

# Role of Regulatory Authorities in Regional Electricity Trade

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# Before we start...

- Regional and national regulatory authorities play an important role in regional trade
- ACER in the EU and FERC in the US play regional regulatory role, providing oversight of national/state regulators
- In the PAEM, it is proposed that the Pan-Arab ARC play the role of regional regulator providing oversight of national regulators in the Member States
- This presentation provides an overview of the roles and responsibilities of the Pan-Arab ARC and the national regulators relating to regional trade in the PAEM
- The roles and responsibilities of these entities are documented in the PAEM General Agreement

# Agenda

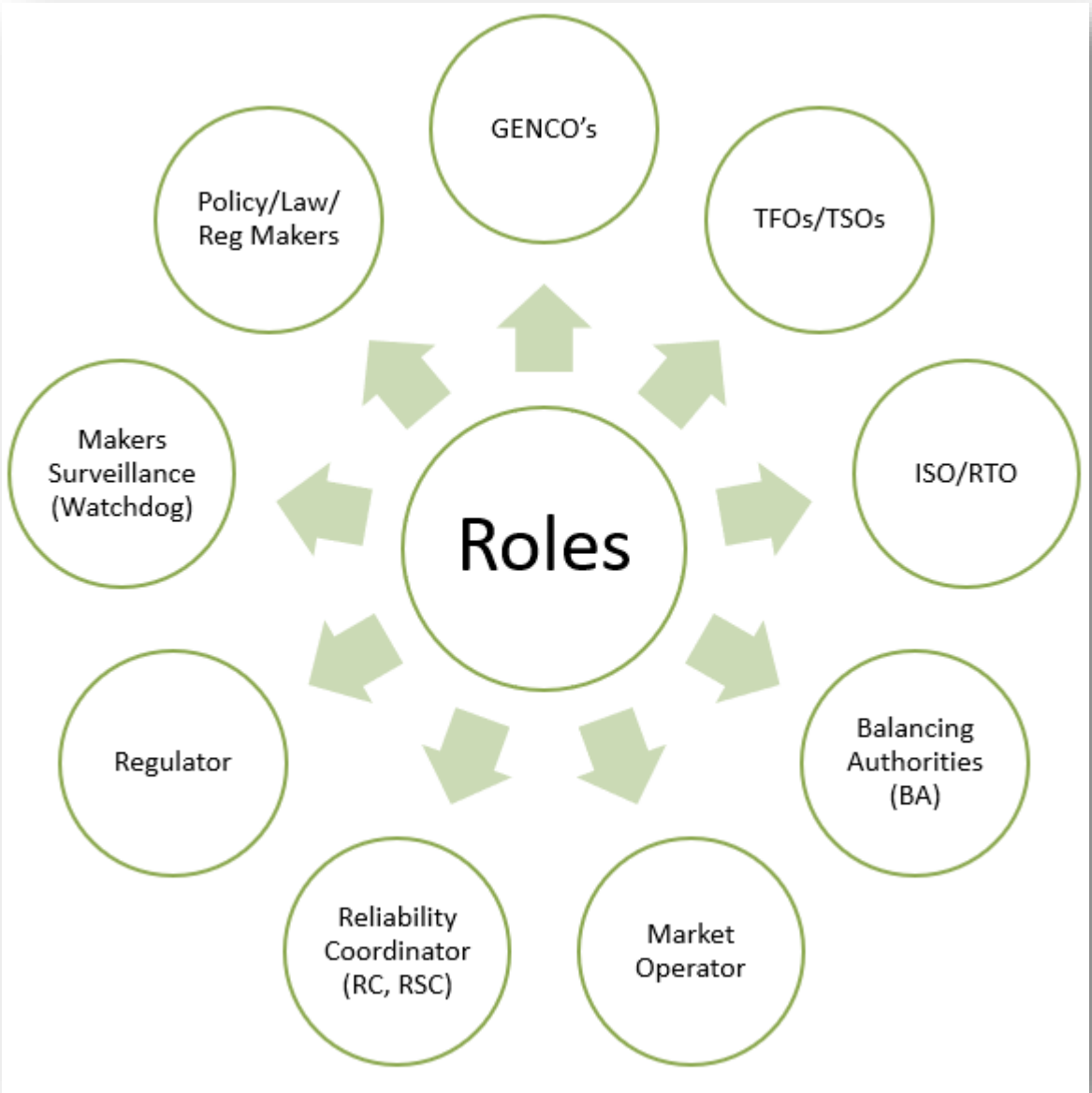
1. Fundamentals of Electricity Markets
2. Benefits of regional trade
3. Overview of the US electricity market and the role of FERC
4. Overview of the EU electricity market and the role of ACER
5. Roles and responsibilities of the Pan-Arab ARC and the National Regulators in the PAEM
6. Priorities of the Pan-Arab ARC

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# Electricity Markets - Fundamentals

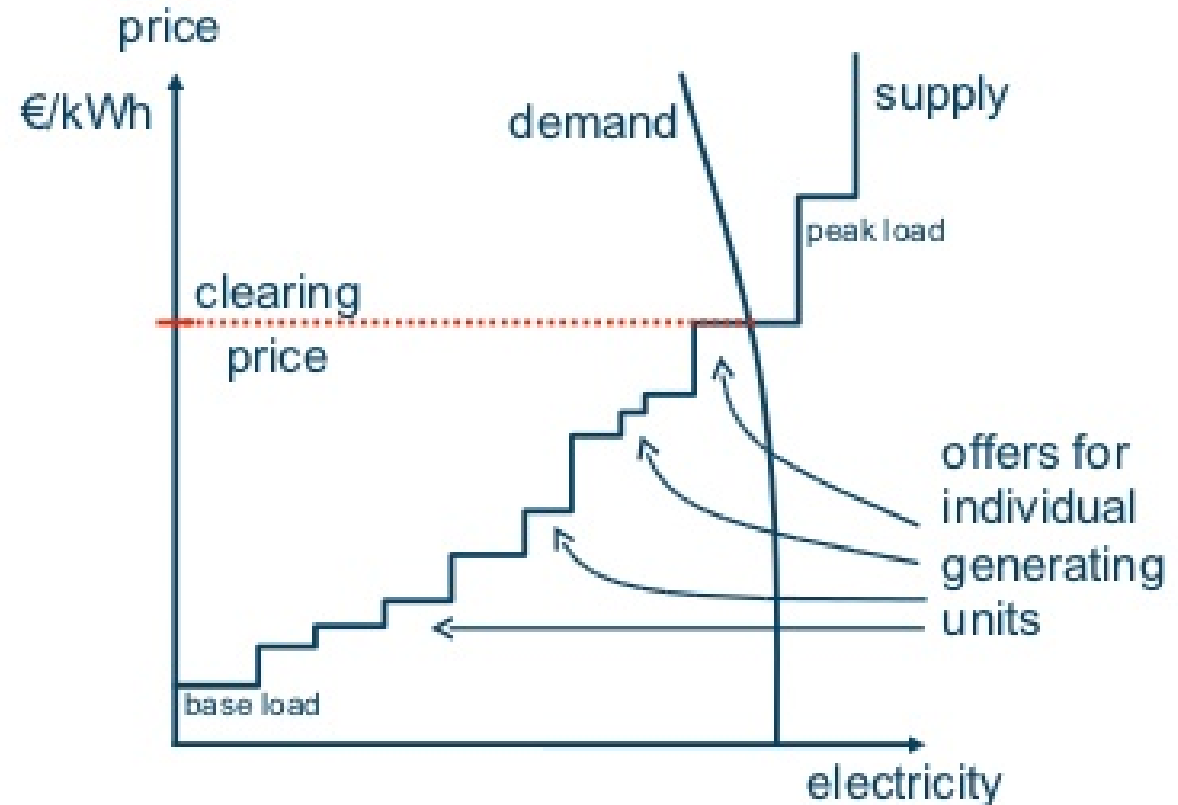
**\*Multiple roles  
can be played by  
one Player**



# Electricity Markets - Fundamentals

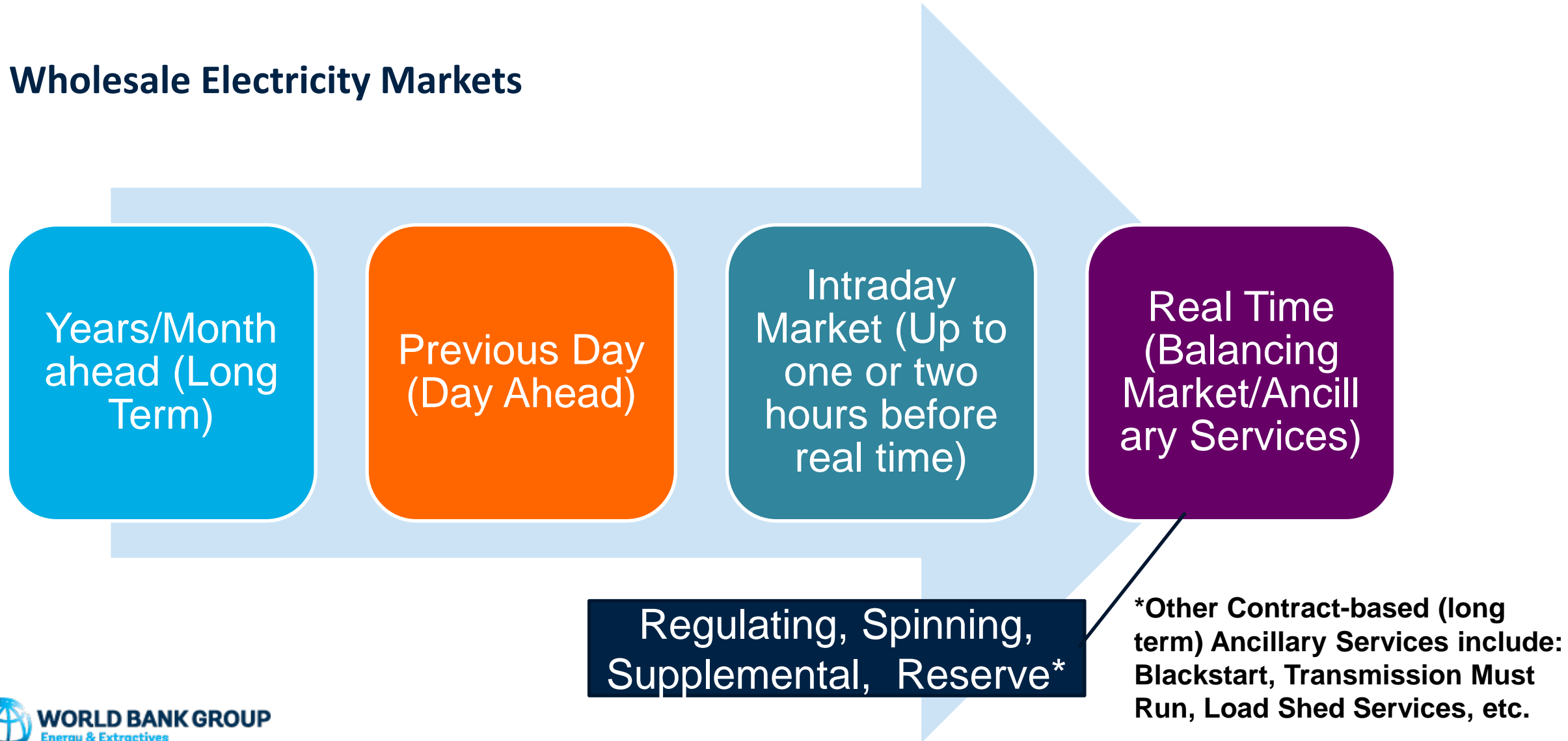
## Supply, Demand and Competitiveness Principles:

- ▶ Congestion Free
- ▶ No Market Powers/Monopoly
- ▶ Open Access
- ▶ Firm and Clear Market Rules
- ▶ Compliance
- ▶ Investment Signals
- ▶ Price Volatility



# Electricity Markets - Fundamentals

## Wholesale Electricity Markets



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# Benefits of Regional Trade

- Many jurisdictions have, or are moving to, expanded regional integration including the European Union (EU), Central America (SIEPAC), West African power Pool (WAPP), Southern Africa Power Pool (SAPP), etc.
- Drivers of regional integration vary, but generally relate to the following:
  - Reduced supply costs owing to: 1) generation dispatch over a broader region resulting in reduced fuel costs, and 2) coordinated and optimized expansion of generation and transmission assets to gain economies of scale and share reserves
  - Improved reliability through assistance from other countries during supply shortages owing to: extreme weather (i.e., drought, heat), mechanical failures (generation/transmission outages), construction delays, etc.
  - Reduced environmental impacts; i.e., improved access to renewable generation sources, optimized dispatch (i.e., greater use of the more efficient and cleaner generation assets), etc.

# Example for a Utilized Interconnector – The case of the SIEPAC\* Interconnection

9 shareholders with no shareholder controlling more than 15% of the issued and outstanding shares

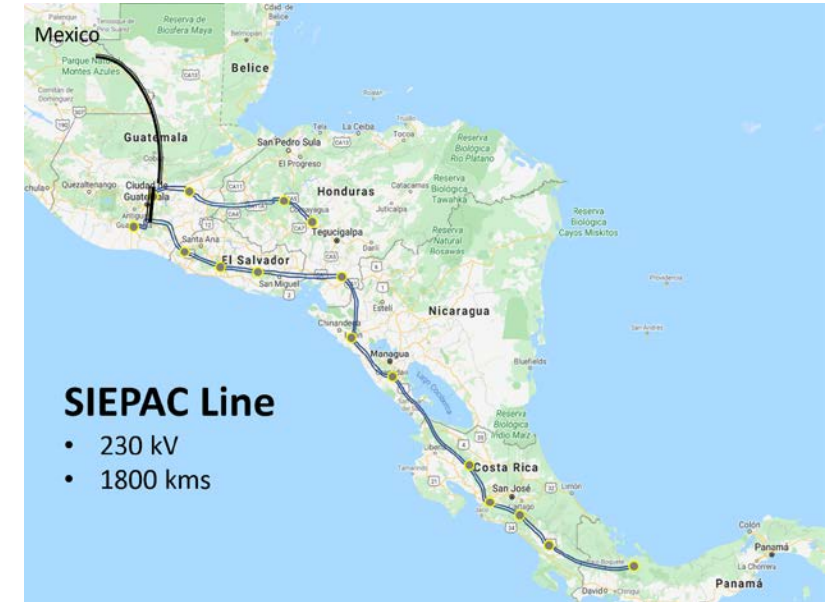
A PPP SPV was formed to design, engineer, construct, and own the 1,793 km interconnector. It is owned by:

- 6 government-owned transmission companies or utilities
- 1 private company
- 2 regional government-owned transmission companies

The total trading benefits just in 2017 exceeded the \$505 million initial investment

## MENA Interconnectors

- 5-7% av. annual utilization of existing cross-border lines
- If the Utilization is increased to 36%, MENA Countries could achieve \$71 Billion in total system cost savings by 2035



\* SIEPAC is the acronym for the Spanish title: Sistema de Interconexión Eléctrica para los Países de América Central.

# Value of Trade and Regional Investments Report (VoTRI)



- 1** Sets a structured analytical methodology to assess the need and benefits of Regional Interconnection through electricity planning model.
- 2** Sets a baseline for a Regional Interconnection Investment Plan & Potential Financing
- 3** Identifies 25 regional investment projects
- 4** Paves the way for transition from three sub-regional integration to a Pan-Arab Electricity Grid

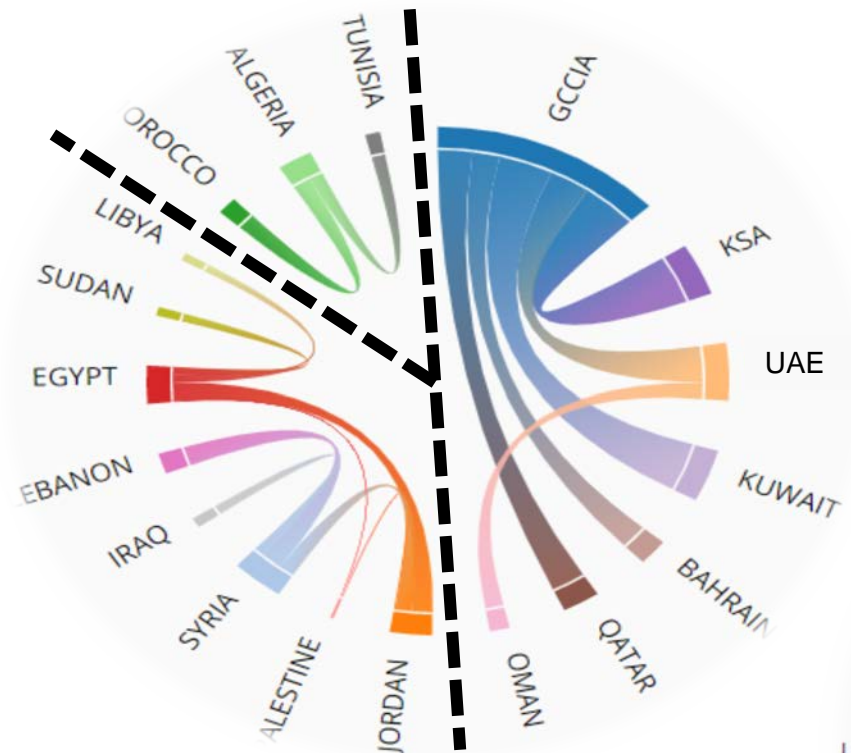
## Identified New Interconnections

New Interconnections	Total Capacity (MW)
KSA - Egypt	3000
KSA - Yemen	500
Tunisia - Libya	1000
KSA - Jordan	1000
KSA - Iraq	1000
Jordan - Iraq	500
KSA - Oman	1000
Kuwait - KSA	1000

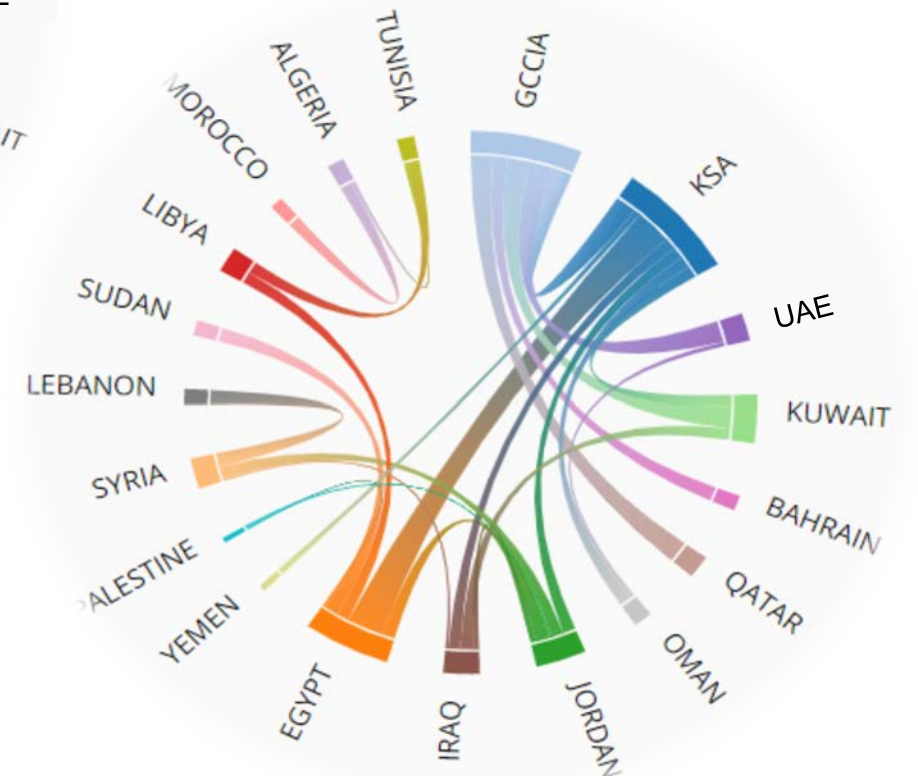
## Identified Reinforcements

Identified Reinforcements	Increased Capacity (MW)
Algeria-Morocco	600
Egypt-Sudan	1000
Egypt - Jordan	650
Egypt – Gaza Strip	175
Jordan – West Bank	160
Libya - Egypt	370
Jordan – Syria	650
Lebanon – Syria	730
GCC Interconnections	600-1050

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



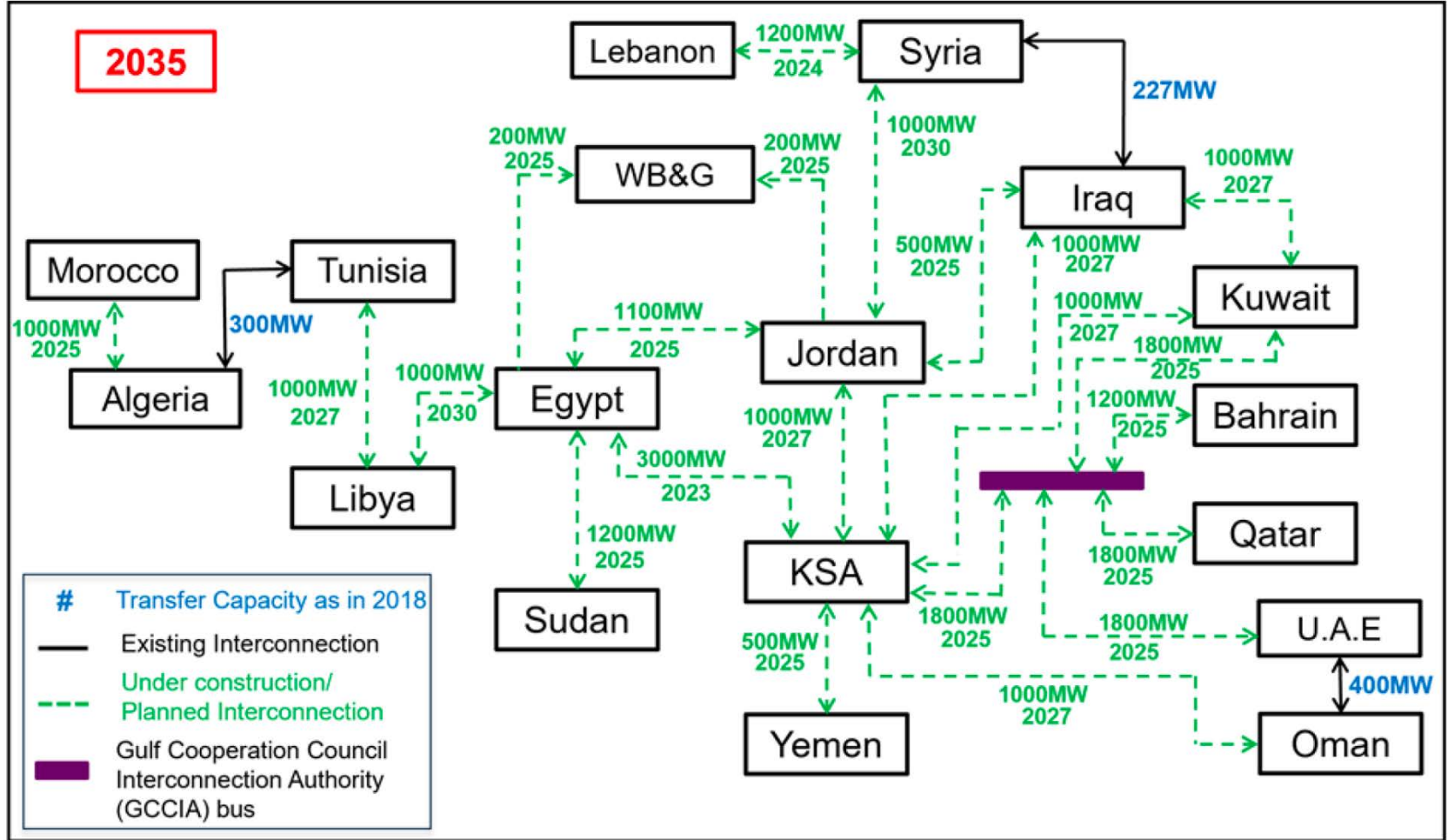
Identified projects can create a Pan Arab grid across MENA by 2035

# Proposed and Reinforced Cross-Border Interconnections

**15** selected interconnection reinforcement projects require investments of about \$1.6bn

**10** proposed interconnection projects require almost \$5.9bn

**\$1bn** to invest in expanding regional cross-border trade saves \$4.6bn in system costs



# ... the identified 25 cross-border transmission lines needed to fully exploit trade potential & create a Pan-Arab grid by 2035

**10 new interconnections**

for reliable bulk electricity trade  
and secure Pan-Arab grids

**15 Reinforcement projects**

for maximum trade potential among  
connected countries

**~18GW**

**ADDITIONAL  
CROSS-  
BORDER  
CAPACITY**

**\$7.1  
bn.**

**ESTMITAED  
INVESTMENT  
COSTS**

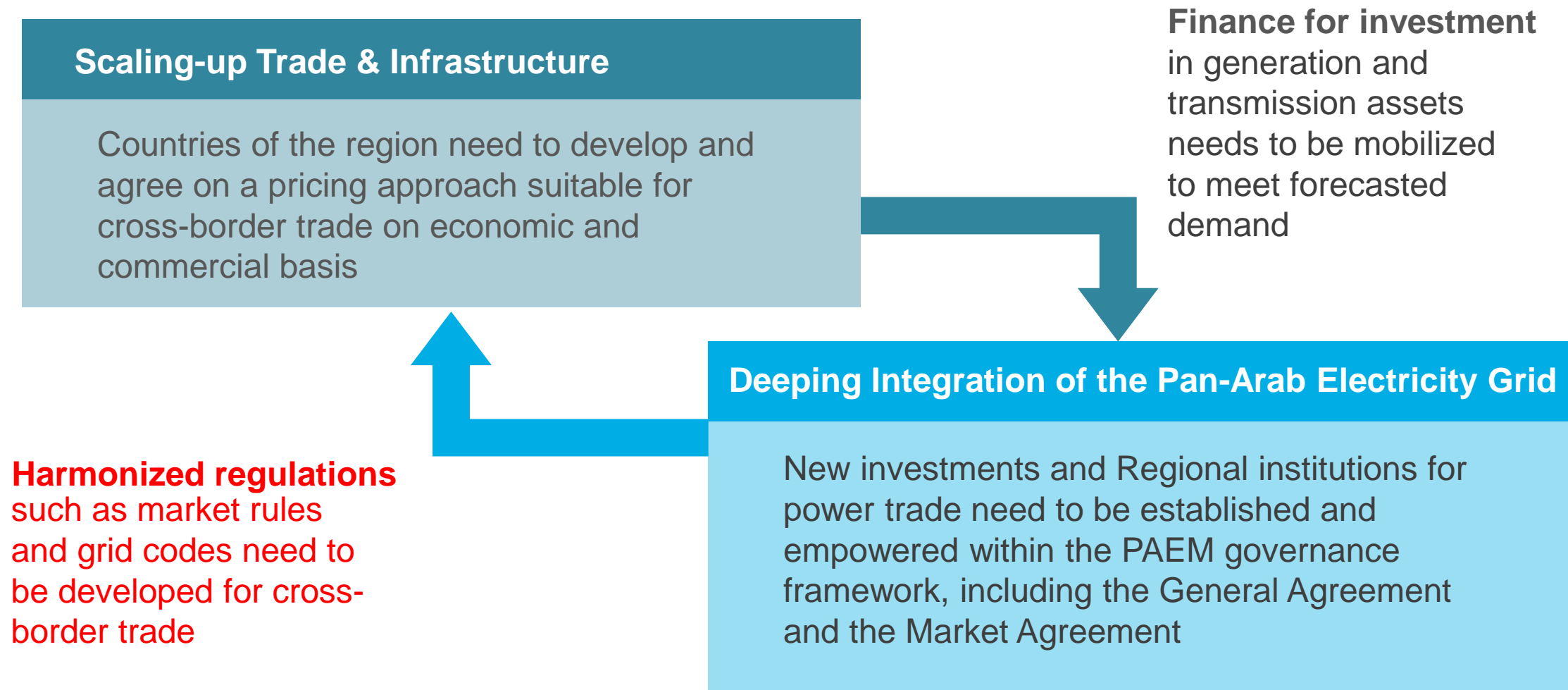
**~ \$4.6  
B/C**

**PER DOLLAR  
INVESTED  
BY 2035**

**192  
GW**

**ENABLED RENEWABLE  
ENERGY  
INTEGRATION**

# Need for Coordinated Support for Regional Trade and Market Integration



# Agenda

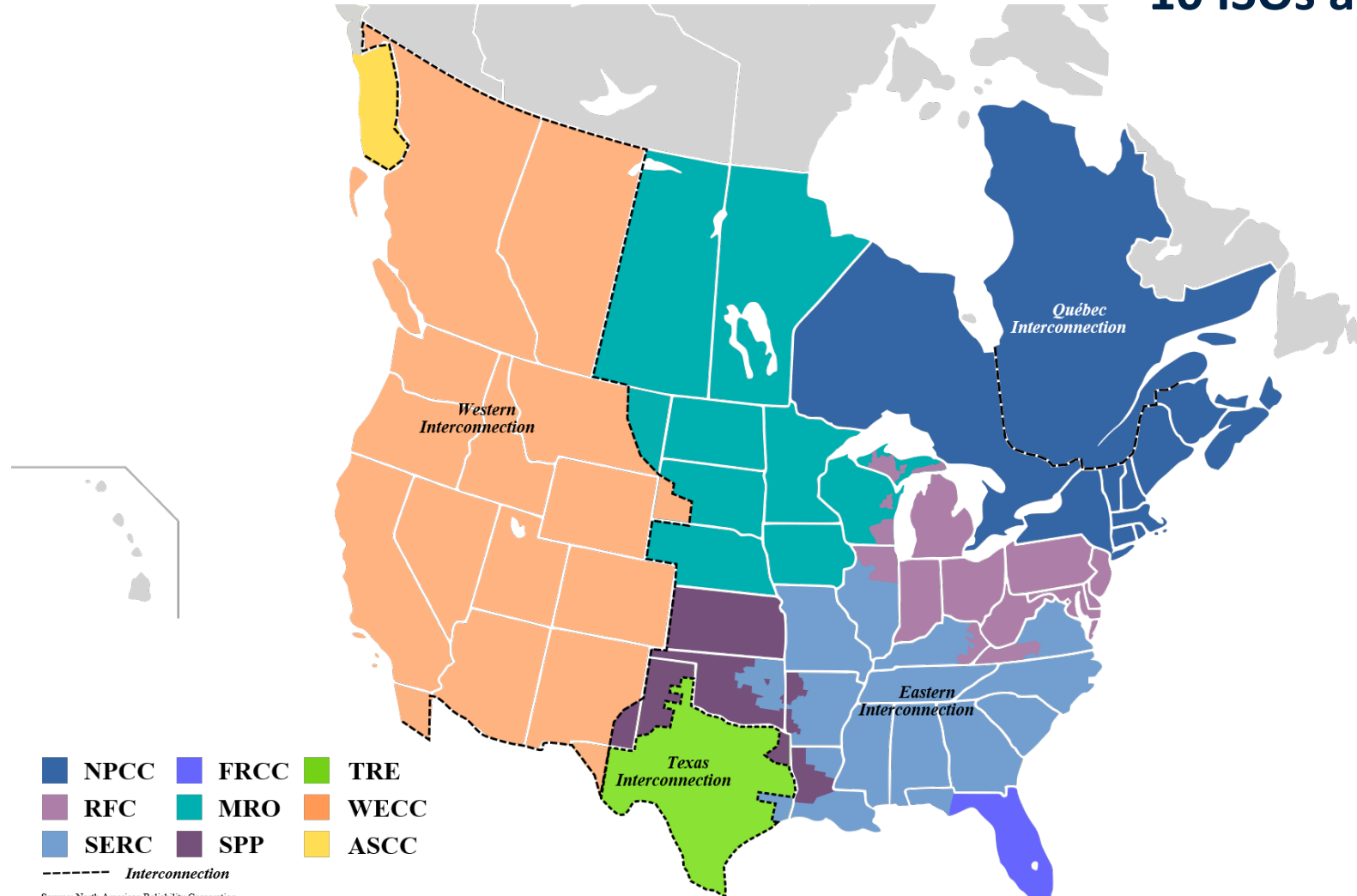
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# North American Market

- MRO – Midwest Reliability Organization**
  - MISO
  - MRO-Manitoba Hydro
  - MRO-SaskPower
- NPCC – Northeast Power Coordinating Council**
  - NPCC-Maritimes
  - NPCC-New England
  - NPCC-New York
  - NPCC-Ontario
  - NPCC-Québec
- RF – ReliabilityFirst**
  - PJM
- SERC – SERC Reliability Corporation**
  - SERC-East
  - SERC-North
  - SERC-Southeast
  - SERC-Florida Peninsula
- SPP – Southwest Power Pool**
  - SPP
- Texas RE – Texas Reliability Entity**
  - Texas RE-ERCOT
- WECC**
  - WECC-CA/MX
  - WECC-NWPP-AB
  - WECC-NWPP-BC
  - WECC-NWPP-US
  - WECC-RMRG
  - WECC-SRSG

## 10 ISOs and RTOs



# Overview – US Electricity Market

- Electricity consumption in the United States was about 3.9 trillion kilowatthours (kWh) in 2021
- The U.S. has about 1.2 million megawatts of generation capacity. Natural gas accounts for just under 44% of all generation capacity followed by coal with a share of 18.5%. Nuclear, hydro and wind together account for about 27% of capacity. Solar constitutes over 5% with other forms of energy accounting for about 12% in total.
- Solar capacity has increased dramatically with more than 25,000 MW installed since 2020, a 60% increase. Solar was the leading source of new utility-scale capacity in 2021
- The wind capacity has increased by 29% from 2020

# US Market - Institutions



and other ISOs

# Role of the FERC

- FERC, the Federal Energy Regulatory Commission, is an independent agency that regulates the interstate transmission of electricity and licenses hydropower projects
- The Energy Policy Act of 2005 gave FERC the following responsibilities:
  - Regulate the transmission and wholesale sale of electricity in interstate
  - Review certain mergers and acquisitions and corporate transactions by electricity companies
  - Regulate the transmission and sale of natural gas for resale in interstate commerce
  - Regulate the transportation of oil by pipelines in interstate commerce
  - Approve the siting and abandonment of interstate natural gas pipelines and storage facilities
  - Review the siting application for electric transmission projects under limited circumstances
  - Assess the safe operation and reliability of proposed and operating LNG terminals



# Role of the FERC (Cntd)



- The Energy Policy Act of 2005 gave FERC the following responsibilities:
  - License and inspect private, municipal, and state hydroelectric projects
  - Protect the reliability of the high voltage interstate transmission system through mandatory reliability standards
  - Monitor and investigate energy markets
  - Enforce FERC regulatory requirements through imposition of civil penalties and other means
  - Oversee environmental matters related to natural gas and hydroelectricity projects and other matters
  - Administer accounting and financial reporting regulations and conduct of regulated companies

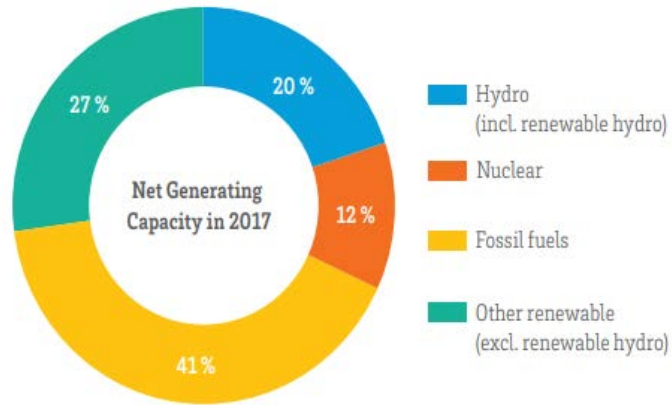
# Role of the FERC (Cntd)

- FERC does not:
  - Regulate retail electricity supply to consumers
  - Approve physical construction of electric generation facilities
  - Regulate activities of the municipal power systems, federal power marketing agencies, and most rural electric cooperatives
  - Regulate nuclear power plants
  - Address reliability problems related to failures of local distribution facilities
  - Regulate tree trimming near local distribution power lines in residential neighborhoods

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# Europe – More RE Integration



(RES)  
(excluding hydro)  
almost  
30 % of the  
total NGC.

- Installed Capacity: **1,060GW** ( end of 2017)
- Comparing 2017 to 2016,
  - Wind Gen increased by +9.8%,
  - Solar Gen increased by +6.1%
- Nine countries within the ENTSO-E perimeter exported more than 10 % of their annual national generation to neighboring ENTSO-E members.

+7 TWh  
OF CROSS BORDER  
EXCHANGES IN ENTSO-E  
BETWEEN 2016 AND 2017

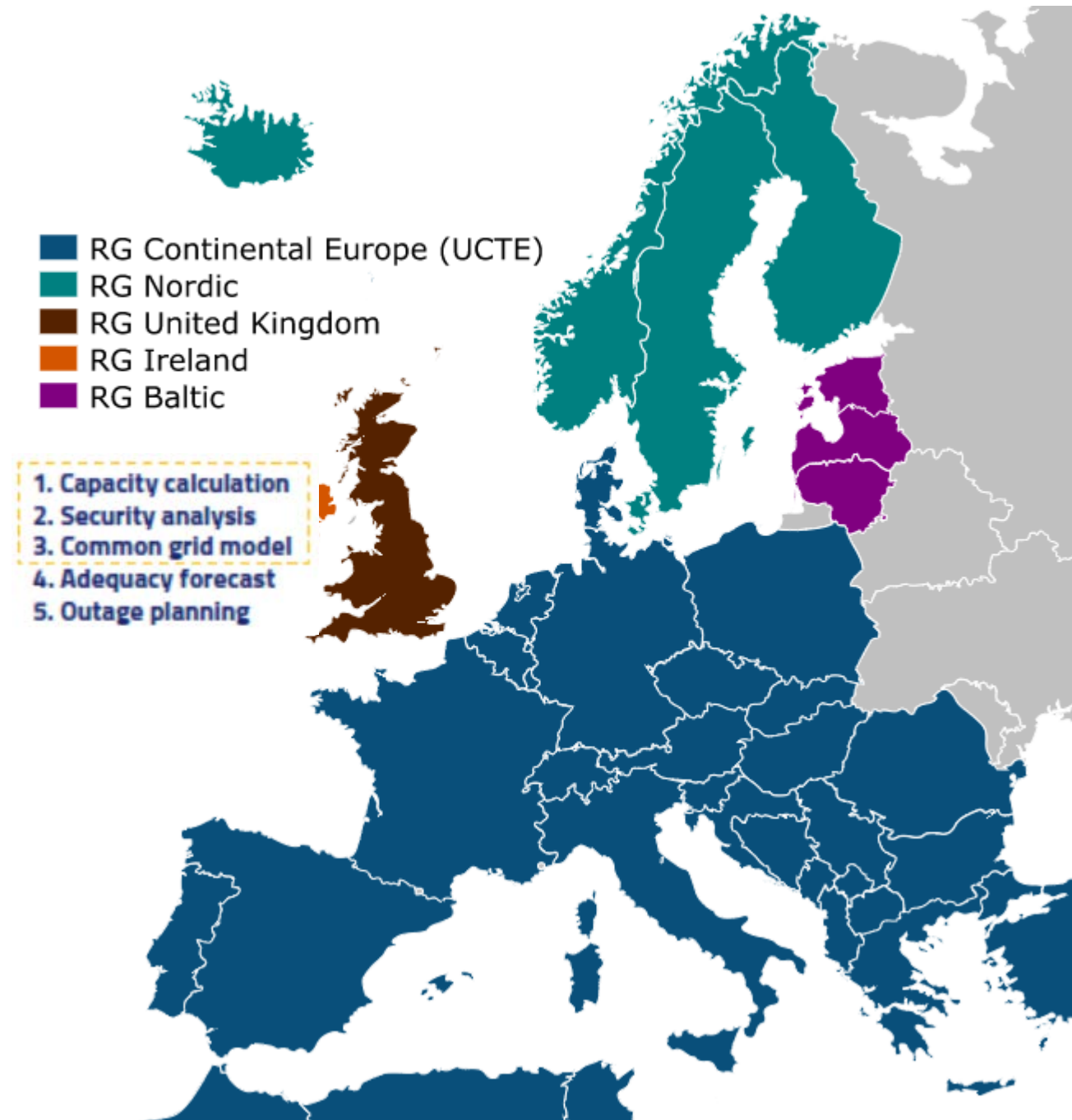
26%  
INCREASE  
IN EFFICIENT USE OF  
INTERCONNECTION  
BETWEEN  
2010 AND 2017

€2.5b-€4b  
per year  
BENEFITS OF  
ELECTRICITY MARKET  
COUPLING/INTEGRATION



# European Case

- ACER (Agency for Cooperation between Energy Regulators) is the Regional Regulator
- Separate TSO and MO Roles
- ENTSO-E is the regional System Operator: 42 Members (+ 1 Observer) from 36 countries
- Six Regional Security Coordinators (RSC) to harmonize operations between member TSOs.



# Role of ACER

- ACER, EU Agency for the Cooperation of Energy Regulators, ensures the European market functions properly
- ACER assists national regulators with the performance of their regulatory function at the European level and, where necessary, coordinates their work



# Role of ACER

- ACER (with respect to electricity):
  - Complements and coordinates the work of national regulatory authorities
  - Helps formulate European network rules
  - Where appropriate, takes binding individual decisions on terms and conditions for access and operational security for cross border infrastructure
  - Advises European institutions on issues relating to electricity
  - Monitors the internal markets in electricity and natural gas and reports on its findings
  - Monitors wholesale energy markets to detect and deter market abuse, in close collaboration with national regulatory authorities

# Summary of Regulatory Roles

- The regional regulator works with the national/state regulators to ensure consistency of application of access terms, conditions and tariffs across the region; i.e., international/out-of-state traders have access to domestic/state markets under the same terms, conditions and tariffs as domestic/in-state traders
- The national/state regulators are responsible for regulating their national/state electricity sectors and ensuring that all participants, including both service providers and customers, are treated fairly.

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# The Vision: Pan-Arab Electricity Market (PAEM)

**Regional trade in electricity can become a transformative force for market integration and sustainable development**

**In the Arab countries, there are great potential benefits from increasing electricity trade beyond their current levels**

**Regional energy trade and investments coordinated at PAEM level:**

- Contribute to the Region's and each country's economic growth
- Are key to achieving the UN Sustainable Development Goals (SDGs)
- Are a significant arena for technological transformation
  - ... with attendant risks and opportunities for the region's fossil-fuel-dependent economies

# Organization of PAEM

- The Memorandum of Understanding (MOU) signed in 2017 sets the vision and governance framework for establishing the (PAEM)
- PAEM is governed by two major market agreements – the General Agreement (legal) and the PAEM Agreement (commercial), both were endorsed by the Arab Ministerial Council for Electricity (AMCE) in July 2020
- An Arab Grid Code (technical) has been developed and submitted to the League of Arab States (LAS) and Member States in June 2020

## THREE PAEM CORE PRINCIPLES





# Organization of PAEM

## 1

### Pan-Arab advisory and regulatory (PAEM ARC) committee

- Review and advise on market governance documents, changes to governance documents, transmission tariffs, generation reserve criteria, cross-border transmission allocation, available transmission capacity, and so on.
- Ensure compliance with governance documentation including nondiscriminatory access.
- Market surveillance.
- Dispute resolution.

Market  
Surveillance  
Group

## 2

### Arab TSOs (PAEM TSOs) committee

- Coordinate and cooperate with national TSOs.
- Play active role in rule-setting process.
- Promote market integration, reliability, and security of supply.
- Research and development, promote public acceptability.
- Participate in energy policy.

Regional  
Market  
Facilitator

## 3

### PAEM Secretariat

- Provide administrative support to regional governing entities.
- Perform market monitoring function under Pan-Arab ARC.
- Maintain comprehensive information systems.
- Carry out other tasks as assigned.



# PAEM Stages: advancing between stages will evolve

**2010-2018**

## Foundational Stage

- Completion of governance and institutional frameworks
- Support trade at the sub-regional level

We are  
HERE

**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.



# Roles and Responsibilities of PAEM National Regulators

- The National Regulators shall ensure that PAEM Participants, the National TSOs and the sub-regional TSOs are treated in a fair and non-discriminatory manner
- Each Member State shall identify its National Regulator and verify that it has sufficient regulatory control over its domestic electricity system to ensure compliance with the rules and the discharge of the responsibilities set out in section 3.8.2 (see next slide)
- The National Regulators shall cooperate at the regional level with the Pan-Arab ARC
- The National Regulators shall be responsible for regulating domestic electricity transactions relevant to the PAEM based on the principles of fairness, efficiency, safety and transparency

# Roles and Responsibilities of PAEM National Regulators (continued)

The National Regulators shall be responsible for:

- Monitoring mechanisms that deal with transmission congestion and emergencies within the national electricity systems that are relevant to the PAEM
- Monitoring the performance of the national transmission entities
- Monitoring and reporting information relating to interconnections, grid use, and capacity allocation as provided by the National TSOs
- Monitoring and ensuring that there is no cross-subsidization between transmission activities and other activities in the national electricity systems

# Roles and Responsibilities of PAEM National Regulators (continued)

The National Regulators shall be responsible for:

- Monitoring and reporting on the extent to which the National TSOs complete their tasks and are in compliance with PAEM rules relating to third-party access, congestion, and interconnection management on the national electricity systems
- Ensuring that transmission and generation investment plans for the national electricity systems are reported and consistent with region-wide investment plans
- Ensuring that the national TSOs report information pertaining to network security and reliability in the national electricity systems
- Establishing network security and reliability rules for the national electricity systems consistent with the Arab Grid Code
- Monitoring transparency of transactions relating to the PAEM

# Roles and Responsibilities of Pan-Arab ARC

- The Pan-Arab ARC provides advice and regulatory oversight of the PAEM
- The Pan-Arab ARC, in conjunction with PAEM Secretariat and Market Monitoring Group, shall carry out the following duties:
  - Monitor compliance with the PAEM General Agreement
  - Ensure that PAEM Participant behavior and the functioning of the PAEM is consistent with the intent of the General Agreement

# Roles and Responsibilities of Pan-Arab ARC (Cntd.)

- The Pan-Arab ARC, in conjunction with PAEM Secretariat and Market Monitoring Group, shall carry out the following duties:
  - Review and approve methodologies for setting fees and tariffs for regulated activities in the PAEM proposed by the Arab TSOs Committee or the Regional Market Facilitator or a Member State, including each Member State's transmission services charge or sub-regional transmission services charge applicable to international transactions to the extent that it benefits the PAEM
  - Ensure transmission service charges for international transactions are applied in a fair and non-discriminatory manner
  - Review and advise on proposed changes to the PAEM General Agreement
  - Review and advise on proposed changes to the PAEM Agreement



# Roles and Responsibilities of Pan-Arab ARC (continued)

- Review and approve the Arab Grid Code and subsequent proposals for changes to the Arab Grid Code and supervise implementation in coordination with the Arab TSOs Committee and the Regional Market Facilitator
- Review and advise on proposals of the Arab TSOs Committee for expansion of international interconnection facilities
- Review and approve Capacity Obligation criteria
- Review and approve rules governing allocation of international interconnection capacity
- Review and approve the methodology for calculation of available transmission capacity
- Review and approve the level of unscheduled deviations within the PAEM
- Review and approve the charge rate for unscheduled deviations within the PAEM

# Roles and Responsibilities of Pan-Arab ARC (continued)

- Review and approve the adjustment mechanism for unscheduled deviations within the PAEM
- Review and approve credit obligations and payment default procedures
- Perform its obligations in relation to the resolution of disputes as set out in the PAEM General Agreement, the PAEM Agreement and the Arab Grid Code
- Coordinate with the National and sub-regional Regulators
- Facilitate the development of the PAEM



# Roles and Responsibilities of Pan-Arab ARC (Cntd.)

- Review and approve proposals of the Arab TSOs Committee and the Regional Market Facilitator in respect of the targeted loss of load expectation, forecasting accuracy, capacity obligations and grace periods to achieve these target values
- Advise Member States as required on policy and regulatory issues relating to the evolution of the PAEM
- Liaise with all relevant persons so as to ensure that its advice on matters raised by the Arab TSOs Committee, the Regional Market Facilitator or a Member State is communicated not only to the person who raised the matter but also to all Member States
- Review and approve the performance standards proposed by the Arab TSOs Committee or the Regional Market Facilitator and the date on which such performance standards shall take effect

# Roles and Responsibilities of Pan-Arab ARC (Cntd.)

- Determine and apply appropriate actions to be taken as a result of the Regional Market Facilitator failing to meet the performance standards
- Recommend penalties and other enforcement actions in cases of non-compliance or breach of the PAEM Agreement or the Arab Grid Code
- Review and approve the facilities that make up the grid and international interconnections
- Review and recommend proposals of the Arab TSOs Committee for construction of new international interconnection facilities

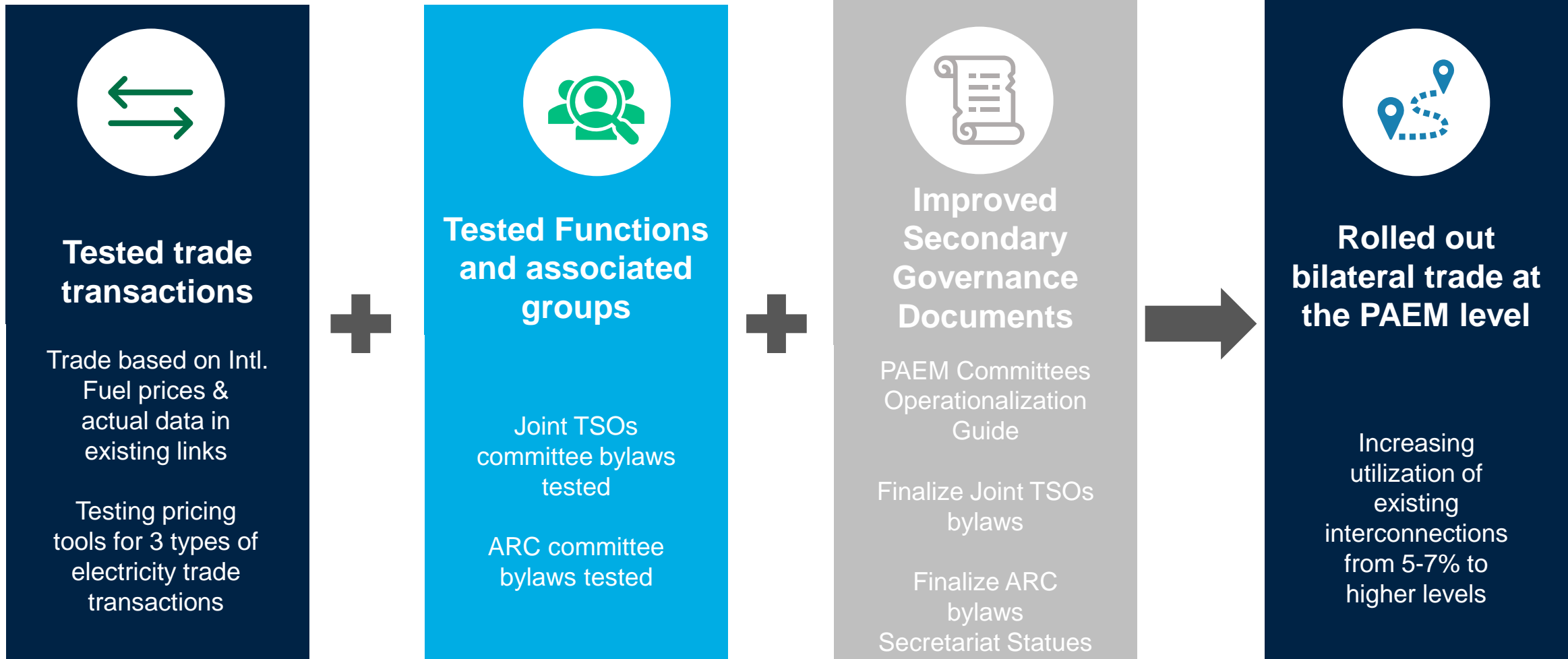
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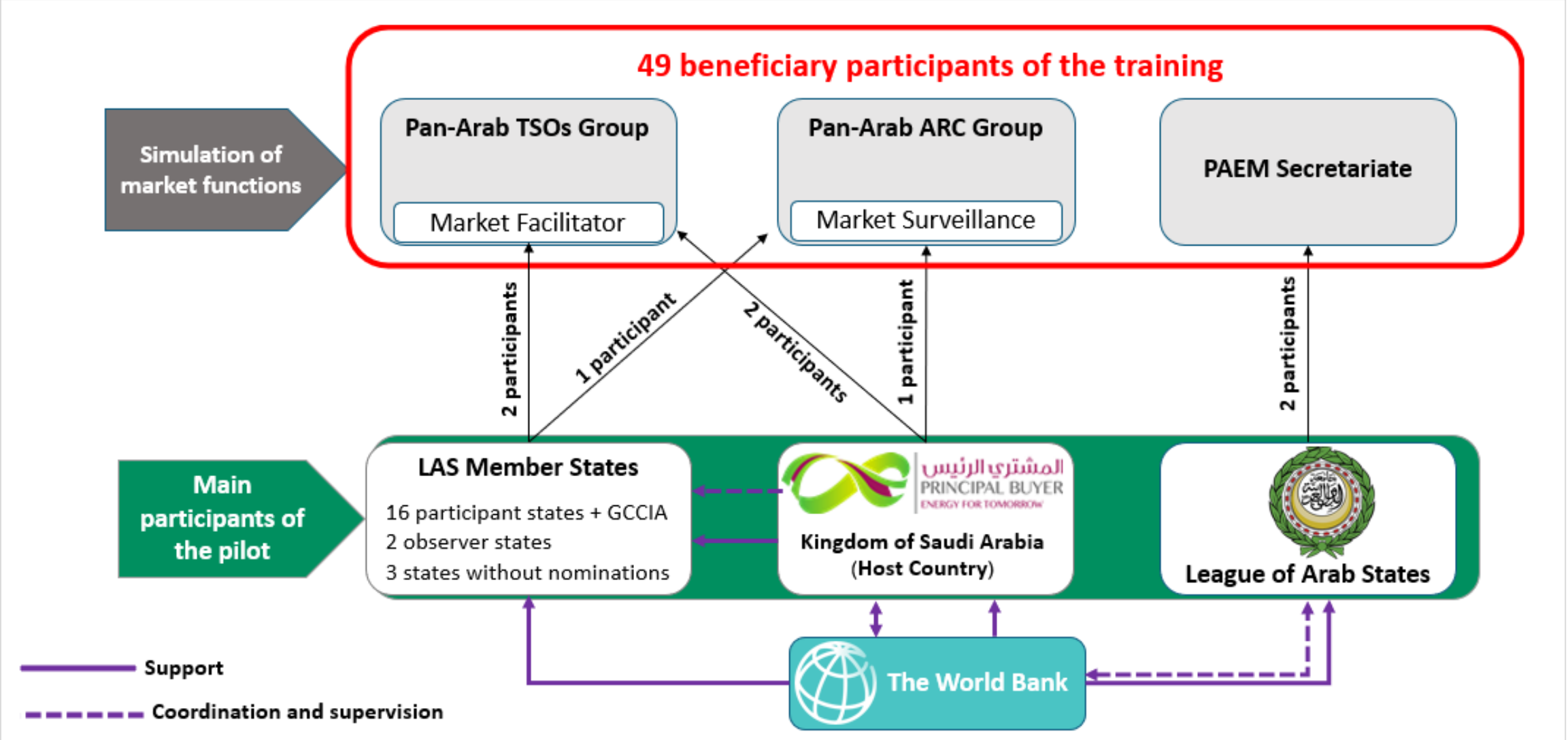
# Roles and Responsibilities of Pan-Arab ARC (continued)

- The Pan-Arab ARC shall establish, maintain, update and publish:
  - a list of all PAEM Participants and a list of all filed Applications for Authorization to Participate in the PAEM
  - a list of all PAEM Participants that will cease to be PAEM Participants and the time that each will cease to be a PAEM Participant
  - a list of all PAEM Participants that are, or are going to be, the subject of a suspension order and the time at which the rights of each listed PAEM Participant was, or will be, suspended
  - Ensure that Member States procure that PAEM Participants carrying on business in their respective Member States maintain separate accounts to provide clear allocation of costs for each activity

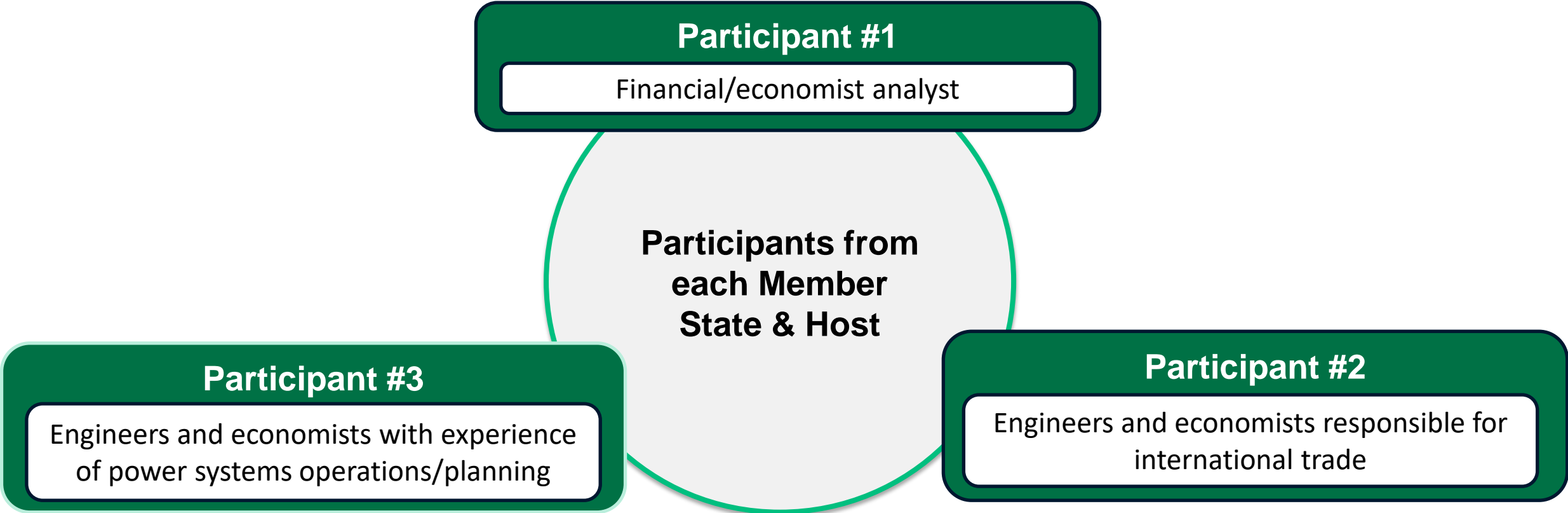
# The WB in collaboration with LAS has designed a training program aimed to advance the preparation and readiness of Member States to scale up trade in early market operations under transitional stage -1



The training program ensured representation of MSs in all the PAEM functions to engage, coordinate, and test trade transactions



Three participants from each Member State and host in the Pilot - all experts must meet a minimum experience requirements to join



# Key roles during the pilot

## MS Representatives

- Experts from all PAEM Member States joining the pilot and the learning experience
- All Member States should be represented in the PAEM committees - should be the nucleus of country technical representatives in these committees once formulated

## Host

- Works closely with WB and takes responsibility to engage with all participating MSs
- Should be ready to utilize its capabilities to perform an active coordination role and pilot oversight with WB
- Develop strong dialogue with MSs representatives and ensure quality control of tasks performed

## LAS

- Coordinates the PAEM Pilot Pricing Program Plan
- Assign two participants to PAEM Secretariat
- Integrate outcomes into PAEM governance development
- Ensure execution of decisions made by Arab Ministerial Council of Electricity (AMCE)

## World Bank

- Execute the pricing mechanism pilot program and provides technical oversight
- Provides just-in-time advice and global good practices on the operation of regional power trade networks
- Provide quality control support to the host
- Deliver the final results of the pilot



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# Pan-Arab ARC – Initial Challenges

- Establishment of the Pan-Arab ARC
- Approval of its statutes/bylaws
- Training on Pan-Arab ARC roles and responsibilities as defined in PAEM agreements
- Training and expertise in open access and transmission tariff design
- Dispute resolution

# Take Home Message: The Do's & Don'ts in Regional Electricity Markets



## Do's

- Economic Assessments
- Investigate Alternatives, Value Based Planning
- Private Sector Partnership (merchant lines)
- Compliance, Self Reporting, Auditing
- Firm Market Rules (Mothballing, etc.)
- Clear Roles (ISO, MO, MSA, **Regulator**)
- Harmonization, Transparency
- Progressive Regulations
- ***INTEGRATE, Build Interconnectors, TRADE !!!***

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## Don'ts

- Over subsidize
- Uncertainty
- ***Stop if you started!!!***

*“Alone we can do so little,  
Together we can do so much”*

Helen Keller

Thank You