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THE POTENTIAL OF ELECTRICITY INTERCONNECTIONS IN THE EASTERN MEDITERRANEAN

RESEARCH PAPER

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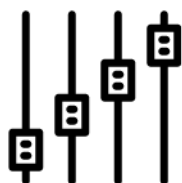
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INTRODUCTION

In January 2022, the US withdrew its support for the Eastern Mediterranean (East-Med) gas pipeline project that aimed to provide Cypriot and Israeli gas to Greece and the rest of Europe. The US argued that the project is not ecologically viable as it is not in line with the Biden Administration's climate ideology and the European Green Deal. It added that it is not financially or commercially viable either, while it increases regional tensions with Turkey thereby not contributing to peace in the region. Instead, the US has supported electricity interconnectors as they are more flexible in sourcing, i.e., electricity can be generated from any source, renewable or not (Claus, 2022).

A fully integrated energy market between Europe and the rest of the Mediterranean basin would facilitate the harmonious development of renewable energy (RE) at a cheaper cost. Countries on the Southern Mediterranean shore have a strong RE potential (solar in particular) and have a comparative advantage; the resources are sufficient to meet national needs as well as those of European countries that are pledging "zero-carbon" electricity. In addition, as the Russian invasion of Ukraine continues, the EU is urgently looking to find alternatives to Russian oil and gas. With its energy security at risk, there is even greater commitment to promote a more efficient use of existing electricity capacity and diversify power generation sources (Rau, et al., 2022). The ongoing war is transforming the energy equilibrium in Europe and provides the East-Med with the unique opportunity to work together in becoming the continent's power provider via electricity interconnectors.

However, the level of interconnection between Mediterranean countries is very uneven. Among the East-Med countries, there is no organization comparable to the EU model, and cross-border trade is very limited (MEDREG, 2021). In general, markets are poorly connected, and interconnection lines are primarily used for security purposes. This is mainly because the East-Med is characterized by elevated levels of geopolitical tension leading to little agreement between nations (MEDREG, 2021).

With all of this in mind, this policy brief aims to give an overview of current and future interconnectors' development plans in the East-Med region. The study will begin by breaking down some of the drivers that are now pushing for such regional cooperation and provide technical input on the electricity capacity of each country as well as geopolitical considerations which may lead to the successful implementation of cross-border interconnectors. It will also lay out some of the obstacles still hindering the implementation of such megaprojects and provide policy recommendations.



Technical Driver

From a technical point of view, cross-border interconnections improve grid security. A larger and stronger electricity network generally offers more flexibility in how electricity is generated and provided and therefore increases the resilience of the network to risks such as power outages caused by short circuits, weather events, cyber attacks, technical failures, system overloads, conflict, etc. (Westphal, et al., 2022).

Increasing Demand for Electricity

Electricity demand and generation in the East-Med have both increased over the past years (see Table 1) as countries have sought to meet rising electricity demand with their generation assets. Table 1 shows that some countries are already failing to match generation with demand (such as Lebanon and Palestine). With power demand expected to continue growing in the future, all countries of the East-Med need to find methods to match rising demand with even greater generation. Interconnections provide an appealing solution to help ensure this balance between supply and demand at a regional level and ensure grid stability.

Table 1: Power demand compared to power generation in East-Med countries for 2016, 2017 and 2018 (MEDREG, 2018)

Country	2016		2017		2018		Average Volume Growth Over the Three Mentioned Years	
	Demand (TWh)	Generation (TWh)	Demand (TWh)	Generation (TWh)	Demand (TWh)	Generation (TWh)	Demand	Generation
Turkey	279.29	274.41	293.87	297.28	303.05	303.65	4.17%	+5.2%
Greece	51.21	42.45	51.93	45.81	51.46	45.21	0.25%	+3.3%
Cyprus	4.34	4.86	4.55	5.01	4.54	5.23	2.31%	+ 3.75%
Egypt	157.49	186.32	158.83	189.55	162.53	196.76	1.59%	+2.77%
Jordan	16.7	19.66	17.5	20.76	17.54	19.82	3.55%	+0.55%
Lebanon	21.67	13.14	22.81	15.04	24.00	15.08	5.24%	+7.37%
Palestine	3.53	0.007	3.73	0.013	3.8	0.024	3.77%	+85.5%
Syria	-	-	-	-	-	-	-	-
Israel	62.00	67.4	62.80	68.3	64.10	69.6	1.68%	+1.6%

Environmental Drivers

The sixth assessment report by the IPCC published in August 2021 showed that the East-Med is one of the most vulnerable regions to climate change globally and that fighting these environmental challenges (including hot spells, droughts, forest fires and heavy rainfall) requires joint action (Rau, et al., 2022). Vulnerability to climate change and ecological concerns in the East-Med are thus becoming key issues to address. Given the growing pressure on all countries to accelerate the energy transition, it is possible to overcome the geopolitical barriers to resolve urgent ecological and climate concerns. Considering the opportunities that can be provided by interconnectors as a means to simultaneously increase renewable energy production and reduce carbon emissions, states should be more open to the expansion of interconnected grids despite their divergences, to mitigate the effects of climate change (Rau, et al., 2022).

New developments in climate and environmental policy towards clean energy is another main driver towards grid interconnections. Countries are setting ambitious targets towards increased RE production and are gradually phasing out non-RE sources (see Table 2 and 3). With these targets in mind, states are required to effectively manage their grid expansion to guarantee its stability. For a grid to be stable, it needs to generate as much energy as is consumed. This becomes an issue when thinking about RE because of the intermittent and uncontrollable nature of these resources (Hive Power, 2021). There can be instances, on the one hand, where the system is overloaded and as such it may get damaged, or energy may be wasted. On the other hand, there can be instances where the energy produced is not sufficient to match demand. For this reason, it is increasingly important to manage these risks and new methods are necessary to integrate RE sources while ensuring grid stability. As cross-border interconnections allow for excess renewable power to be traded between the interconnected countries, they could ensure a feasible long-term solution to grid instability.

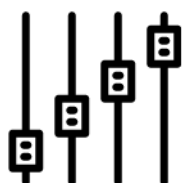
Table 2: RE targets in East-Med countries (Shatila, et al., 2021; IRENA, 2021; Milhem, n.d.)

Country	RE Policy Target(s)
Turkey	30% of electricity generation from RE by 2023, reach net zero by 2053
Greece	Phase out all operational coal plants by 2025, generate 61% of electricity generation from RE by 2030
Cyprus	23% of electricity generation from RE by 2030
Egypt	20% of electricity generation by 2022, 42% by 2035
Jordan	21% of generation mix by 2020, 31% by 2030
Lebanon	12% of generation mix by 2020, 30% by 2030
Palestine	10% of electricity generation by 2020
Syria	10% of electricity generation by 2030
Israel	30% of electricity generation from RE by 2030, reach net zero by 2050

Table 3: Electricity generation sources in East Med countries (MEDREG, 2018)

Country	Primary Electricity Generation Source	Secondary Electricity Generation Source	Tertiary Electricity Generation Source
Turkey	Coal	Natural gas	Hydro
Greece	Natural gas	Coal	Wind
Cyprus	Diesel/ Heavy Fuel Oil (HFO)	Wind	Solar PV
Egypt	Natural gas	Hydro	Wind and solar PV
Jordan	Coal	Wind and Solar PV	N/A
Lebanon	Diesel/HFO	Hydro	Solar
Palestine	Solar PV	-	-
Syria	-	-	-
Israel	Natural gas	Coal	Solar PV





REGIONAL ELECTRICITY MARKET SYSTEM: AIM, STATUS, AND ROLE OF CROSS-BORDER INTERCONNECTIONS

Current Interconnections

As shown in Table 4, interconnections in the East-Med are still quite low, and out of the existing infrastructure of the region, several interconnectors are used either purely on an emergency basis to cover unexpected or scheduled outages due to maintenance, or they are not in operation.

Table 4: Current interconnections in the East-Med (MEDREG, 2021)

No.	Interconnection	Voltage (kV)	Operation Capacity (MW) or Operation Mode	Theoretical Capacity (MW)
1	Turkey – Greece	400	Synchronous	1510
2	Turkey– Greece	400	218	1800
3	Jordan – Egypt	400	550	550
4	Egypt – Libya	220	150 (33)	N/A
5	Jordan – Palestine	33	80	80
6	Palestine – Israel	33	1100 MVA	N/A
7	Jordan– Palestine	33	N/A	N/A
8	Turkey – Georgia	220	Emergency	287
9	Turkey – Georgia	400	700 HVDC Back-to-Back	1510
10	Turkey – Iran	154	Isolated island mode	204
11	Turkey – Iran	400	Isolated island mode	1510
12	Turkey – Syria	400	Not in operation	1005
13	Turkey – Iraq	400	Not in operation	408
14	Jordan – Syria	400	Not in operation	800
15	Lebanon (Ksara) – Syria	400	Not in operation	550
16	Lebanon (Deir Nbouh) – Syria	220	Not in operation	200
17	Lebanon (Anjar) – Syria	66	Not in operation	80

Furthermore, countries of the East-Med continue to focus on meeting their own demand through investing in local power generation rather than through power trading (see Tables 5 and 6). Table 5 shows that assuming no technical constraints, power imports in Cyprus, Lebanon, Jordan, and Egypt are exceptionally low (around or less than 1 percent), and only very high in Palestine (99.36 percent). The latter is an exception because local power generation is minimal, and cross-border interconnections with Jordan and Israel constitute the primary source of electricity supply in the country. Similarly, Table 6 shows that except for Greece, which is linked to the European electricity market, power exports are very low in the region (almost 0 percent).

Low imports and exports are due to the fact that most of the countries in the region could face technical problems when operating their national grids in a synchronous regime with the surrounding countries. This is also due to the lack of compatibility between national grids, which causes difficulties in sustaining the required levels of grid stability in some countries. In addition, political problems between East-Med countries play a negative role in achieving synchronous operation.

Table 5: Power imports in the East-Med (MEDREG, 2018)

Country	Import % 2016	Import % 2017	Import % 2018	Average Volume Growth Over the Three Mentioned Years
Turkey	2.27%	0.93%	0.81%	-0.73%
Greece	18.81%	15.96%	N/A	-2.85%
Cyprus	0%	0%	0%	0%
Egypt	0.29%	0.34%	0.411%	0.06%
Jordan	2%	0.29%	1.07%	-0.46%
Lebanon	0.59%	3.61%	0.078%	-0.51%
Palestine	99.81%	99.65%	99.36%	-0.22%

Table 6: Power exports in the East-Med (MEDREG, 2018)

Country	Export % 2016	Export % 2017	Export % 2018	Average Volume Growth Over the Three Mentioned Years
Turkey	0.53%	1.11%	1.01%	0.24%
Greece	1.99%	15.96%	N/A	13.97%
Cyprus	0%	0%	0 %	0%
Egypt	0.4%	1.75%	0.21%	-0.095%
Jordan	0.22%	0.274%	0.47%	0.098%
Lebanon	0%	0%	0%	0%
Palestine	0%	0%	0%	0%

Future Projects

Despite the limited interconnections between countries of the East-Med, there are potential projects that may offer increased power exchanges. These are summarized in Table 7 below, and represented on the map in Appendix A.

Table 7: Future potential interconnection projects in the East-Med (Med-TSO, 2020)

No.	Interconnection Project/Cluster	Nominal Capacity (MW)
1	EG – TR (Egypt – Turkey)	3000
2	IL – TR (Israel – Turkey)	2000
3	EG – JO (Egypt – Jordan)	550
4	JO – SY (Jordan – Syria)	800
5	SY – TR (Syria – Turkey)	600
6	GR - CY- IL (Greece – Cyprus – Israel) (EuroAsia)	1000/1000
7	CY – EG (Cyprus – Egypt) (EuroAfrica)	1000
8	EG-GR (Egypt – Greece)	700
9	JO – PS (Jordan – Palestine)	100

PROJECT N°1: EGYPT – TURKEY (EG-TR)¹:

The project consists of an interconnection between Turkey and Egypt, to be accomplished through a 3000 MW high voltage direct current (HVDC) submarine link with a length of about 700 km.

¹ More details on the project can be found [here](#).

PROJECT N°2: ISRAEL – TURKEY (IL-TR)²:

The project consists of a new interconnection between Israel and Turkey to be accomplished through a 2000 MW HVDC submarine cable with a length of about 600 km.

PROJECT N°3: GREECE – CYPRUS – ISRAEL (GR-CY-IL)³:

The project is also known as the EuroAsia interconnector and consists of two new interconnections:

- One interconnection between Damasta in Crete (Greece) and Kofinou in Cyprus, to be accomplished through a 1000 MW HVDC submarine link with a length of about 894 km.
- One interconnection between Kofinou in Cyprus and Hadera in Israel, to be accomplished through a 1000 MW HVDC submarine link with a length of about 314 km.

PROJECT N°4: CYPRUS – EGYPT (CY-EG) IN ADDITION TO PROJECT N°3⁴:

This project is also known as the EuroAfrica interconnector and is complementary to Project N°3. It consists of one new interconnection between Cyprus and Egypt and comprises the construction of two submarine cables (2 × 500 MW) of 500 km length between Kofinou in Cyprus and Egypt (connection point currently not defined).

PROJECT N°5: EGYPT – JORDAN (EG-JO)⁵:

The project consists of a new interconnection between Jordan and Egypt to be accomplished through a 13 km 400 kV alternating current (AC) submarine cable with a capacity of 550 MW. Egypt and Jordan are already interconnected since 1998 with an exchange capability of 550 MW. As such this project would increase the current transfer capacity between the two countries to reach about 1100 MW.

PROJECT N°6: JORDAN – SYRIA (JO-SY)⁶:

The project consists of one new interconnection between Hassan Ind substation in Jordan and Der Ali substation in Syria to be accomplished through a 400 kV AC overhead line of about 102 km with a capacity of 800 MW.

PROJECT N°7: SYRIA – TURKEY (SY-TR)⁷:

The project consists of the following infrastructure:

- A new 400 kV AC overhead line of about 115 km with a capacity of 600 MW between Birecik HPP Substation in Turkey and Syria.
- The construction of a Back-to-Back converter substation next to the Birecik HPP Substation (is already in the investment plan of the Turkish Electricity Transmission Corporation).

PROJECT N°8: JORDAN – PALESTINE (JO-PS)⁸:

The project consists of one new interconnection between Jordan and Palestine to be realized through a 132 kV AC overhead line of about 47 km in length with a capacity of 100 MW.

In addition to the above projects, in October 2021, the European Network of Transmission System Operators (Entso-E) included a new project in its 10-year Development Plan of the European Energy Networks (TYNDP, 2022). This project would connect wind and solar power

² More details on the project can be found [here](#).

³ More details on the project can be found [here](#).

⁴ More details on the project can be found [here](#).

⁵ More details on the project can be found [here](#).

⁶ More details on the project can be found [here](#).

⁷ More details on the project can be found [here](#).

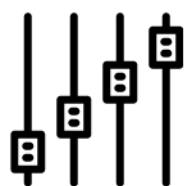
⁸ More details on the project can be found [here](#).

in Egypt (9.5 GW of installed capacities) through a High Voltage line with a length of 1373 km (AC in its Overhead line part and DC in its submarine cable part), with Greece (Attica region) passing through Crete.

The expected capacity of this cable is 700 MW, and power will be transmitted to the Greece-Italy and Greece-Bulgaria electricity transmission networks. The expected commissioning date would be in the year 2028 (Bellini, 2022).

The abovementioned projects are essential to reinforce the East-Med interconnections. Some of them are in progress such as Egypt-Jordan (Project N°5) and Jordan-Palestine (Project N°8) which are expected to be commissioned in the short term, due to their relatively low cost and short distance, while the project Egypt-Greece would be commissioned in the medium term (2028), despite the relatively high cost. The project Israel-Cyprus-Greece (Project N°3) is also expected to be commissioned in the year 2028 for its first phase Cyprus-Crete (it was recently inaugurated as a part of the “EuroAsia Interconnector”), and it is expected that this project will put an end to Cyprus’ energy isolation.

Other projects such as Egypt-Turkey (Project N°1), Israel-Turkey (Project N°2), Cyprus-Egypt (Project N°4) are expected to be commissioned in the long-term (beyond 2028) due to their relatively high cost and long distances, and the possible difficulties in providing funds in the medium term. Projects N°6 and N°7 are currently on hold due to the Syrian crisis.



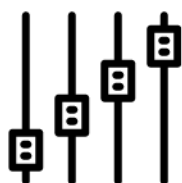
GEOPOLITICAL CONSIDERATIONS EVOLVING RELATIONSHIPS IN A HEATED REGION

The geopolitical status of the East-Med region has reduced the possibility to trade electricity due to intra- and inter-state crises, combined with the lack of trust among countries, as well as the absence of an all-inclusive forum to facilitate dialogue and cooperation. At the heart of geopolitical disputes in the East-Med is the ongoing conflict between the internationally recognized Greek-Cypriot-governed Republic of Cyprus (“Cyprus”) and the self-declared Turkish Republic of Northern Cyprus (TRNC) supported by Turkish Cypriots and the Turkish government (Tanchum, 2021). The Turkish government and the TRNC dispute any decision made by Cyprus, including, and of relevance to this study, the maritime boundaries and EEZs agreed upon by Cyprus and its neighbors (Sukkarieh, 2021). Conversely, Cyprus and its allies contest the sovereignty of the TRNC and the Turkish position regarding Cyprus. Beyond this conflict, Turkey has had difficult relationships with Greece, Israel, and Egypt (Sukkarieh, 2021; Tanchum, 2021).

Nonetheless, the situation in the East-Med is gradually changing, and an evolution towards better cooperation may be in sight. Indeed, since the beginning of 2021, Turkey has changed its behavior with regards to its East-Med neighbors (Tanchum, 2021). This is linked to the difficult economic crisis the country is facing, the sudden decision by Iran to cut gas flows into Turkey, and more recently the Russian invasion of Ukraine. These changes have provided increased incentive for Turkey to diversify its energy relations, attract foreign investments, and seek closer ties with a number of its neighbors, including Egypt, Israel, and Greece (Tanchum, 2021; Hurriyet Daily News, 2021; Tokyay, 2022). Furthermore, beyond its talks with Turkey, Israel has recently redefined its position in the Arab world and in the East-Med (Tanchum, 2021). To begin, the recent visit of Egyptian Minister of Petroleum and Mineral Resources, Tarek El Molla, to Israel has signaled that the countries have established a solid energy relationship. Additionally, the Abraham Accords which have normalized relations between

Israel, the UAE, Bahrain, Sudan, and Morocco have opened the door to greater opportunities between Israel and the Arab world.

The geopolitical status in the East-Med has also been characterized by the absence of diplomatic or economic ties between Israel, Lebanon, and Syria. With regards to energy, Lebanon and Israel officially announced on October 27, 2022, their acceptance and signature of the maritime border proposal mediated by the US and intended to solve a decade-long dispute over their maritime boundaries (MESP, 2022).



WHAT IS STILL HINDERING THE DEVELOPMENT OF INTERCONNECTORS?

Political Hurdles

Even though there is a push towards greater collaboration in the region, no formal agreements have been ratified and as such, nothing has truly been proposed to address issues regarding the remaining maritime boundary disputes. Additional geopolitical efforts are required to guarantee trust, cooperation, and collaboration between nations on power trading issues.

Inadequate Governance and Regulatory Framework for Interconnections

Countries involved in interconnection projects need to have the regulatory framework in place to allow for successful entry of foreign electricity into domestic electricity markets and successful export of their electricity to foreign markets (Mitchell, 2021). This is especially difficult for countries in which electricity utilities hold vertical monopolies, i.e., own and control the generation, transmission, and distribution of electricity in all sectors of the economy. Indeed, such monopolies limit free market competition, thus making it difficult for foreign electricity to penetrate local markets (Mitchell, 2021). While Turkey, Cyprus, Greece, and Egypt have or are on the way to unbundle their electricity markets, Jordan, Lebanon and Israel have electricity utilities that hold vertical monopolies, and are responsible for generating and supplying electricity to all sectors in the economy (NEPCO⁹, JEPKO¹⁰, EDCO¹¹ and IDECO¹² in Jordan; EDL¹³ in Lebanon; IEC¹⁴ in Israel).

Technical Barriers

Interconnections entail the construction and operation of expensive transmission lines and substations, or in the case of HVDC, converter stations (United Nations, 2006).

Interconnections also hold additional technical costs, complexities, and risks. AC interconnections, especially, require a high degree of technical compatibility and operational coordination, which grows in cost and complexity with the scale and inherent differences of the systems involved (United Nations, 2006). Within countries, there are typically common technical standards for all utilities, which reduces the complexity of interconnecting separate

⁹ National Electric Power Company.

¹⁰ Jordanian Electric Power Company.

¹¹ Electricity Distribution Company.

¹² Irbid District Electricity Distribution Company.

¹³ Électricité du Liban.

¹⁴ Israel Electric Corporation.

systems. But when comparing countries, on the other hand, power systems may have evolved quite separately with very different standards and technologies, which adds an extra layer of technical complexity to interconnections (United Nations, 2006). This is the case in the East-Med.

The greatest benefits of interconnection are usually derived from synchronous AC operation, but this operation results in reliability risks since in any synchronous network, disturbances in one location are quickly felt in other locations. In addition, long-distance interconnections with long transmission lines have potentially greater stability problems than shorter lines.

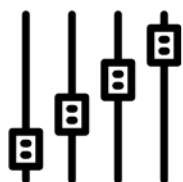
Finally, many systems that have undergone electricity liberalization in recent years have experienced large increases in transmission capacity utilization, reducing reserve margins. Minimizing the likelihood that an interconnection will lead to voltage collapse, dynamic and transient instability, or cascading outages due to propagated disturbances requires careful planning and a well-coordinated operation (United Nations, 2006).

Financial Implications

The difficulties associated with the geopolitical, regulatory, or technical risks of interconnector projects in the East-Med have made their financing challenging. Indeed, investors may find themselves less attracted to such projects. Many see the EU as an important sponsor of such initiatives, but it is likely that East-Med cross-boundary interconnector projects will require other private funders to ensure success, especially since most countries of the region are not part of the EU. Taking the case of Project N°3 (IL-CY-GR (EuroAsia)), the EU has already allocated €657 million to the funding of the Greece-Cyprus (Cyprus-Crete section) interconnection and a further €100 million grant was offered to the Cyprus Recovery and Resilience fund for the project (Ellinas, 2022), knowing that the whole project's cost is around €2.5 billion. Securing these costs ensures the start of construction and makes the project more interesting for banks and investors. Nonetheless, funding for the connection between Israel and Cyprus in Project N°3 is more uncertain and a greater variety of investments as well as a risk mitigation plan will be required to successfully implement this project, as well as any of the aforementioned ones (Rau, et al., 2022).

Additionally, the East-Med region shows significant differences in terms of economic development and as such, technology and infrastructure costs may be more complicated to secure in countries struggling with economic hardships.





CONCLUDING REMARKS AND RECOMMENDATIONS

Around the Mediterranean Sea, there is a considerable contrast between the Northern, Southern and Eastern shores. In the North and West sides of the Mediterranean (mostly EU members), infrastructures and supply development were completed decades ago. This has not been the case in the East-Med region. Energy plays a vital role for the security of the Mediterranean countries and no significant economic progress can be foreseen without the support of reliable energy. The East-Med thus requires significant investment in the electricity sector to meet the resulting increase in electricity demand, while a common objective across the entire region is to make energy supplies more secure and sustainable.

The role of interconnectors can be interpreted as the following:

- 1) Reduce high price differentials between different market nodes and/or countries, which leads to better economic exchange.
- 2) Reduction in the investment in generating capacity, improving reliability and pooling reserves.
- 3) Positively contribute to achieving national renewable energy targets through the integration of renewables.
- 4) Contribute to solving adequacy and security of supply issues, and improve system flexibility, diversity of generation mix, voltage stability and the control of power flows.
- 5) Fully or partially contribute to resolving the isolation of countries in terms of power system connectivity or to meeting specific interconnection targets as additional system restoration mechanisms.
- 6) Enable cross-border flows to overcome internal grid congestions and mitigate loop flows in bordering systems.
- 7) Improve load factor and increase load diversity.

To achieve this, the following must be considered at the various levels:

Political:

- Political agreements among East-Med countries need to be developed to ensure effective construction and operation of these projects. This includes but is not limited to agreements on how benefits and costs of the project will be shared, how the interconnection will be operated and secured or what type of information will be shared between trading countries (United Nations, 2006).
- Building a power market in the East-Med requires elaborating a successful regional contract or forming an East-Med Electricity Forum (EMEF) similar to the East-Med Gas Forum (EMGF).

Regulatory and governance:

- Establishing a regulatory platform among East-Med countries similar to the MEDREG Association for collaboration, coordination and data sharing between national TSOs with regards to electricity interconnectors. Each of the East-Med countries shall be represented by its national regulatory authority or the electricity governing body in the regulatory platform of the region to jointly promote greater harmonization of the regional energy markets and legislations.

- It is important for countries of the East-Med, especially those that still have electricity utilities which hold vertical monopolies, to unbundle their electricity markets in a manner that would permit the participation of the private sector under PPP schemes and ensure prices are competitive in foreign markets (Mitchell, 2021).

Technical:

- Maintaining the overall system flexibility and grids' stability at the national level will be achieved by ensuring the compatibility of grid systems and implementing common standards. The proposed interconnections represent an attempt to confront the different East-Med countries' national development plans to raise the challenges of diversification of their electrical mixes and allow more RE to be integrated.

Financial:

- Establishing a collaborative, adequate and more sustainable regional fund for electricity interconnectors among East-Med countries with the aim to attract investments. The fund shall be financed by the countries of the region based on the volume of each country's grid and may attract financing from other neighboring regions like European countries (Entso-E) based on the fact that the better interconnection within each region would also bring a benefit for the other neighboring regions, including the Gulf.

Europe can assist the East-Med countries on regulatory, governance, technical and financial levels by helping adapt its systems to upscale the region's standards. Energy trading between the countries of the region and the EU will require compatibility of systems and cooperation on multiple levels.



BIBLIOGRAPHY

- Bellini, E., 2022. *PV Magazine Subsea cable to bring wind, solar power from Egypt to Europe*. [Online] Available at: <https://www.pv-magazine.com/2022/10/12/subsea-cable-to-bring-wind-solar-power-from-egypt-to-europe/> [Accessed 24 October 2022].
- Claus, P., 2022. *US Abandons EastMed Pipeline Plan*. [Online] Available at: <https://malliotakis.house.gov/media/in-the-news/us-abandons-eastmed-pipeline-plan> [Accessed 25 May 2022].
- Ellinas, C., 2022. *Cyprus energy: the need for electrical interconnection*. [Online] Available at: <https://cyprus-mail.com/2022/01/29/cyprus-energy-the-need-for-electrical-interconnection/> [Accessed 28 June 2022].
- Hive Power, 2021. *Grid Stability Issues With Renewable Energy Sources, How They Can Be Solved*. [Online] Available at: <https://www.hivepower.tech/blog/grid-stability-issues-with-renewable-energy-how-they-can-be-solved#:~:text=Understanding%20Grid%20Stability&text=For%20a%20power%20grid%2C%20to,from%20the%20grid%20than%20generated> [Accessed 20 June 2022].
- Houssari, N., 2022. *Arab News – US urges Lebanon to resolve maritime border issue with Israel Previous*. [Online] Available at: <https://www.arabnews.com/node/2021561/middle-east> [Accessed 24 June 2022].
- Hurriyet Daily News, 2021. *Turkey, Greece agree on 25-article cooperation package*. [Online] Available at: https://www.hurriyetdailynews.com/turkey-greece-to-take-concrete-steps-to-improve-ties-fm-cavusoglu-165158?utm_source=Facebook&utm_medium=post&utm_term=post [Accessed 25 June 2022].
- IRENA, 2021. *Energy Profile Syrian Arab Republic*. [Online] Available at: https://www.irena.org/IRENADocuments/Statistical_Profiles/Middle%20East/Syrian%20Arab%20Republic_Middle%20East_RE_SP.pdf [Accessed 20 June 2022].
- MEDREG, 2021. *Regional integration: sub-regional regulatory convergence*. [pdf] Milan: MEDREG. Available at: http://www.medreg-regulators.org/Portals/default/Skede/Allegati/Skeda4506-518-2021.3.10/Regional_Integration_ENG.pdf?IDUNI=3v41sb1fiogcy20u2jcdvjs8599 [Accessed 20 June 2022].
- MEDREG, 2018. *Mediterranean Electricity Markets Observatory*. [pdf] Milan: MEDREG.
- Med-TSO, 2020. *Mediterranean Network Development Plan at 2020*. [pdf] Rome: Med-TSO.
- MESP, 2022. *The East Med Energy Report*. [pdf] Beirut: MESP. Available at: <https://www.mesp.me/wp-content/uploads/2022/10/The-East-Med-Energy-Report-Issue-11.pdf> [Accessed 24 October 2022].
- Milhem, H. Z., n.d. *Paving the Way for a Renewable Energy Future in Palestine. This Week in Palestine* [Online] Available at: <https://thisweekinpalestine.com/paving-the-way-for-a-renewable-energy-future-in-palestine/#:~:text=The%20Palestinian%20Energy%20Authority%20issued.if%20certain%20prerequisites%20are%20attained> [Accessed 20 June 2022].
- Mitchell, G., 2021. *Supercharged: The EuroAsia Interconnector and Israel's Pursuit of Energy Interdependence*. [pdf] Mitvim. Available at: <https://mitvim.org.il/wp-content/uploads/2021/02/Gabriel-Mitchell-The-EuroAsia-Interconnector-and-Israels-Pursuit-of-Energy-Interdependence-February-2021.pdf> [Accessed 3 July 2022].

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Rau, M., Seufert, G. & Westphal, K., 2022. The Eastern Mediterranean as a Focus for the EU's Energy Transition. [Online] Berlin: Stiftung Wissenschaft und Politik (SWP). Available at: <https://www.swp-berlin.org/publikation/the-eastern-mediterranean-as-a-focus-for-the-eus-energy-transition> [Accessed 28 June 2022].

Shatila, S. Z., Al-Ashmawy, R. & Obeid, J., 2021. Leveraging Energy Storage Systems in MENA. [pdf] Dammam: APICORP. Available at: https://www.apicorp.org/wp-content/uploads/2021/12/Leveraging_Energy_Storage_in_MENA_EN_FINAL.pdf [Accessed 20 June 2022].

Sukkarieh, M., 2021. The East Mediterranean Gas Forum: Regional Cooperation Amid Conflicting Interests. [pdf] NRGi. Available at: https://resourcegovernance.org/sites/default/files/documents/the_east_mediterranean_gas_forum_regional_cooperation_amid_conflicting_interests_0.pdf [Accessed 21 June 2022].

Tanchum, M., 2021. Eastern Mediterranean Energy and Regional Cooperation: 2021 Outlook. [pdf] Barcelona: IEMed. Available at: https://www.iemed.org/wp-content/uploads/2021/10/Eastern-Mediterranean-Energy-Regional-Cooperation_Medyearbook2021.pdf [Accessed 1 July 2022].

The Arab Weekly, 2021. Lebanon, Israel maritime border row reignites. The Arab Weekly [Online] 25 September. Available at: <https://the arabweekly.com/lebanon-israel-maritime-border-row-reignites> [Accessed 25 June 2022].

Tokyay, M., 2022. Presidential visit to Ankara could start 'new period' in Israel-Turkey relations: Erdogan. Arab News [Online] 27 January. Available at: <https://arab.news/wwjng> [Accessed 20 June 2022].

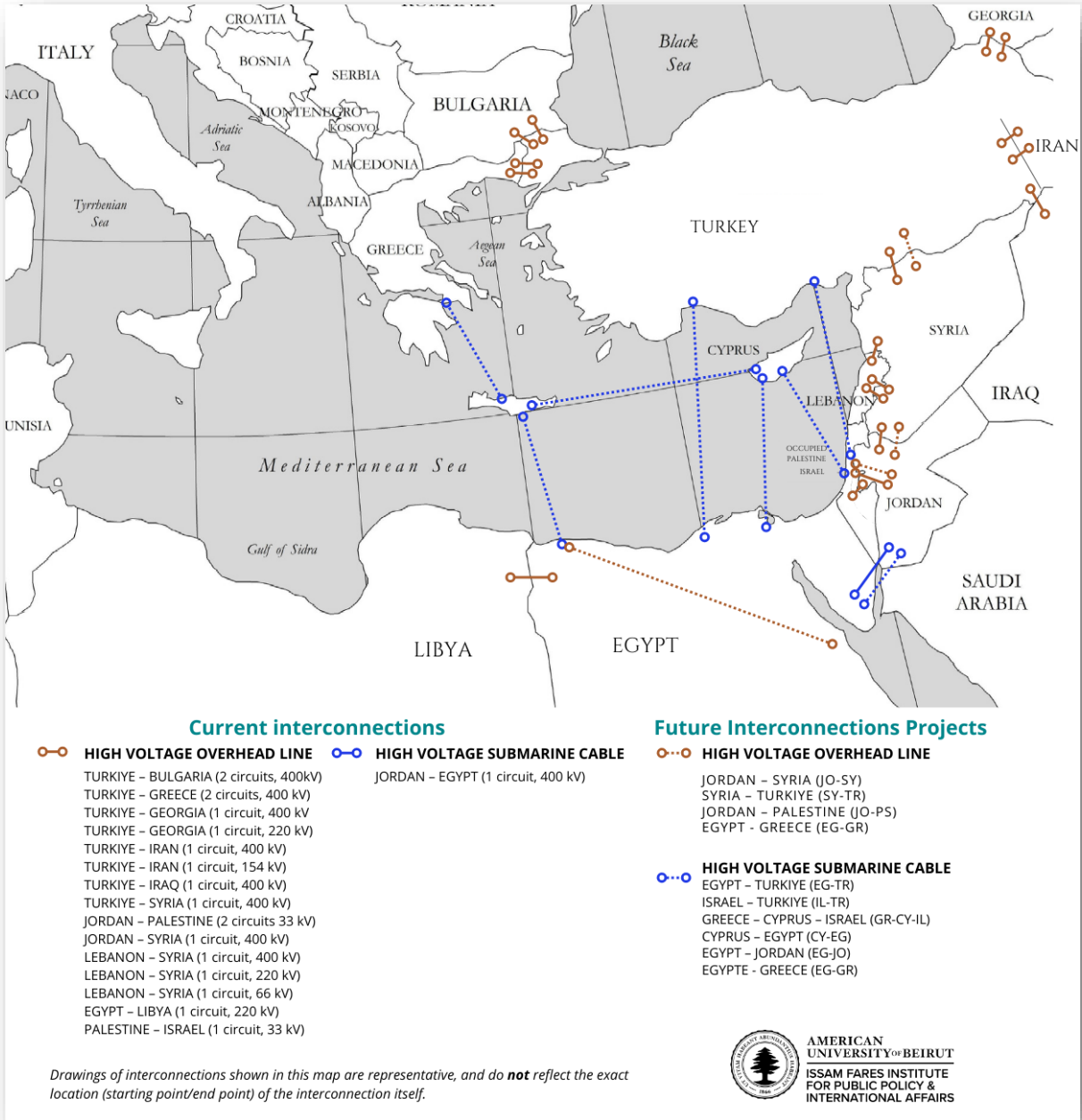
United Nations, 2006. Multi Dimensional Issues in International Electric Power Grid Interconnections. [pdf] New York: United Nations. Available at: <https://www.un.org/esa/sustdev/publications/energy/interconnections.pdf> [Accessed 3 July 2022].

Westphal, K., Pastukhova, M. & Pepe, J. M., 2022. Geopolitics of Electricity: Grids, Space and (political) Power. [Online] Berlin: Stiftung Wissenschaft und Politik (SWP). Available at: <https://www.swp-berlin.org/en/publication/geopolitics-of-electricity-grids-space-and-political-power#hd-d37840e610> [Accessed 28 June 2022].



APPENDIX A

ELECTRICITY INTERCONNECTIONS IN THE EASTERN MEDITERRANEAN



ABOUT IFI

Inaugurated in 2006, the Issam Fares Institute for Public Policy & International Affairs at the American University of Beirut is an independent, research-based, policy-oriented institute. It aims to initiate and develop policy-relevant research in the Arab world.

The Institute aims to bridge the gap between academia and policymaking by conducting high quality research on the complex issues and challenges faced by Lebanese and Arab societies within shifting international and global contexts, by generating evidence-based policy recommendations and solutions for Lebanon and the Arab world, and by creating an intellectual space for an interdisciplinary exchange of ideas among researchers, scholars, civil society actors, media, and policy makers. Through its work, Issam Fares Institute aspires to inform policy-making processes and influence the public debate, as well as to innovatively explore state of the art research methodologies and new ways for research dissemination. Issam Fares Institute also responds to emerging policy needs in Lebanon and the Arab world by attracting talented scholars and practitioners and building an agile organization.

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