MEDPRO

MEDITERRANEAN PROSPECTS

Thinking Ahead
for the Mediterranean

EUROPEAN COMMISSION
European Research Area

SEVENTH FRAMEWORK PROGRAMME

Funded under Socio-economic Sciences & Humanities

WP 4b - Energy and climate change mitigation

New coherent energy supply and demand scenarios

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Brief model description

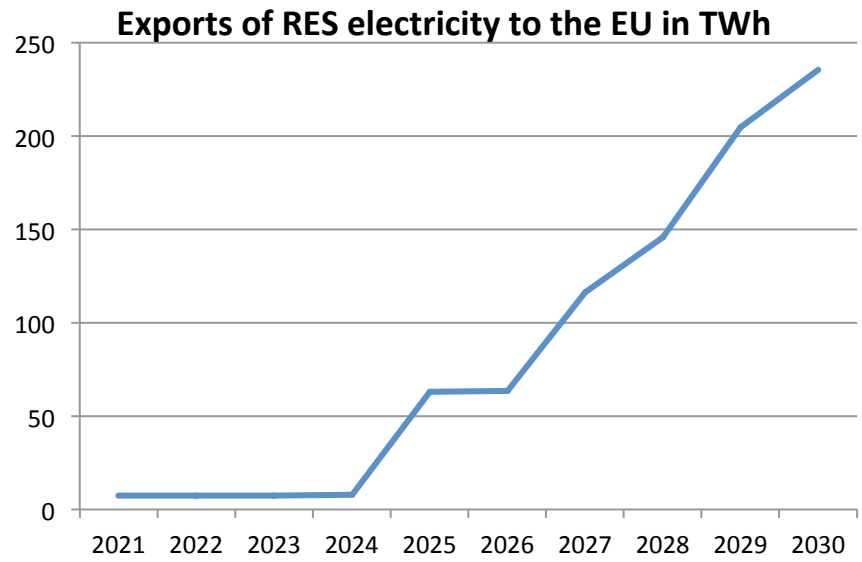
- The MENA-EDS model (developed for the purposes of the MEDPRO project) is a large-scale energy system model that
  - simulates the formation of prices for end-users of energy
  - estimates the energy quantities demanded and supplied by the main energy system actors in an exhaustive manner
  - incorporates energy related CO2 emissions, environmentally oriented policy instruments and emission abatement technologies
- MENA-EDS is particularly detailed in terms of energy related technologies and the dynamic mechanisms leading to their adoption
- The MENA-EDS model is a recursive dynamic model with annual resolution and produces analytical quantitative results up to 2030.
- In the framework of the MEDPRO project, the model has been applied to the MED-10 region that includes Algeria, Morocco, Tunisia, Egypt, Libya, Israel, Syria, Lebanon, Jordan and Turkey.
- The MENA-EDS model takes as exogenous inputs for macroeconomic, demographic and sectoral activity projections as well as for international primary fuel prices (coming from the latest PROMETHEUS projections)

The MED-EU cooperation scenario

- Assumes that the region contributes to the climate policy effort of the EU
  - By integrating into the ETS in the context of
    - A common target leading to accelerated decarbonisation at lower prices for the EU
    - A free allocation of allowances to MED-10 participants at the reference case values
    - The MED-10 countries benefit from an opportunity of generating revenues by reducing their emissions and by selling their allowances to the EU countries
  - Renewable facilitating policies and infrastructure in MED-10 countries accompany the ETS enlargement
- Incorporates investments on RES generation and a distribution grid dedicated to exports
  - Such investments are financed by EU participants and the RES electricity is bought at fixed rates (Power Purchase Agreements) ensuring a normal return on capital (at an 8% discount rate)
- The MENA-EDS model has been used in conjunction with the PRIMES model for Europe in order to evaluate this scenario

The MED-EU cooperation scenario

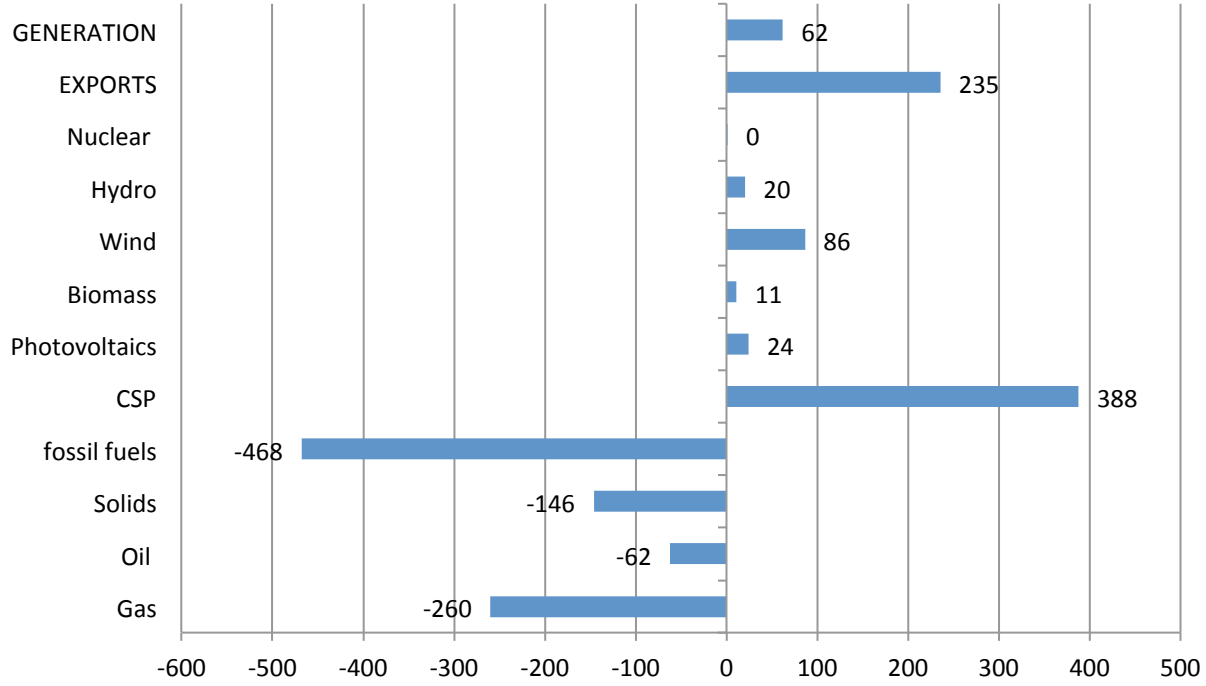
	2015	2020	2025	2030
MED-EU club CO2 emission reductions, ETS sectors relative to 2005	-24.1%	-28.7%	-32.8%	-45.1%
MED-EU club CO2 emission reductions, ETS sectors relative to reference scenario	-16.7%	-21.7%	-30.5%	-39.8%
Carbon price for ETS sectors in the MED-EU cooperation scenario(€'08/ t of CO2)	13	25	35	60
Carbon price for ETS sectors in the EU alone scenario(€'08/ t of CO2)	14	29	52	78



- Morocco is the first country to export RES electricity to the EU because of its proximity to Spain which becomes the first EU country to import under the scheme.
- By 2025, green electricity exports to Europe have taken off reaching over 60 TWh/year. Algeria and Libya become major players exporting mainly via Italy.
- The years between 2025 and 2030 see massive additions to export capacities with the region's exports nearly quadrupling to reach 235 TWh. New HVDC lines are constructed linking Algeria with Spain and France, Morocco with Spain and Tunisia with Italy
- Egypt takes part in this trade with some delay, due to late interconnection developments and accelerates integration post 2030
- In 2030, electricity exports represent 14.5% of total power generation in the region and cover 6.4% of the EU's electricity needs.

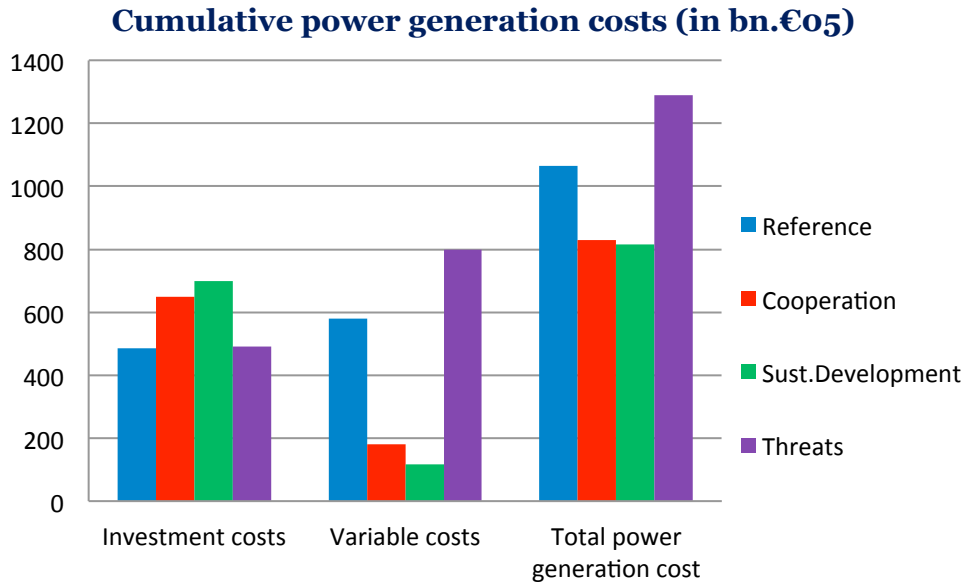
The MED-EU cooperation scenario: Power generation

Power generation: Changes from the reference scenario in 2030 (in TWh)



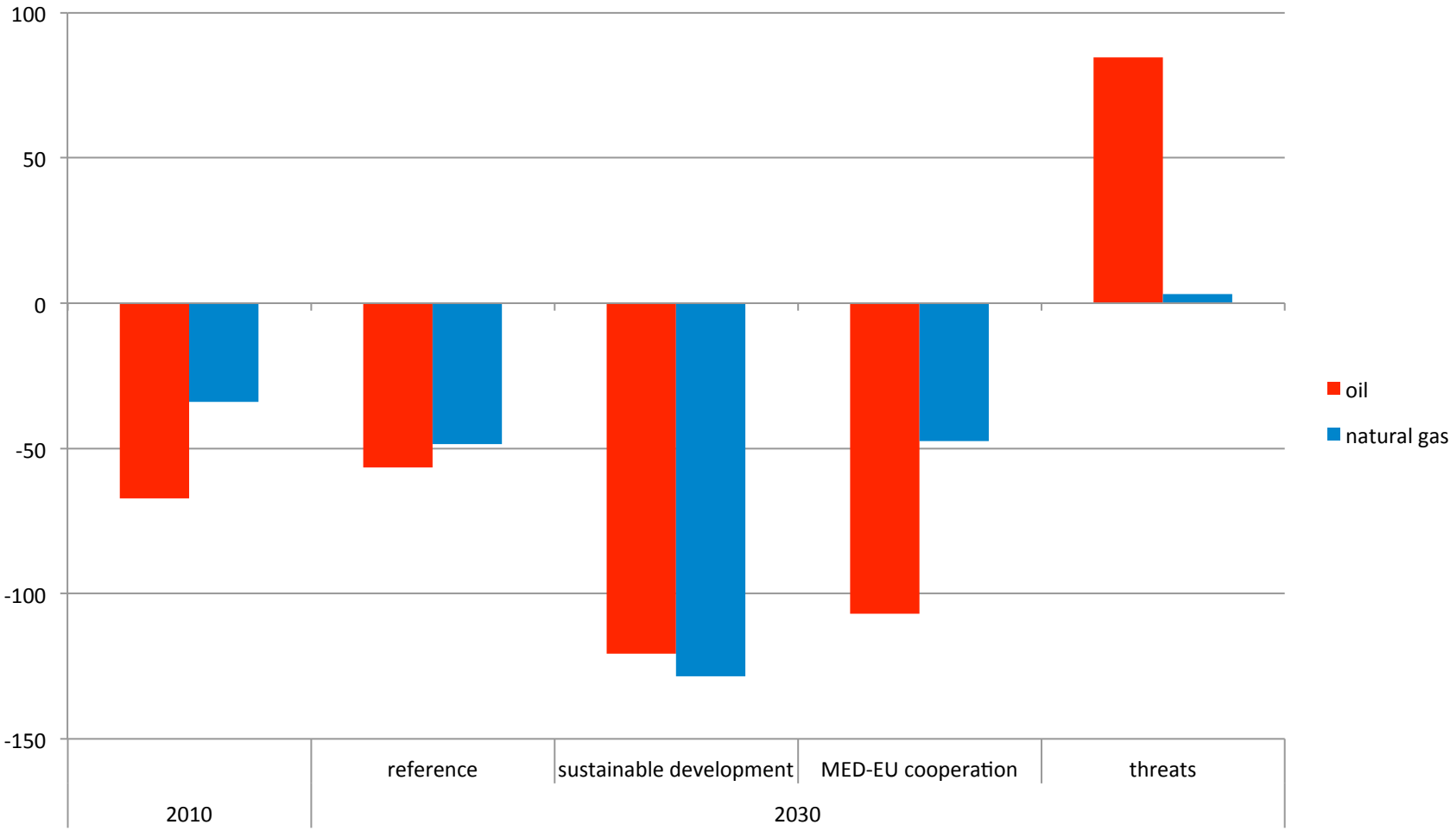
- By 2030, natural gas fired capacity is 8% lower in the cooperation scenario than in the reference case, while at the same time gas based generation drops by 24%.
- Gas in the scenario assumes increasingly the role of following the load especially in the context of an increase in intermittent renewable energy share in the generation mix.

Cost implications of the scenarios

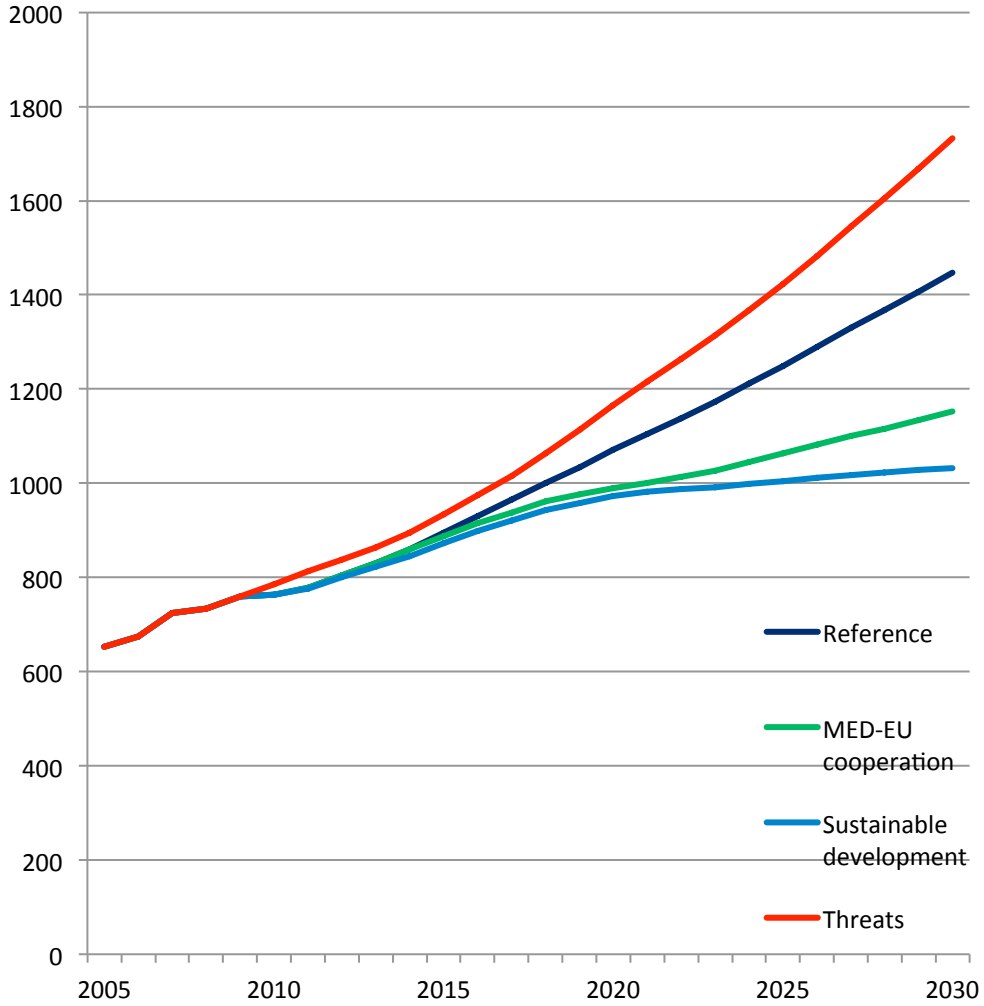


	Investment costs		Variable costs		Total power generation cost	
	in billions €'05	% change from reference	in billions €'05	% change from reference	in billions €'05	% change from reference
Reference	486.1		579.0		1065.1	
MED-EU cooperation	649.1	33.5%	179.2	-69.1%	828.4	-22.2%
Sustainable development	698.0	43.6%	117.5	-79.7%	815.5	-23.4%
Threats scenario	491.4	1.1%	799.4	38.1%	1290.8	21.2%

Net imports (in Mtoe) of hydrocarbons in the MED-10 region in the alternative scenarios



Impacts of scenarios on CO2 emissions



- In the reference ("median") scenario emissions nearly double between 2010 and 2030
- The threats scenario represents an even more serious situation with CO2 emissions increasing by 20% compared to the reference case in 2030
- The other two scenarios describe a more sustainable evolution
  - Deceleration of emissions growth
  - In the Sustainable development scenario emissions stand 29% lower than the reference case in 2030
  - Possible synergies if combined

Conclusions about Reference projection

- Despite deceleration in population growth, rapidly increasing prosperity means that energy consumption in the region expands considerably
- Electricity demand projected to grow even faster
- Vigorous growth in energy demand for transport
  - Private motorisation projected to grow 2.5 times in the region as a whole
- Natural gas increases share in meeting energy needs
  - Expansion of distribution grids, competitive pricing and intra-regional trade
- Oil use more and more concentrated on transport
- Reduction in the use of traditional biomass

Conclusions about opportunities

- Huge potential for RES
    - Especially solar thermal, photovoltaics, wind
  - Exploitation will depend to a large extent on
    - Active government support
    - A favorable investment climate (local and FDI)
    - Engagement in promoting carbon-free technologies
      - Cooperation with the EU
      - Possibilities for massive exports to EU accompanied by mutual benefits
  - High penetration rates of RES feasible
      - Higher storage capabilities for solar thermal
      - Complementary use of natural gas
    - Imply a massive increase in investment for power generation
    - However, drastic reductions in variable costs (especially fuel costs)
    - On balance, reduction in total generating costs
- Key role of natural gas in power generation
  - In the reference scenario increase of share (from 56% in 2010 to 70% in 2030)
  - In the scenarios assumes the role of swing producer

Conclusions about EU-MED cooperation

- In the pro-active and cooperation scenarios
  - EU-MED energy market integration provides mutual benefits; it exploits RES potential of MED, lowers decarbonisation costs for the EU and provides tremendous opportunities for investment and jobs
  - Regional demand for hydrocarbons is lower and allows for higher economic exploitation of gas potential
  - Exports of major producers increase, while import dependence of resource poor countries decreases
  - Building confidence and long-standing infrastructure enable markets in the delivery of large scale RES investment; the EU ETS platform could provide a solid start-up
- Under the threats scenario assumptions
  - Higher demand for hydrocarbons
  - Slower development of resources
  - Contraction of export capabilities and deterioration in external energy balance
  - Costs are higher than in reference

Thank you!

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About MEDPRO

Title	MEDPRO – Prospective Analysis for the Mediterranean Region
Description	MEDPRO explores the challenges facing the countries in the South Mediterranean region in the coming decades. The project will undertake a comprehensive foresight analysis to provide a sound scientific underpinning for future policy decisions at both domestic and EU levels.
Mediterranean countries covered	Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey
Coordinator	Dr. Rym Ayadi, Centre for European Policy Studies (CEPS)
Consortium	Centre for European Policy Studies, **CEPS**, Belgium; Center for Social and Economic Research, **CASE**, Poland; Cyprus Center for European and International Affairs, **CCEIA**, Cyprus; Fondazione Eni Enrico Mattei, **FEEM**, Italy; Forum Euro-Méditerranéen des Instituts de Sciences Economiques, **FEMISE**, France; Faculty of Economics and Political Sciences, **FEPS**, Egypt; Istituto Affari Internazionali, **IAI**, Italy; Institute of Communication and Computer Systems, **ICCS/NTUA**, Greece; Institut Europeu de la Mediterrania, **IEMed**, Spain; Institut Marocain des Relations Internationales, **IMRI**, Morocco; Istituto di Studi per l'Integrazione dei Sistemi, **ISIS**, Italy; Institut Tunisien de la Compétitivité et des Etudes Quantitatives, **ITCEQ**, Tunisia; Mediterranean Agronomic Institute of Bari, **MAIB**, Italy; Palestine Economic Policy Research Institute, **MAS**, Palestine; Netherlands Interdisciplinary Demographic Institute, **NIDI**, Netherlands; Universidad Politecnica de Madrid, **UPM**, Spain; Centre for European Economic Research, **ZEW**, Germany
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