The Integration of the PAN – Arab Electricity Market PAEM

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**PAEM Principles and Objectives**

Achieve the best results, at the short and long term, for electricity supply at both regional and national levels.

Enable Electricity trade and exchange between Member States, electricity buyers and sellers not only within their national markets, but also at the level of all Member States’ markets on the basis of fair access to the grid and competition.

Promote public and private investment in large projects in the field of generating and transmission electricity of regional interest based on cost reduction.
The MOU sets the vision and governance framework in a five-stage development plan:

**2010-2018**

**Foundational Stage**
- Completion of governance and institutional frameworks
- Support trade at the sub-regional level.

**2020-2024**

**Transitional Stage-1**
Implementing a transitional regional market design focusing on identifying and expanding trade opportunities.

**2025-2031**

**Transitional Stage-2**
Expanding the transitional regional market’s functionality, focusing on unbundling TSOs, and introducing wholesale competition.

**2032-2036**

**Transitional Stage-3**
Moving toward an ultimate regional market design, focusing on full wholesale competition which is supported by several financial markets.

**2037-2038**

**Ultimate Goal**
Achieving a fully integrated Arab regional market, focusing on a fully interconnected and synchronized Arab electricity network.
PAEM Integration - Opportunities

- System Size (GW)
  - EU network (ENTSOe): 1,030
  - Pan-Arab Electricity Market (PAEM): 300
  - Brazil – Uruguay – Argentina: 130
  - Mid-Western (US) and Manitoba (CA): 110
  - Greater Mekong Sub-region and Nam-Theun 2: 83
  - South African Power Pool (SAPP): 56
  - SIEPAC (Central American Countries): 10

- Electricity Pool
  - EU network (ENTSOe)
  - Pan-Arab Electricity Market (PAEM)
  - Brazil – Uruguay – Argentina
  - Mid-Western (US) and Manitoba (CA)
  - Greater Mekong Sub-region and Nam-Theun 2
  - South African Power Pool (SAPP)
  - SIEPAC (Central American Countries)
PAEM Integration – Opportunities (Cont.)

**European Network of Transmission System Operators for Electricity (ENTSO-E)**

- **COMIEC**: Tunisia, Morocco, Algeria, Libya
- **GCCIA**: KSA, UAE, Kuwait, Qatar, Bahrain, Oman
- **COMELEC**: Tunisia, Morocco, Algeria, Libya
- **EIJLPST**: Egypt, Iraq, Jordan, Libya, Lebanon, Palestine, Syria, Turkey

**Connections**

- **Morocco - Spain**
- **Syria - Turkey**
- **Tunisia - Italy**
- **Egypt - Greece**
- **Tunisia - Libya** 500 MW
- **Egypt - Sudan**
- **Sudan**
- **Egypt / Jordan** Connection will be Upgraded To be 1100 MW
- **Egypt / Jordan / GCC IA Under Study (2000 MW)**
- **Jordan - KSA 1000 MW**
- **Iraq - Kuwait**
- **KSA - Iraq 1000 MW**
- **500 MW**
- **KSA – Yemen**
- **Egypt – KSA 3000 MW Expected 2024**
- **Iraq – KSA 1000 MW**
- **500 MW**
- **500 MW**
- **500 MW**

**PAEM Integration – Opportunities**

- **Egypt - Greece**
Utilization of Infrastructure By Enabling trade on economic merits

Increase Utilization of Existing Interconnection Capacity  
New and Reinforced Interconnections by 2035

Ref: World Bank
Benefits of enabling trade on economic merits through the existing interconnections only May:

- Decrease total system costs by US$71 billion
- Increase the annual average utilization from 5–7 percent in 2018 to 36 percent in 2035
- Exhibit an estimated commercial value of trade of US$23 billion
- Improve energy security by 23 percent
- Increase the share of renewable technologies in the energy mix to 17.6% by 2035

Existing Cross-Border Interconnectors with expected utilization greater than 50% in 2035:

<table>
<thead>
<tr>
<th>Country Pair</th>
<th>Interconnector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria – Tunisia</td>
<td>GCCIA – Kuwait</td>
</tr>
<tr>
<td>Egypt – Libya</td>
<td>GCCIA – Bahrain</td>
</tr>
<tr>
<td>Egypt – Sudan</td>
<td>GCCIA – KSA</td>
</tr>
<tr>
<td>Egypt – Jordan</td>
<td>Oman – UAE</td>
</tr>
<tr>
<td>Syria – Iraq</td>
<td>Syria – Lebanon</td>
</tr>
</tbody>
</table>

Ref: World Bank
Identified projects transform the level of integration among national power grids in MENA, increase RE Integration, and Decarbonize the Economy. Arab countries grids, mainly sub-regional, in 2022.

Identified New Interconnections:

<table>
<thead>
<tr>
<th>New Interconnections</th>
<th>Total Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSA - Egypt</td>
<td>3000</td>
</tr>
<tr>
<td>KSA - Yemen</td>
<td>500</td>
</tr>
<tr>
<td>Tunisia - Libya</td>
<td>1000</td>
</tr>
<tr>
<td>KSA - Jordan</td>
<td>1000</td>
</tr>
<tr>
<td>KSA - Iraq</td>
<td>1000</td>
</tr>
<tr>
<td>Jordan - Iraq</td>
<td>500</td>
</tr>
<tr>
<td>KSA - Oman</td>
<td>1000</td>
</tr>
<tr>
<td>Kuwait - KSA</td>
<td>1000</td>
</tr>
</tbody>
</table>

Identified Reinforcements:

<table>
<thead>
<tr>
<th>Identified Reinforcements</th>
<th>Increased Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria-Morocco</td>
<td>600</td>
</tr>
<tr>
<td>Egypt-Sudan</td>
<td>1000</td>
</tr>
<tr>
<td>Egypt - Jordan</td>
<td>650</td>
</tr>
<tr>
<td>Egypt – Gaza Strip</td>
<td>175</td>
</tr>
<tr>
<td>Jordan – West Bank</td>
<td>160</td>
</tr>
<tr>
<td>Libya - Egypt</td>
<td>370</td>
</tr>
<tr>
<td>Jordan – Syria</td>
<td>650</td>
</tr>
<tr>
<td>Lebanon – Syria</td>
<td>730</td>
</tr>
<tr>
<td>GCC Interconnections</td>
<td>600-1050</td>
</tr>
</tbody>
</table>

Ref: World Bank
The Needs To Accomplish An integrated PAEM

Scaling-up Trade & Infrastructure

- Complete and Improve the Infrastructure.
- Countries of the region need to develop and agree on a pricing approach suitable for cross-border trade on economic and commercial basis.

Completing governance framework

- General Agreement
- Market Agreement
- Grid codes
- Market rules
The Needs Cont. PAEM Institutions - Forming Market Committees

Arab Ministerial Council of Electricity (AMCE)

Executive Bureau

- Pan-Arab ARC Committee
- PAEM Secretariat
- Arab TSOs Committee

Regulatory WG

- Operation – Planning WG
- Operation WG
- ICT WG
- Planning WG
- Area / Market WG

Member States TSOs
Sub-regional TSOs/Facilitat
The benefits from a fully integrated PAEM by 2038

- Save total power system cost
- Share economic benefits from bilateral trade
- Catalyze private investment in renewable energy
- Increase cross-border transmission capacity utilization
- Improve energy security
- Higher share of renewable energy
- Lower cost of compliance with carbon targets
Thank You

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