

Consulting, Solutions and Services Division

ADB Workshop

The electrical Interconnections as key enabler for the Integration of regional electricity markets

Andrea Meola
Business Development Director
CESI S.p.A.

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Testing • Consulting • Engineering • Environment



Power System Planning

The Benefit of the Interconnections

The creation of new interconnections among power pools / regions and the enhancement of transfer capacity within interconnected systems is a common trend worldwide, for a series of reasons.

Power System
Security

New interconnections between different countries, can help achieve global, regional and national energy goals **improving security of energy supply.**

Power system
reliability and
performance

The development of interconnection capacity between countries (or areas) allows **greater electrical system reliability and flexibility** in the generation mix and operation.

Power system
economics

The availability of cross-border transmission capacity, may help **import power from cheaper (including environmental costs) units located in another area, country or region** and to increase the overall social welfare

Power System Planning

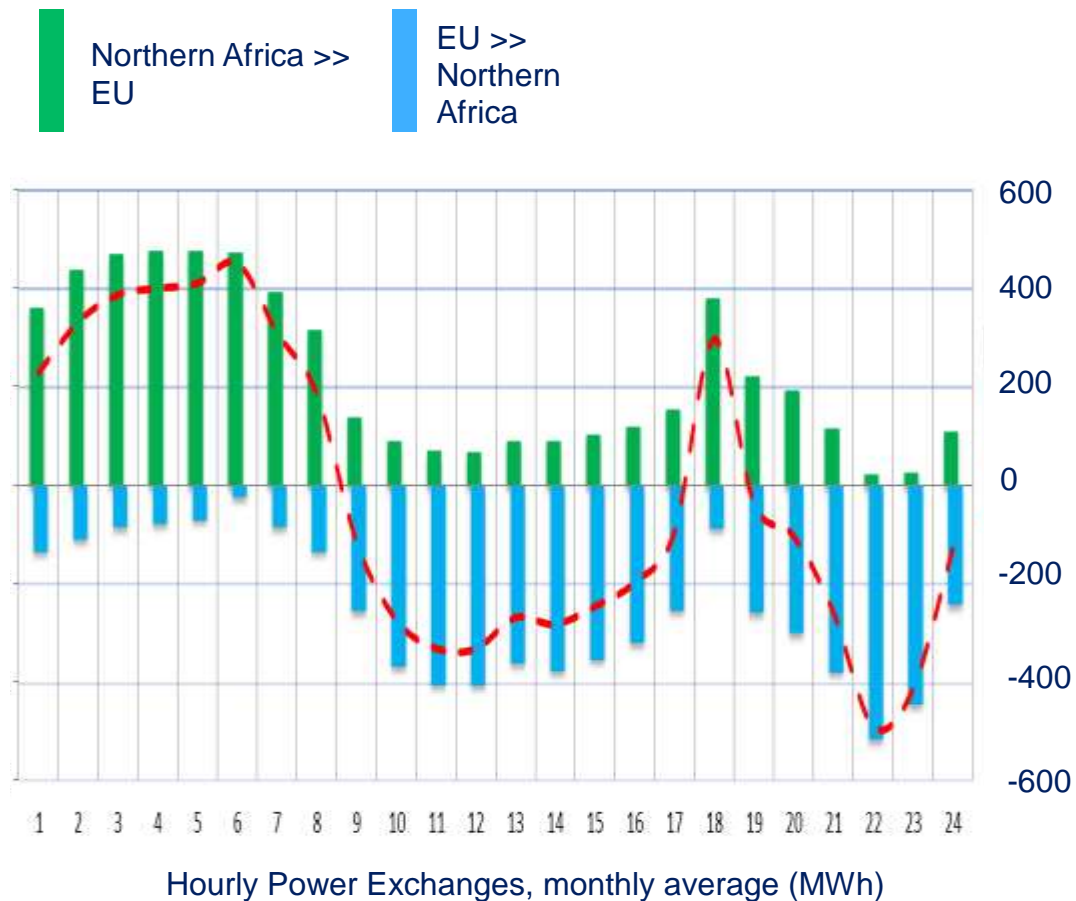
Key Case – Optimisation of a HVDC submarine cable

Several feasibility studies have been performed to evaluate the opportunity of connecting Northern African countries with Western European through submarine electrical interconnections



Key Case
Optimisation of a
HVDC submarine
cable connecting
Northern Africa and
Europe

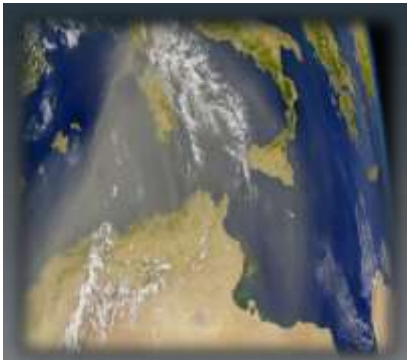
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Year: 2013
Location:
Mediterranean



Power System Planning

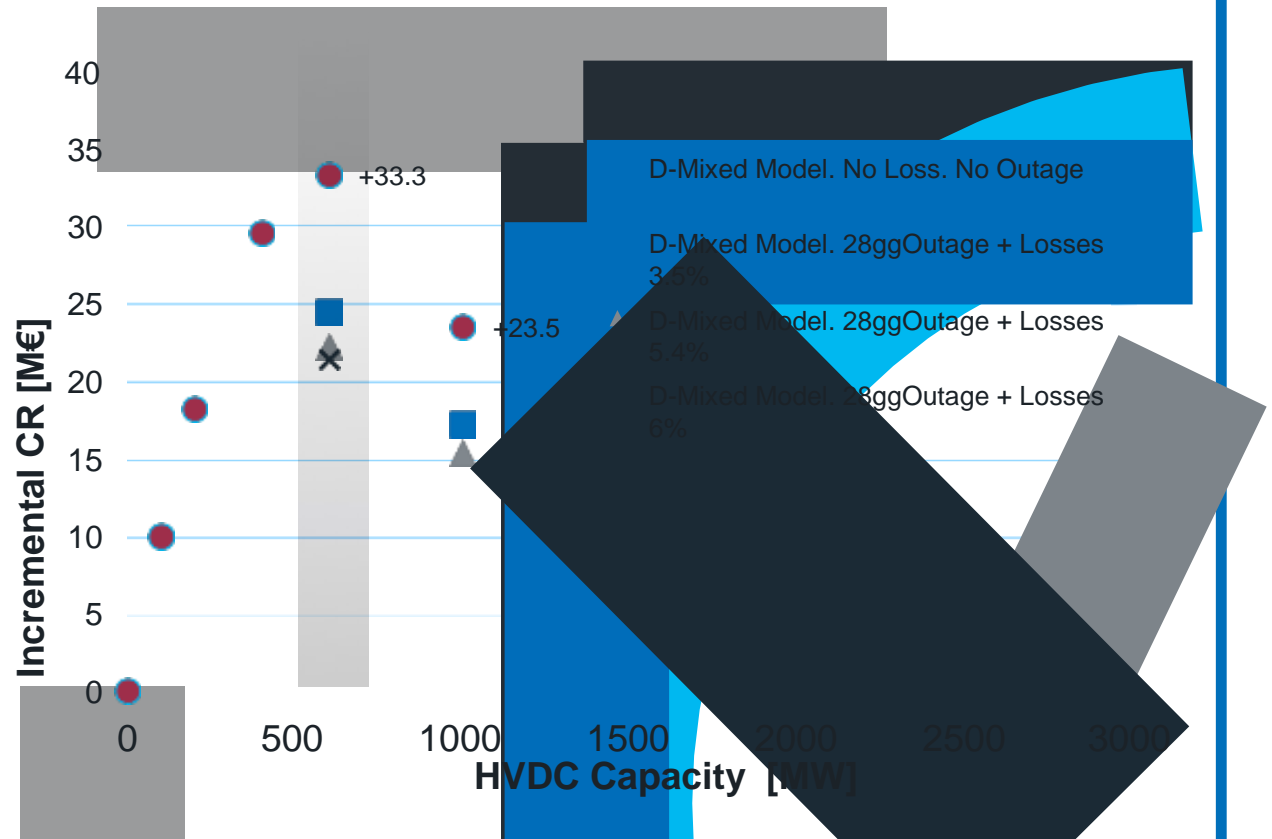
Key Case – Optimisation of a HVDC submarine cable

...the benefit for the Investor/link operator is a proxy of the Congestion rent, defined as the link capacity multiplied by the Price differential between the two areas...



Key Case
Optimisation of a HVDC submarine cable connecting Northern Africa and Europe

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Power System Planning

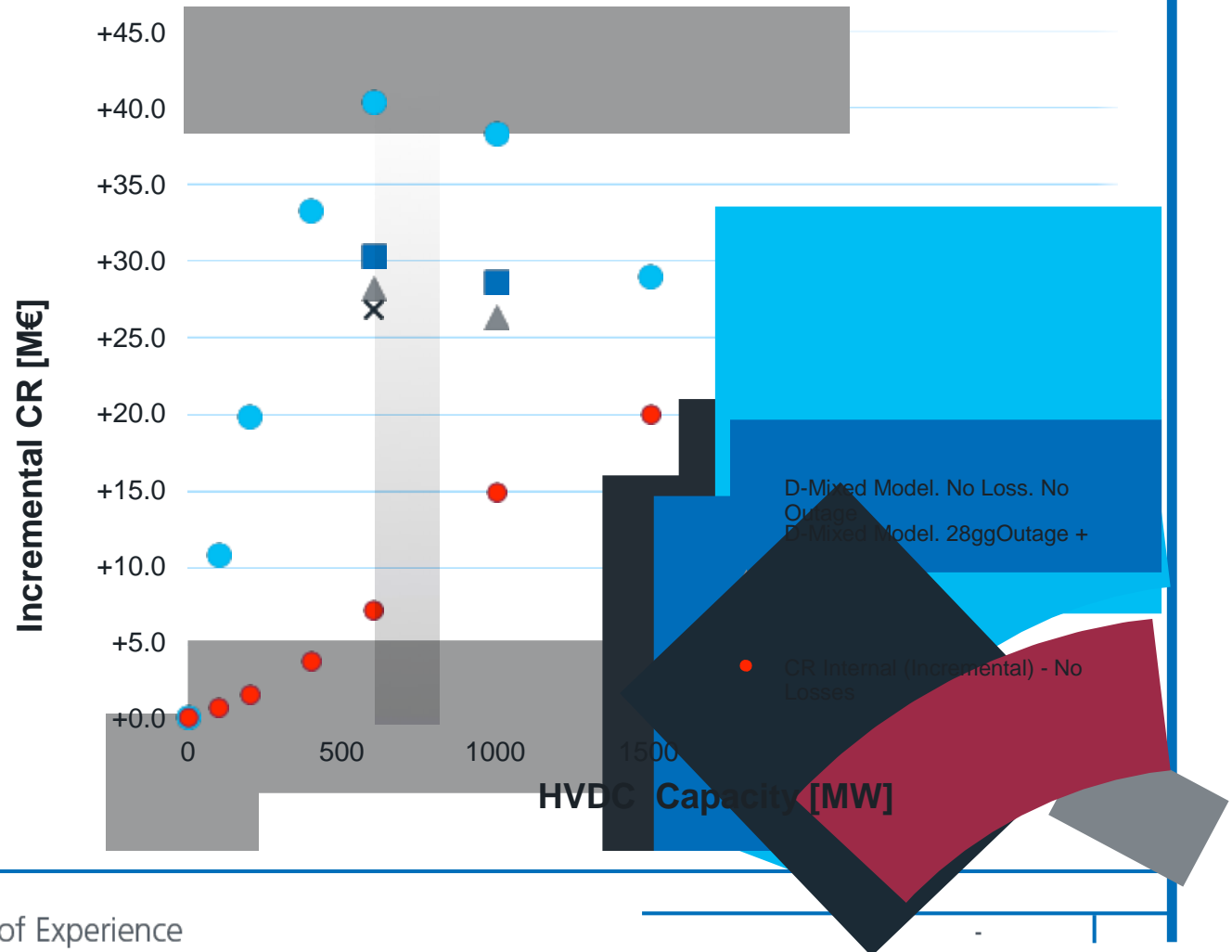
Key Case – Optimisation of a HVDC submarine cable

...while the actual calculation should take into consideration the increased congestion rent of other transmission infrastructures which are impacted by the new investment..



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Power System Planning

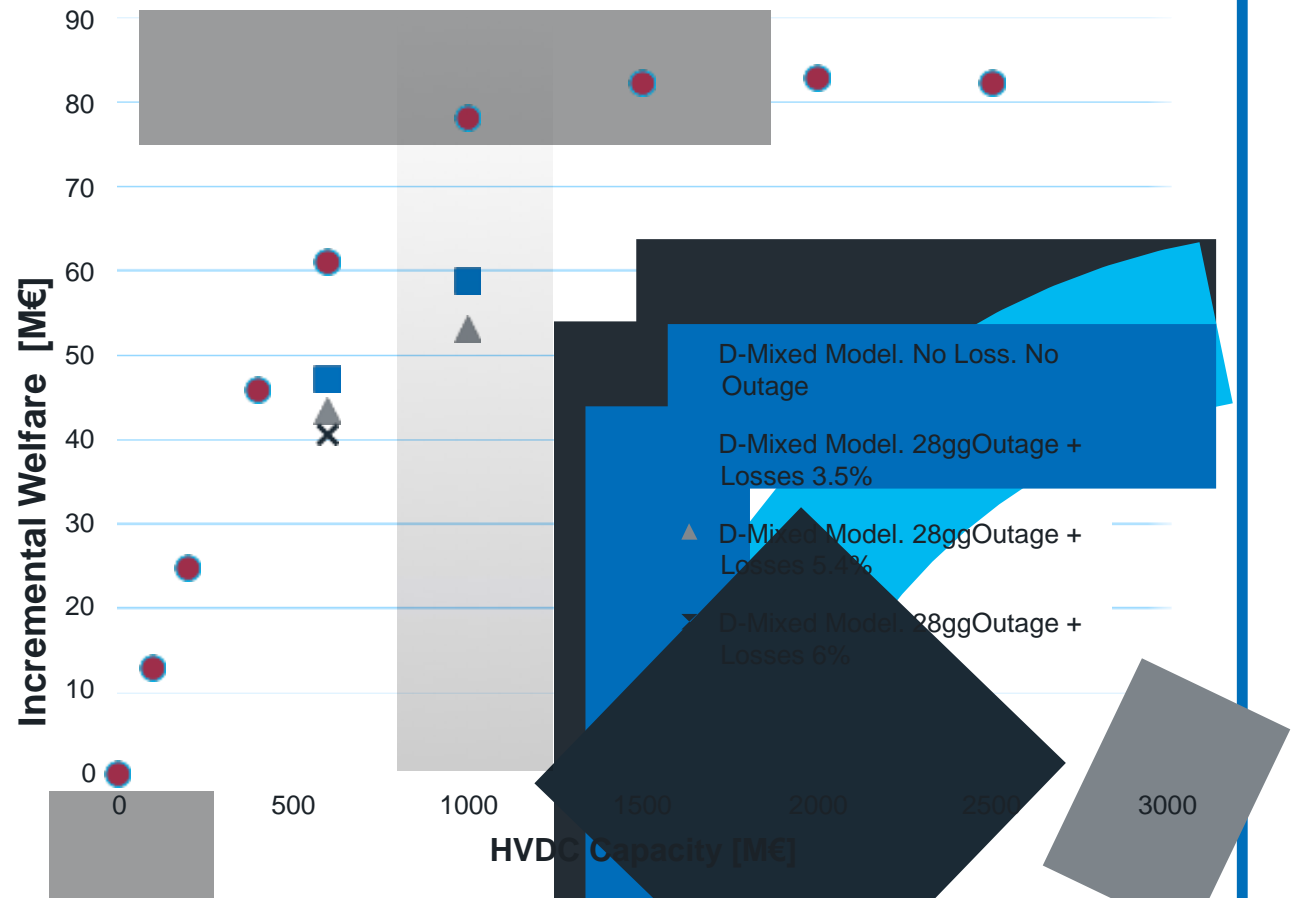
Key Case – Optimisation of a HVDC submarine cable

Today when evaluating the interconnection benefit, other factors are typically considered, such as the global social welfare increase...



Key Case
Optimisation of a HVDC submarine cable connecting Northern Africa and Europe

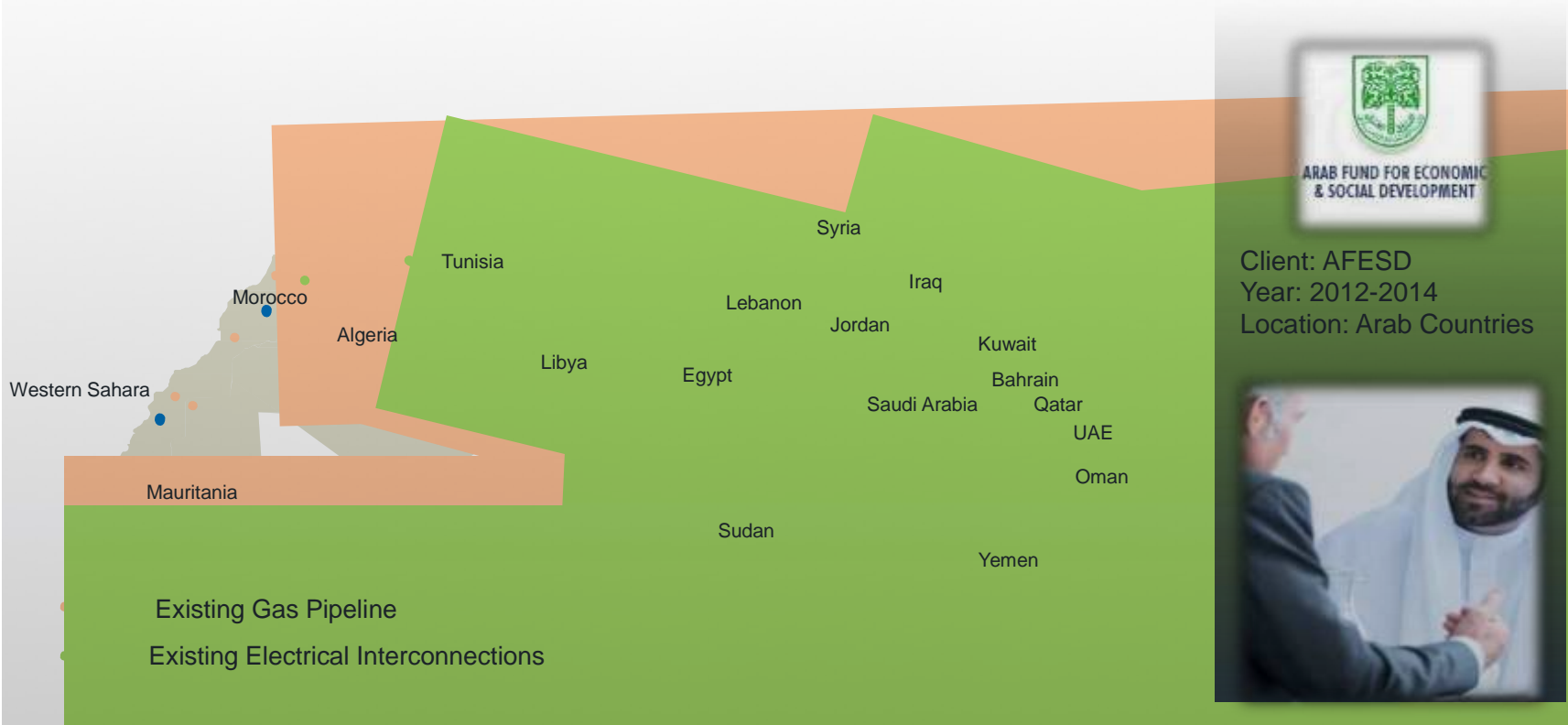
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Power System Planning

Regional Optimisation

Analysis become more sophisticated once it's a regional interconnection to be optimized, and the modeling is extended to gas infrastructures as well..



Power System Planning

Regional Optimisation

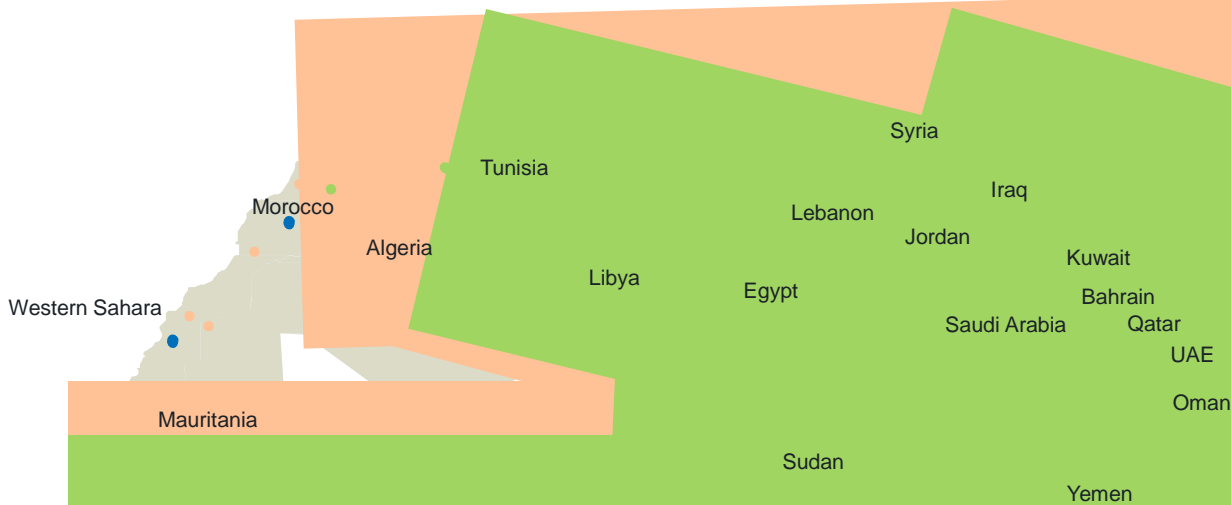
Project Key Goals and Challenges

- The Arab League of Countries sought the assistance of the AFESD to carry out a feasibility study with the goal of determining **the possibility for energy trade among the Arab countries** as well as with other electric power markets, Electricity and Natural Gas.
- This study helps to investigate **ways to maximize benefits of the integrated Arab electrical interconnection**, and to assess the possibility and potential for exploitation of natural gas reserves for electric power export.



ARAB FUND FOR ECONOMIC
& SOCIAL DEVELOPMENT

Client: AFESD
Year: 2012-2014
Location: Arab Countries



Existing Gas Pipeline

Existing Electrical Interconnections

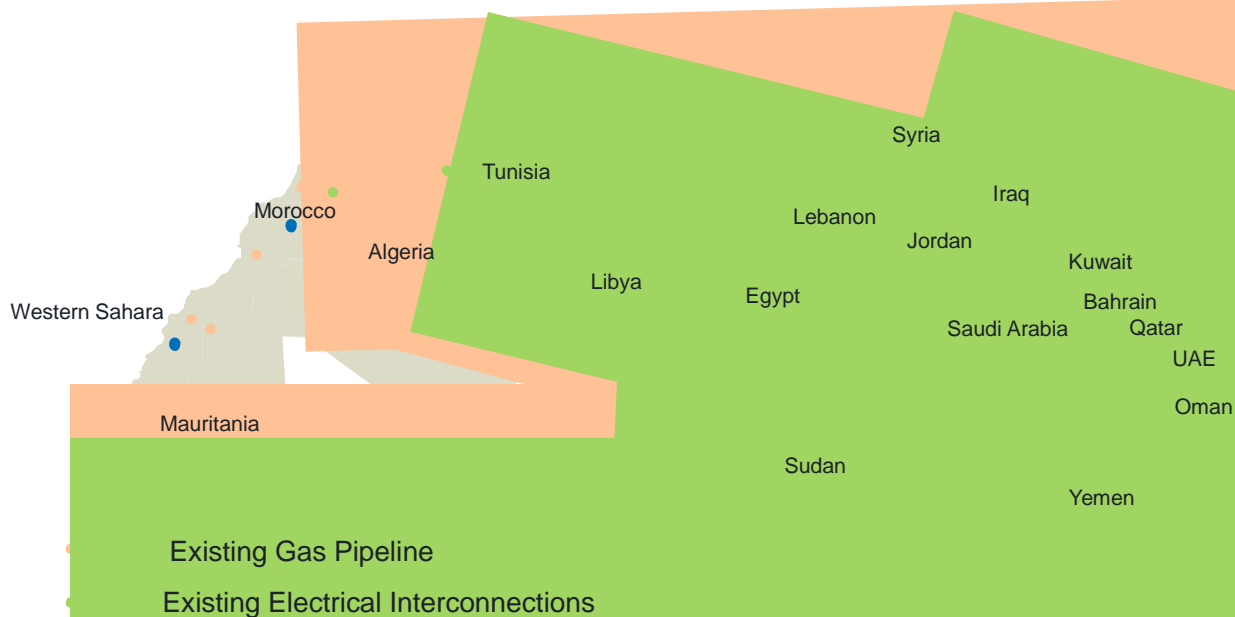


Power System Planning

Regional Optimisation

The Model

- more than 1,400 thermal power plants of different technologies
- more than 70 hydro power plants
- 180 RES power plants of different technologies
- almost 40 different electrical interconnections
- 5 NG cross-border infrastructures.



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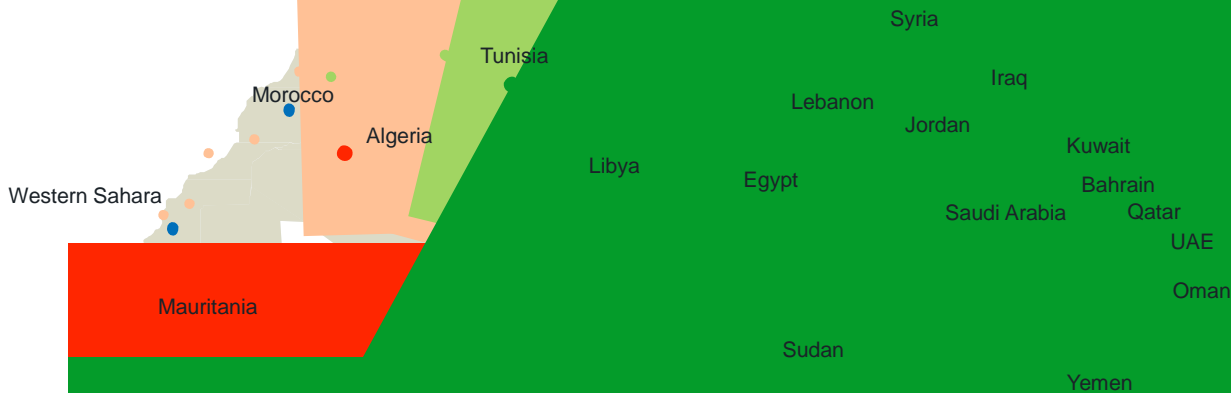


Transmission Application

Power system and Power Market Modelling

Key Results and Recommendations

- Adoption of the **least cost generation-transmission expansion plan** as the best options for new electricity and gas interconnections **for each Arab country separately and for all Arab countries combined**, in order to maximize the use of their gas resources.
- New Regional Infrastructures suggested
- Saving of **some Billions dollar for year**, 70% derives from Opex reduction (optimization of the usage of natural resources), while more than 25 % derives from saving in term of CO2
- Recommendations on the **setting up of rules for the cross-border trading (CBT) of electricity**



Client: AFESD
Year: 2012-2014
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