Renewable Energy Development in the Mediterranean Region

Renewable Energy Investments In The Mediterranean And Beyond
CESI has a solid track record in RES integration, interconnection planning and system studies in the Region...

- **Enel Green Power – Morocco**
  - Maximum penetration of RES
  - Study for connection of WF in the southern grid of Morocco

- **Tunur – Tunisia**
  - Large size power corridor Tunisia-Europe to export power generated with CSP technology

- **The Royal Hashemite Court – Jordan**
  - Integration of RES

- **SONELGAZ – Algeria**
  - Interconnection study of the Adrar-In Salah network

- **GRTN/Terna – ALGERIA**
  - Feasibility study for an HVDC between Algeria and Italy

- **RES4MED / SONELGAZ - Algeria**
  - Max RES penetration in Algeria in 2020 and 2030

- **ELMED – Tunisia**
  - Cost-benefit analysis for HVDC between Italy and Tunisia

- **Enel Green Power – Tunisia**
  - Maximum penetration of RES

- **NEPCO – Jordan**
  - Study for the reinforcement of a power transmission corridor “Green Corridor” to enable a massive RES deployment

- **Egyptian Electricity Holding Company – Egypt**
  - Development of master plan for the transmission network

- **ITALGEN – Egypt**
  - Wind Farm Impact on the Network

- **GECOL - Libya**
  - Defence Plan and Design of a Special Protection Scheme

- **REAOL – Libya**
  - Connection of WF in the transmission grid
...and carried out extensive bilateral and multilateral system studies assessing the existing and future power system:

- **2001-2003**: 1st MedRing study
- **2003-2004**: ELTAM
- **2009-2010**: 2nd MedRing study
- **2011-2013**: D.i.i. study
- **2012-2014**: MedGrid study
- **2012-2014**: AFESD study
- **2015-2017**: MedTSO regional market study
- **2015-2017**: MedGrid study
The Region is extremely rich in natural resources but still lays behind in electricity mix decarbonization

- Uneven distribution of NG & oil resources
- Huge Wind and Solar Potential (IRENA estimates ca. 200,000 TWh/year)
- Still lagging behind in RES generation deployment
RES support policies are progressively shifting toward competitive auctions attracting investments in new capacity

<table>
<thead>
<tr>
<th>Country</th>
<th>Competitive Auctions</th>
<th>FIT</th>
<th>Net Metering</th>
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<tbody>
<tr>
<td>Morocco</td>
<td>✓</td>
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<td>Algeria</td>
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<td>Jordan</td>
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Remarkable drop in the LCOE of new solar and wind power plants

Source: Irena
RES Development Plans in the Region are highly ambitious and require strong T&D development to maintain adequacy.

Integration of RES requires strong T&D development.

Need for a clear and stable regulatory framework to support financing in RES power plants.

### RES penetration Targets in North Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Penetration rate</th>
<th>Target year</th>
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<tbody>
<tr>
<td>Morocco</td>
<td>42%</td>
<td>2020</td>
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<tr>
<td>Algeria</td>
<td>40%</td>
<td>2030</td>
</tr>
<tr>
<td>Tunisia</td>
<td>30%</td>
<td>2030</td>
</tr>
<tr>
<td>Libya</td>
<td>10%</td>
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<tr>
<td>Egypt</td>
<td>20%</td>
<td>2022</td>
</tr>
<tr>
<td>Jordan</td>
<td>10%</td>
<td>2020</td>
</tr>
</tbody>
</table>

Source: RES4MED
VRES balancing and financial sustainability of investments strictly depend on the creation of a competitive power market

- **Long term commercial agreements** (as Egypt – Jordan) to guarantee investments in electrical infrastructure until proper spot market is established

- **Exploit the existing interconnections** to balance RES variability

- RES balancing and gas flexibility drive *creation of a unified regional power market*

- **Additional transmission capacity will be needed** to comply with ambitious future goals
Electrical integration is a key priority to face the fast demand growth and foster the implementation of RES

- Two synchronous power pools:
  - ENTSO-E, Turkey, Maghreb
  - Mashrek

- 13 cross-border electricity interconnections are currently active in the North African countries and more are under consideration

- Estimated investments in HV lines and interconnectors (33,000 km) by 2025: \(\approx 30 \text{ b€} \) (MEDTSO)

- Potential exchanges within the interconnected Arab system: 125 TWh in 2030

- Benefits from optimisation of NG and G&T assets: 35 bUS$ by 2030 (AFESD)
Looking forward: RES development as a key driver to electrify Sahara

- CESI and Sonelgaz O.S. together in a major interconnection Project

- Interconnecting an isolated area in the South of Algeria with the National Grid

- RES potential is fully exploited as electricity flows from South to North (ca.1.5 GW)

First step toward the sustainable electrification of isolated communities in Sahara