

I n t e r n a t i o n a l H y b r i d C o n f e r e n c e

EU Policies towards the East Mediterranean Sea: Energy and Security

**JEAN MONNET CENTRE OF EXCELLENCE
NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS**

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**Energy Interconnections and their Role in Enhancing Greece's Energy Security
and Geopolitical Position**

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**INSTITUTE OF ENERGY
FOR SOUTHEAST EUROPE**



Introduction (I)

- In this short presentation, we shall argue that the existence and continuous operation of several internal and cross border energy interconnections help Greece maintain security of energy supply, while at the same time they enhance the country's geopolitical position. We should therefore consider the following:
 - Cross border energy flows are vital in ensuring the continuous and safe functioning of national energy systems.
 - Although energy supply has progressively become globalised in recent years, energy markets are still, by and large, functioning at local/national level. Hence, to a large extent, they depend on incoming flows augmented by limited storage capacity. In countries, like Greece, which are energy import dependent, the existence of interconnections acquires special significance.
 - Today's energy arteries concern crude oil and products, natural gas and electricity. In the case of electricity, where limited storage availability applies, the need of cross border interconnections is paramount.
 - In a fully liberalised electricity market, such as the one in Europe (including SEE), cross border interconnections are vital in order to maintain trade and enhance competition.

Introduction (II)

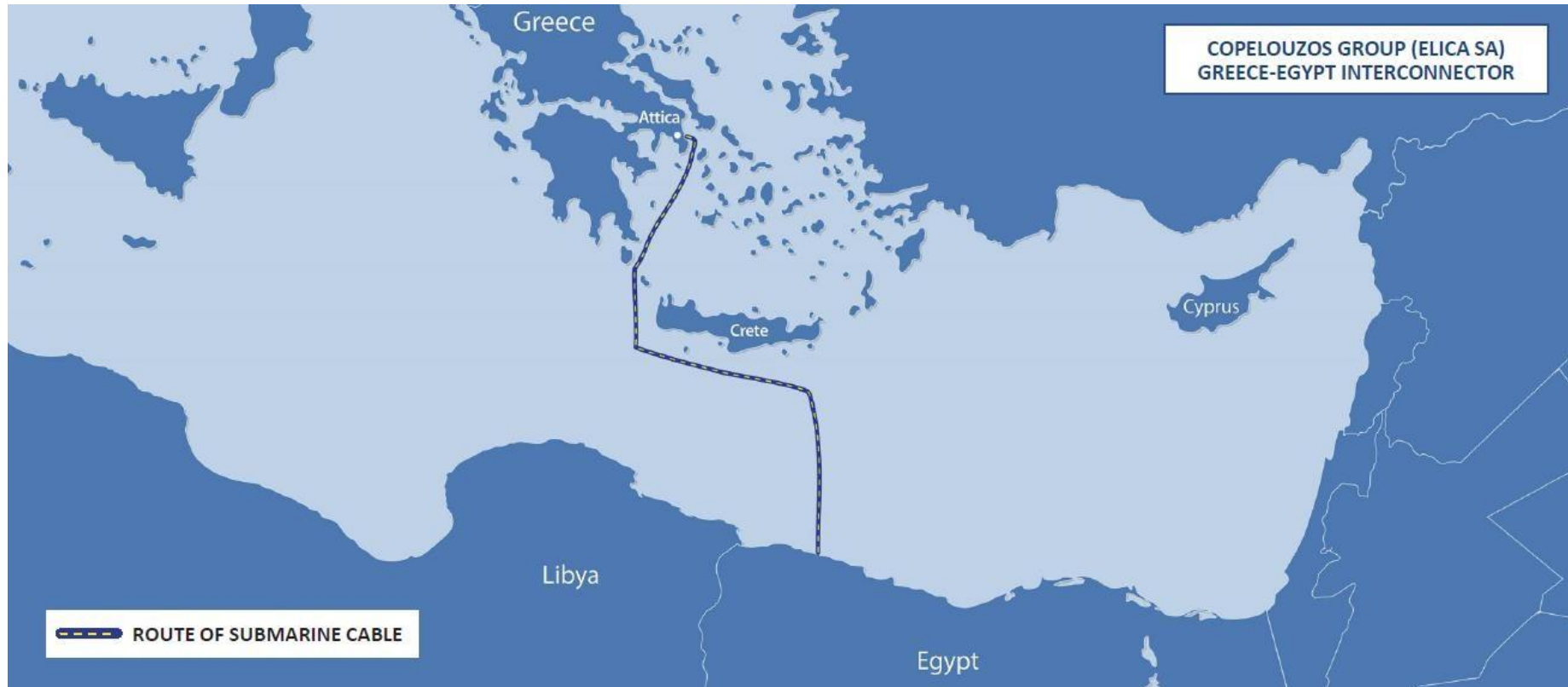
- The existence of internal and cross border energy interconnections and energy corridors help ensure the optimum operation of national energy systems and furthermore help to enhance the geopolitical standing of a country or a whole region.
- In the case of Greece, which is highly vulnerable in terms of energy dependence, with approx. 75% of energy demand satisfied from imports, electricity and gas interconnections play an increasingly important role in ensuring energy security.
- Furthermore, Greece's geopolitical position is strengthened through the establishment and operation of internal and cross border energy connections, primarily electricity and gas.
 - More specifically, active electricity links between the mainland and the islands - with most of them to be fully interconnected by 2028 - help ensure territorial integrity and protect sovereign rights.
 - Whereas in the case of gas interconnections, their contribution is more relevant in terms of geopolitics as they strengthen Greece's role as an energy transit country through the establishment of energy corridors.
 - No less important is the successful operation of Greece's gas trading hub, through HENEX, which started operation in March 2021 and which relies on a liquid and transparent market. In this context, the operation of several pipelines, interconnectors and LNG terminals ensure market liquidity and ease of transmission.

EuroAsia Electricity Interconnector



Source: EuroAsia Interconnector

Greece-Egypt Electricity Interconnector

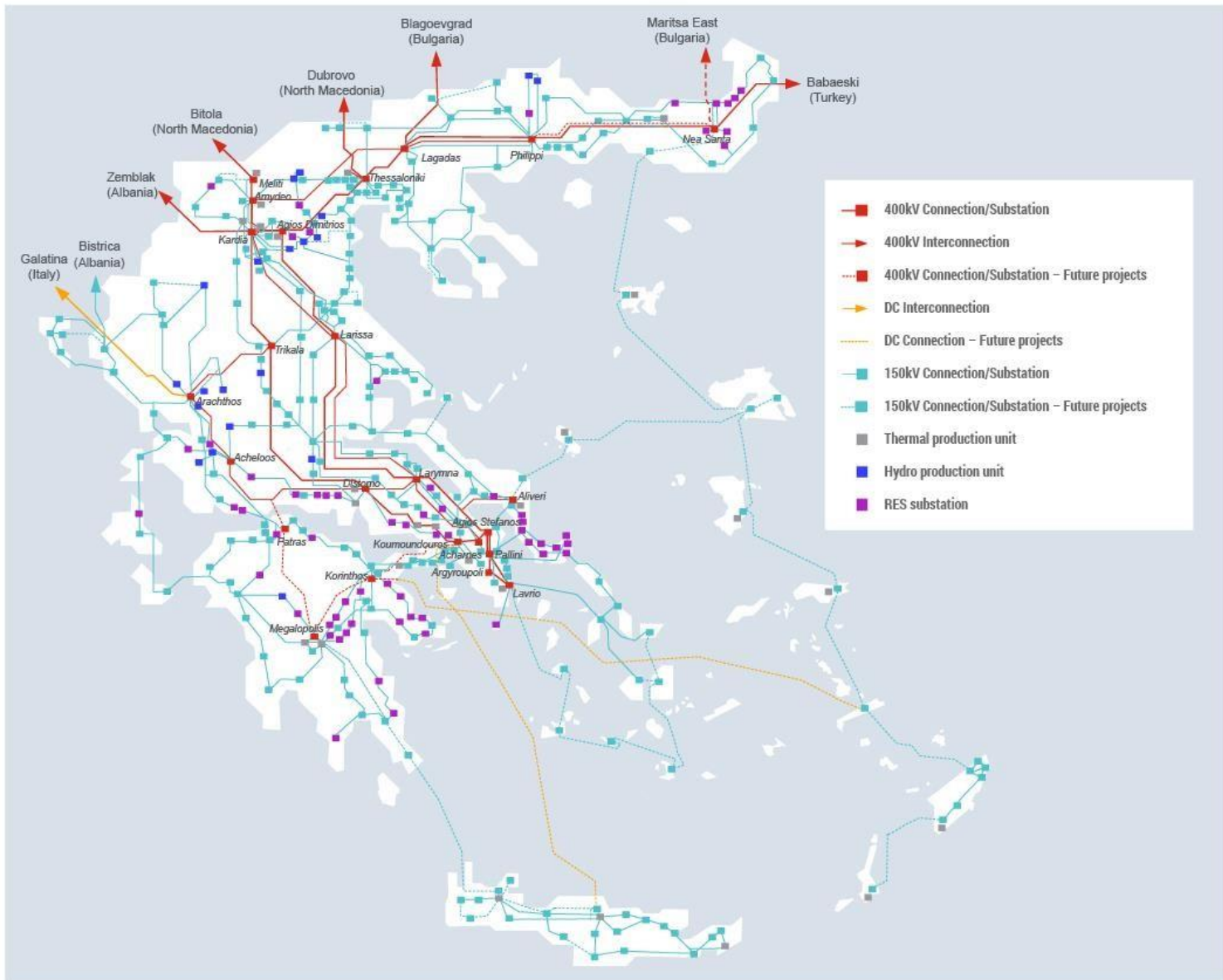


Source: ELICA Group

Electricity Interconnections and Energy Storage

- As electricity interconnections increase in Greece's mainland and islands, it is estimated that the penetration of renewable energy sources and hence the energy storage needs will rise.
- In Greece, important electricity interconnection projects are progressing, such as in the Cyclades, the NE Aegean and the Dodecanese, while the most important project is the interconnection of the mainland with Crete, which is being carried out in two phases: (a) the small interconnection of Crete-Peloponnese (completed) and (b) the large interconnection of Crete-Attica, which is expected to be completed in the first half of 2023.
- Despite the extensive electricity interconnections in the islands, there will be 40 non-interconnected small islands for many years to come. These are suitable for the installation of integrated clean electricity systems, using batteries and RES, with the possibility of ensuring energy autonomy of 95%.

Domestic and Cross Border Electricity Interconnections in Greece



Source: IPTO

Διασυνδεδεμένο Σύστημα Ηλεκτρικής Ενέργειας του ΑΔΜΗΕ έως το 2030

- Υφιστάμενη Γραμμή Μεταφοράς
- **Σημαντικά έργα που θα κατασκευαστούν έως το 2024**
 - Διασυνδέσεις Κρήτης
 - Διασύνδεση Βορείων Κυκλάδων
 - Διασύνδεση Νοτίων & Δυτικών Κυκλάδων
 - Διασύνδεση Εύβοιας-Σκιάθου
 - 2η διασύνδεση Ελλάδας-Βουλγαρίας
 - Επέκταση Συστήματος 400 kV στην Πελοπόννησο
 - Ανακατασκευή ΚΥΤ Κουμουνδούρου
- **Σημαντικά έργα που σχεδιάζονται έως το 2030**
 - Διασύνδεση Δωδεκανήσων
 - Διασύνδεση Βορειοανατολικού Αιγαίου
 - Νέα ΓΜ 400 kV Φιλίππων- Νέας Σάντας
 - ΚΥΤ Αργυρούπολης

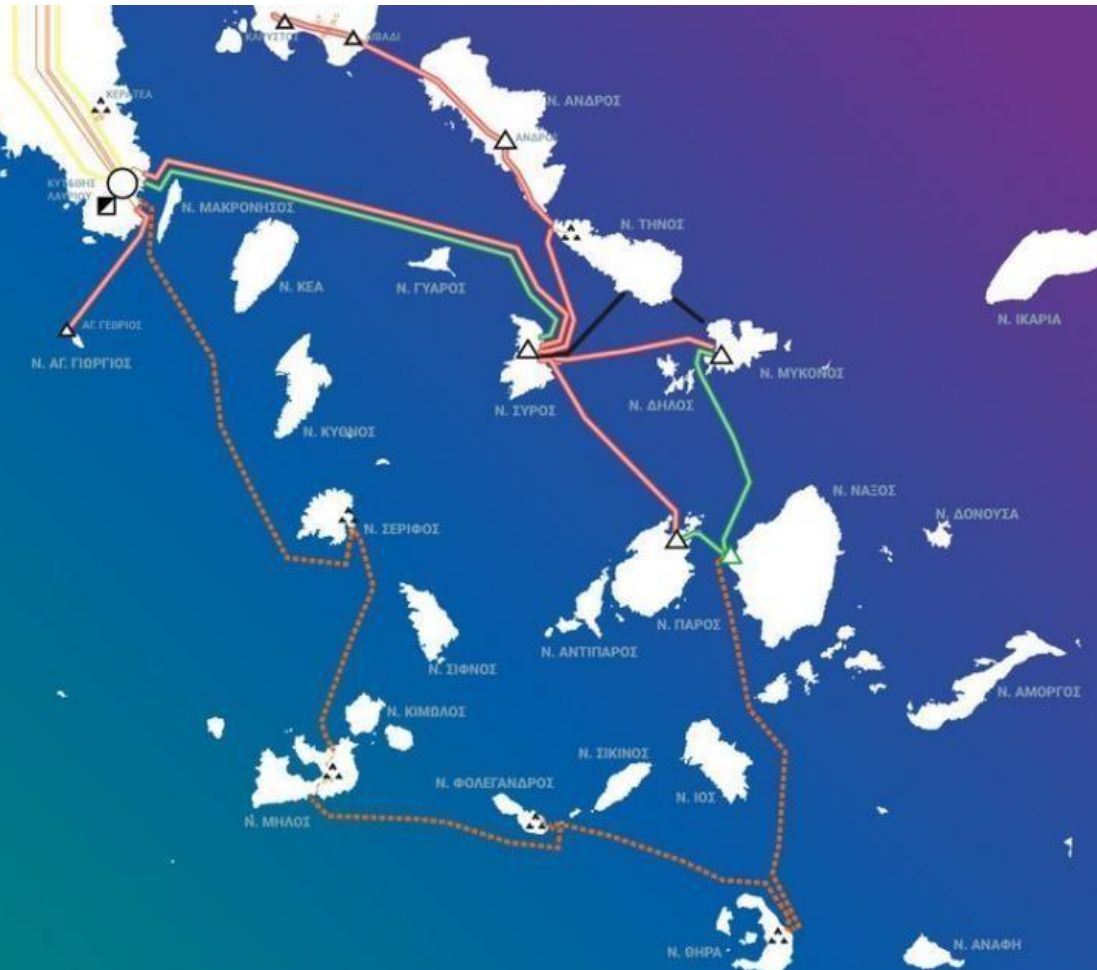


Electricity Interconnections in the Cyclades Islands

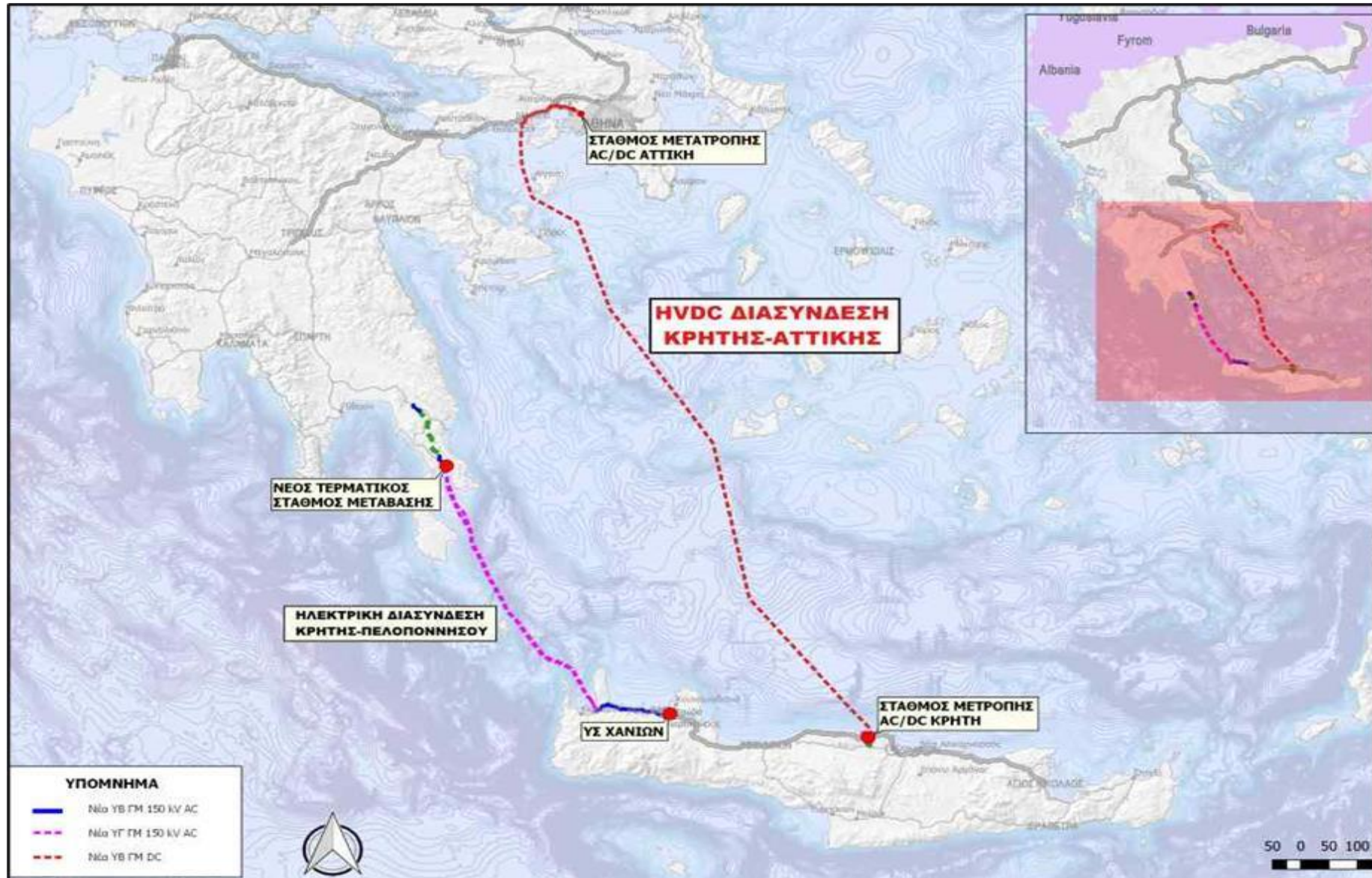
Διασυνδέουμε τις Κυκλάδες, διασυνδέουμε το αύριο

αδμηε

ΑΝΕΞΑΡΤΗΤΟΣ
ΔΙΑΧΕΙΡΙΣΤΗΣ ΜΕΤΑΦΟΡΑΣ
ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ



Electricity Interconnections of the Mainland with Crete



Gas Interconnector Greece-Bulgaria (IGB) (In Operation)



IGB	
Length	182 km
Diameter	32-inch (813 mm) pipes
Capacity	3-5 bcm/y

Source: IGB AD

South Kavala Underground Gas Storage (Conceptual Stage)



South Kavala UGS	
Storage Facility Type	Aquifer
Capacity	0.36 bcm/y

Source: ENTSO-G

Vertical Corridor and BRUA (Under Construction)



Source: IENE



Source: European Commission

BRUA	
Length	843 km
Diameter	32-inch (813 mm) pipes
Capacity	0.5 bcm/y transport capacity towards Bulgaria and 4.4 bcm/y towards Hungary

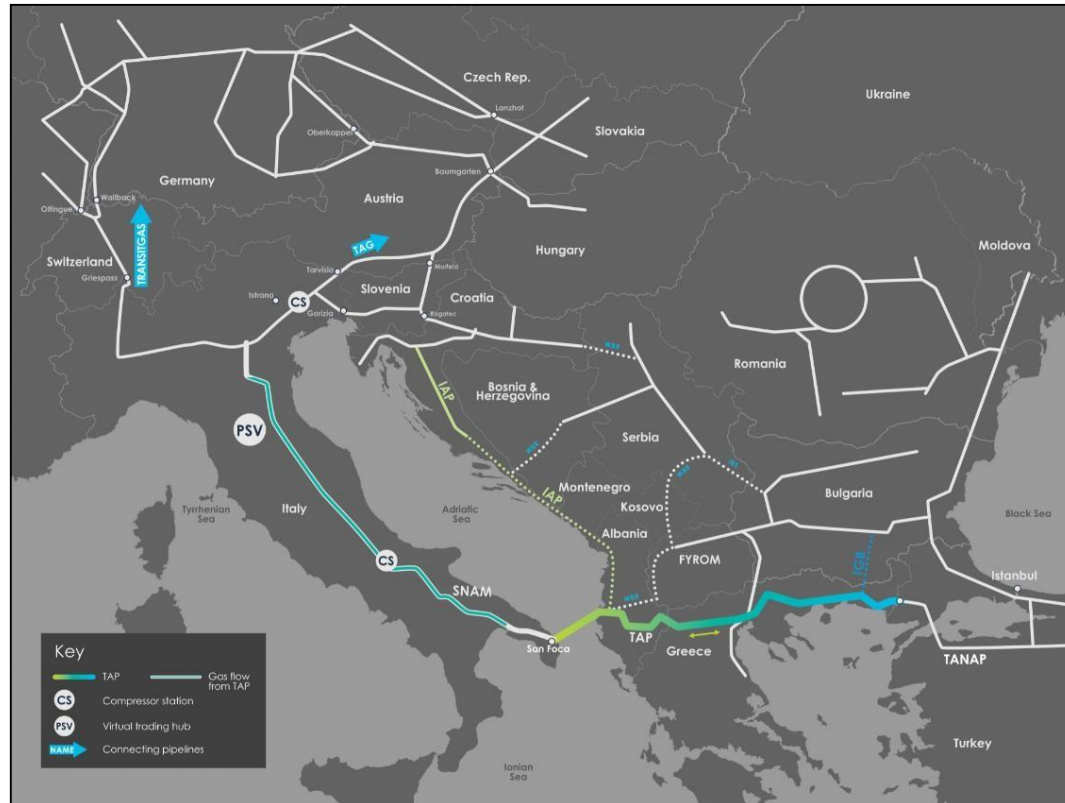
Gas Interconnector Greece-North Macedonia (IGNM) (Under Development)



IGNM	
Length	115 km
Capacity	3 bcm/y

Source: ENTSO-G

The TANAP-TAP System (In Operation)



TAP	
Length	878 km
Diameter	48-inch (1,200 mm) pipes
Capacity	10-20 bcm/y

TANAP	
Length	1,850 km
Diameter	48-or-56-inch (1,200 or 1,400 mm) pipes
Capacity	up to 31 bcm/y

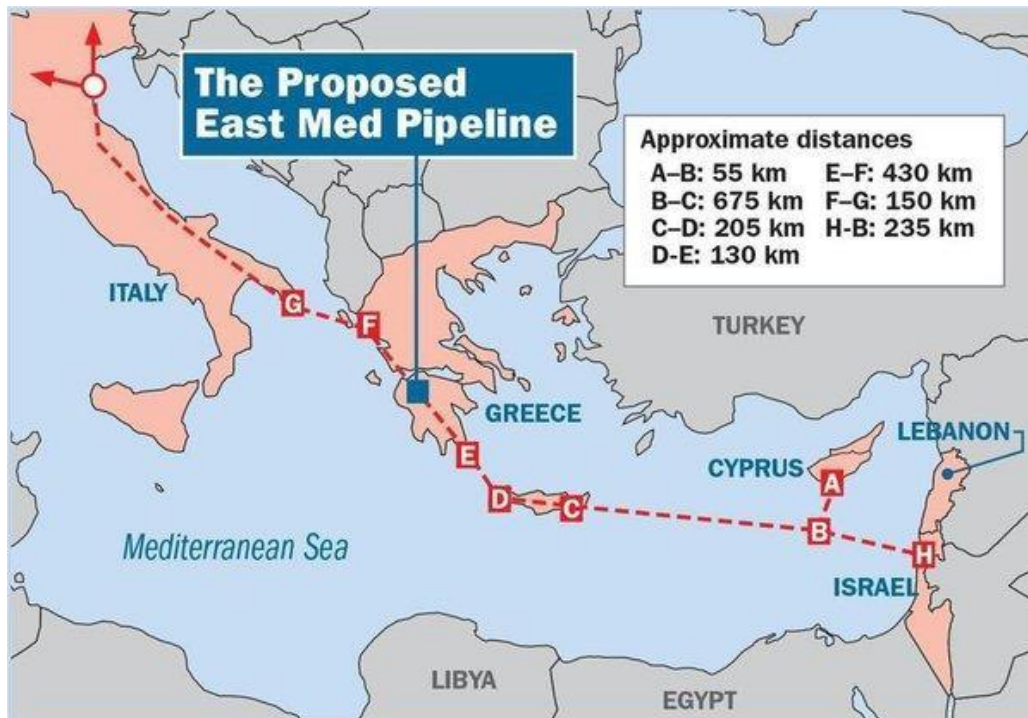
Source: TAP AG

Turk Stream (On Operation)



Turkish Stream	
Length	1,100 km
Diameter	Outer diameter of 32 inches (812.8 mm) and will be installed in water depths up to 7,220 ft (2,200 m).
Capacity	Two stretches: Each stretch will have a capacity of 15.75 bcm/y.

East Med and Interconnector Greece-Italy (IGI) Poseidon (Conceptual Stage)



East Med	
Length	1,300 km (offshore) 600 km (onshore)
Diameter	32-inch (813 mm) and 48-inch (1,200 mm) pipes
Capacity	10-20 bcm/y

IGI	
Length	216 km
Diameter	32-inch (813 mm) pipes
Capacity	14-20 bcm/y

Source: DEPA

The Expanded South Gas Corridor



Note: The TANAP, TAP, Turk Stream and IGB have been completed, while BRUA is still under construction. The IAP, the IGI Poseidon in connection with East Med pipeline, the Vertical Corridor and the IGNM are still in the study phase. Blue Stream and Trans Balkan are existing pipelines.

Existing and Planned Electricity Interconnections in Greece and the Region

- **EuroAsia Interconnector** (transmission capacity: 1 GW, planned to be increased to 2 GW, *under construction*)
- **Greece-Egypt Interconnector** (transmission capacity: 3 GW, *study stage*)
- **Attica-Crete (Phase B)** (transmission capacity: 2x500 MW, *under construction*)
- **Cyclades - North Aegean - Dodecanese** (*partly completed and under construction*)
- **Second Greece-Bulgaria** (Increase of transmission capacity to 800 MW for the Greece to Bulgaria direction and to 1,350 MW for the Bulgaria to Greece direction, *under construction*)
- **Second Greece-Albania** (A new 400 kV interconnector between the south transmission system of Albania and the Greek power system)
- **Second Greece-Turkey** (A new 400 kV interconnector between Greece and Turkey)
- **Second Greece-Italy** (expansion of existing 500 MW to + 1 GW)
- **Greece-Slovenia-Austria** (9.0 GW, *under study*)

Existing and Planned Gas Interconnections and LNG Facilities in Greece and the Region

□ Gas Interconnections

- **Interconnector Greece-Bulgaria (IGB)** (*in operation*)
- **Interconnector Greece-Turkey (IGT)** (*in operation*)
- **Interconnector Greece-North Macedonia (IGNM)** (*under development*)
- **East Med** (*under development*)
- **Interconnector Greece-Italy (IGI)** (*under development*)

□ LNG Facilities

- **Revithoussa LNG Terminal** (*in operation, since 2001*)
- **Alexandroupolis FSRU** (*under construction, end of 2023*)
- **Dioryga FSRU** (*under development, 2024*)
- **Volos FSRU** (*under development, 2025*)

Discussion

- ❑ The Eastern Mediterranean, the Black Sea and Caspian Sea regions are, each in their own way, changing from peripheral zones into interconnected spaces. The USA, EU, China, Russia and – across the Black Sea – Iran and Turkey are competing in these zones to influence the reconfiguration of electricity and grids.
- ❑ Electricity and gas interconnections facilitate regional cooperation and enhance energy security.
- ❑ Continued energy supply diversification depends on the availability and improvement of electricity and gas interconnections. As Europe is trying to decouple from Russian gas supply, the role of new electricity and gas routes acquires a new significance.
- ❑ Combining interconnections with other technological innovations, such as creating an electricity highway and linking them to energy storage projects and investment in renewables in the region, would allow for optimal trade in energy across the European system, given the time differences between countries.
- ❑ Completing the integration of electricity networks in SE Europe will require both sufficient long-term electricity storage projects and adequate cross border and internal electricity interconnections. This means going beyond a second 400 kV transmission line to Bulgaria, which is currently being developed, by quickly promoting similar lines in Albania, North Macedonia, and large capacity HV interconnections with Italy and Slovakia.
- ❑ The regional electricity network is to be completed once the Eurasia Interconnector comes on stream in 2026. This will also signal the integration of the entire European electricity grid and hence the role of SE Europe has to be seen in a new light.
- ❑ The construction of new electricity lines and interconnections, along with new gas pipelines, will enhance Greece's position as an important energy transit country and regional energy player. Such expanded energy network, including most of the islands, will undoubtedly help Greece to strengthen its sovereignty over its land and sea areas.



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The background of the slide is a dark blue image of a globe showing city lights at night. Overlaid on the globe are numerous glowing blue lines that form a complex network, representing energy transmission or a global network. The lines are curved and intersect, creating a sense of dynamic energy and connectivity.

*Thank you
for your attention!*

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