BEYOND THE POLITICAL ECONOMY OF ELECTRICITY AND GAS TRADE IN THE MIDDLE EAST AND NORTH AFRICA REGION

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PPIAF Enabling Infrastructure Investment
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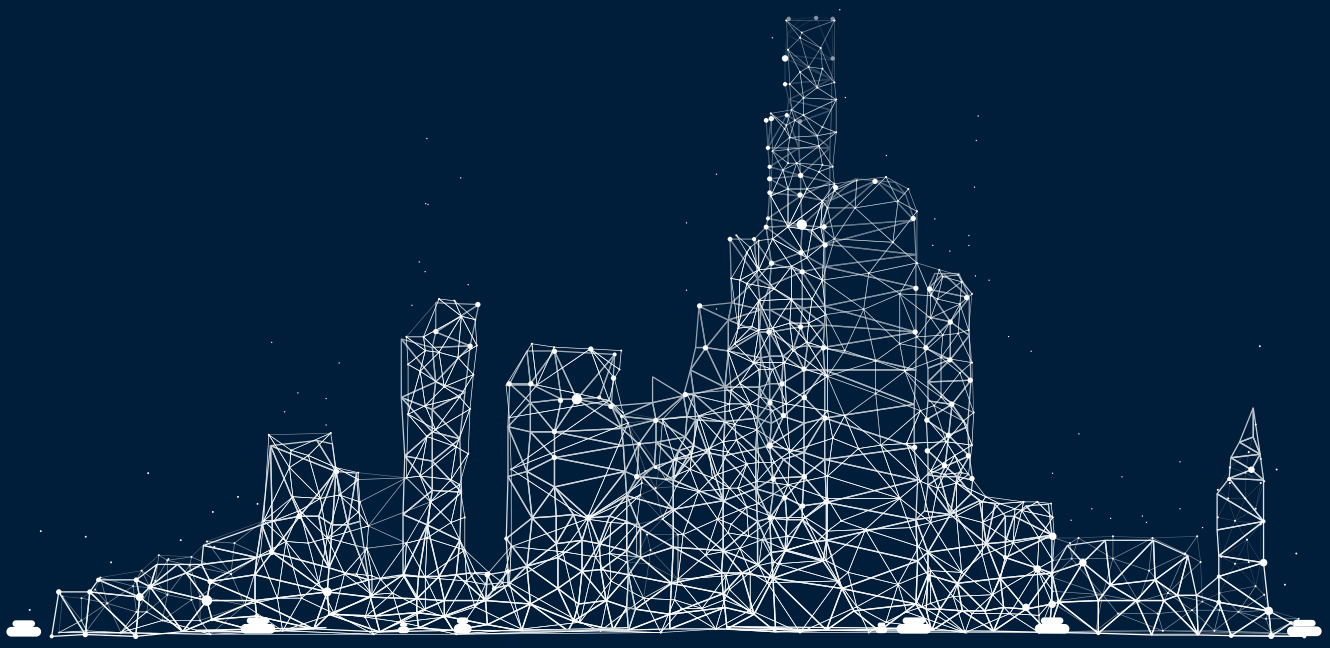

PREFACE

This paper is intended to inform regional energy cooperation in the Middle East and North Africa (MENA) region, and to support ongoing efforts to promote electricity and gas trade among MENA countries.

One of the World Bank Group's (WBG's) corporate strategy objectives is to promote regional cooperation in the energy sector around the world. Despite the compelling rationale for regional energy trade, MENA remains at the margins of the global trend towards regional grid and market integration. Both electricity and gas trade volumes within the region have been modest. The WBG has accordingly undertaken several studies of the electricity and natural-gas sectors, and pursued several programs to support intraregional (as well as interregional) trade.

In 2013, the WBG concluded the initial phase of a fruitful cooperation program with the League of Arab States (LAS), establishing the Pan-Arab Electricity Market (PAEM) governance framework. This formed a much-needed vision for the PAEM design, market rules, and institutions.

In 2016, the World Bank scaled up support for regional trade among Arab countries by establishing the Pan-Arab Regional Energy Trade Platform (PA-RETP) Initiative. The PA-RETP aims to further advance electricity and gas trade among Arab countries, with the ultimate goal of creating the PAEM and articulating a strategic approach for developing a Pan-Arab Gas Market (PAGM). The PA-RETP focuses on devising enablers of regional electricity and gas trade (e.g., pricing mechanisms); developing regional market governance structures and institutions; and introducing innovative financing solutions to advance regional electricity and gas investments.

One of the initiative's key products is this paper, which aims to inform and advance political support for accelerated cooperation and move to implementation. Successful and timely implementation is necessary to reap the benefits of commercial electricity and gas trade, and to build on successful milestones at the sub-regional and Pan-Arab levels.

The timing of this note was prompted by these milestones, including the envisaged legal establishment of the PAEM and initial steps to deepen intra-regional gas trade and move towards a PAGM vision.

ACKNOWLEDGEMENTS

This report was prepared by Phillip Cornell (Principal Author), under the Pan-Arab Regional Energy Trade Initiative,[i] led by Waleed Alsuraih (Task Team Leader and Lead Energy Specialist), and comprising Alexander Huurdeman (co-Task Team Leader and Senior Energy Specialist), Emmanuel Py (Senior Energy Specialist), Mohammed Qaradaghi (Senior Energy Specialist), Debabrata Chattopadhyay (Senior Energy Specialist), Abdulaziz Al-Shalabi (Energy Specialist), Mark Njore (Program Assistant, Energy), Doug Bowman (Consultant, Senior Energy Specialist), Victor Loksha (Consultant, Senior Energy Specialist), John Irving (Consultant, Senior Power Engineer), Ilka Deluque Curiel (Consultant, Energy Specialist), and Javier Inon (Consultant, Energy Specialist).

The Pan-Arab Regional Energy Trade Initiative was incorporated by the World Bank's Middle East and North Africa (MENA) region under the **MENA Climate Action Plan** and under Commitment #5: Enabling Collective Action. The initiative is also in line with the new MENA regional strategy that focuses on four pillars (Reviewing the Social Contract; Regional Cooperation; Resilience; and, Recovery and Reconstruction"[ii]), expanded to include digital transformation and maximizing finance for development. It is an essential part of the MENA Strategy's pillar on regional cooperation.

The team is grateful to its regional management (*inter alia*, Anna Bjerde, Director, Strategy and Operations, MNAVP; and Sajjad Shah-Sayed, Manager, MNADE) and to its Global Practice Management (Riccardo Puliti, Senior Director; Lucio Monari, Director; and Erik Fernstrom, Practice Manager) for their support and funding.

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The task team wishes to acknowledge the support and cooperation extended to it by members of the steering committee and of the study team of the Pan-Arab Electricity Market.

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This publication is being presented at the First Pan-Arab Regional Energy Trade Conference held in Cairo, the Arab Republic of Egypt, on November 6 and 7, 2019. The conference is co-organized by the World Bank (with support from the Public Private Infrastructure Advisory Facility and the Energy Sector Management Assistance Program), the Arab Fund for Economic and Social Development, and the League of Arab States (LAS). The conference gathers Arab and international experts and decision makers to exchange experiences—creating momentum, a shared vision, and an action plan for regional energy trade and partnerships for both electricity and gas.

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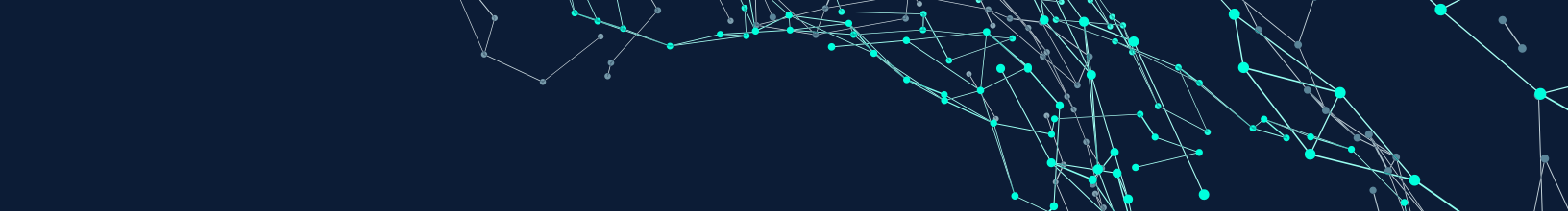


information, visit www.ppiaf.org.

The Energy Sector Management Assistance Program (ESMAP) is a partnership between the World Bank and 19 partners to help low- and middle-income countries reduce poverty and boost growth through sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the World Bank's country financing and policy dialogue in the energy sector. Through the World Bank Group (WBG), ESMAP works to accelerate the energy transition required to achieve Sustainable Development Goal 7 (SDG7) to ensure access to affordable, reliable, sustainable and modern energy for all. It helps to shape WBG strategies and programs to achieve the WBG Climate Change Action Plan targets.

The report was edited by Luba Vangelova. It was designed by Nursena Acar.

EXECUTIVE SUMMARY

Technological changes in the energy sector, global economic shifts, and regional demographics have forced a tight timetable on domestic economic reforms across the Middle East and North Africa (MENA) region. They also underscore the value of cooperation with neighbors. The political-existential imperative to move quickly on economic transformation is generally recognized by governments in the region; the challenge is to convince stakeholders that mutual trust, interdependence, transparent governance, and competent institutions are the critical ingredients to achieving their goals.

For the purposes of this paper, the political economy of energy trade refers to domestic and international economic and political factors that shape the motivations, decisions, actions, and outcomes of energy trade among countries.[iii]

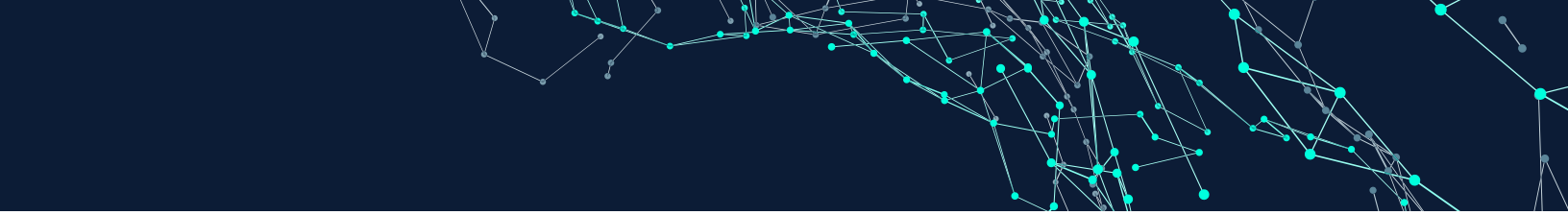
Energy trade within the MENA region is traditionally limited, with most energy resources exported from the region in the form of oil and gas. Many countries have committed to a long-term vision for a Pan-Arab Electricity Market (PAEM) to facilitate increased trade and infrastructure investments, but existing cross-border power infrastructures remain limited and underutilized. Gas trade among MENA countries is also historically minimal, thanks to pipeline politics, domestic subsidies, and strategic concerns.

As countries across the region confront rapidly growing domestic demand, structurally weaker oil prices, and a changing fuel mix, greater intra-regional trade and market integration can deliver market efficiencies to more securely meet growing demand while supporting economic development and energy-sector transitions. There is a strong economic case in favor of fostering regional gas and power markets, particularly given endemic budget constraints, but political considerations and rivalries can pose impediments.

Domestically, many oil-producing countries are engaged in programs to diversify their economies, and national economic reforms across the region often include energy-sector reform and ambitious clean-energy targets. Grid interconnection could improve the efficiency of variable renewable-energy integration, reduce costs, and improve reliability. Yet motivated champions of regulatory synchronization are lacking due to concerns about implicit wealth transfer (from trading subsidized resources); over-dependence on neighbors for strategic resources (especially where there are political difficulties e.g. with Qatar, or the Islamic Republic of Iran); and the low number of market participants. As a result, cross-border infrastructure is difficult to build and reliably operate, and domestic market reform is taking place at various speeds.

Full domestic energy-market liberalization is not necessarily a pre-requisite for increased electricity and gas trade. Mechanisms such as unified cross-border pricing (based on agreed commercial terms and benchmarking) can facilitate commercial trade and organic market formation by mitigating the effects of variously subsidized energy products, and place more emphasis on efficiency. But ultimately countries will need to reduce price distortions and increase market access along the value chain if they want to create a competitive environment and allow for cost-reflective price discovery—both of which are necessary for deeper market integration and to fully exploit the benefits of trade.

In each country, the drivers, pace, and context for electricity and gas-sector reform and trade will be different. Resource-rich exporters may have different agendas for trade than energy importers, and centralized political structures pursuing transformation will determine the distribution of costs and benefits differently than delicate heterogeneous



parliaments prioritizing stability. Even the optimal end-state market structure may be different (for example with regard to forms of unbundling).

However, regional variability should not delay action, both to advance trade and to address domestic reforms. Even as countries in the region are pursuing electricity-market reforms at different speeds, more progress is needed across the board, particularly where trade offers compelling economic and financial benefits.

Regional states have only begun to remove single-buyer market restrictions and allow third-party access to transmission systems. In most cases the process has been marked by setbacks and inconsistent political environment support. While each country faces its own challenges, political structures, and menu of policy options, moving ahead with regional trade should not delay domestic reforms or imply path dependency. In fact, regional trade could encourage governments to accelerate these reforms to fully exploit its potential.

A bottom-up approach to market integration is key to securing buy-in from domestic stakeholders, and should support national objectives such as renewable-energy integration and energy efficiency—which in turn drive the need for grid flexibility, market reform, and greater market participation.

Regional institutions and trading rules will be necessary, such as those developed for the PAEM, but institutions should be tailored to meet the specific trading needs of the region as they evolve. In other words, trading rules without regional institutions to enforce their application will not bring the envisaged benefits of trade, and vice-versa. They should evolve together in a phased process relying on buy-in from participating countries.

When it comes to trade in natural gas, despite holding much of the global reserves, the region struggles to meet rising internal demand.

Major producers such as Qatar and the Islamic Republic of Iran are politically isolated from their neighbors, while Saudi Arabia consumes its production at home to produce power and petrochemicals.

Changing political and gas dynamics in the Eastern Mediterranean have encouraged new energy trade paradigm, boosted the Arab Republic of Egypt as an exporter, improved import options for energy-poor Jordan, and prompted the search for regional export routes that bypass Turkey.

The Qatar-United Arab Emirates Dolphin Pipeline has commercially independent governance structure and continues to operate in the presence of political strains, while the Arab Gas Pipeline has suffered from a fluctuating supply picture in Egypt and conflict along its route.

Developing LNG infrastructure and a flexible regional market continues to be the preferred option, and the Saudi Arabian strategy even seeks to tie in upstream gas acquisitions from around the world. All of this can be encouraged with the development of regional trading hubs.

Integrating regional gas and power markets can support national development strategies due to their synergies and complementarities, and ultimately help to promote regional peace and prosperity. But it can also pose new challenges in terms of pooling sovereignty, and risks that must be adequately managed.

Dedicated institutions and mechanisms for coordination and accountability are necessary to facilitate functioning markets, but should be limited to carrying out clear mandates and

subject to national control.

Increasing outside investment and expanding market participants can yield significant benefits, but could also expose the region to foreign asset control or cyber-security vulnerabilities. The process should respect stakeholders' concerns about security and sovereignty throughout.

Indeed, recognizing national primacy and advocating for timely regional progress are not mutually exclusive. The moment is ripe to move forward.

Building on the recent efforts to establish the PAEM and advance gas trade, the following is a summary of **key messages,** which aim to provide an overarching framework for Arab countries in accelerating the transition to successful PAEM operations, and a Pan-Arab gas trade vision:

1. **The benefits of regional trade are positive and significant at the national level, but vary among market participants.** By 2035, greater regional trade shows a reduced need for total generation capacity, by as much as 49 gigawatts (GW), equivalent to combined nominal capacity of Iraq, Jordan, Lebanon, West Bank and Gaza, and Syria; and 3% higher than that of entire Maghreb countries. MENA countries have a great deal to gain from electricity and gas trade—from alleviating fiscal pressure, to supporting national development aims, and encouraging wider cooperation. However, for individual market participants, full market integration can be challenging. The broader economic challenge is how to allocate costs and benefits across market participants. This is the case for both investment costs (in particular, cross-border transmission infrastructure or domestic infrastructure investments that have cross-border implications) and operational costs.
2. **Realizing commercial trade benefits requires greater utilization of cross-border infrastructure.** Large gains are possible from greater use of existing cross-border infrastructure, even before new investment in interconnections. Cross-border infrastructure is under-utilized because existing trade focuses on exchange-in-kind and emergency exchanges (mostly because of pricing distortions stemming from subsidized fuel)[1]. Eventually removing price distortions at the wholesale level is key—benchmarking pricing to try to estimate those distortions and to commercially price traded energy is a near-term fix, but effective price reform (particularly of fuel-to-power prices) is needed to address the concern of implicit wealth transfer.
3. **Accelerating bilateral trade should be a priority.** Bilateral partnerships, and small groups of countries within a region, can create power-trading pools or gas trading hubs that later attract neighboring countries, and possible private players. For example, the GCC interconnection provides a core that can later expand trading to Egypt and Yemen as well as create opportunities for new pool with Mashreq countries While region-wide markets come to fruition, preliminary decisions to facilitate sub-regional trade can be taken in the meantime. The World Bank has already identified the ullage of existing infrastructure; the promotion of bilateral connections; and the interconnections between transmissions systems as some of the quick wins that can be achieved under the prevailing market conditions.
4. **Electricity-market integration can positively impact employment, to the degree**

[1] Even in the Gulf Cooperation Council (GCC) where institutions and infrastructure are largely in place, the utilization rate is under 6 percent (compared to about 50 percent in Europe), and figures are similarly low across the region.

that it can facilitate renewable-energy deployment. The region's ambitious renewable-energy targets could unlock the potential of new industries in the region. Project-level data indicate that, on average, renewable energy creates more jobs than fossil fuels (solar photovoltaic [PV] projects create at least twice the number of jobs per unit of electricity generated than coal or natural gas projects). Additionally, fiscal efficiencies gained from market integration, domestic liberalization, and the reduction of energy subsidies may free up government resources for targeted employment and manufacturing schemes.

5. **Development of regional markets can be compatible with varying speeds of domestic reform.** The early stages of the PAEM implementation plan substantially scale up bilateral trade but do not require liberalization. However, domestic reforms and regional market integration should go hand-in-hand. Non-discriminatory open access to the grid and third-party sales are eventually necessary for improving competitiveness and market liquidity at the national and transnational levels. Countries should follow a bottom-up approach to market integration, ensuring political feasibility and convincing domestic stakeholders within the specific national context. Market integration is a long process that requires continuous political support. As a way forward, the building of an integrated market could follow a "national control and regional cooperation" approach.
6. **Regional institutions should gradually evolve with the market.** A certain degree of compatibility in regulatory frameworks is required for integrated electricity and gas markets to function effectively. Indeed, this is addressed under the Grid Code and market agreement of the PAEM. To progressively align and implement regulatory approaches requires an independent institution at the regional level. The creation of specialized and empowered bodies (for example through the Arab Ministerial Council for Electricity) to facilitate cooperation between transmission system operators (TSOs) is a first step. TSO alignment is vital to addressing technical issues, but also to push policy-makers to take the necessary successive decisions. Political institutions also have a key role to play, both in enabling dialogue in the first place and supporting overall coordination.
7. **Synergies between regional electricity and gas trade, and advanced technologies, support national goals for sustainable-energy transitions.** Ambitious renewable-energy and efficiency targets are driven by national priorities and economic transformation, but they are also major catalysts for market integration. More efficient power trading in turn facilitates renewable energy build-out and investment, which is closely correlated with gas capacity (for baseload power) and gas prices (for power pricing and sustainability). Using unsubsidized gas prices yields CO2 emissions savings of 939 million tons without electricity trade, and about 1.3 billion tons with trade. New technologies such as utility-level power storage and hydrogen have the potential to reshape electricity trade and the relationship between gas and power—but that relationship remains tight

ABBREVIATIONS

ADB	Asian Development Bank
AGP	Arab Gas Pipeline
bcf/d	billion cubic feet per day
bcm	billion cubic meters
BRI	Belt-and-Road Initiative
CCS	carbon capture and storage
CSP	Concentrated Solar Power
EIJLLPST	Eight-Country Interconnection Project
EMGF	East Mediterranean Gas Forum
ENTSO-E	European Network for Transmission System Operators - Electricity
EU	European Union
FDI	foreign direct investment
FSRU	floating storage regasification unit
GCC	Gulf Cooperation Council
GCCIA	Gulf Cooperation Council Interconnection Authority
GDP	gross domestic product
GEMS GCC	Electricity Market System
GW	gigawatt
GWh	gigawatts/hour
HFO	heavy fuel oil
IEA	International Energy Agency
IFI	international financial institution
IMF	International Monetary Fund
IPP	independent power producers
LAS	League of Arab States
LNG	liquid natural gas
MEG	Maghreb-Europe Gas Pipeline
MENA	Middle East and North Africa
MMBTU	one million British Thermal Units
MOU	memorandum of understanding
O&M	operations and maintenance
PAEM	Pan-Arab Electricity Market
PA-RETP	Pan-Arab Regional Energy Trade Platform

PAGM	Pan-Arab Gas Market
PPP	private-public-partnership
PRG	partial risk guarantees
PV	photovoltaic
RES	renewable energy sources
RPM	regional pricing mechanism
SDG	Sustainable Development Goal
SME	small and medium enterprise
tcf	trillion cubic feet
TPA	third-party administrator
TSO	transmission system operators
WBG	World Bank Group

All dollar amounts are U.S. dollars unless otherwise indicated.

1 PURPOSE AND CONTEXT

This note is intended to support ongoing efforts to promote Pan-Arab energy trade by highlighting the role and benefits of intra-regional electricity and gas exchange, with a view to improving energy security in the Middle East and North Africa (MENA) region.[iv]

After some background, this note contributes to discussions on energy security within the region by highlighting various aspects of the current political economy of the energy sector, specifically electricity and gas, which are relevant to the discussion on cooperation for regional integration and their convergence with sustainable development.

This note argues that, given the benefits of trade and technological developments outlined herein, the time is right to move from cooperation agreements towards the operationalization and implementation of trade by developing the necessary institutional and regulatory building blocks. Innovative technologies and wider economic trends are converging in new ways that amplify synergies within traditional energy sectors (such as oil, gas, and power) and foster emerging sectors such as hydrogen.

Given the benefits of trade and technological developments outlined herein, the time is right to move from cooperation agreements towards the operationalization and implementation of trade

Despite the disruptive nature of the process, the pace of change is forcing new political bargains and policy goals across the region, but it presents Arab countries with new opportunities as well as challenges. Those include harnessing the highly diverse resources and unique positioning of the region to best optimize the energy system, and managing the transition by realizing the benefits of electricity and gas trade.

Despite having signed a memorandum of understanding (MoU) committing to the establishment of the Pan-Arab Electricity Market (PAEM), several national and regional actions and steps are required to ensure successful implementation and optimization of the market. The proposed market under the PAEM seeks to achieve progressive regional integration of electricity systems.

The region also faces a window of opportunity for increased trade in natural gas, and the two markets are intimately linked. Market-oriented actions in the regional trade efforts would go a long way toward facilitating both the PAEM and the Pan-Arab Gas Market (PAGM), while ensuring the sustainability of energy provision within the region.

Energy trade should be a key ingredient of the energy security formula of each country, and timely action should be taken now. Rather than let narrow political differences slow the pace of advancement, developing and opening up in a coordinated fashion can deliver shared benefits either directly (in the form of new revenues or cost savings from trade) or indirectly (in the form of greater energy access, jobs, competitiveness, and sustainability).

The international political economy of trade, and of energy trade in particular, rests on the economic understanding that gains from trade can accrue from efficiencies and a more optimal utilization of resources, but political preferences and competition will shape and limit the nature of that trade. In some cases, the economic benefits of greater efficiency may be judged to be lesser than the costs of trade, which can include exposure to international markets that undermines the domestic political bargain.

At this historical juncture, the international political economy of energy is transforming. Energy trading relations are now routinely confronted by the often-intractable politics of securing access to a wide range of resources; the drive towards constituting a distinctively low-carbon economy with its particular implications for various energy carriers; and the ongoing institutional reconfiguration of both the demand and supply sides of international resource markets. In the context of those changing markets, energy producers with a particular advantage (for example, abundant oil supplies) may see it eroding as the fuel mix transitions. Adapting to a new emerging

energy economic reality, in conjunction with domestic changes in demography or tastes, in turn requires new political choices and policy tools to ensure resilience and economic growth.

MENA countries are confronted with precisely these choices. In oil and gas producers, the prevailing political bargain traditionally offered cheap energy and state-funded development, in return for political subservience and allowing the state to retain monopoly control over energy resources. In a global energy economy where returns from fossil fuels face long-term declines, and where domestic demand is surging thanks to economic and demographic growth, that underlying bargain is increasingly untenable. National economic reforms therefore focus on weaning domestic users off subsidies (particularly of energy) and also opening the energy economy to benefit from more efficient and cleaner alternatives. Both are linked—energy subsidies hinder trade, while greater energy trade puts pressure on subsidies.

Energy subsidies are among the most pervasive and controversial fiscal policy tools used in the MENA region. In a region with few functioning social welfare systems, subsidized energy prices continue to form an important social safety net, albeit a highly costly, inefficient, and unsustainable one. While it is clear that energy subsidy reform will take time and not be the only variable at play, its potential socio-economic dividends are important factors for enabling some common regional objectives, including sustainable fiscal policies, fiscal space to invest in key areas such as human capital, and a more efficient and equitable distribution of scarce resources. Thus, reform can help to promote a more stable political status quo in the long term. With almost all MENA countries moving ahead with energy subsidy reform, it is timely to start capitalizing on that by advancing trade as creditworthiness improves. In turn, trade based on a viable commercial framework could provide countries with an incentive to accelerate subsidy reform and encourage market access domestically and regionally by more participants (i.e., traders and consumers).

With rising prospects for energy trade come important political questions that touch on the core of national sovereignty and security, particularly in a region where conflict is more prevalent. As other regional examples demonstrate, increased trade and more deeply integrated markets imply some degree of transnational governance and regulation—but they also hold out the prospect of interdependence and institutionalized conflict resolution that can mitigate regional violence.

Subsequent sections will review the state of electricity and gas trade in the region; sub-regional initiatives to promote interconnections and market integration; and prospects for these sectors. However, some general observations can be drawn in advance about the regional context for overall trade.

1.1. REGIONAL CONTEXT FOR TRADE

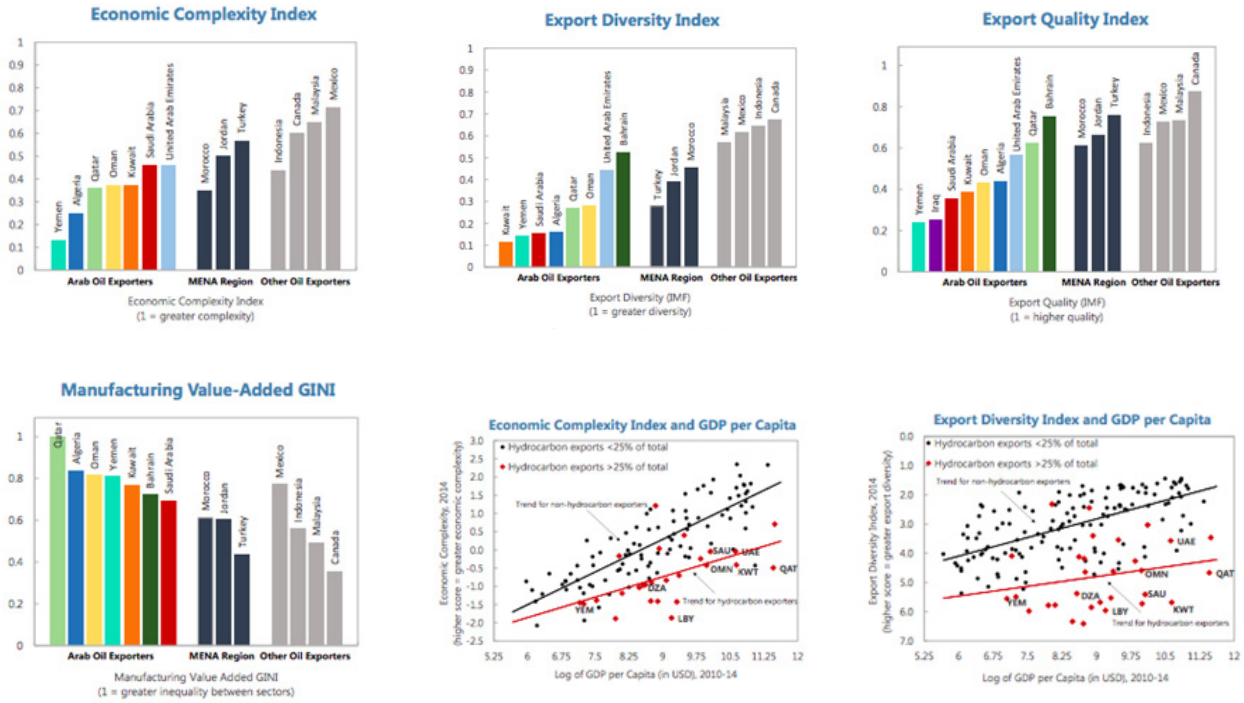
Since the 2011 uprisings and protests collectively referred to as the "Arab Spring", stagnant authoritarian regimes have been forced to contend with a young and sizeable generation of digitally connected citizens who are generally more dissatisfied with archaic hierarchies, entrenched political interests, corrupt bureaucracies, restrictive conservativism, and national parochialism. In some cases, the result was political revolution, reactionary counter-revolution, or brutal internal violence. While more extreme revolutionary sentiment has since been muted, regional elites have been forced to contend with the existential need for political and economic reform—particularly as traditional rentier behavior becomes less sustainable with the long-term decline of returns on hydrocarbons. Oil prices face structural weaknesses going forward, thanks to the rapid increase in unconventional supply (in the medium term) and peak oil demand (in the longer term).

In response, many regional governments have embarked on national economic reform programs such as Saudi Arabia Vision 2030, UAE Vision 2021, New Kuwait Vision 2035, Qatar National Vision 2030, Egypt Vision 2030, and Oman Vision 2040. Kick-starting non-hydrocarbon economic growth, and particularly employment, will be vital.

If present trends continue, by 2050 more than 300 million young people will be coming onto the regional job market. That represents a potential addition to the workforce roughly equal to three-quarters of the region's current population, and implies that the region needs to create 10 million jobs per year during that period. Regional birthrates are falling, but some countries are still above 3 percent (compared to European countries that often fall below replacement rates), and there is a demographic bulge now hitting the Arab job market, as well as an increasing percentage of educated women. These jobs, or their equivalents in paid work, are not going to come from the public sector; many will have to come from a vibrant and competitive private sector.[v]

Such changes, and the tectonic global economic shifts that precipitated them, have reshaped the region's approach to global trade and the socio-political imperative to open up.

Figure 1.1: Measures of Economic Diversity in MENA Countries[2]



Source: The Observatory of Economic Complexity; the International Monetary Fund's (IMF's) Diversification Toolkit; UNIDO INDSTAT4 Industrial Statistics Database; and IMF staff estimates.

While fossil fuels dominate regional exports to the rest of the world, there are significant opportunities for the MENA countries to boost exports in various other sectors. Data suggest that the region's combined untapped export potential of pharmaceuticals is worth an estimated $11 billion. The

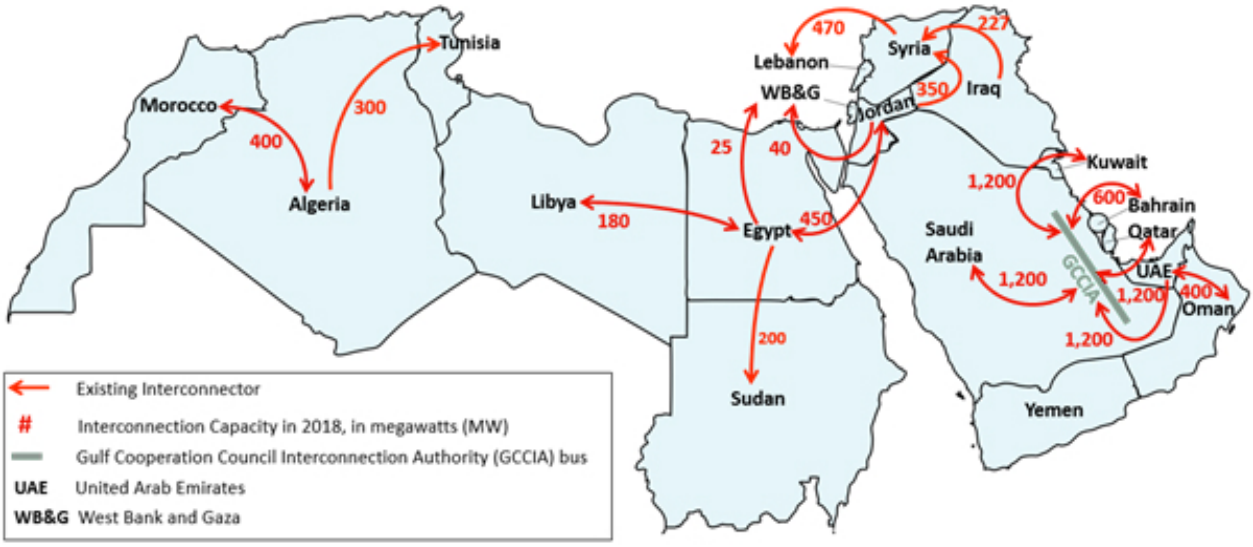
[2] **GINI Index** (World Bank Glossary): the Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

GDP (World Bank Glossary) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Country abbreviations in the last two graphs: Yemen (YEM), Algeria (DZA), Libya (LBY), Oman (OMN), Saudi Arabia (SAU), United Arab Emirates (UAE), Kuwait (KWT), and Qatar (QAT).

untapped export potential for precious metals is estimated at about $10 billion; for fruits and vegetables, the figure is almost $7 billion. In the following section, we find the figure for electricity to be as high as $135 billion. Despite the existence of multiple trade agreements among the countries of the MENA region, intraregional trade of both energy and non-energy products continues to be low.

Figure 1.2: Existing Cross-Border Power Interconnector Utilization in 2018[3]



The potential for increased regional trade is therefore hard for governments to ignore, but sometimes difficult to realize.

This is partly due to ongoing political disagreements or misaligned interests among regional states. In the past decade, some political fault-lines have hardened, leading to new strategic blocs. These are more complex than the Sunni-Shi'a divide portrayed in the press, but some do revolve broadly around approaches to regional Iranian influence and to various political-religious movements. Some results include the ongoing war in the Republic of Yemen, the blockade of Qatar, the increased isolation of Turkey, a quiet Israeli détente, fragile politics in Algeria and the Levant, and domestic instability in Libya, Iraq, and the Syrian Arab Republic.

Active regional involvement on the part of major external actors such as the United States, the Russian Federation, and China contribute to those divisions and influence regional investment and trade strategies. Recent departures in U.S. policy have complicated efforts to seek capital, investment, and ongoing security guarantees from Washington, while the Chinese Belt and Road Initiative (BRI) economic mega-plan offers new sources of financing and an alternative development model.

In short, as MENA governments respond to economic and social imperatives, they face major choices and policy challenges to increased trade and the pursuit of domestic economic reforms.

Given their prominence, the energy sector and regional electricity and gas trade are central to those efforts, and the time is right to address them.

[3] The map is for illustration purposes.

2 UNPACKING THE ECONOMIC BENEFITS OF ELECTRICITY AND GAS TRADE

If the costs of energy-market integration (vulnerabilities of interdependence, relegation of regulatory control to international institutions, and realignment of the domestic political bargain) are broadly intangible, the gains from trade and greater efficiency are more concrete and calculable. Nevertheless, costs and benefits are not evenly distributed, and their impact on particular stakeholders will ultimately determine how integration is pursued. As in any trade arrangement, the broader economic challenge for integration is how to allocate costs and benefits across market participants.

2.1. THE VALUE OF ELECTRICITY TRADE

Previous studies have identified the **potential economic benefits that the MENA region could accrue if all 18 countries engaged in full regional bilateral electricity trade.**[viii] They are direct sector-level gains from the ability to efficiently develop and deploy generation assets at a regional level and optimize cross-border power trade, versus each country developing its own generation resources. Benefits include increased access to lower-cost generation alternatives in a PAEM that can meet export as well as domestic electricity demands. Such analysis reconfirms the strong economic case for power-system integration and electricity trade.

The growing demand for energy in the region has required governments to direct significant resources towards augmenting supply, consequently increasing the fiscal burden of the sector.[ix] That burden has become even more pronounced because of the weak medium- and long-term outlooks for the oil price.

Given such budget constraints, integration can help meet the required levels of infrastructure investments. It has been estimated that the region requires electricity investments of about 3 percent of regional gross domestic product (GDP) to keep up with demand to 2035. In 2015, the region's fiscal deficits averaged 9.3 percent of GDP, and the economies with the largest deficits were also those with the highest levels of electricity subsidies. As economies adjust to this fiscal situation, there will be a scarcity of financing available for the electricity sector.[x] The sector must therefore drive internal efficiency gains, and also attract private infrastructure investment.

The savings and benefits derived from electricity trade present an excellent opportunity for treasuries and utilities to ease their financial burdens.

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Electricity Trade can decrease the total generation capacity required in the region. By 2035, scenarios with greater regional trade show a reduced need for total generation capacity, by as much as 49 gigawatts (GW). Significant generation investments can therefore be avoided. Regional integration and electricity trade can also lead to massive cost savings. Modeling results show the potential gain from the ability of the regional power system to tap into a more diverse set of resources, and to pool operating reserves and generation capacity. This allows postponing some expensive investments to meet national-level peak demand, while improving reserve margins and contributing to better security of supply.

In the scenarios with natural gas priced at current domestic levels, the introduction of electricity trade decreases the total system cost (in present-value terms) by $83.6 billion, or 6 percent. The savings from trade are further enhanced in the scenarios with unsubsidized (international) gas prices, where the total system cost decreases by $90.9 billion, or 6.7 percent. Finally, when gas-price liberalization is also accompanied by the introduction of carbon caps, the benefits from trade are even greater, reducing the system costs by $135 billion, or 9.2 percent.

Much of the benefit of trade can be attributed to the ability of an integrated system to better meet each country's demand and capacity reserve requirements. The composition of benefits can vary across policy scenarios. With regional integration and trade, the costs to meet the reserve requirements fall especially sharply as trade enables greater access to reserves through cross-border transmission interconnections.

The introduction of electricity trade impacts electricity prices in each country, but it does not necessarily mean that prices will be reduced. Many countries (mostly those with substantial generation gaps or few resources) may see reductions in their electricity prices. For some countries, the impact of trade on electricity prices is marginal. For some countries that are net exporters, electricity prices may increase. These are mainly gas exporters that have an incentive to invest more in generating capacity, due to their ability to efficiently generate electricity at lower prices. However, as they install more generation capacity, the price of electricity also rises as their effective demand (including export requirements) rises. In that case, they may need to utilize more generation than would otherwise be used absent such trade, or may even need to invest in progressively more expensive generation technologies.

2.2. THE VALUE OF GAS TRADE

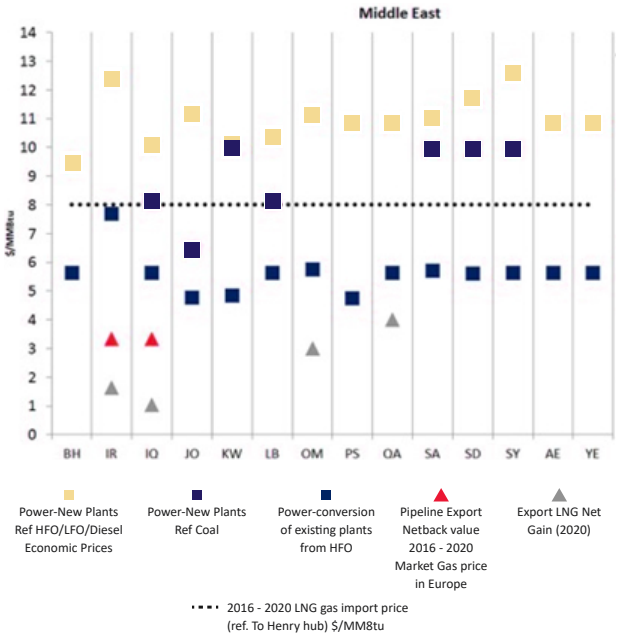
The benefits of gas trade between countries and in the Pan-Arab regions are potentially significant. When gas is moved from low cost producers to customers in need, both sides win. The benefits of trade come in the form of lower gas and electricity prices resulting in welfare improvements, cleaner and more efficient power production with fewer emissions relative to other fossil fuels, and enhanced security of supply.

The question is whether there is a trading space, defined as the area where both sellers and buyers are better off from trading, i.e., sellers receive higher netbacks within the region than from exporting outside the region, and buyers spend less on fuel for power generation than they would otherwise. A 2017 World Bank study[xi] derived this trading space for each country, comparing the netback value from gas export to world markets, to the value of that gas when replacing coal and heavy fuel oil (HFO) for power generation within the regionthe netback from export to world markets, to the value of consuming gas in the power sector instead of coal and heavy fuel oil (HFO). The value of gas in the power sector is the value that makes the buyer indifferent between the competing fuels, taking into account capital costs, operations and maintenance (O&M), and efficiencies.

If the reference is construction of new HFO-fired power plants (to be considered for peak load), the case seems clear. The gas price could rise to the level of $10 to 11 per one million British Thermal Units (MMBTU) and still be competitive with HFO. The variation between the countries originates from varying local efficiencies. The same conclusion is reached when comparing with existing HFO-fired power plants, except in the case of Jordan, which already has efficient plants. Comparing to coal is mostly relevant whenever new baseload is needed. Import or supply prices of gas above $6 per MMBTU would render the coal-plant option more economical in terms of cost of generated electricity.

Therefore, whenever the alternative is HFO, the value of gas to the buyer is always above the sellers' netback from export, leaving a positive trading space. Most countries should be willing to pay more than the LNG import price for a power plant converting from HFO to gas. If we consider coal as the reference, the trading space narrows for most countries.

Figure 2.1: Netback Value of Gas in Export (LNG + Pipeline), Power Sector (Coal, HFO)



Note: Abbreviations stand for Bahrain, the Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, West Bank and Gaza, Qatar, Saudi Arabia, Sudan, Syria, the United Arab Emirates, and the Republic of Yemen.

Source: World Bank 2017.

2.3. ENERGY TRADE AND ECONOMIC DEVELOPMENT

The United Nations Sustainable Development Goal 7 (SDG7)[xii] recognizes the importance of access to affordable, reliable, sustainable and modern energy for all. A well-established energy system supports all sectors, from medicine to education, agriculture, infrastructure, communications and high technology. Facilitating greater electricity and gas trade can support the aims of SDG7, particularly in terms of fostering employment, improving energy efficiency, and expanding energy access.

2.3.1. EMPLOYMENT

Economic reform programs across the region seek to diversify the economy and generate non-oil-sector employment for their relatively young populations, with an active role for small and medium enterprises (SMEs).[xiii]

To the degree that electricity market integration can facilitate deployment of new and cleaner energy technologies, it can positively impact employment. Project-level data indicate that, on average, renewable energy creates more jobs than fossil fuels (solar photovoltaic [PV] projects create at least twice the number of jobs per unit of electricity generated than coal or natural-gas projects). For example, if the Gulf Cooperation Council (GCC) were to progress toward its renewable-energy targets, this could create an average of 135,000 direct jobs per year. Such jobs would mostly be in construction and installation, which may impact nationals less in countries where expatriates dominate those métiers.

Many Arab countries have been able to localize parts of the renewable-energy supply chain. Concentrated Solar Power (CSP) projects in the United Arab Emirates, Morocco, and the Arab Republic of Egypt target or achieve upwards of 40 percent local content. The development of indigenous solar PV and wind-power supply chains is a key element of various national economic visions. Though the development of local and regional job markets may prove to be a challenge in the short term due to the human capital needs associated with the deployment of new technologies, it also presents an opportunity for the education sector, which would be required to help fill the human-capital requirement gap.

In addition to creating renewable-energy jobs, efficiencies gained from market integration, domestic liberalization, and the reduction of energy subsidies can free up government resources to be redirected toward other employment-generating investments.

2.3.2. ENERGY EFFICIENCY

A key component of energy-sector administration is supply and demand management. While adopting policies to address the problem of production efficiency, it is prudent to consider a region-wide conservation and consumption-efficiency policy.

The PAEM provides a relevant example, in that it provides the framework for inter-state distribution of electricity based on the diversity of demand in member countries. However, the gains to be achieved may be eroded by the absence of (or disparity in) national conservation policies. Coordinating national conservation policies to optimize gains from regional integration is achievable within the PAEM, because it already provides the framework for sharing information, technology, and infrastructure. Consequently, it would be easier to assess, measure, develop, and implement measures to ensure effective and efficient energy use.

2.3.3. ENERGY ACCESS

The primary aim of an integrated energy market would be to secure energy provision within the region. This would mean not only augmenting supply levels to meet demand, but also ensuring that energy is affordable to all consumer segments. Social-intervention policies have done very little to ensure that the poorer sections of the public can actually afford energy. The affordability of energy is largely impinged by high production costs and inefficiency, which energy suppliers naturally pass on to

consumers. Through regional integration, countries can optimize supply and reduce inefficiency, while adopting more dynamic tariff systems and conservation strategies. These will contribute to the lowering of prices for many consumers, particularly among poorer sections of the public. This is, however, dependent on a transition from a state-controlled pricing policy to a market-based approach to pricing.

2.4. THE POLITICAL VALUE OF ELECTRICITY GAS AND TRADE

In addition to economic efficiencies, reduced demands on public budgets, cheaper integration of renewable energy, increased employment, more efficient energy consumption, and wider energy access, **greater regional energy trade can also provide political and strategic benefits.**

There is a longstanding orthodox belief that greater trade creates interdependencies that are conducive to international peace, and European integration is a common reference. The correlation is real, but perhaps more complicated. Experience shows that conflict can indeed occur in the presence of established and substantial energy trade, and vice-versa. Russian gas continued to flow to Europe during the Ukraine crisis, the Soviet Union was a major source of natural gas to Western Europe during the Cold War, and the first era of globalization at the turn of the 20th century was swiftly followed by two of the most destructive wars in human history.

Nevertheless, the data is compelling. Empirical analysis organized by the Asian Development Bank (ADB), based on a large-panel data set of 290,040 country-pair observations from 1950 to 2000, confirms that an increase in bilateral trade interdependence and global trade openness significantly promotes peace. It suggests that **the effect of trade openness varies depending on the geographical proximity of countries** (global trade openness reduces the probability of conflict more for countries far apart from each other than for countries sharing borders). Meanwhile the results also show that **military conflict between countries significantly reduces not only bilateral trade interdependence but also multilateral trade integration.**[xv]

In the MENA region, gas trade in the Maghreb may have averted conflict between Algeria and Morocco in the 1990s, by providing a key avenue of cooperation in the presence of severe discord over the Western Sahara, but both countries have also sought to extricate themselves from interdependence.[xvi] When Jordan began importing Israeli gas under pressure from an American government looking to cement peace between its two regional allies, it sparked the largest Jordanian demonstrations since the Arab Spring. The Qatar-United Arab Emirates Dolphin pipeline continues to operate in the presence of the blockade, but after decades of looking to use Qatari gas to supply the rest of the GCC, both Qatar and their Saudi Arabian-United Arab Emirates adversaries are making long-term plans that assume an ongoing rift.

The lesson to draw is that trade alone is not a panacea for suppressing conflict, but it can provide a basis for building trust if it goes hand in hand with a political settlement. Indeed, the same political courage that is needed to institutionalize a functioning trading relationship can also promote conflict resolution and dialogue. In both cases, political will to build trust is a prerequisite for reaping the economic and political rewards of trade and peace.

Those political rewards can be significant. Leaders have come to see the economic clout that trade produces as more than merely an engine for military prowess: They now understand prosperity to be a principal means by which countries measure and exercise power. The strategic importance of trade is not new, but it has grown in recent years and strongly reinforces the economic case for expanding trade.[xviii] The world is moving to a new multipolar geostrategic reality, where a rules-based multilateral order underpinned by American hegemony is giving way to a new era of competition for greater geographic and economic power, driven by the shifting center of gravity of the global economy, the realignment of relationships between and among countries, and rapid technological

change. Energy is poised to play an important role in this upheaval and will be affected by such changes.

For regions like the Middle East that sit between emerging power centers in China, Europe, Russia, and the United States, close regional cooperation on issues such as grid integration, energy independence, trade, and cyber security will be key to exerting and maintaining Arab influence and power. Close regional cooperation on strategic issues such as power markets and network security can also avert a fate where the region becomes a contested sphere of influence for competing great powers. Strong rules, institutions, and trade cooperation within the region should help guard against foreign control of strategic assets; onerous trade or investment terms; and infrastructure-economic dependencies on outside powers.

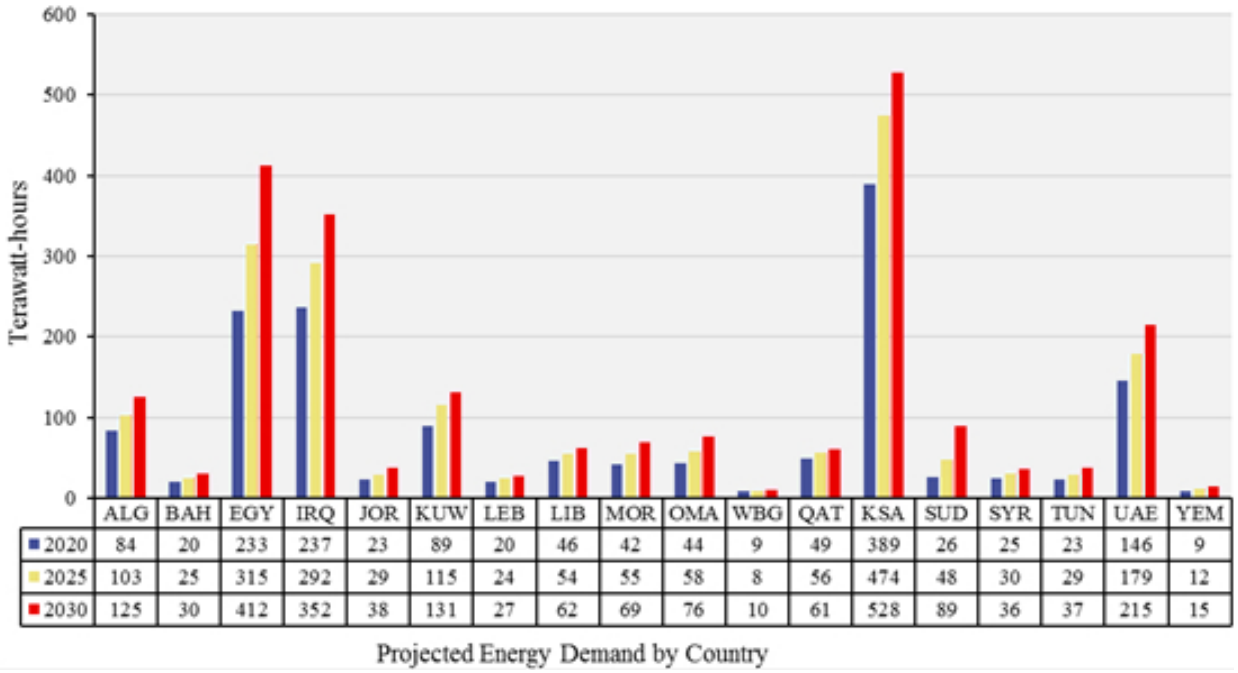
Even if electricity- and gas-market integration is sometimes driven by intra-regional disputes (to reduce dependence on the Islamic Republic of Iran, Qatar, or Turkey, for example), and even if increased trade is not a *prima facie* guarantee of peace, deepening regional energy-trade relationships can revive Arab unity as traditional American-style multilateralism and institutions in the region seem to ebb.[xix] That will be key not only to encouraging a confluence of interests among Arab states and reducing local conflict, but also to developing a secure Arab economic bloc that can stand confidently in a technologically and economically competitive multi-polar world.

3 REGIONAL ELECTRICITY TRADE IN THE MIDDLE EAST AND NORTH AFRICA

3.1. OVERVIEW

In order to meet rapidly growing power demand in much of the region at lower cost, countries can benefit from greater trade and more integrated electricity markets. This section provides an overview of electricity trade and an analysis of future trends.

Figure 3.1: Electricity Demand is Increasing Rapidly Across the MENA Region



	ALG	BAH	EGY	IRQ	JOR	KUW	LEB	LIB	MOR	OMA	WBG	QAT	KSA	SUD	SYR	TUN	UAE	YEM
2020	84	20	233	237	23	89	20	46	42	44	9	49	389	26	25	23	146	9
2025	103	25	315	292	29	115	24	54	55	58	8	56	474	48	30	29	179	12
2030	125	30	412	352	38	131	27	62	69	76	10	61	528	89	36	37	215	15

Note: ALG = The People's Democratic Republic of Algeria; BAH = The Kingdom of Bahrain; EGY = The Arab Republic of Egypt; IRQ = The Republic of Iraq; JOR = the Hashemite Kingdom of Jordan; KSA = The Kingdom of Saudi Arabia; KUW = The State of Kuwait; LEB = The Lebanese Republic; LIB = The State of Libya; MOR = The Kingdom of Morocco; OMA = The Sultanate of Oman; WBG = West Bank and Gaza; QAT = The State of Qatar; SUD = The Republic of the Sudan; SYR = The Syrian Arab Republic; TUN = The Republic of Tunisia; UAE = The United Arab Emirates; YEM = The republic of Yemen.

Source: World Bank 2019

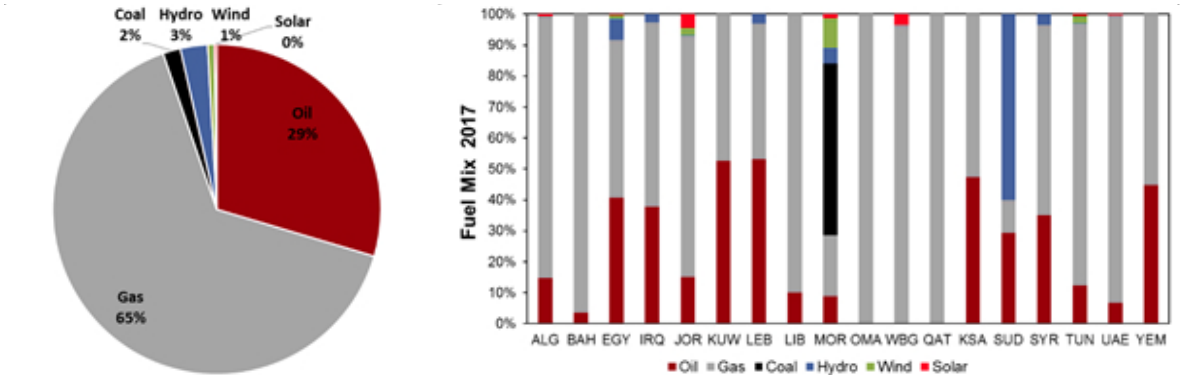
Much of the MENA region has been experiencing significant demographic and economic growth in recent years. Attendant with this level of economic activity has been a growing demand for energy, and especially for electricity, which has risen by about 6 to 12 percent annually since 2005. Historically, resource-rich countries in the region have comfortably met domestic demand with vertically integrated national monopolies that burn abundant local oil and gas to supply consumers, industry, and the energy sector itself. Major efforts to reduce oil (and especially crude) burn, and to improve efficiency in power generation, have further boosted the role of gas-fired generation (mostly combined-cycle) and pushed up demand for natural gas as well as electricity.

Rapidly rising energy consumption, coupled with uncertain medium- and long-term oil prices, inefficient state-owned utilities, restricted market access, and subsidized domestic energy, has put many countries on a fiscally unsustainable path. As a result, and in the context of broader economic transformation programs to diversify the economy, many countries in the region are generally pursuing a dual-track domestic energy-reform agenda, centered on the power sector.

First, there are major efforts to rebalance the domestic fuel mix by substantially increasing the share of renewable energy in power generation—particularly solar, and to a lesser degree onshore wind. This is meant to free up domestically produced hydrocarbons for export, ideally in the form of higher value-added refined or petrochemical products. Particularly where those renewable-energy technologies are indigenous or the equipment is domestically produced, they can also help to spur a local technology ecosystem and foster employment.

Secondly, and starting longer ago, **many countries are pursuing power-sector reform and liberalization alongside pricing reform.** The objective is to improve efficiency, improve the sector's financial sustainability, attract private investment, and apply market-based approaches to meeting dynamic and growing demand. Yet the progress of power-sector restructuring has been inconsistent and often beset by missed targets and crossed deadlines. Plans to increase the role of the private sector in generation (and ultimately in transmission and distribution), to reduce and eventually remove energy price subsidies of fuel inputs and electricity, and to minimize fiscal pressures on the public budget, often suffer from the political difficulties inherent in raising consumer prices and overcoming entrenched institutional, bureaucratic, and economic interests. As a result, the rate of domestic reform varies across the region.

Figure 3.2: Fuel Mix in the Region and by Country



Note: ALG = The People's Democratic Republic of Algeria; BAH = The Kingdom of Bahrain; EGY = The Arab Republic of Egypt; IRQ = The Republic of Iraq; JOR = the Hashemite Kingdom of Jordan; KSA = The Kingdom of Saudi Arabia; KUW = The State of Kuwait; LEB = The Lebanese Republic; LIB = The State of Libya; MOR = The Kingdom of Morocco; OMA = The Sultanate of Oman; WBG = West Bank and Gaza; QAT = The State of Qatar; SUD = The Republic of the Sudan; SYR = The Syrian Arab Republic; TUN = The Republic of Tunisia; UAE = The United Arab Emirates; YEM = The republic of Yemen.

Source: World Bank 2019

Generation, transmission, and distribution have been unbundled in only a few countries, and even there, monopoly transmission entities are not fully separated. In different ways, Oman and the United Arab Emirates (Abu Dhabi) have separated competition and supply from monopoly transmission. The next step is to leave behind the single-buyer model, whereby single state-owned utilities are almost always the only game in town. The United Arab Emirates, Oman, Jordan, Egypt, and Saudi Arabia have established electricity regulators tasked with addressing the disparate interests of consumers, energy companies, and governments. All of these countries, as well as Bahrain, Kuwait, and Qatar, have introduced private-sector participation or independent power producers (IPPs) into the market for generation; however, none have achieved genuine competition at the wholesale level.

Progress and consistency are partly hampered by inadequate reform models that may not have been suitably tailored to local circumstances, and that can lead to regressive distribution costs among ratepayers; difficulties in recovering public investments; and reduced system reliability and supply security for consumers. The "OECD model" or "1990s model" of electricity-sector reform typically includes unbundling generation, transmission, distribution, and retail supply from a vertically integrated state-owned monopoly, and introducing competition into generation and retail supply (through wholesale markets, retail competition, and privatization).[xx] This model is based on experiences in Europe and North America since the 1980s, but the weaknesses of "one size fits all" are exposed when applied in regions such as the Middle East, where the power sector is marked to a greater degree by capacity expansion. Even where it was originally pioneered, the model has produced mixed results in terms of providing efficient price signals for dispatching and investment, particularly in the presence of increasing variable renewable-generation capacity. The weight of evidence suggests that prescriptions as specific and contingent as the OECD model cannot be applied globally. Model market reforms entail significant political costs and risks, which in many circumstances have exceeded the benefits, as perceived by influential local actors.[xxi]

This is important, because such actors are key to reform implementation at the sector level. Countries that can mobilize a strong reform champion, ideally supported by a stable and competent bureaucracy, generally go further with sector reform. However, unless wider stakeholder alignment is achieved through outreach efforts and ultimately legislative support, reforms may prove difficult to sustain and vulnerable to reversals of various kinds. Outside assistance can therefore provide value; however, although donors play an important role in introducing reform ideas and supporting their implementation, they do not seem to have much influence on a country's overall reform trajectory, which is instead shaped by local political factors.[xxii]

Relatively recent efforts to ramp up variable renewables in MENA countries, and also the imperative to diversify those economies quickly, both inform how these countries will need to pursue more longstanding liberalization efforts. Each country will have to grapple with the political costs of rebalancing the cost burden, and also the temptation to rush reforms with top-down decision-making, and state-driven investment through favored local champions. The other temptation, in the absence of a commercial environment that convinces or attracts transparent investment from the open market, is to pursue "strategic" investment or financing bids from national infrastructure banks. Such loans may address short-term challenges (posed by transparent bidding) for some political actors, but they may also impose dubious financing and political terms over the long run.

Creating a framework for genuine competition is bureaucratically difficult, and it forces local actors to compete among themselves. Sequencing is a typical issue. Some policy makers may pursue sector reform with a view to addressing underlying distortions, while, in practice, subsidies across the supply chain have to be addressed ahead of sector reform. Yet with the right country-specific transition model, it can yield the cost-reflective price discovery necessary to underpin private-sector investment; transparent foreign direct investment (FDI); the efficient consumption of electricity; wholesale and retail competition; systemic adaptability to future technology; flexibility in a dynamic global energy economy; and supply security. Market reforms also advance cross-border power trade and the integration of regional electricity markets, which in turn yield further efficiencies and promote greater realization of renewable-energy deployment.

The link between domestic market reforms and liberalization on the one hand, and regional market integration on the other, is significant, without being monolithic. That is to say, while full market liberalization is not necessarily a pre-requisite for increased trade and market integration, removing price distortions on the supply side and guaranteeing non-discriminatory open access to the grid are essential for addressing concerns about "implicit wealth transfer" and illiquid markets, respectively, that can impede further cooperation and limit the benefits of trade.

Cross-border infrastructure is under-utilized because existing trade focuses on exchange-in-kind and emergency exchanges (mostly because of pricing distortions stemming from subsidized fuel). Functioning, regular, and liquid short-term trading markets are undeveloped. Lack of access limits the number of sellers, and limits buyers to state-owned utilities. Highly subsidized fuel inputs to generation hinders transparent pricing at the border.

Eventually removing price distortions at the wholesale level is key—benchmarking pricing to try to estimate those distortions and to commercially price traded energy is a near-term fix, but effective price reform is eventually needed to address the concern of implicit wealth transfer.

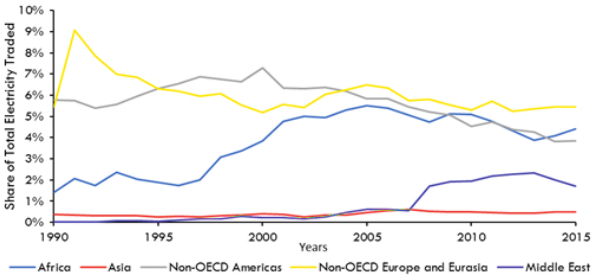
3.2. THE STATUS QUO OF REGIONAL ELECTRICITY TRADE

The MENA region is broadly comprised of three broad interconnection geographies: the GCC, the Eight-country regional interconnection (Mashreq), and the Maghreb interconnection. Even those with such infrastructure that exists at

the sub-regional level is severely underutilized for the reasons explained earlier. There is also the Political reticence to dependence on neighbors is another contributing factor.

Physical interconnections among the GCC countries are most advanced, due to the bloc's infrastructure design, and the regional institutional and governance set-up.

Figure 3.3: Traded Power in Non-OECD Regions[xxiii]



Note: OECD = Organization for Economic Co-operation and Development.

3.2.1. GCC GRID

GCC grid development has been driven by an institutional champion—the Gulf Cooperation Council Interconnection Authority (GCCIA), created in 2001. However, **the utilization of GCC interconnections has been only about 5 to 6 percent,** compared to about 50 percent in Europe. That is because trade among GCC countries takes place either as exchanges to mitigate emergency incidents, or through bilateral contracts settled with in-kind or in-cash payments. There is no designated and authorized entity to make decisions on trade transactions without approval by another government entity (ministry and/or regulator). An exception is Saudi Arabia's principal buyer, which is envisaged to have decision-making authority over trade. Otherwise, each bilateral electricity trade may require a slow process of government approval, making more advanced day-ahead trading impossible. Additionally, there is a lack of third-party grid access, which limits market liquidity to the state-owned utilities.

Without short-term trading and market liquidity to deal with load and time differences, countries cannot utilize existing physical infrastructure to maximize the economic gains of trade. However, such a market is unlikely to materialize on a sustainable basis, bolstering the case for large bilateral contracts.

Individual trades settled with in-kind or in-cash payments are so painstakingly reviewed and approved because wholesale prices are otherwise distorted by domestic subsidies, removing incentives for "commercial" trade. Retail rates within the region have traditionally been kept low as part of the domestic political bargain. Artificially low tariffs are in turn supported by subsidized fuel inputs to generators from state-owned oil and gas companies, which bear the domestic cost in return for the right to sell fossil fuel abroad at a significant profit. As such, energy traded at the wholesale price extends those subsidies to foreigners, and state-owned oil and gas companies object to this "implicit wealth transfer." Correcting those wholesale prices to compensate producers is an opaque and non-automated process, because the real (marginal) cost of fuel production and the price paid by generators are not disclosed.

Determining a mechanism for pricing cross-border power trade on a commercial basis (in the presence of domestic subsidies and subsidized fuel inputs) can provide a regular if imperfect way to facilitate greater trade until the subsidies themselves are reduced or removed in each country. Whether prices are benchmarked to international market prices, or to a reference price linked to the estimated real cost of oil and gas production, a common pricing regime should be coordinated.

The progress made by the GCCIA, as the designated regional body within a defined governance framework, goes beyond the small size of trade and shows how regional cooperation takes time and significant collective effort to materialize. Without the GCCIA, the GCC interconnector would have been limited to emergency operations and marginal energy exchange, similar to other sub-regions in MENA. Hence, the GCCIA's experience and practices served as a main reference for developing the PAEM's governance framework.

There has been considerable interest in expanding the use of the grid for commercial purposes. The GCCIA has positioned itself as one of the most important advocates of regional

power trading.[xxiv] When the United Arab Emirates' link to the grid opened in April 2011, energy ministers and other regional leaders described it as both an emergency tool and as a backbone for future trade.[xxv] In November 2017, a six-month trial of spot trading was initiated, with the aim of developing a commercial platform from this experience. The GCC Electricity Market System (GEMS) was subsequently inaugurated at the 8th Saudi Arabia Smart Grid Conference in Jeddah in 2018, developed on the basis of market and exchange rules for the GCC power market.[xxvi]

The successful use of the GCC interconnection grid for commercial electricity trading provides incentives for expanding the grid beyond the GCC. Egypt has been in discussions with Saudi Arabia for many years over the possibility of linking both countries' national power grids, to take advantage of different demand peaks between Egypt and the Gulf countries. This in turn could incentivize further GCC investment in clean-energy projects in Egypt. The Republic of Yemen provides another grid-expansion option; it could benefit significantly from the added generation capacity and power-system stability that access to a GCC electricity pool could provide. An interconnection could be an important form of post-conflict economic restructuring in the Republic of Yemen.

3.2.2. MAGHREB REGIONAL INTERCONNECTION

The Maghreb regional interconnection, which includes Morocco, Algeria, and Tunisia, was initiated in the 1950s and evolved into multiple high-voltage transmission interconnections among the three countries. In 1997, these countries connected to the European Network for Transmission System Operators - Electricity (ENTSO-E) via the 2x400 kilovolts alternating current (AC) interconnection between Spain and Morocco. Morocco, Algeria, and Tunisia are all synchronized with the ENTSO-E network.[xxvii]

In 2003, the European Commission and the energy ministers of the Maghreb nations signed a protocol with the objective of developing a regional energy market that would eventually be integrated into the European Union (EU) electricity market. The protocol called for the creation of mechanisms to facilitate trade, such as establishing how to deal with tariffs, trans-border networks and constraints, and compensation for network damage. Then in 2010, the Maghreb nations signed the Algiers Declaration, in which they agreed to take steps towards harmonizing laws, regulatory frameworks, and economic and technical conditions for the creation of a viable power market. They also agreed that the market would be based on nondiscriminatory and transparent network access.[xxviii] However, harmonization and network access remain elusive (with the exception of Morocco, which appears to be pursuing some measures in these areas).

Electricity demand in the Maghreb region has been growing over the past two decades at an annual rate of 5 to 7 percent. This is primarily attributed to a growing population, increased economic development, and increased electricity access. Ongoing growth requires significant investment in new generation, as well as investment to replace retired plants. Capacity may need to be further increased if renewable-energy production continues to scale up so rapidly (Morocco has been particularly aggressive). Integrated regional electricity markets with reserve sharing will help to incorporate large-scale renewable-energy development and reduce the amount of capacity needed for backup.[xxix]

Figure 3.4: Power Exchanges between Maghreb Countries Earlier in the Decade

Interconnection	Max Transfer Capacity (MW)	Energy Exchanged (GWh/YEAR)	Load Factor (%)
Algeria-Tunisia	150	141	11.0
Tunisia-Algeria	150	122	9.0
Morocco-Algeria	400	613	17.0
Algeria-Morocco	400	662	19.0
Morocco-Spain	700	15	0.2
Spain-Morocco	700	4227	69.0

Note: Data for 2010 or most recent year available

Source: World Bank 2013

According to the semi-public operator Red Eléctrica de España, Morocco is a net exporter of electricity to Spain in 2019.[4] Morocco exported 76 percent of Morocco-Spain border exchanges of electricity and imported only 24 percent. Spain's electricity imports from Morocco reached almost 20,588 gigawatts/hour (GWh) in 2018, whereas its exports to Morocco were only 10,442 GWh. Some of that is also from Moroccan coal plants, and the EU decision in 2019 not to apply carbon tariffs at the border will allow that trade to continue.

3.2.3. EIGHT-COUNTRY (MASHREQ) REGIONAL INTERCONNECTOIN

The Eight-Country Interconnection Project (EIJLLPST) (involving Egypt, Iraq, Jordan, Libya, Lebanon, West Bank and Gaza, Syria, and Turkey, sometimes referred to as the Mashreq sub-region) was initiated in 1988 by Egypt, Iraq, Jordan, Syria, and Turkey, as part of an effort to upgrade their electricity systems to a regional standard.[xxx] Lebanon, Libya, and West Bank and Gaza later brought the agreement to eight countries.[xxxi]

The original five countries signed a general trading agreement in 1992. This established their commitment to develop interconnections, as well as their objectives of providing mutual assistance and sharing benefits as part of the network, to improve reliability and the region's economies through the exchange of surplus power. In 1996, the agreement became a comprehensive agreement outlining the terms and conditions for use of the interconnection. Those cover reserve sharing during emergencies; capacity transactions; interchanges of surplus power and energy; regulation of energy flows to maintain schedules; regulation of reactive power flows; transmission services (making each country's transmission facilities available for the purpose of transmitting power and energy to other parties); operating reserves, including maintaining minimum levels of reserves and their sharing between countries; coordination of maintenance schedules; and coordination of planning to increase reliability and maximize the value of the interconnection. The interconnection agreement also established the scope and duties for the permanent committees.

Despite the interconnection, operations have been limited to in-kind and emergency exchanges. Tight generation supply in some countries, lack of a harmonized regulatory framework, limited access to national transmission networks, and the fact that trade is generally restricted to a single government-owned entity in each country, all constrain electricity exchanges within the region. In addition to these issues, the interconnected systems are often not continuously synchronized, so part of a national grid system must be isolated from the main grid to accept imports from another country.[xxxii]

Overall, the national transmission systems in the Mashreq sub-region are constrained by the lack of a dedicated regional institutional framework (e.g., similar to that of the GCC). Such a framework would facilitate market transactions, promote regional trade, compensate entities for providing transport services, and determine the technical feasibility of transactions. Building regional infrastructure is only the first step toward increasing trade flows.

3.3. OUTLOOK FOR ELECTRICITY TRADE

In practice, developing an integrated power market is an evolutionary process. Buy-in from subnational stakeholders will be key, and market integration will only gain support if it can be shown to advance established national priorities. Recognizing unique national circumstances, and prioritizing the national interest, with coordination and cooperation at the sub-regional and regional levels, are principles that have been reiterated in past PAEM documents.

The GCC, EIJLLPST, and Maghreb are at different stages of development, and the countries within these regional markets have different levels of commitment to reform. Therefore, it is proposed that each country commit to implementation

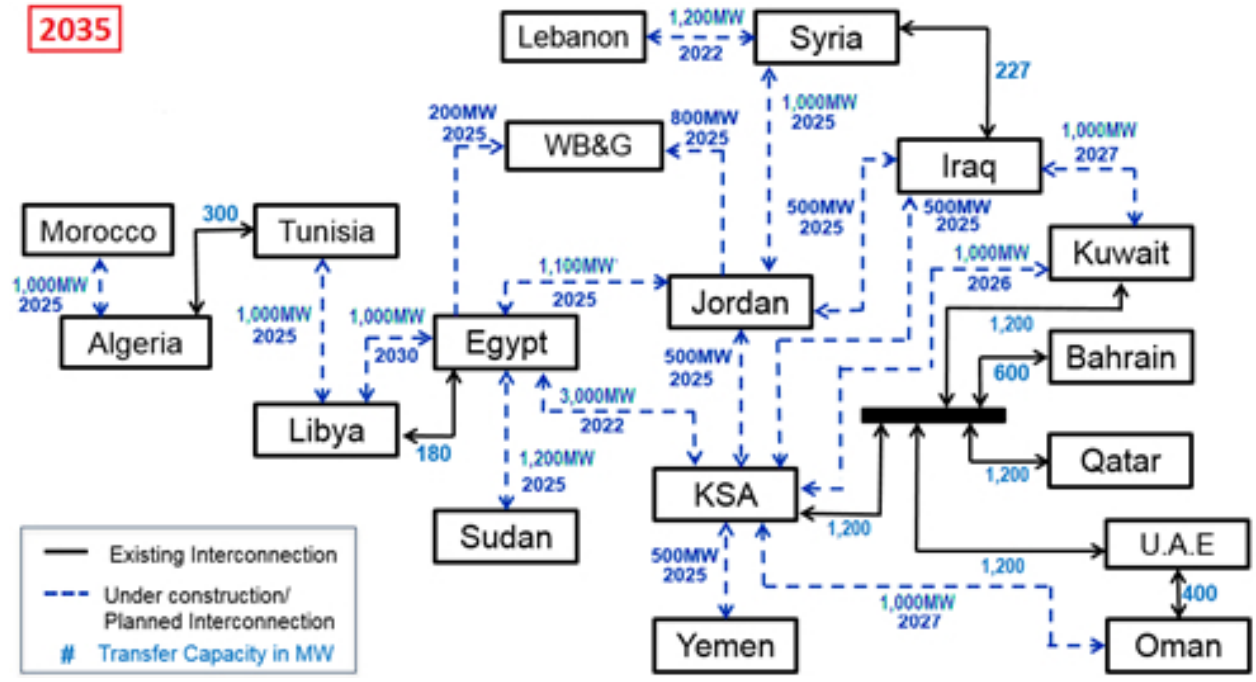
of the proposed transitional regional market design, but each sub-regional electricity market would proceed with implementation at its own pace, consistent with direction given by the regional market institutions.[xxxiii]

Bilateral partnerships, and small groups of countries within a region, can create power-trading pools that later attract neighboring countries, and possible private players. While region-wide markets come to fruition, preliminary decisions to facilitate sub-regional trade can be taken in the meantime. The World Bank has already identified the ullage of existing infrastructure; the promotion of bilateral connections; and the interconnections between transmissions systems as some of the quic market conditions.

The PAEM is a result of extensive efforts to improve trade and integration of electricity systems in the region. It aims to enable countries to exploit their electricity-trade potential and eventually expand to European, African, and ultimately Asian markets. Based on the PAEM's tools, a regional pricing mechanism was endorsed to apply to bilateral transactions in order to overcome exporting fuel subsidies,
until countries are ready to move to a competitive market.

Strengthening bilateral trading is an important step towards a functioning wider market, with all of its benefits. Various studies undertaken by the League of Arab States (LAS), the Arab Fund, and the World Bank have identified clear benefits from a fully integrated regional electricity grid. In 2014 the Arab Fund conducted feasibility studies for energy trade among Arab countries, and identified options for new electricity and
gas interconnections. The World Bank subsequently developed a tailored electricity-trade value model, as well as an updated investment plan for regional interconnections that takes into account the growing role of renewable energy, increasing policy emphasis on energy efficiency, and intended national targets for emissions reduction.

Figure 3.5: Regional Network with Proposed and Reinforced Cross-Border Interconnections in 2035



Note: WB&G = West Bank and Gaza; UAE = United Arab Emirates.

Source: World Bank 2019

4 REGIONAL GAS TRADE IN MIDDLE EAST AND NORTH AFRICA

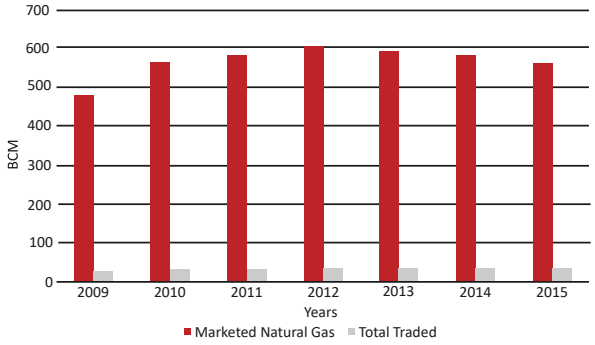
46% of global natural gas reserves accounting for

20% of global production

Despite holding 46 percent of global natural-gas reserves and accounting for 20 percent of global production, Arab countries struggle to meet rising internal demand.

Part of that comes back to domestic energy subsidies to consumers, and to industrial sectors such as petrochemicals, aluminum, steel, refineries, and cement. Fuel-price subsidies create price distortions, inflate domestic demand, and hinder investment in trading opportunities. Imported gas exposes the magnitude of those subsidies. So even though the region exports significant volumes of gas to the global market, only 10 percent of gas exported from MENA countries is traded within the region.

Figure 4.1: Marketed Versus Traded Gas in the MENA Region



Sources: Organization of Arab Petroleum Exporting Countries (OAPEC) and the International Gas Union (IGU).

The Middle East is gas rich in aggregate, but the region is not homogenous. Some countries (Qatar, the Islamic Republic of Iran, Algeria, Egypt, and Saudi Arabia) possess significant gas reserves and production, whereas others (Kuwait, Bahrain, and Jordan) are relatively gas poor.

In addition to subsidies, and more than in the case of power, gas trade is susceptible to political blocs and changing alignments. That is partly a result of the physical nature of pipeline trade, and also because natural gas is considered a strategic asset (like oil).

In view of the rising demand for gas, together with abundant export surpluses, there is a case to be made for the promotion of cross-border gas trade in the MENA region. In the case of LNG trade, that means the development of gas-trading hubs and markets, as well as the costly infrastructure to send and receive the product, whether in the form of in-place liquefaction and regasification, or more flexible and mobile floating import infrastructure (floating storage regasification units, or FSRUs). Pipelines are vulnerable to shifting political sentiment, but adequate institutional mechanisms for dispute resolution and defining trade terms can facilitate continued gas flow even in the presence of major political crises (as in the case of Qatar). Fixed pipeline infrastructure is also vulnerable to changing supply and demand patterns (such as in Egypt), highlighting the importance of reverse-flow capabilities and flexibility in the network.

4.1. GAS PIPELINE TRADE IN THE MENA REGION

Transporting natural gas is costly, and pipelines remain the most practical way of transporting large volumes on a regular basis.

4.1.1. ARAB GAS PIPELINE

The Arab Gas Pipeline (AGP) is a 1,200-kilometer-long pipeline initiated within the framework of bilateral dialogues between Egypt and Jordan in 2001 to move gas from the northern Sinai town of El Arish to the Jordanian city of Aqaba. The memorandum of understanding (MoU) later included Syria and Lebanon. Israel, Turkey, and Iraq also signed deals to cooperate in this trans-regional pipeline project.[xxxv]

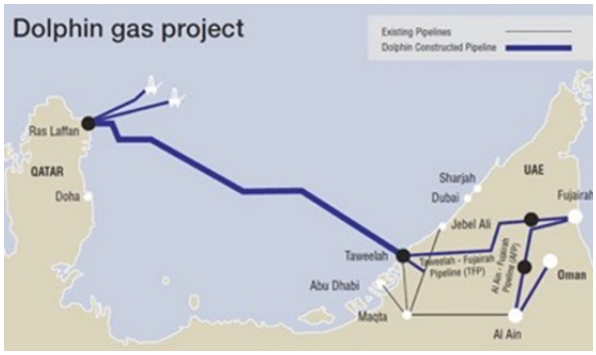
The AGP was considered a model for strategic and economic linkage between Egypt, Jordan, and Syria (and between Africa, Asia, and eventually Europe). However, the AGP has been the target of attack several times since the start of the Arab Spring in early 2011, affecting its ability to deliver regular supplies. The resulting shortage of deliveries to Jordan prompted the country to develop alternative LNG import capacity. Because of a see-saw supply-demand balance in Egypt in recent years, all Egyptian exports were finally halted through the AGP. Now that Egyptian exports are back, the line is being reconsidered for bringing offshore Eastern Mediterranean gas to Egyptian LNG ports for shipment.

Despite the difficulties, the AGP is still considered an important pipeline in the region. The line was once planned to extend further north and eventually to Europe. However, these future connections are ambitious and unlikely to happen, given the supply-demand situation, economic feasibility, and the complexity of building across borders.

4.1.2. DOLPHIN GAS PIPELINE

Qatar drove the creation of the Dolphin Pipeline, which links it to the United Arab Emirates and eventually on to Oman. The line was a much-reduced form of the pan-GCC pipeline envisioned at the November 1989 GCC summit. The original idea was to connect the national gas grids of Saudi Arabia, Kuwait, Bahrain, and the United Arab Emirates into a single integrated system, with later extensions to Pakistan and other countries.

Figure 4.2: The Dolphin Gas Pipeline/ Project



Sources: TOTAL

While much of the impetus behind the Dolphin Pipeline was to improve political integration of the GCC nations, the project was also rooted in commercial interests. Oman and the United Arab Emirates faced a significant gas shortage, even with increased imports from Qatar.

The diplomatic crisis that erupted in June 2017, and the ensuing embargo against Qatar led by Saudi Arabia, the United Arab Emirates, Bahrain, and Egypt, has not affected existing gas exports to neighboring countries. Qatar continues to export approximately 2 billion cubic feet per day (bcf/d) of gas via the Dolphin Pipeline, with the United Arab Emirates taking the bulk of the supplies.

A bilateral agreement between Qatar and the United Arab Emirates facilitates construction and operation, gas transport, and optimal utilization of the pipeline for the benefit of both countries.[xxxvi] The Qatar–United Arab Emirates (UAE) Agreement further provides for the establishment of a joint Qatar-UAE Commission for overseeing implementation of the agreement (on issues such as construction, operation and utilization). The commission also serves as a mechanism to resolve disputes concerning the interpretation or application of the agreement. Those institutional mechanisms have helped the Dolphin Pipeline to remain operational even in the context of the Qatar crisis.

4.1.3. TRANS-MEDITERRANEAN AND MAGHREB-EUROPE PIPELINES

Significant pipeline infrastructure has been developed over recent decades to export Algerian gas to Europe, transiting and supplying neighboring Tunisia and Morocco along the way, despite political difficulties.

The first link between Algeria and Tunisia was constructed from 1978 to 1983, as part of the Trans-Mediterranean pipeline to bring gas to Italy. The capacity of the pipeline was subsequently doubled in 1994, and it is operated by Eni. Algerian relations with Tunisia have been cordial, but not close. When the gas pipeline was constructed in the 1970s, territorial disputes

between the two countries complicated negotiations, and transit terms included a mix of gas-delivery quotas and fees that would shift according to Tunisian needs and the prevailing gas price. The country currently imports about 4.9 billion cubic meters (bcm) from Algeria as transit-fee quotas or direct imports, but is seeking to reduce dependence (with coal-to-power or power lines to Italy) rather than deepen it.

The more difficult Algerian relationship has been with Morocco, due to competition for regional hegemony, old border issues, and the fate of the Western Sahara. Animosity between the two countries prevented the implementation of a 1989 regional integration plan. Nevertheless, the Maghreb-Europe Gas Pipeline (MEG) was the first to deliver Algerian gas to Spain, via Morocco, when it came on stream in 1996. Today, the MEG supplies about 45 percent of Moroccan demand. Significantly, the flow has not been affected by poor relations between the two countries. However, when a second pipeline to Spain opened in 2011, it bypassed Morocco, linking Algeria to Europe via a 120-mile undersea route, due to concerns about transit dependence. Morocco has meanwhile engaged in constructing LNG import facilities at Jorf Lasfar near Casablanca, rather than increasing Algerian imports.

Piped gas in the Maghreb has always been a tense proposition due to political disputes, and energy trade between Algeria and its neighbors has been a by-product of European efforts to import Algerian gas, rather than driven by supply and demand within the region. Yet since the construction of these pipelines, and despite tensions, trade dependence has grown along with demand in Tunisia and Morocco. Energy interdependence has arguably helped to maintain peace in the latter case, while also bestowing political leverage that frustrated governments have sought to circumvent through alternative routes or diversification. As the Maghreb countries develop their own power sectors and diversify their sources (e.g., Morocco's early drive into renewable energy, and Tunisia's plans for direct connection to Italy), the aim is largely to reduce dependence on Algerian gas, not to increase it.

4.2. LIQUEFIED-NATURAL-GAS TRADE IN THE MENA REGION

Although pipeline infrastructure can more cheaply transport large volumes of gas, LNG presents the advantage of transport flexibility and allows for geographic diversification.[xxxvii] This is significant, given dynamic political relations in the region, conflict, and fluctuations in the supply picture, resulting from domestic crises or demand changes (such as in Egypt or Iraq). In-place pipeline infrastructure is also vulnerable to disruption, for example by violent attack, growing domestic demand, or lack of robust commercial agreements.

The MENA region includes Qatar, the world's largest LNG exporter since 2006.[xxxviii] The country will continue to play a major role—in 2018, it lifted a self-imposed moratorium on production from its North Dome gas field, the largest in the world. Meanwhile Algeria was a pioneer in LNG technology, with the world's first commercial-scale liquefaction plant in 1964.

Yet regional gas reserves are unevenly distributed, and over the past decade, difficulty meeting domestic demand has prompted several countries to engage in LNG imports. The International Energy Agency (IEA) expects the region to become the world's second-largest importer of LNG, increasing from 480 bcm in 2015 to 738 bcm in 2040. Egypt and Jordan received their first LNG shipments in 2015; the United Arab Emirates has been chartering two FSRUs for several years; and Bahrain began operating an FSRU in 2019.[xxxix] The next regasification projects on the horizon are in Kuwait and the United Arab Emirates. The Emirate of Sharjah expects to bring its own FSRU online by late 2020, making it the third in the United Arab Emirates.

LNG can introduce greater flexibility but adds significantly to the cost of transport. Liquefaction and regasification infrastructure is expensive, with an entire chain costing many billions of dollars, and can end up as stranded assets or require major overhaul in the event of unexpected supply and demand changes. One

of the most famous examples was in the United States, where, thanks to the shale revolution, LNG import facilities were converted to export, propelling the country on a path to becoming the world's leading LNG exporter by the mid-2020s. Similar trends in the MENA region are taking place following domestic gas finds in Egypt and the United Arab Emirates, and greater pipeline exports into Jordan. This has driven increased regional interest in mobile FSRUs that can provide greater flexibility but are more expensive to lease and operate on a monthly or yearly basis.

The price of LNG fluctuates with supply and demand, and it became more attractive in the region after prices dropped significantly in the period from 2013 to 2014. The region experiences extreme seasonal demand fluctuations that peak in summer, when LNG demand is lowest in major Northern Hemisphere markets. LNG has thus become a staple for meeting peak demand in places such as the United Arab Emirates, where LNG trading markets are most developed.

Although the region's overall gas demand continues to rise, LNG imports are less predictable. After surging mid-decade, demand fell 37 percent in 2018, and the Middle East is now expected to make up less than 4 percent of global imports for at least eight years. New domestic gas resources (in Egypt and the United Arab Emirates) have been the main reason. Locally produced gas is preferred over imports, even at a cost premium. And in the context of the global market, regional LNG imports are still very small. Even Kuwait, the MENA region's biggest importer, buys less than relatively small Asian markets such as Thailand, Bangladesh, or Pakistan.

Saudi Arabia has made natural-gas security a national priority, committing tens of billions of dollars to exploration, development, and production. However, in a major strategy shift, Saudi Aramco has been actively working to secure a foothold in American shale gas, and exploring LNG selling opportunities with a number of international companies, to gain a foothold in international gas trading, and ultimately to fill a looming regional supply gap. In 2019, it signed a deal with U.S.-based Sempra Energy to supply LNG from Port Arthur in Louisiana, and eventually it may choose to sell that gas to the GCC or to Saudi Arabia itself (via the new import terminal in Bahrain, for example). In conjunction with plans to develop a GCC gas market, the Saudi Arabian strategy seeks to bypass traditional LNG suppliers (including neighboring Qatar) and supply the region with its own internationally sourced gas.

MENA countries are directing domestic natural-gas production to the home market while investing in import infrastructure and capacity, with the aim to promote energy security and reliably meet peak demand. In view of low spot LNG prices, several countries have resorted to FSRUs as a quick fix, before contemplating more expensive long-term solutions.[xl]

Were it not for the political schisms with Qatar and the Islamic Republic of Iran, including those major exporters in the regional market would seem obvious. But national strategies are accounting for those divisions over the long term, buoyed by domestic gas finds and by Saudi Arabia's global ambitions.

4.3. OUTLOOK FOR GAS TRADE

Incentives for regional gas integration and trade have historically been a combination of geography, economic incentives, and the creation of political alliances. Whether countries choose high-volume fixed pipeline infrastructure or high-cost flexible LNG, infrastructure will ultimately depend on the costs and risks they associate with interdependence, and on their own geopolitical outlooks.

In the wake of the GCC crisis and Qatar blockade, the United Arab Emirates, Saudi Arabia and Oman agreed to establish a natural-gas network, to be later extended to Kuwait and Bahrain, with links to Iraq, Jordan, and Egypt. Since 2017, rapid developments have taken place that have sped up the finalization of an agreement to set up a GCC gas network. Efforts have been backed by discoveries of natural gas sources in the United Arab Emirates, Saudi Arabia, and Bahrain. The initiative is driven in particular by Saudi Arabia

and the United Arab Emirates (Abu Dhabi), and is complemented by Saudi Arabian investments of about $150 billion over the next 10 years, targeting gas production of about 23 bcf per day (9 bcf above current levels). Other than Qatar, the only GCC country that exports gas is Oman, and its numbers are small. Plans to expand gas production in the United Arab Emirates and Saudi Arabia (both from domestic production and upstream assets abroad) therefore anchor the GCC gas-grid effort.

Despite the political genesis of this effort, advancements within the GCC can form a nucleus for regional and pan-Arab gas-market visions. It is still in the infrastructure planning and building phase—connecting the gas networks of Saudi Arabia and the United Arab Emirates will entail the construction of about 500 kilometers of pipelines. This would link Saudi Arabia to Abu Dhabi's gas hub at Habshan, and then on to Abu Dhabi and the United Arab Emirates' gas network. This network is connected to Oman's gas infrastructure, with a bidirectional

Figure 4.3: GCC Gas Infrastructure

Sources: Middle East Economic Survey (MEES) 2019

pipeline crossing into the country about 100 kilometers west of Sohar.

As the physical infrastructure becomes operational, the development of an emerging governance framework for this gas trade bloc will be important. Given the GCC track record, that framework could form the basis for wider pan-Arab market governance. Planned future expansion to Iraq, Jordan, and Egypt could exploit existing infrastructure such as the AGP, and reinforce efforts to transport and export Eastern Mediterranean gas (which is seeking export markets as GCC demand is expanding).

Incentives for regional gas integration and trade have historically been a combination of geography, economic incentives, and the creation of political alliances.

For its part, Qatar's strategy in the face of regional blockade has been to increase its role in global trade—it has ambitious plans to expand its LNG export capacity by 40 percent over the next five years with the Qatar New Megatrains project. It has also been opening to foreign investment. After easing residency and visa regulations in 2017, a new law was drafted in May 2018 to allow 100-percent ownership in all sectors. As Qatar continues to push for greater foreign investment, further regulatory and economic liberalization is likely over the coming years, with an increased role for supermajors in Qatari gas. Qatar has also been aggressively expanding its overseas gas presence in the past year, with investments in key liquefaction projects in Africa, the United States, and Latin America.

In the Eastern Mediterranean, natural-gas developments are helping to shift strategic alliances. In 2009 and 2010, a pair of U.S.-Israeli consortia exploring the seabed near Haifa discovered the Tamar and Leviathan fields, which collectively hold an estimated 26 trillion cubic feet (tcf) of natural gas. The timing of these discoveries was opportune. After the 2011 Arab Spring, Israel suffered frequent supply interruptions and the eventual termination of its contract with Egypt, which had previously provided 40 percent of Israeli consumption. That was partly political, but also partly because Egypt (which had once been the sixth-largest LNG exporter globally) swung to importing LNG for its domestic market as demand outstripped supply. The 2011 revolution led to an economic downturn, and the country experienced a sharp

decline in tourism revenue and foreign direct investment. However, economic conditions have improved over the past few years, and financial support from the United Arab Emirates, Saudi Arabia, Kuwait, and international financial institutions (IFIs, such as the International Monetary Fund [IMF] and the World Bank) has helped Egypt address its increasing domestic demand for energy.

In 2015, Eni's discovery of the enormous Zohr field in Egyptian waters changed the balance once again, returning Egypt to self-sufficiency and raising the renewed prospect of LNG exports in 2019, from Egypt as well as from elsewhere in the region. Israel has been able to meet all of its domestic demands from its new offshore discoveries, and has begun to explore export options, including via Egyptian LNG ports. Israeli exports to Jordan have met with protests there, but in the context of a quiet rapprochement with Gulf Arab states since 2017, natural gas is helping to mute some long-standing animosities. Further finds around Cyprus have created a new club of Eastern Mediterranean gas producers seeking to deliver gas to international (primarily European) markets.

Indeed, Egypt has the potential to become a regional gas hub, based on the strengths of its domestic market and its ability to share transportation, processing, and export infrastructure with neighboring countries. A true regional market hub requires not only supply from the Eastern Mediterranean (Cyprus, Israel, Egypt, and possibly Lebanon), but also a regional expandable infrastructure-corridor approach to keep supply costs low and to remain competitive in various gas markets. Egypt has developed strategic options and a 10-year implementation plan for opening the market and developing a traded-gas hub.

Prospects for export cooperation among these Eastern Mediterranean countries has put many of them on one side of an emerging Middle East fault line. Turkey finds itself on the other. In January 2019, Egypt, Israel, Cyprus, Greece, Italy, Jordan, and West Bank and Gaza established the East Mediterranean Gas Forum (EMGF), in an effort to coordinate energy policies and establish a regional gas market. The group (to which the World Bank is an advisor) will attempt to develop and organize the region's growing gas market, allowing its members to tap their new resources. Although the formation of the EMGF may be a step in the right direction, Turkey's exclusion remains a major stumbling block to the future of regional energy cooperation. It will also inform a new political alignment in the Eastern Mediterranean, with the United States turning its strategic support from Turkey (a North Atlantic Treaty Organization ally) toward the Cypriot-Israeli-Egyptian trio and its Gulf Arab allies.

Indeed, U.S. regional policy is particularly influential, and its focus on the Islamic Republic of Iran under the current government informs strategic realignment. In that context, Washington has also been an active supporter of Arab energy-market integration, insofar as it can reduce dependence on imports from Iran (for example to Iraq).

5 TRADE AND THE ENERGY TRANSITIONS

In addition to the variation of load curves and differences in the costs of generation, fundamental changes in the region's energy mix are potentially major drivers of increased power trading. These include a growing deficit of local gas supplies, the introduction of nuclear power, and especially the fast growth of renewable energy.

Natural gas has been the cornerstone of the region's generation mix since the 1970s, playing an important role as a transition fuel for the region to reduce oil-fired generation while providing flexible supply. This transition has been happening over the last two decades, during which generation efficiency has improved to more than 40 percent across the region. The region now uses indigenously produced natural gas for most of its domestic power generation and water desalination. With the rise of variable renewable energy, and until technologies such as utility-scale storage or hydrogen come to fruition, gas will continue to serve as a flexible source of baseload power. As such, gas is a key element of the energy transitions, serving as a bridge fuel to reduce emissions and increase efficiency relative to liquid fuels, and also a key enabler of renewable-energy expansion.

But domestic gas production is often insufficient to meet demand. Saudi Arabia has significantly increased its upstream investments in gas both at home and abroad. The United Arab Emirates, Bahrain, and Kuwait have been forced to start importing LNG for power generation, while Oman consumes more and more of its own production. Only Qatar has abundant supplies. As long as states such as the United Arab Emirates, Bahrain, and Kuwait continue to buy LNG at international market prices, there will be an incentive to look for alternative gas resources from within the region. However, domestically produced gas continues to be expensive. The accelerated plans for a GCC gas network and increased trading are intended precisely to pool and balance domestic gas production, and gain efficiencies from regional reserves that are lacking (with Qatar out of the equation).

In the Maghreb, renewable-energy expansion in Morocco and efforts to reduce dependence on Algerian gas imports have precipitated new LNG import capacity at Jorf Lasfar near Casablanca. In the Mashreq region, significant wind-power additions in Egypt and Jordan will also require flexible baseload power. New production in the Eastern Mediterranean, coupled with functioning intra-regional gas trade, can complement new regasification capacity in Jordan to satisfy demand that will continue to rise.

In short, gas will continue to play a central and even growing role across the region for decades, as a key bridging or enabling element of the energy transitions. Given political barriers vis-à-vis some of the region's gas exporters (Qatar, the Islamic Republic of Iran, Israel, and Algeria), trade among the remaining countries will be key to pooling domestic gas production and reducing the need for LNG imports from the global market. Ultimately, settling those political disputes and facilitating trade with those countries will be the most cost-effective route to meeting gas demand for energy transition and to achieving regional gas security.

In addition to gas, less flexible baseload capacity is also increasing. The construction of four nuclear-power reactors in the United Arab Emirates, the first of which has been formally completed, but yet to be brought online, will provide a quarter of the United Arab Emirates' anticipated electricity demand when all reactors are operational[xli]. Nuclear power would provide baseload electricity for the entire system in most other countries, but the United Arab Emirates' dependence on combined-cycle gas-fired power plants for its water supplies to a large extent negates the baseload premise of nuclear power. The Emirates Nuclear Electricity Corporation might find itself, in effect, having to export its baseload at times of low seasonal demand.

5.1. TRANSFORMING THE GENERATION MIX

The flexibility of gas as a source of baseload power is important because of the main story of energy transitions—the scaling up of the deployment of renewable-energy sources (RESs)

that will transform the energy mix. In the Middle East, solar PV and onshore wind will produce peaks and troughs in supply that can be more easily managed through cross-border flows. Coupled with the extreme demand fluctuations that characterize the region, and with a shortage of gas supply in many countries, the increased use of renewable-energy technology will boost the gains from energy trade.

The region's sustainable-energy transitions must be considered within a broader framework of socio-economic development, particularly where it is being pursued alongside other economic changes to facilitate sustainable growth. Encouraging more renewable generation in fossil-fuel-producing countries is largely meant to free up domestic resources for export or industrial uses, but renewable-energy technology deployment can have positive impacts on economic growth and diversification; job creation; balance of trade; and water security.

The rise of renewable energy in the Middle East is both recent and rapid. In 2015 nearly 80 percent of non-hydro renewable-energy growth was concentrated in only four of the 22 regional states, and installed capacity was negligible.

In 2019, countries in the region are among the global frontrunners in renewable-energy development. In 2016, $11 billion were invested in renewables across the Arab region, compared to $1.2 billion in 2008—a nine-fold increase in only eight years. From 2015 to 2018, installed renewable-energy capacity tripled in the GCC region. Recent auctions resulted in record-breaking solar-energy prices. The region recognizes the socio-economic benefits of renewable-energy deployment. It is key to national economic-transformation programs, given the opportunity for industrial diversification, the development of new domestic value-chains, and technology transfer.

Indeed, ambitious targets set by all countries in the region are expected to translate into a combined 80 GW of renewable capacity by 2030. The establishment of policy, regulatory, technical, and economic frameworks enabling the scaled-up deployment of renewables will be indispensable.

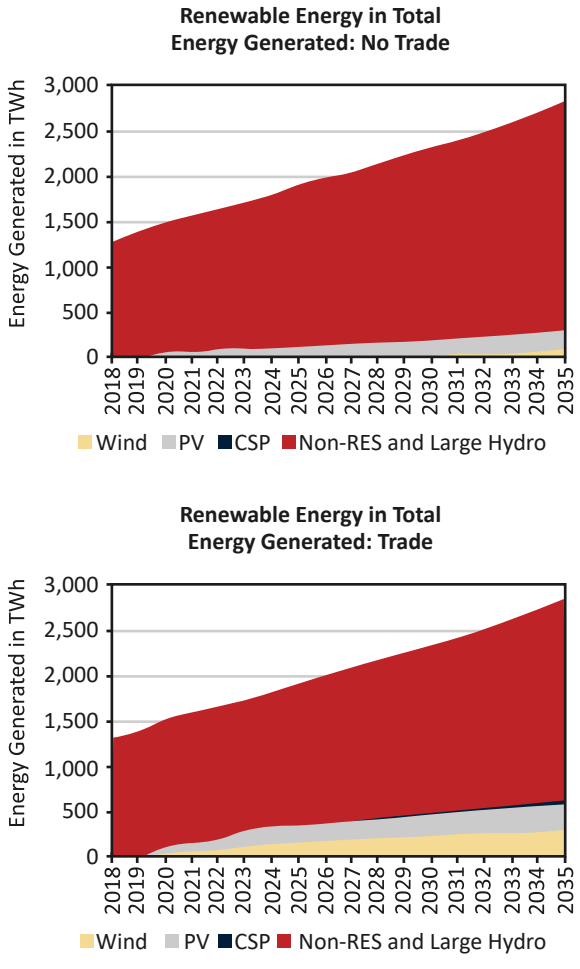
It is worth mentioning that the widespread penetration of RESs has been a prominent issue in regional integration deliberations in Southeast Asia, Southern Africa, South America, and elsewhere. The supply of intermittent generation is also increasing in more saturated markets such as Europe and the United States. Those changes are creating challenges for wholesale markets. Short-term energy and ancillary-services markets, built on existing models of optimal pricing and investment, must accommodate the supply variability and market-price impacts of renewable technologies. That raises questions about whether current market designs can be adapted to provide adequate long-term price signals to support investment in an efficient portfolio of generating capacity and storage.[xlii] The recent experience of the California Independent System Operator (CAISO) illustrates the impact of intermittent generation on supply patterns, supply variability, and market-based energy prices. In the EU, it has created the need to develop network codes and market design in the area of ancillary services from variable renewables; render a harmonized cost basis for ancillary services; and, ultimately, a functioning single electricity market with cost-efficient integration of variable renewables and increased grid management and system security.

In less mature power markets, where demand and capacity is expanding quickly, but where variable renewables are expected to make up a significant portion of that new capacity, those challenges can be even greater. The rise of renewables is becoming a significant consideration in the network interconnection discussion of the Arab countries.

The relationship of renewable energy with regional integration can be described in four ways. First, most RES sites (wind farms and solar fields) are far from power grids and would require dedicated transmission lines to deliver power to the grid. This affects the overall transmission capacity and the possibility of electricity trade. Second, renewable-energy supply is expected to grow substantially and to provide a significant source of exported electricity. Third, regional integration of power networks results in larger and more

diversified generation capacity than in isolated national markets, and thereby provides a better opportunity for the development of RESs, as well as possibly stronger commercial incentives to develop local renewable-energy manufacturing and supply chains. Fourth, there is substantial international financial support for RES development, which could be tapped by public and private entities to expand renewable-energy generating capacity and strengthen cross-border interconnections that offer synergy between RESs and regional integration. RES development is of particular relevance to the development of the grid codes. Interconnection of renewable-energy generation (particularly wind) with the power grid raises specific concerns about system stability.

Figure 5.1: Renewable Energy Penetration up to 2035, With and Without Electricity Trade



Note: CSP = concentrated solar power; Hydro = hydroelectricity; PV = photovoltaic; RES = renewable energy sources; TWh = terawatt-hour.
Source: World Bank 2019.

To keep grid operations stable, there is a need to ensure that other power-generation sources are available to compensate for hourly variations of renewable-energy power generation. The associated technical issues include backup systems and power quality. The grid code could also require certain technical specifications from the manufacturers and developers of RES plants to minimize impacts on the grid's stability.

The potential that regional integration programs such as the PAEM present for improving renewable-energy penetration is significant. World Bank projections show that, in the scenario with international gas prices and electricity trading, renewable energy would grow to 35.9 percent of installed regional capacity by 2035 (from 1.4 percent today). In the base scenario, with current gas prices and no trading, in 2035 renewable energy would account for only 21.8 percent of installed capacity.

In keeping with this, the PAEM envisages an integrated supply system that aligns with national renewable-energy goals. It recognizes that interconnection of electricity from renewable-energy sources has implications for the overall capacity of the market and requires dedicated transmission lines for connection to the integrated grid. It also recognizes that the growth in renewable energy would impact positively on the market's electricity-export agenda, while diversifying power generation within the market. Consequently, borrowing from the EU, one of the objectives of the proposed transitional market design for the PAEM is to improve "sustainability as it relates to use of natural resources and their impact on the environment".[xliii] A successful implementation would therefore see the PAEM setting targets for the production of energy from renewable sources, greenhouse-gas emissions, and energy-efficiency gains[xliv]

Meeting ambitious renewable-energy targets and developing cross-border power trade therefore represents a two-way street. Yet while decision makers have embraced the former as an integral part of economic transformation to achieve narrow national-development aims, there is not yet a similar embrace of the latter.

They must come to see the two as intimately linked—in order to achieve (in some cases extremely) ambitious targets for renewable-

energy expansion in the near to medium term, a similar urgency should be placed on improving cross-border trade, achieving a wider electricity market, and advancing the PAEM. That will improve the anticipated utilization rates of new generating assets and make them more attractive investments. In the meantime, energy-sector reforms that are necessary to encourage renewable-energy buildout will also facilitate regional trade.

5.2. REDUCING NATIONAL EMISSIONS AT LOWER COST

The impact of power- system integration and trade on the region's CO2 emission trajectory is found to be moderately positive (i.e., leading to moderate reductions in CO2 emissions relative to cases with no trade). However, this impact is less pronounced than that of the other key variables, such as the level of gas prices or the introduction of CO2 emission limits. With gas prices at current levels, the CO2 emission reduction due to trade is almost negligible. It is more significant when the gas prices are set at the EU Hub level. When, in addition, CO2 emission caps are introduced, the impact of trade decreases again, but the impact of the CO2 emission caps themselves is much more powerful—the additional emission savings due to the caps amount to 1.2 billion tons of CO2 without trade and 880 million tons with trade.[xlv] Indeed, carbon policies that regulate emissions will be required (in addition to trade) to meet the region's emission targets.

The dynamics of CO2 emissions are driven to a large extent by the changing mix of generation technologies. By 2035, the share of zero-emission renewable-energy technology in the region is expected to increase dramatically, albeit starting from a very low base. In the cases considered, the share of renewable energy (wind, solar PV, and CSP) in the total installed capacity in 2035 ranges from 21.8 to 37.7 percent.

International gas prices must be used to ensure generation technologies are competing on a level playing field. While the switch from current gas prices to international prices leads to higher installed capacity requirements and higher capital costs, the fuel-cost savings more than offset this increase for the system. Renewable technologies are deployed at a much higher rate under international prices, because they are more competitive under fairer market conditions.

Moreover, using international gas prices leads to reductions in carbon emissions. If the CO2 emissions under the EU Hub gas prices are compared with those under the current domestic prices, the emission savings amount to 939 million tons of CO2 equivalent when there is no trade, and about 1.3 billion tons when there is trade.[xlvi]

Renewable-energy and efficiency targets are driven by national priorities and economic transformation, but they are also major catalysts for market integration. More efficient power trading in turn facilitates renewable-energy build-out and investment.

5.3. ELECTRICITY AND GAS TRADE SYNERGIES FOR HIGHER EFFICIENCY

As has been discussed, the penetration of variable renewable-energy sources in the electricity sector is expected to increase significantly over the next two decades. Apart from the need for the provision of sufficient baseload power, the volatile production of renewable-energy sources creates particular challenges for the daily balancing process, i.e., for balancing deviations between planned or forecast production and demand on the one hand, and the actual outturn in real time on the other hand.

Therefore, the rise of renewable energy in the MENA region would generally imply that gas-fired generation will become even more important and even the main source of balancing power in many countries. Additionally, the increasing dependency of the electricity market on gas-fired power plants will also increase the inter-dependency between the electricity and gas sectors. Consequently, more

volatile power prices may lead to more volatile gas consumption and may therefore contribute to more volatile prices in the gas market as well. Overall, the gas markets may thus also be faced with an increasing need for flexibility, bolstering the case for gas-market integration and increased trade. The introduction of trade in gas in current energy-trade discussions would go a long way towards ensuring a smooth transition in the direction of realizing the envisaged renewable-energy scenarios.

That being said, technological advancements such as energy storage and hydrogen trade will likely impact gas trade and demand, reducing the positive correlation between an expanding renewables sector and the need for gas, and also allowing for new options to transport and trade generated power.

5.4. DISRUPTIVE TECHNOLOGIES

Hydrogen is an emission-free energy carrier that can be used for long-term storage and heating applications, and is considered one of the best options for short-term CO2 emission reduction. Combining the conversion of hydrocarbon resources to "blue hydrogen" with carbon capture and storage (CCS) improves their environmental performance. When produced from electrolysis powered by renewables, the resulting energy carrier is carbon-free "green hydrogen." The main benefit of hydrogen is its ability to facilitate de-carbonization of various sectors, which results in the integration of large amounts of variable renewable energy.[xlvii]

The technology is suited to the emerging energy profile in the MENA region, with abundant low-cost solar power; significant gas resources; underground storage space for carbon captured from hydrogen production; and a geographic location with access to European and Asian markets. Hydrogen offers a way to avoid curtailment of renewable generation when supply outstrips demand, initially as conversion into heat, and eventually into storable and transportable energy. That can displace more carbon-intensive "blue hydrogen" and reduce the need for gas-fired baseload capacity in the context of expanding renewables, mitigating regional gas demand growth. Additionally, hydrogen can be delivered through the existing gas network, firstly as an additive to natural gas in small quantities, and eventually as the primary fuel.

The technology has major potential for MENA countries, but hydrogen producers, shippers and consumers have to be linked by viable commercial contracts and markets. International standardization will be crucial in this value chain, including for "guarantees of origin"; hydrogen purity; the design of liquefaction/conversion and regasification/reconversion facilities; and equipment specifications. Governments have to make a clear commitment and invest directly in early deployment; the United Arab Emirates is a regional leader in this sector. Even under an optimistic scenario, hydrogen trade will take a long time to displace LNG. The technology is most advanced in the Asia-Pacific region, where 2030 export targets in places such as Australia and New Zealand are equivalent to less than 1 GW.

Other technological advances that will shape the future of electricity markets include those relating to decentralization and digitalization. On the distribution side, "smart grids" will comprise modernized power networks where the convergence of power-system engineering and intelligent communication systems enables greater flexibility of business and system operations.[xlviii] Smart meters enable real-time load balancing, giving consumers the option to actively manage their consumption. Smart grids are a complement to micro-grids, distributed generation systems capable of functioning as "islands" or being plugged into the grid, enabling efficient operation.

Other technological advances that will shape the future of electricity markets include those relating to decentralization and digitalization.

Another key technological innovation is blockchain, a cryptographically secure shared record of transactions updated by a network of computers instead of a central authority.[xlix] In combination with big data and the Internet of things (IoT), blockchain technology can act as the backbone of the industry's smart-grid management system, enabling the automatic diagnosis and reconfiguration of network problems; because traffic no longer goes through a central system, the impact of disruptions is minimized. The development of advanced distribution-side technologies could facilitate decentralized trading platforms (such as peer-to-peer markets) and a diversity of market participants. Technological developments in the electricity sector present huge opportunities for MENA countries and are complementary to energy-efficiency programs.

6 OPERATIONALIZING TRADE COOPERATION: FROM VISION TO ACTION

Developing regional markets can be compatible with varying speeds of domestic reform. However, domestic reforms and regional market integration should go hand-in-hand to fully exploit the benefits of trade. Countries should follow a bottom-up approach to market integration, ensuring political feasibility and convincing domestic stakeholders within the specific national context. Market integration is a long process that requires continuous political support, and also decisive action.

Reaching a level of consensus on regional energy-trade agreements and treaties among countries is a major milestone, and demonstrates a real commitment to cooperation among the participating states. Yet experience shows that implementation is the key phase, and determines the positive effect on the ground.

6.1. MOBILIZING DOMESTIC POLITICAL WILL AND CHAMPIONS FOR TRADE

Political will is in turn subject to how specific national policy stakeholders perceive the costs of pooling some degree of sovereignty, compared to the benefits that can be accrued from trade and integrated markets. Relegating any degree of authority to regional international institutions is difficult, and can engender popular backlash if it appears to undermine legitimate local power structures (as seen in parts of the West). Economic interdependence and technocratic decision-making can provide for de-politicized economic exchange and promote peace, but they can also frustrate parochial political objectives. On the other hand, the potential economic gains from trade are indeed enormous, and they can facilitate economic transitions that are imperative in a changing world. However, the mismatch between winners and losers will always be a sensitive political challenge, and one that has been too often ignored in the past.

Achieving market integration requires an approach that convinces local stakeholders and creates champions for energy trade. It is a long process that requires continuous political support. Consistent steps forward to build trust through pursuing bilateral trade (as low-hanging fruit) can allow stakeholders to feel the benefits. This process is essential for both electricity and gas trade, because it builds a needed foundation for trade, focusing on economic benefits that can evolve over time to ensure complementarities between national priorities and regional goals—and finally to meet rising energy demand at lower cost without compromising security of supply. As a way forward, the building of an integrated market may follow a "national control and regional cooperation" approach.[1]

That is because, ultimately, the advancement of regional energy trade and accompanying institutions will be the product of national political considerations. Overall, MENA states lack motivated domestic political champions (particularly in the case of gas trade) that could push forward the regulatory policy harmonization required to enable the market. In particular, reconciliation of domestic energy prices and reform of domestic electricity markets are still works in progress, which should advance in tandem with increased facilitation of regional bilateral power trade. In fact, the essential reform to exploit the full potential of electricity and gas trade across MENA is cost recovery across the supply chain of both.

While political actors may recognize the benefits of the outcome (that is, greater efficiencies, reduced fiscal burden, and a greater share of renewable energy), seeing various proposals and prerequisites through to completion can prove challenging. Those domestic political challenges are valid and various, ranging from localized economic disruption, to dislodging political institutional interests, and unseating established elite privileges. Processes such as energy-pricing reform, and introducing both domestic and foreign competition to the sector, can incur losses among some actors or sectors of the population. Delicate processes of compensating domestic losses and reforming domestic institutions will be very specific to national circumstances. The issue of whether and when to mitigate the costs associated with

such policy changes, whether through explicit government compensation, grandfathering, or phased or postponed implementation, is critical to maintaining political support for reform.[li]

Addressing domestic institutional resistance may be easier in countries with more authoritarian or centralized political structures, and the temptation to hoard political power during periods of economic transition is very real. Over the long term, however, autocracy shuts out policy inputs, encourages rash mistakes, and is counterproductive for sound economic development. Where political power-sharing is more delicate (for example, in Lebanon or Tunisia), trying to shoe-horn external models for reform is even more dangerous. Despite the pressure to integrate regional energy markets quickly because of changing technology, differentiated national strategies to identify, convince, and make champions of local stakeholders are vital.

Market integration will be driven by key decision-makers across the various states, either acting individually or as sub-regional groups. Analysis suggests that decision-makers in the GCC for example, while broadly supportive, have some way to go before endorsing the creation of a fully functioning power pool. An interim solution based on a series of bilateral trading relationships should be promoted, and efforts to encourage further integration should focus on convincing those decision makers who are most receptive to arguments for long-term economic efficiency and wellbeing.[lii]

Engaging in the root-and-branch reform that underpins trade and regional market integration requires decision-makers to weigh the risk associated with policy change. The theory of market reforms rests on critical assumptions, without specified measures to assess and manage risks. One is that the benefits of reforms outweigh the costs, but measuring both is difficult in economic and especially political terms. A more fundamental, political question is what distribution of reform benefits and costs among actors is likely or desirable. Countries may therefore lack a broad evidence base to predict the feasibility and impact of reforms, so options to mitigate associated risks can be valuable to convincing stakeholders.[liii]

A step-based approach to market integration is not a call for gradualism. While each country faces its own challenges, political structures, and menu of policy options, that does not mean that reaching for the low-hanging fruit should imply path dependency to avoidance or limited achievement. Exogenous forces such as technology, global energy markets, and geopolitics are forcing a tight timetable on necessary regional change. Respecting national variation and seizing the moment to advocate for rapid progress are not mutually exclusive. The moment is ripe to move forward.

Once the political will is in place, regional institutional development should follow practical need rather than top-down centralization. A certain degree of compatibility in regulatory frameworks is required for integrated electricity markets to function effectively. Indeed, this is addressed under the Grid Code and market agreement of the PAEM. To progressively align and implement regulatory approaches does require some degree of independent decision making and institutionalization at the regional level. The creation of specialized PAEM bodies to facilitate cooperation between TSOs and regulators is a practical necessity. In the early stages, the PAEM secretariat can help to coordinate among national institutions. The envisaged regulatory and TSO committees of the PAEM's initial transitional stage will have to develop modes of operation to facilitate trade and build the case for such specialized regional bodies.

6.2. OPERATIONALIZING THE PAN-ARAB ELECTRICTY MARKET

Security, sustainability, and competition are the guiding principles to achieving the PAEM vision by 2038.

The initiative has been developed largely under the support of the World Bank and the LAS as a champion of the cause. The LAS has been instrumental in studying the market's feasibility, as well as appropriate regulatory and institutional frameworks. The World Bank

continues to work closely with countries in the region to develop a plan for realizing the proposed PAEM. The PAEM, having learned from the past, is well-suited to guide the development of a thriving regional energy-trade market that is operated by and for the benefit of its regional members.

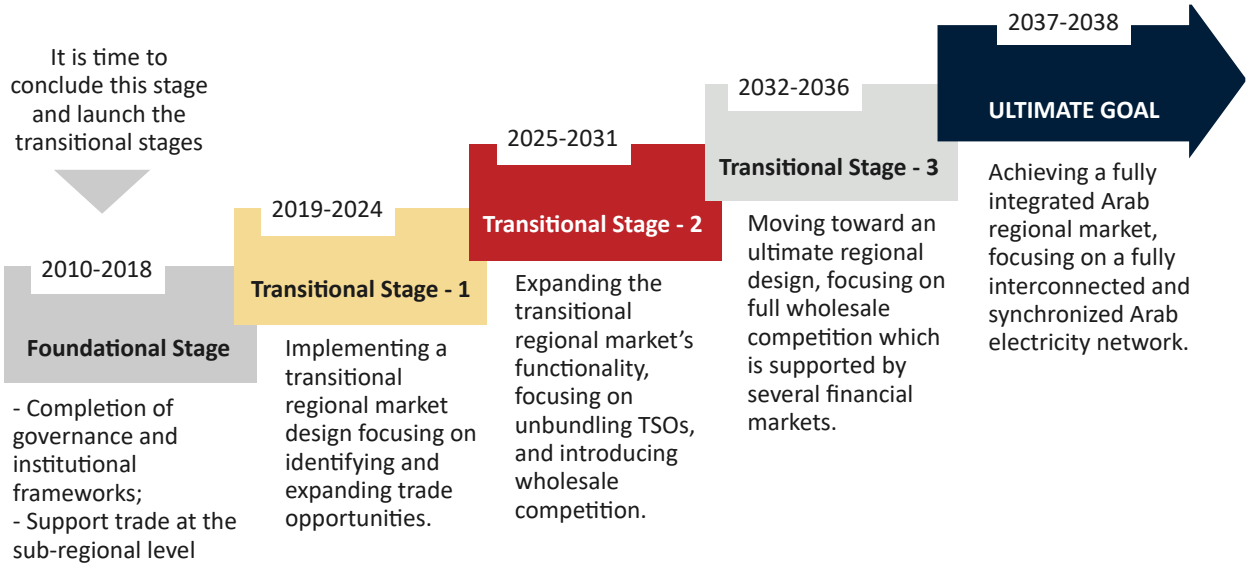
The trend in developed regional markets such as the EU points to a multilevel approach to regulation, where minimum standards are set at the regional level, with different degrees of implementation at the national level. The long-term goal may be a progressive harmonization of rules across participating states, to facilitate greater certainty, transparency and predictability within the market and ensure uniform development across the market. The PAEM's governance framework envisages such an approach, as outlined in the draft Grid Code that takes into consideration the need for a sufficient grace period until all countries are ready to harmonize technical rules at the regional level. Such a period must be agreed by all member states and should not impede the early operations of the PAEM.

Indeed, proceeding with full implementation of the final design of the PAEM in the near (or even the medium) term would not be possible. Consistent with experience elsewhere in the world, a phased approach to regional-market integration is proposed that will increase regional trade while allowing time for Arab countries to address obstacles and mitigate risks. It is anticipated that the phased approach will include multiple steps, gradually moving the regional market toward full wholesale competition. Figure 13 shows the adopted phases towards achieving the PAEM vision as per the signed MoU.

Before Arab countries can progress to the later stages of regional market development, progress is needed in areas such as subsidy reform, power-sector unbundling, and reliability improvements to meet minimum standards. Therefore, the immediate focus should be on operationalizing the first transitional stage and the encouragement of bilateral trade—but moves to advance domestic reform should be concurrent and determined, and lay the groundwork for further cooperation.

Under the transitional, or initial, regional market design proposed in Stage 1, trade takes place through direct seller-to-buyer bilateral contracts, with member states providing transit service as necessary. Domestic power-market reform is not a prerequisite, and bilateral contracts for energy are freely negotiated by the contract parties. National TSOs provide all system and balancing services necessary to meet domestic needs, as well as any regional

Figure 6.1: A Schematic of the Path to Regional Electricity-Market Integration Under the PAEM Vision



Source: World Bank 2018.

transactions, and they use system services to maintain supply reliability and quality on their national networks. They are reimbursed for providing transmission and system services in the PAEM through a regulated transmission-services charge that recovers the costs of capital, operation, and maintenance and losses. Transmission-service charges for transactions in the PAEM are applied in a fair and non-discriminatory manner. They are reviewed by the PAEM regulatory committee and approved by the Ministerial Council. Domestic balancing energy charges are regulated, and relate to deviations between quantities included in bilateral contracts and actual quantities exchanged in the PAEM. Balancing energy charges for transactions in the PAEM are also regulated, with prices reviewed and approved by the PAEM regulatory committee.

The core steps to operationalize the initial transitional stage of the PAEM are as follows:

- **The role of the regional market facilitator is to facilitate trade at the regional level.** The regional market facilitator will publish market prices for each country based on each country's marginal production cost, using international fuel prices as the basis. The market prices will be nonbinding, intended to identify trade opportunities, and provide a reference price for use in freely negotiated bilateral contracts.
- **The regional market facilitator will be independent,** and may include a number of committees (i.e., planning and operating committees).
- **Eligible regional market participants are free to negotiate bilateral contracts** for capacity or energy with any other eligible regional market participant.
- **The technical feasibility of bilateral contracts must be confirmed in advance by the regional market facilitator,** who in turn informs each national TSO impacted by the transaction.
- **There is fair and open access to the transmission networks of each country at published terms, conditions, and prices.** Transmission service is harmonized across the regional market.
- **Each country is required to meet minimum reliability criteria,** as documented in the Arab Grid Code.
- **Transmission-service tariffs recover the cost of capital; operation and maintenance of transmission assets; losses; and balancing and system services necessary to support bilateral contract transactions.** Tariffs will also recover the cost of network expansion.
- **Allocation of cross-border transmission capacity is based on auctions to eliminate bottlenecks when they arise.** Calculation of available transmission capacity is done in a transparent and nondiscriminatory manner, based on real physical bottlenecks.

When national TSOs claim that a bilateral contract cannot be physically transacted, the regional market facilitator will verify such claims. The regional market facilitator's verification will be non-binding, but if differences arise between national TSOs and the regional market facilitator, the Pan-Arab ARC will be called on to conduct a review and render a decision that is binding on the parties. In order to capture some benefits of regional trade during the initial PAEM stages, the Executive Bureau of the Arab Ministerial Council for Electricity endorsed the World Bank's proposal for the PAEM's Regional Pricing Mechanism (RPM). The core driver of the RPM is to advance trade on a commercial basis from efficient and competitive generation sources, and to overcome the lack of trade due to highly subsidized fuel for power generation. The RPM consists of a one-year pilot period to facilitate exchanges-in-kind (recognizing different energy values at different times of year); cost/benefit sharing at (cost + value)/2, whereby the seller receives its marginal production cost plus half the difference between its marginal production cost and the marginal production cost of the buyer; and "emergency support - cost + fixed profit", whereby the seller receives its marginal production cost plus a margin (e.g., 15 percent). The pilot is currently planned for 2020 and will be hosted by Saudi Arabia, with all PAEM members joining to finalize the RPM before its rollout in 2021.

6.3. BOTTOM-UP APPROACHES TO ADVANCING GAS-MARKET INTEGRATION

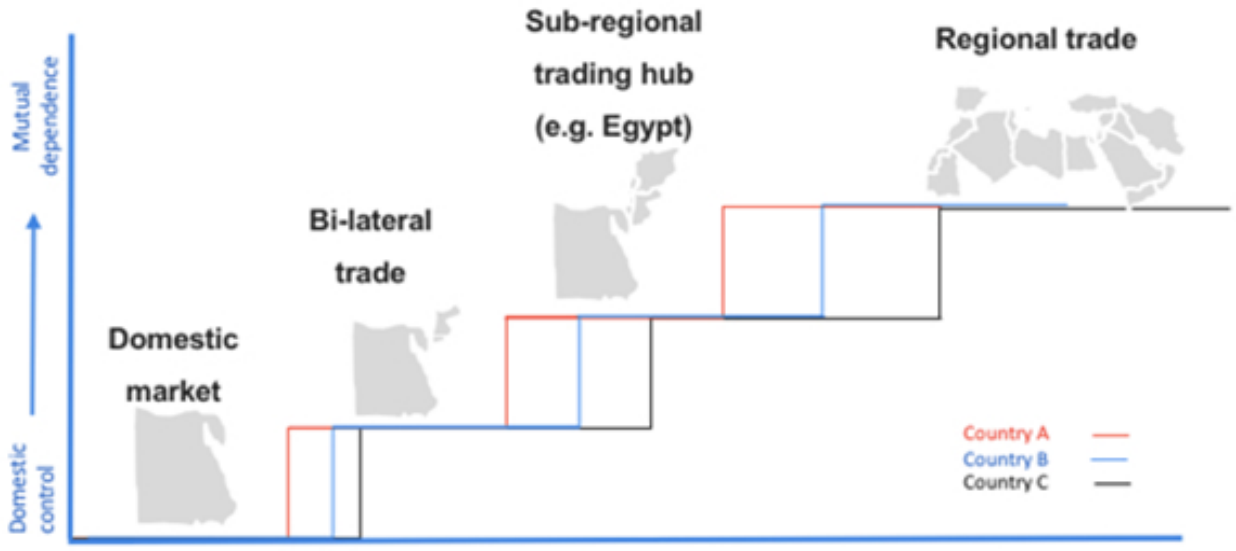
The vision for a Pan-Arab gas market is relevant and timely. Gas trade takes place where surplus gas finds a market at mutually and economically acceptable prices. In the case of the MENA region, new production in the Eastern Mediterranean is looking for markets, while consumers in the GCC and elsewhere are looking to source gas, absent cooperation with Qatar.

Unlike the PAEM, gas-market integration is relatively nascent. Developing trade will require political will to cooperate in regional trade agreements; market-based gas prices across the region; a harmonized regulatory environment for trade and supply; and an investment framework for infrastructure.

In keeping with the bottom-up, national-interest-focused approach to trade enhancement, countries gradually move up a trading staircase, each at its own pace, to introduce the pre-requisites for a Pan Arab gas market.

A concurrent high-level dialogue between countries in a platform to develop political willingness also has a role, and a forum for such dialogue should preferably be found in an existing regional organization, for which gas trade would be a natural fit. However, sometimes the political impetus for market formation will be driven by regional champions for strategic reasons. Such is the case in the GCC, where Saudi Arabia and the United Arab Emirates are leading efforts to build and develop a GCC gas market. That is partly due to economic considerations, as Saudi Arabian and United Arab Emirates demand increases in line with power demand and the integration of renewable energy. But it is also a function of the Qatar crisis, and seeks to develop efficiencies for gas utilization precisely because it excludes the region's major exporter.

Figure 6.2: Getting to Regional Gas Trade and a Pan-Arab Gas Market



Source: World Bank 2017.

Going forward, enabling regional gas trade will require developing a shared vision; identifying political, policy and commercial solutions; defining an action plan; developing a regional governance structure; developing a regulatory framework; and facilitating and supporting (along with regional and international partners) the needed infrastructure investments.

Bearing in mind national differences, the following short-term actions could be taken nationally, based on international good practices, paving the way for a harmonized regulatory environment for trade and supply:[lv]

1. Decide policies and responsibilities for the regulator, gas-transmission companies, and independent transmission and distribution pipelines within the primary gas-sector legislation;
2. Determine eligible customers to buy at deregulated gas at market prices;
3. Determine the regulator's additional responsibilities for regulating third-party administrators (TPAs) to pipelines to promote competition in the gas market;
4. Unbundle/create transmission and distribution companies; and
5. Develop TPA rules for transmission and distribution systems, and LNG terminals.
6. The development of primary gas-sector legislation does not have to take many years, but political sensitivities often prolong the process.

Developing integrated energy markets (whether for gas or power) is a continuous process, and Europe's example is one of evolutionary change, where smaller groups (such as Nord Pool) can follow more liberal approaches and still co-exist with alternative, more national approaches. Bilateral partnerships, and small groups of countries within a region, can (and should) create trading pools that later attract neighboring countries, such as in the case of the GCC. These projects will take some time to come to fruition, but transitional decisions and tools to facilitate trade are feasible in the meantime.

As sub-regional gas markets in the GCC, the Levant, and (to a lesser extent) the Maghreb develop, they can gain experience and lay the building blocks for more comprehensive regional trade down the road.

The integration of regional gas and power markets can support national-development strategies due to their synergies and complementarities, and ultimately help to promote regional peace. But they can also pose new challenges in terms of pooling sovereignty and risks that must be adequately managed. The process should respect stakeholders' concerns about security and sovereignty throughout, while progressing on practical steps to advance the process.

6.4. INFRASTRUCTURE INVESTMENT

In order to advance regional trade, the development of interconnecting infrastructure will be key.

6.4.1. POWER INFRASTRUCTURE

Introducing regional electricity trade will drive savings by reducing the need for new generation capacity. However, it will also require investments to enhance or expand certain transmission lines.

Accounting only for existing interconnections to engage in regional electricity trade increases the annual average utilization[lvi] from 31 percent in 2018 to 37 percent in 2035. Only two interconnectors—from Oman to the United Arab Emirates and from Jordan to Syria—are consistently used more than 50 percent over the planning horizon.

World Bank modeling has assessed the potential benefits, for the period from 2018 to 2035, of engaging in regional electricity trade by increasing the utilization of existing cross-border interconnectors. They are substantial—total economic benefits amount to $52 billion, derived mainly from fuel savings and avoided capex that would otherwise be deployed for capacity reserves.[lvii] Total capital costs increase when electricity trade is enabled, due to increased deployment of renewable generation (primarily solar PV, and nuclear technologies). The fact that $52 billion in benefits is possible from lower fuel costs and increased reliability, without significant new infrastructure build, is remarkable. The figure is also growing, along with the share of renewables. Only a few years ago, the net present value of savings up to 2030 at 2014 prices was estimated at $35 billion (along with $11 billion saved from lesser-polluting emissions).[lviii]

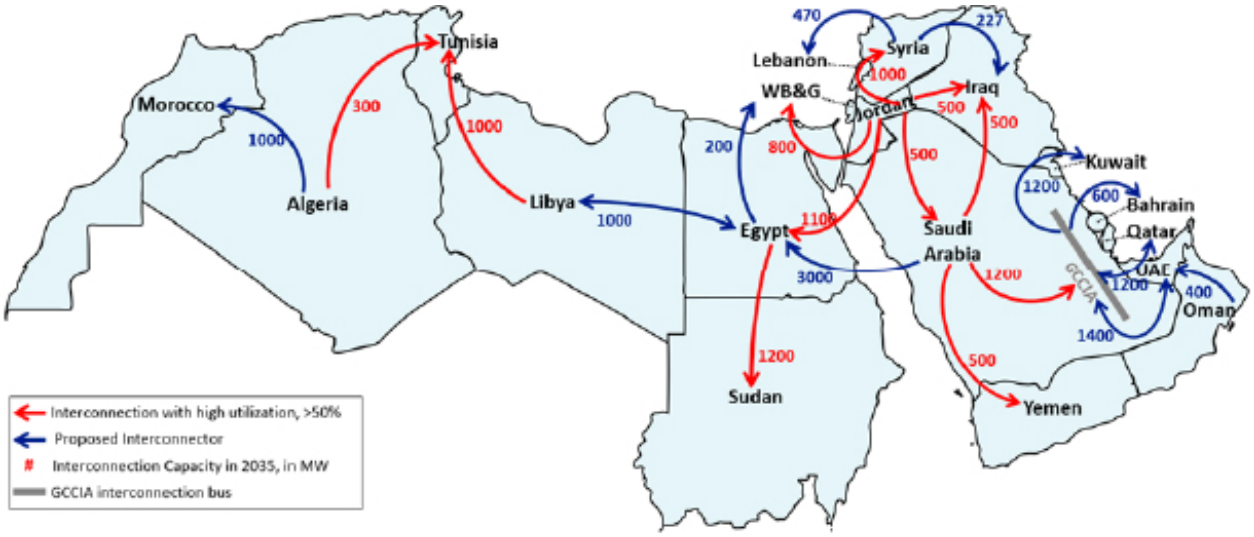
There is, of course, a need to improve coordination and related control facilities, and efficiency can also be improved (the average energy loss in the production, transport and

distribution levels is about 19 percent, whereas the global average is about 8 percent). But the cost of such softer measures is likely to be a small fraction of the savings.

However, new interconnection investment will be key where those lines are expected to be effectively utilized. A more detailed transmission investment plan is an important next step.

Under World Bank scenarios, the lines that would consistently be utilized at over 80 percent are: Algeria-Tunisia; Egypt-Sudan; Jordan-Egypt; Jordan-Saudi Arabia; Jordan-Iraq; Jordan-Syria; Jordan-West Bank and Gaza; Libya-Tunisia; Saudi Arabia-the Republic of Yemen; Saudi Arabia-Iraq; Saudi Arabia-GCCIA. These transmission lines therefore appear to be good candidates for further study or investment, given that they are critical to the power-trade network. Developing a transmission investment plan is an important next step towards realizing Pan-Arab electricity trade.

Figure 6.3: Proposed cross-border interconnectors utilization in 2035



Note: WB&G = West Bank and Gaza; UAE = United Arab Emirates.
Source: World Bank 2019.

6.4.2. NATURAL-GAS INFRASTRUCTURE

Determining new infrastructure priorities to improve gas security and promote trade is the challenge facing countries in the region. The United Arab Emirates, Bahrain, Kuwait, and Jordan have opted for LNG facilities to meet peak demand and to add alternative supply sources, in some cases with FRSUs (as discussed above).

When transporting large quantities of gas, pipelines are an attractive alternative, although conflict, war, and civil unrest can be major barriers to fixed infrastructure investment. Onshore gas pipelines are more vulnerable to third-party interactions than offshore pipelines. Gas pipelines that require new investments impose dependence on both the seller and the buyer, and because pipeline lifecycles usually outlast the prevailing political alignments, this could result in stranded mid-stream assets. There is some evidence that interdependence can help bind national interests and mitigate political fall-out in the short term, but the argument is plagued by unknown political counterfactuals. More commonly, interdependence means gas continues to flow even in the presence of political conflict, as long as trading institutions and conflict-resolution mechanisms continue to function, and trading interests are ring-fenced.

Moreover, technical and economic barriers can limit the feasibility of trading infrastructure.

Deep-water pipeline limitations were originally the reason for pipeline export to Italy and Spain from

Algeria via Tunisia and Morocco. Technical experience means more challenging pipeline routes are now possible, such as those from Cyprus and Israel to Egypt; from Saudi Arabia to Egypt; and from Oman to India. Some connections (e.g., Egypt to Italy) are still hampered by engineering limitations.

Pipeline pressure and capacity scaling are other issues to consider. In order to improve economies of scale, it is important to coordinate long-distance transportation rather than build infrastructure for individual fields or smaller markets.

6.4.3. MOBILIZING CAPITAL FOR INFRASTRUCTURE: PRIVATE INVESTMENT VERSUS STRATEGIC DEAL-MAKING

Many potential projects have large economic benefits, but their realization is dependent upon the ability to create a financial structure that enables capital mobilization and is sustainable over the lifetime of a project.

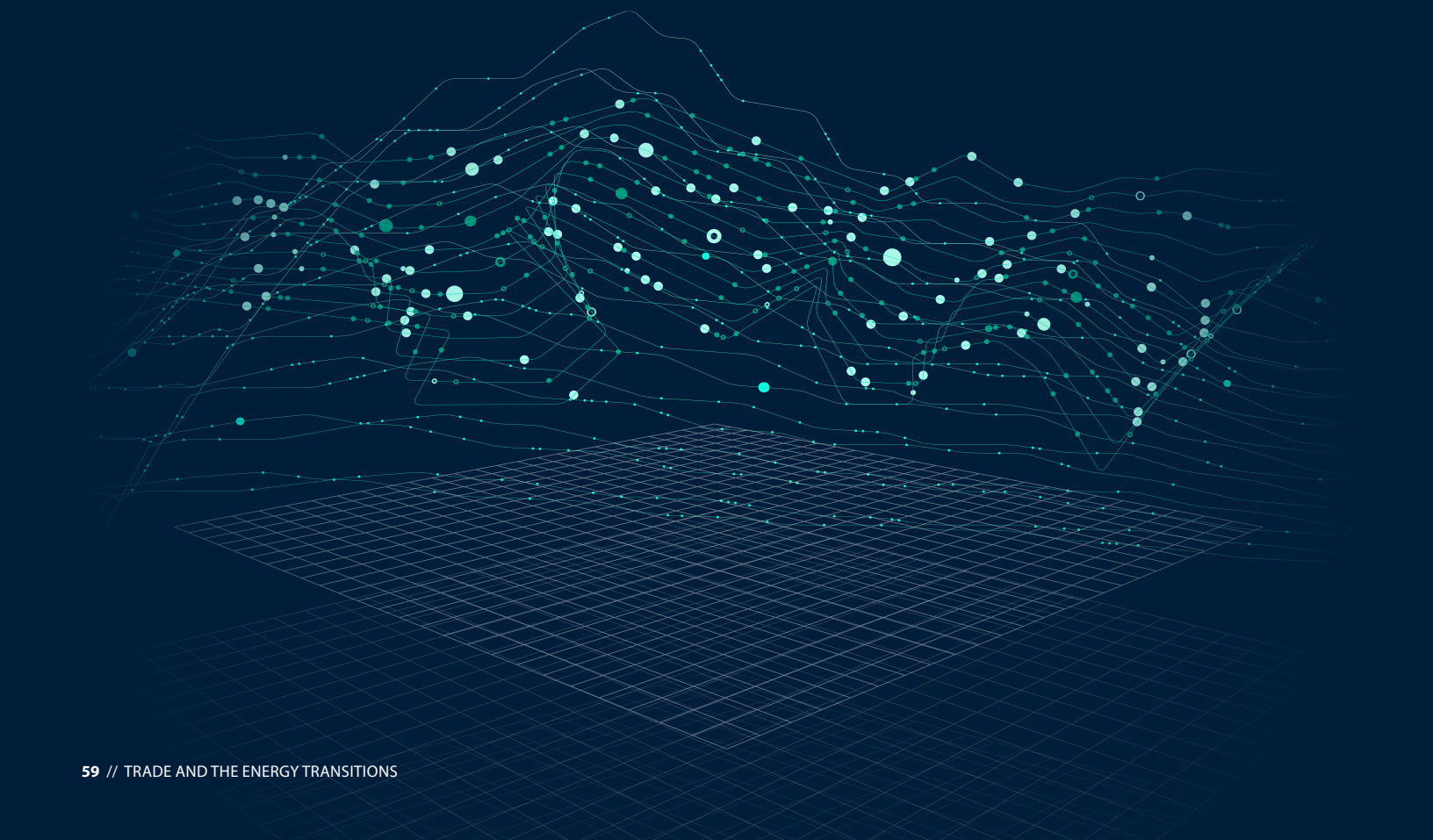
The traditional utility financing model for transmission sees equity provided by the utility itself (through net internal cash generation); it is also sometimes augmented by direct equity contributions from a government. Creditworthy utilities may in turn raise funds for capital investment through bond issues and/or commercial borrowing. Typically, in the case of regional transmission projects, the debt has been provided by IFIs such as the World Bank, secured through sovereign guarantees.[lix]

However, the traditional utility-finance model has come under pressure for two reasons. The first is limited headroom for sovereign guarantees, with ministries of finance increasingly reluctant to provide these to state-owned utilities. Second, the supply of concessionary finance is coming under pressure, as the resources of the IFIs are being shifted to other sectors.

This has led to the increasing use of private-public-partnerships (PPPs), whose capital structures may be quite complicated, often including equity participation by governments or IFIs and debt participation by private lenders enticed by partial risk guarantees (PRGs).[lx]

Yet when it comes to the need for national infrastructure investment, there is a tension between various models of transparent and competitive bidding open to outsiders on the one hand, and one of fiscal-expansionary, state-driven strategic investments coupled with closed-door deals (for example, with favored national champions that crowd out local competitors, or with foreign companies or foreign state-owned banks whereby deals are part of a political *quid pro quo*) on the other hand. Public financing, or cheap credit that is coupled with long-term foreign control of assets or technology, can be seductive ways to circumvent close scrutiny of the creditworthiness of projects or borrowers. However, they can also pose long-term strategic risks, while undermining sustainability.

MENA countries that are in a hurry to develop infrastructure should be aware of the trade-offs.



CONCLUDING MESSAGE

As a result of changing trends in global energy; technological evolution of energy production; political changes in the Middle East and North Africa; and the fiscal unsustainability of the status quo, countries in the MENA region are undergoing profound economic transitions. Efforts to enhance electricity and gas trade, and to integrate those markets, can help to alleviate pressures on national budgets and improve energy security, while facilitating the growth of renewable energy.

The Pan-Arab Electricity Market, and more nascent sub-regional and eventually regional gas markets, are mutually reinforcing goals that require both domestic market reform and international governance. The process is necessarily a gradual one, and progress will be uneven across countries. That is a function of how key stakeholders evaluate and define the costs and benefits of integration, from both political and economic perspectives. National sovereignty implies the necessity of a bottom-up approach, but the World Bank, the Arab League, and various international institutions can help develop the necessary regional mechanisms to facilitate trade, as countries themselves implement national reform and deliver infrastructure investments.

This paper has attempted to shed light on that process, and on the political economy of electricity and gas trade in the region, with the aim of supporting prosperity and peace for the people of the Middle East and North Africa.

NOTES

[i] See: https://blogs.worldbank.org/ppps/creating-second-largest-regional-electricity-market-world.

[ii] Renewing the social contract; regional cooperation; resilience; recovery and reconstruction.

[iii] The World Bank's Articles of Agreement (International Bank for Reconstruction and Development 1945: Article III, Section 5) treat economics and politics as mutually exclusive matters, and prohibit "political or other non-economic influences or considerations" in its activities. Historical reasons for this include prevailing "functionalist" ideas that development could be achieved through technical solutions (Cissé 2011: 60-61). Later legal interpretation of the Articles acknowledges that "politics and economics are often two sides of the same coin" (Leroy 2012: 9), such that it is appropriate for the World Bank to "consider political issues that have implications for economic development (Khemani and others 2016: 237), so long as "partisan politics or ideological disputes" are not involved (Leroy 2012: 9).

[iv] The MENA region includes Algeria, Bahrain, the Arab Republic of Egypt, the Islamic Republic of Iran, Israel, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, the Syrian Arab Republic, Tunisia, the United Arab Emirates, West Bank and Gaza, Djibouti, and the Republic of Yemen. The Islamic Republic of Iran and Djibouti are not included in the analysis covered in this note.

[v] Inhorn 2018.

[vi] World Bank 2019b.

[vii] As per International Trade Centre Export Potential Map.

[viii] World Bank 2019c. NB: This assessment of value builds on previous efforts to define the PAEM governance framework by the World Bank, and the Arab Fund's study of regional investments. Economic benefits of trade are calculated as a difference in system costs for scenarios with and without trade. The study considered cross-border power trade over existing as well as already planned interconnections.

[ix] It is estimated that the region would require infrastructure investments totaling $450 billion by 2020 to meet 135 GW generation capacity. See World Bank 2013.

[x] World Bank 2018.

[xi] World Bank 2017a.

[xii] SDG7 Compass.

[xiii] "Middle East and North Africa region. Overview," World Bank.

[xiv] International Renewable Energy Agency 2016.

[xv] Lee and Pyun 2009.

[xvi] Lounnas and Messari 2018.

[xvii] Froman 2014.

[xviii] Ladislaw and Tsafos 2019.

[xix] El-Gamal 2019.

[xx] Poudineh, Fattouh, and Sen 2018.

[xxi] Lee and Usman 2018.

[xxii] Foster and Rana 2019.

[xxiii] International Energy Agency 2017.

[xxiv] Al-Asaad and Ebrahim 2008; Al- Shahrani 2009.

[xxv] Kumar 2011.

[xxvi] Gulf Cooperation Council Interconnection Authority 2018.

[xxvii] World Bank 2013.

[xxviii] ibid.

[xxix] ibid.

[xxx] Although the EIJLLPST Interconnection Agreement was signed in the 1980s, physical interconnections between Syria and Jordan and between Syria and Lebanon were constructed in the 1970s.

[xxxi] According to the Minutes of the Eighteenth Annual Meeting of Medelec, the EIJLLPST interconnection will be renamed the Electrical Interconnection of Three Continents (EITC) at the next ministerial meeting.

[xxxii] ibid.

[xxxiii] World Bank 2013.

[xxxiv] World Bank 2017b.

[xxxv] "Arab Gas Pipeline (AGP), Jordan, Syria, Lebanon, Egypt," Hydrocarbons Technology.

[xxxvi] Qatar–UAE Agreement (Article 2). The Qatar–UAE Agreement also provides provisions regarding security arrangements (Article 7) and exchange of information (Article 9).

[xxxvii] Brunekreeft and Guliyev 2009.

[xxxviii] Energy Information Center.

[xxxix] ibid.

[xl] Arab Petroleum Investments Corporation 2016.

[xli] World Nuclear 2017.

[xlii] Joscow 2019.

[xliii] World Bank 2013.

[xliv] ibid.

[xlv] World Bank 2019c.

[xlvi] ibid.

[xlvii] International Energy Agency 2019.

[xlviii] Farhangi 2010.

[xlix] Peng and Poudineh 2017.

[l] World Bank 2013.

[li] Trebilcock 2014.

[lii] ibid.

[liii] Lee and Usman 2018.

[liv] Finalized by the World Bank in response to the received country comments on the original document, and also aligned with the final agreements of the PAEM. Countries decided to introduce regional interconnection technical rules, along with benchmarking with other practices, before endorsement by PAEM members. The Arab Fund is now supporting this effort.

[lv] World Bank 2017a.

[lvi] NB: Annual average interconnection utilization refers to the ratio of the yearly electricity flowing over a transmission line divided by the maximum possible yearly electricity flow.

[lvii] World Bank 2019c.

[lviii] Arab Monetary Fund 2018.

[lix] World Bank 2019a.

[lx] ibid.

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