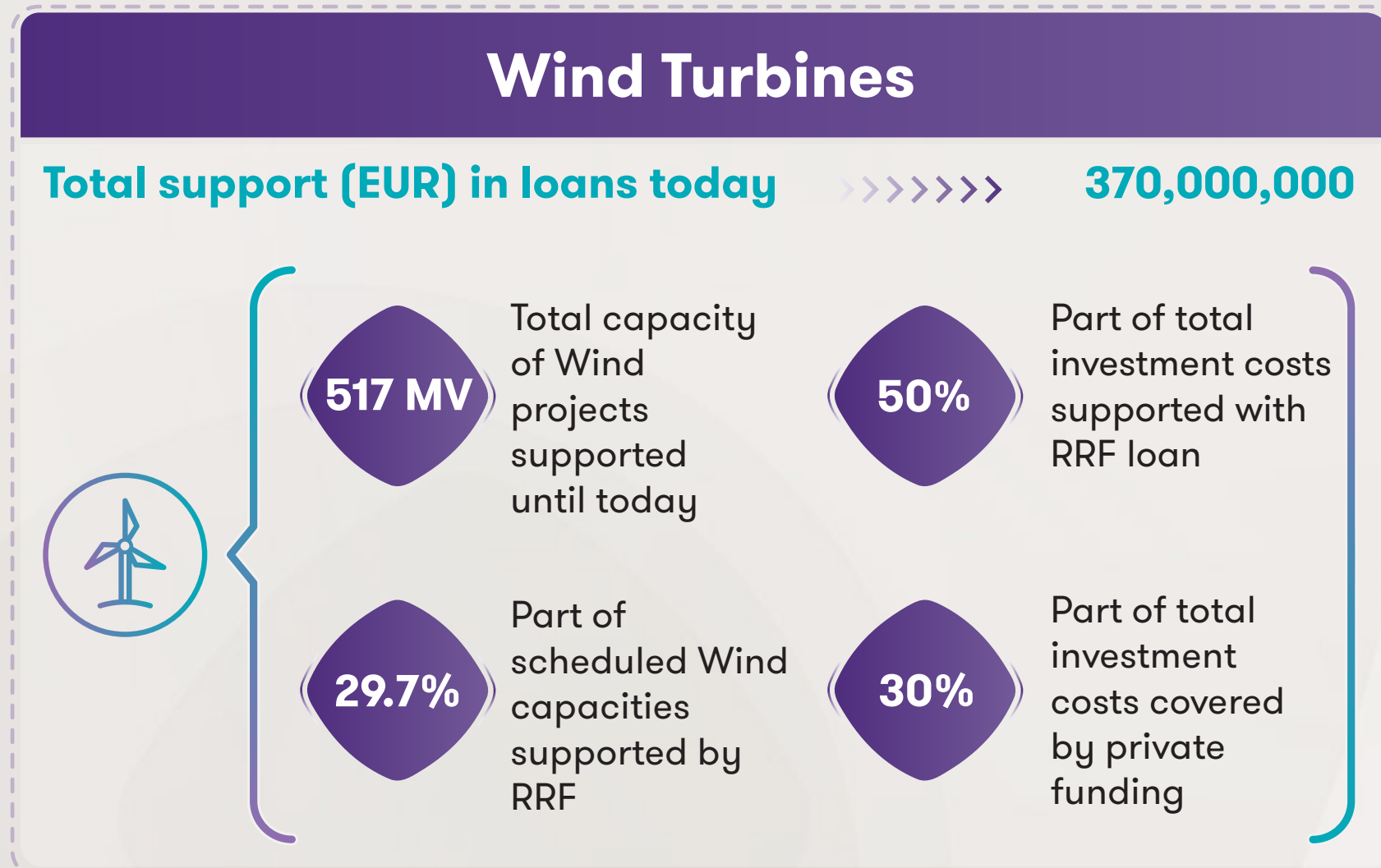
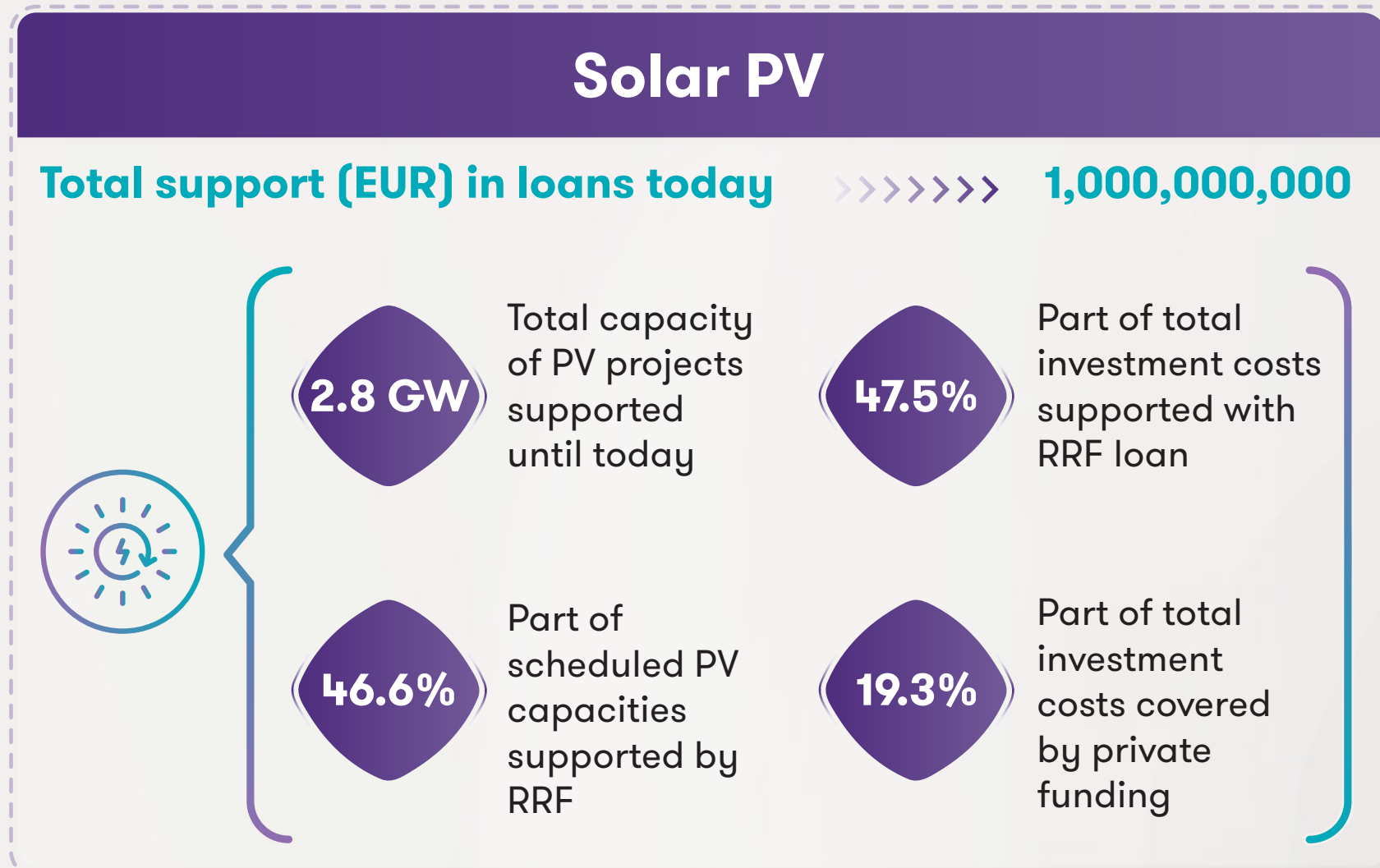
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Results

Analysis of market margins for RES and Storage in terms of capacity



RRF contribution in the development of RES and Storage



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Conclusions

- ② The new tentative NECP sets **ambitious goals** for the development of RES and Storage capacities.
- ② In order to reach the targets set by the NECP for 2030, **a total capacity of approx. 24.3 GW** (15.4 GW RES production, 8.9 GW of storage, H2 and synthetic fuels) must be installed.
- ② The **scheduled capacities** (according to ADMIE, DEDDIE and GT business intelligence) reach **8.4 GW for RES production** (PV, onshore wind, hydro, other RES) and **1.88 GW for storage** (Batteries and the Amphilochia HPS).
- ② Taking into account scheduled capacities (projects that have already been scheduled in terms of financing), an **additional total capacity of approx. 14 GW is required** (RES production accounts for 7 GW, storage, H2 and synthetic fuels account for 7 GW).
- ② Up until now, the **RRF has proven to be a valuable tool** for the development of RES production in Greece. According to latest data, it is estimated that **46.6% of the scheduled PV capacity** will have been funded by the RRF, while **28.5% of the scheduled onshore wind capacity** will have also been funded by the RRF.
- ② The RRF has also proven to be **a valuable tool for the development of Storage**. The Amphilochia HPS project has received funding (loan and grant) while there is huge interest from Battery Energy Storage Systems developers for the use of the RRF for their projects.
- ② **Offshore wind grabs the lion's share (24%)** of the investment needs, reaching 4.86 bn €, assuming 2030 CAPEX values.
- ② **Batteries require 15% (3.08 bn €)** of the total funding and **solar another 10% (2.04 bn €)**.
- ② By making reasonable assumptions regarding CAPEX for each technology, it is estimated that **approx. 20.21 bn € will be required** in order to reach the NECP 2030 targets for green technologies.

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Vassilis Kazas

Managing Partner

E vassilis.kazas@gr.gt.com

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Ioannis Stefanou

Partner, Head of Energy Sector

E ioannis.stefanou@gr.gt.com



Nikos Frydas

Vice President, Principal, Energy Sector

E nikos.frydas@gr.gt.com



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