Energy prospects in the Mediterranean by 2030 : towards a breakdown scenario ?

June 2012

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- **« *Mediterranean Energy Perspectives* »:**
  - **MEP 2008 and MEP 2011**
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Context

- An OME-Plan Bleu cooperation
- Several RE an EE targets at country and regional scale
- Elaborating several scenarios on the basis of OME's modelisation works
  - 2009-2010 : Experts workshop (North and South), Plan Bleu/OME
  - 2011-2012 : MEP 2011 publications and new RE and EE assumptions

MEP 2011

Description:

- **Geographical cover: 24 countries**
- **Data sources:**
  - **OME's members, national and international sources;**
- **Reference year= 2009;**
- **In-house model : econometric, external variables based on GDP, population and international prices;**
- **Perspectives based on existing and/or engaged projects and targets**
- **Bottom-up model. Desagregation by Sub sector and energy source**

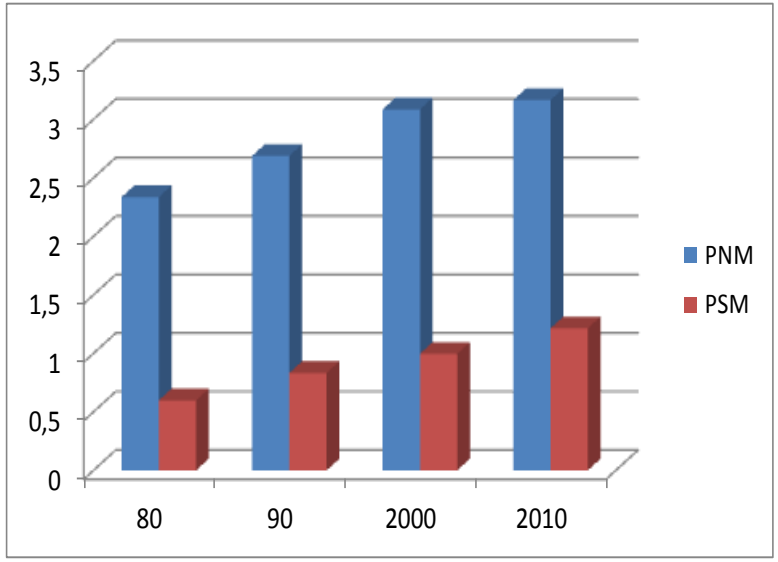
Geographical cover

- North Mediterranean Countries (NMCs)
- South and East Mediterranean Countries (SEMCs)

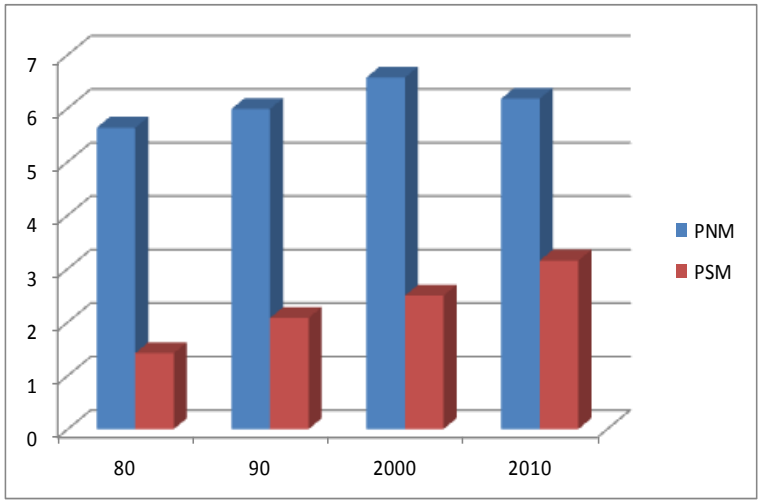
SEMCs include: Algeria, Egypt, Israël, Jordan, Lebanon, Libya, Morocco, Palestine, Tunisia, Turkey and Syria.

Disparities, interdependence and « convergence »

TPES / inhab (tep/inhab)



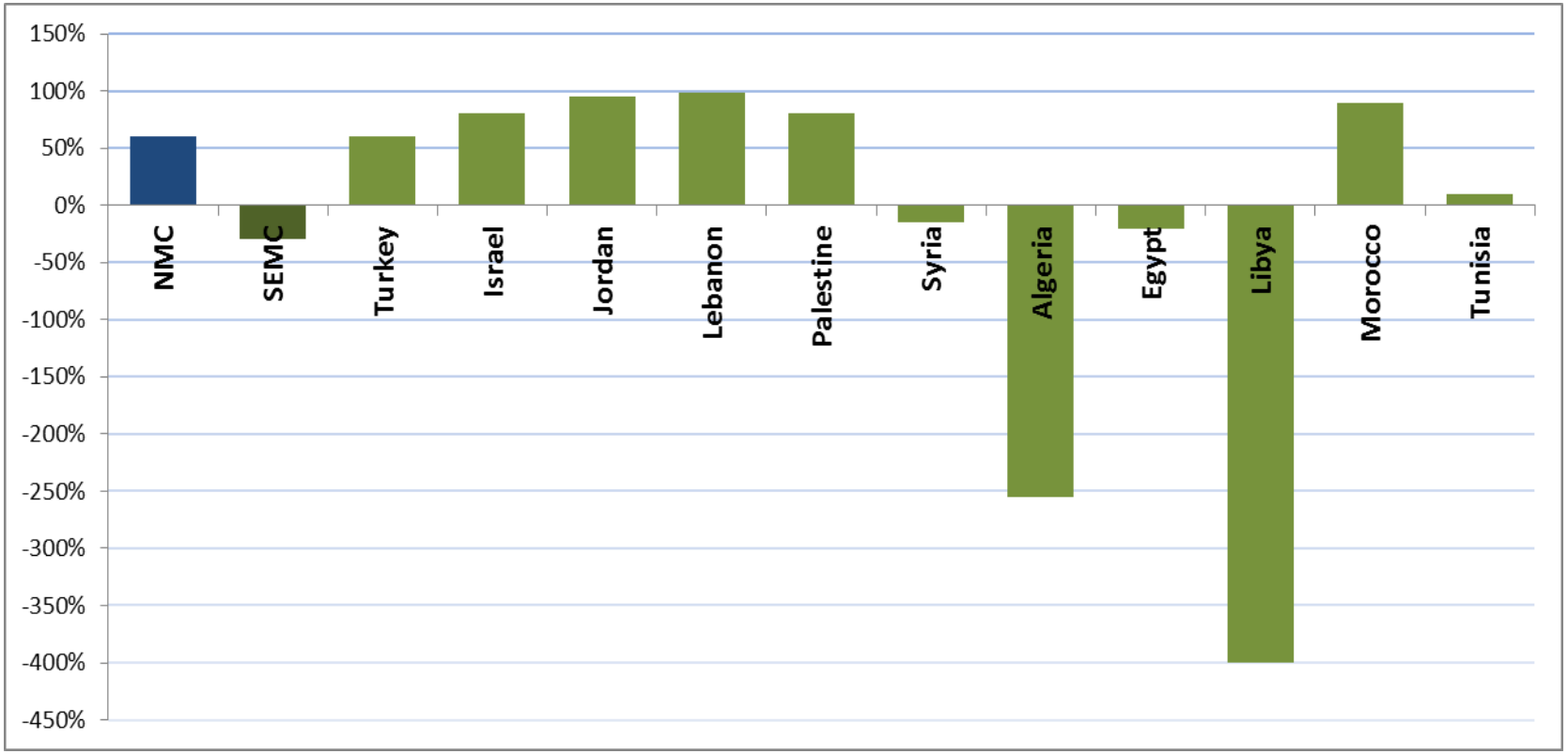
CO_2 / inhab (tCO_2/inhab)



Source: OME - MEP2011

A strong energy dependency

2009



Source: OME

Time for decisions

- **Growing needs;**
- **A huge potential for energy saving;**
- **Ambitious RE programmes**

But the whole is still under constraint

RE: ambitious programmes

ome

PNUE

PAM

plan bleu

RE: ambitious programms

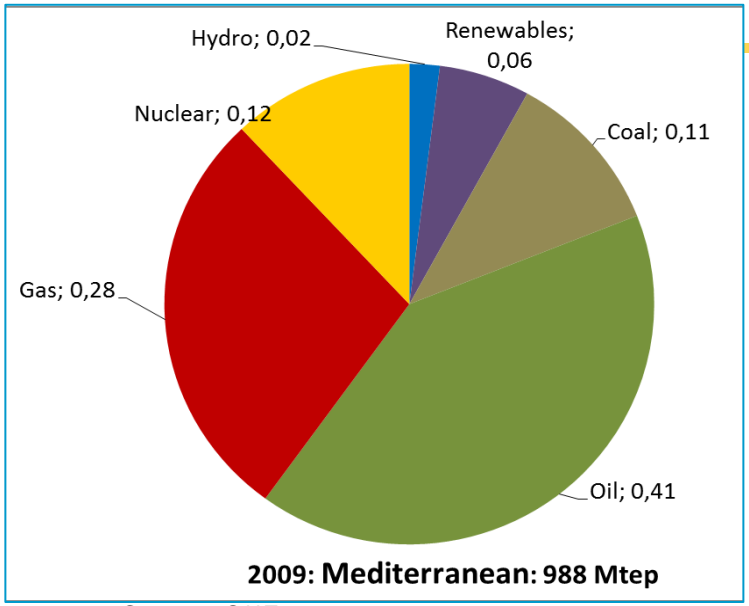
Country	Photovoltaic (PV) capacity (2009)	PV targets	Concentrated solar power (CSP) targets
Algeria	3 MWp	800 MWp by 2020 3000 MWp by 2030	1200 MW by 2020 7000 MW by 2030
Egypt	10 MWp	1000 MWp by 2020 (est.)	
Tunisia	2 MWp	15 MWp in buildings 0.5 MWp for street lighting + several other projects	100 MW by 2016
Israel	20 MWp	15-30 MWp by 2020	250 MW
Jordan	1 MWp	300-600 MW by 2020	
Libya	1.5 MWp	150 MWp	7000 MW
Morocco	10 MWp	2000 MW (mostly CSP)	

Reference scenario (MEP 2011)

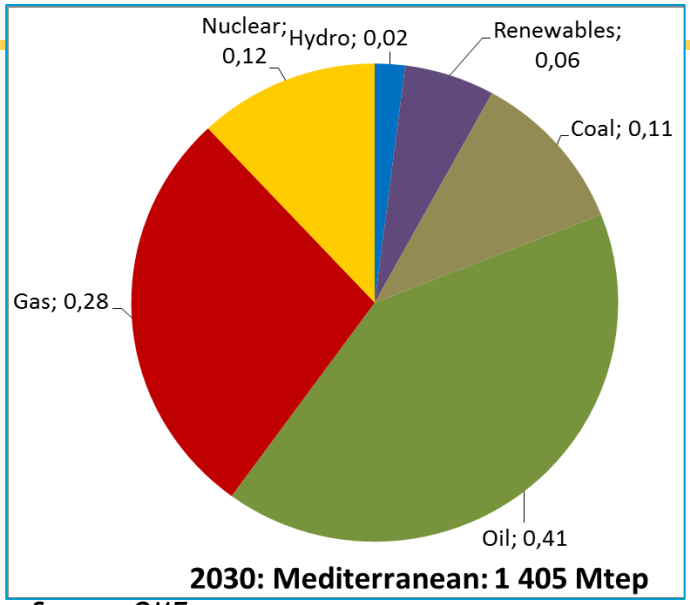
Reference scenario is a conservative scenario:

- **Continuation of present trends;**
- **Past trends, current measures & policies and on going projects;**
- **However, it has a cautious approach to the announced measures and projects:**
  - **No large scale RE projects,**
  - **No major efforts for large scale energy conservation,**
  - **A more moderate realization rate of programmes,**
  - **Electrical needs will be covered in priority by classic fuels**

Share of renewable energies in primary energy demand (%)

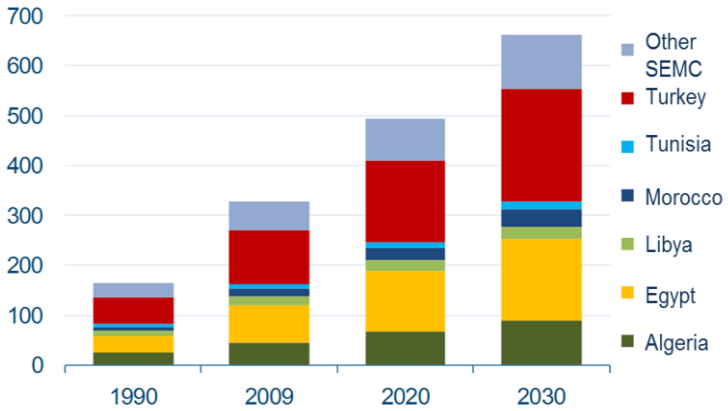


Source: OME

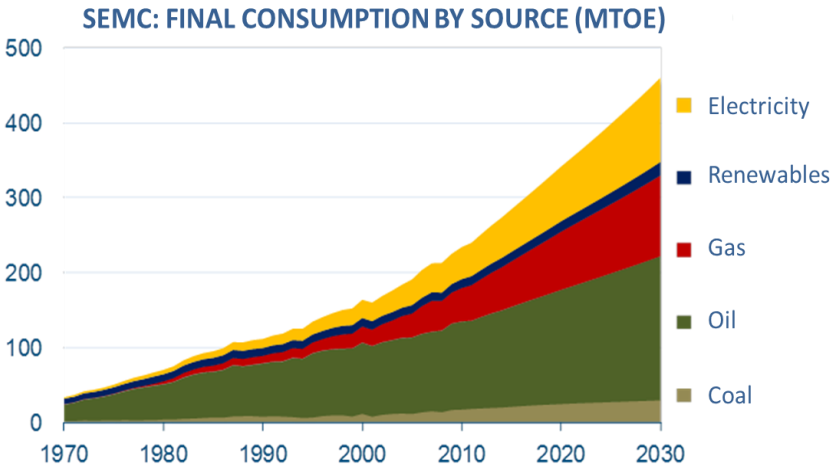


Source: OME

Business-as-usual scenario – energy demand by country for 2030



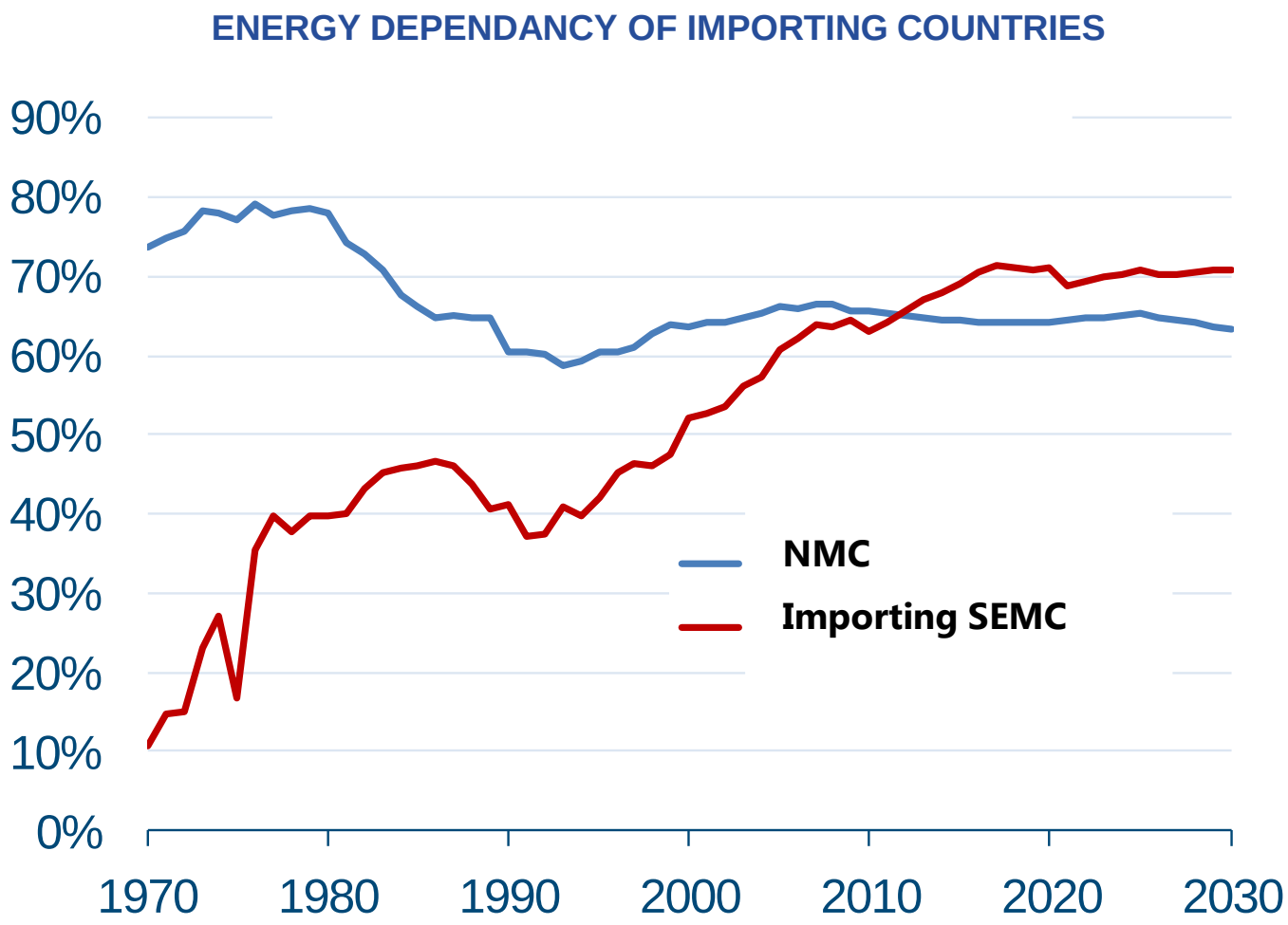
Source: OME



Source: OME

A strong growth of energy deman in SEMC which leads to the necessity of RE and EE strategies

A strong energy dependency

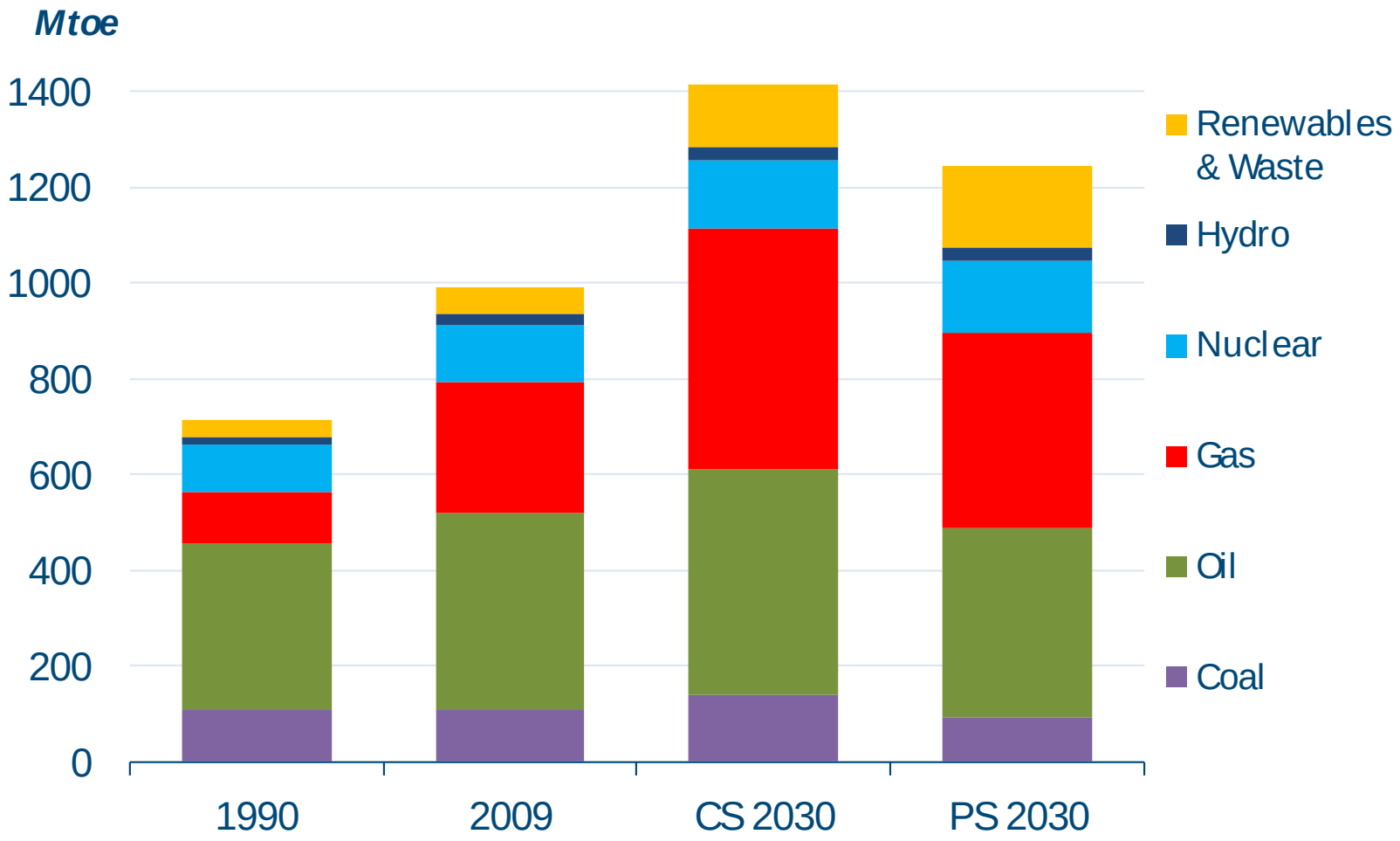


Source: OME

Alternative scenario (MEP 2011)

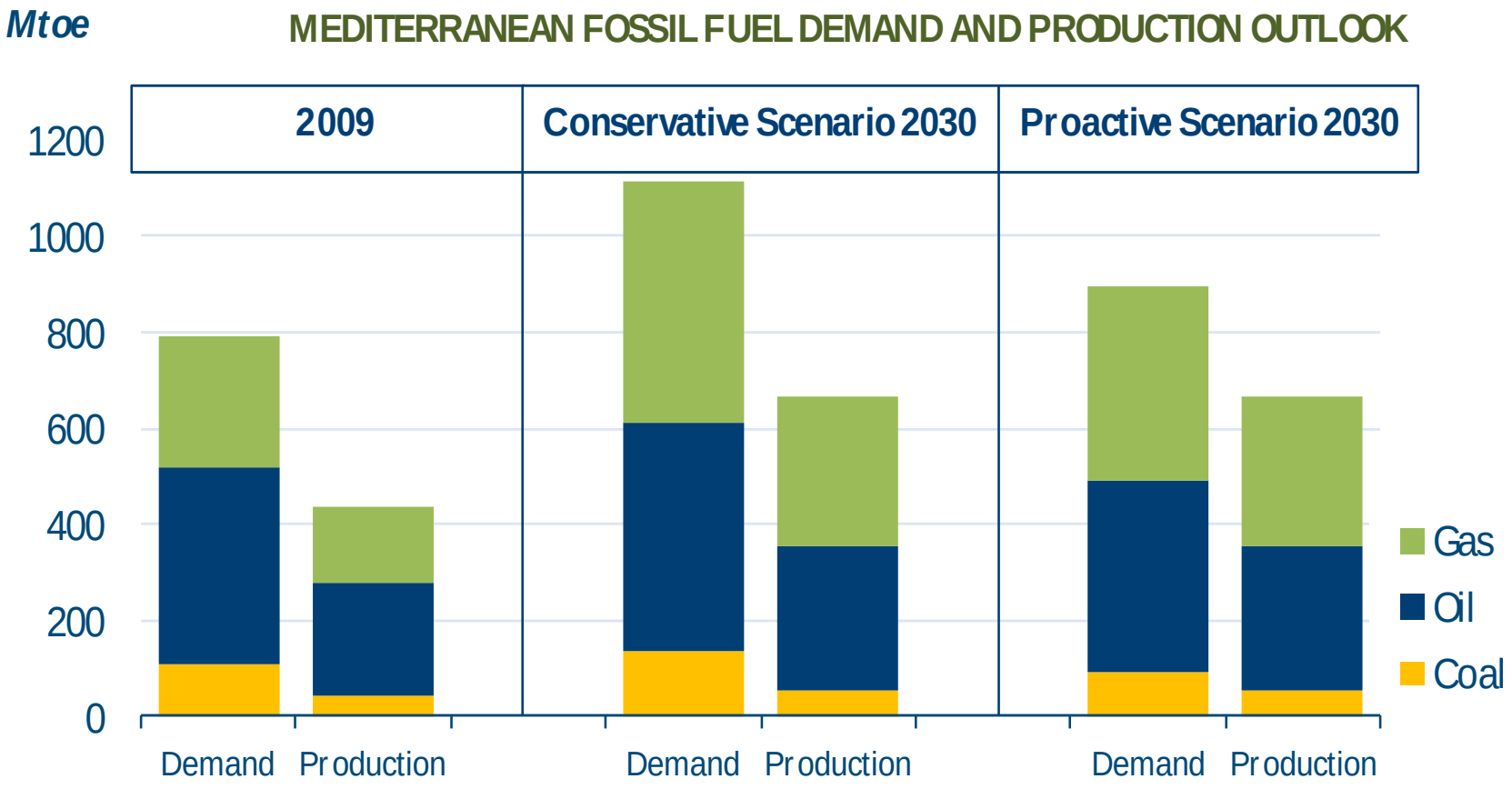
- **A PROACTIVE approach**
- **The Alternative scenario - « Proactive » - is based on the implementation of ambitious energy efficiency programmes and broader diversification in the energy supply mix**
- **This includes:**
  - **More renewable energy sources for electricity generation, in line with the countries' programmes and objectives**
  - **More renewables in the final consumption, especially solar thermal**
  - **Emergence of nuclear project after 2020 in some South countries,**
  - **A decline in oil and coal input to electricity generation,**
  - **The implementation of policies and measures to reduce energy intensity**

Results: natural gas era



Source: OME, 2011, MEP 2011

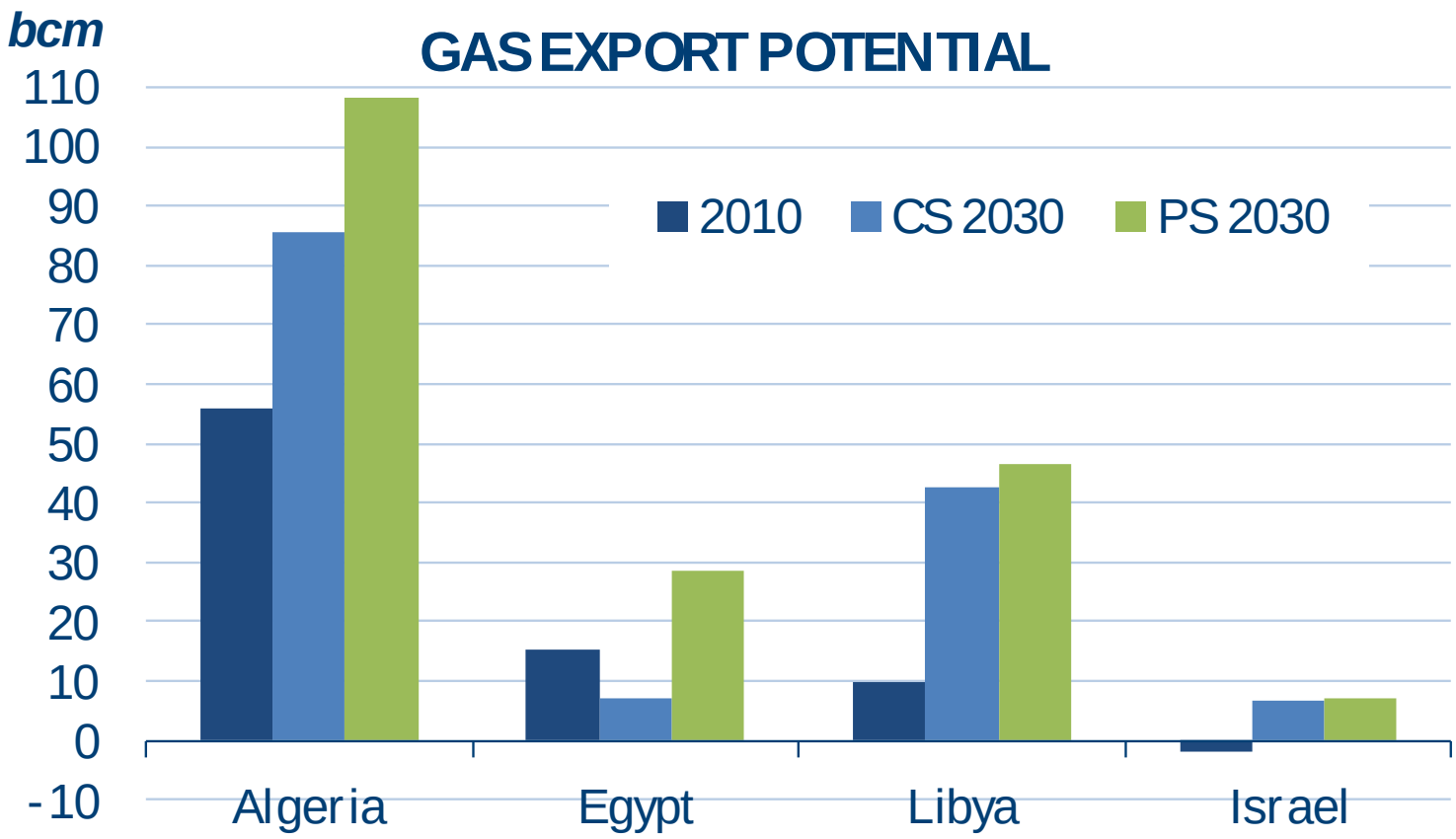
Constraints somewhat loosened



Source: OME, 2011, MEP 2011

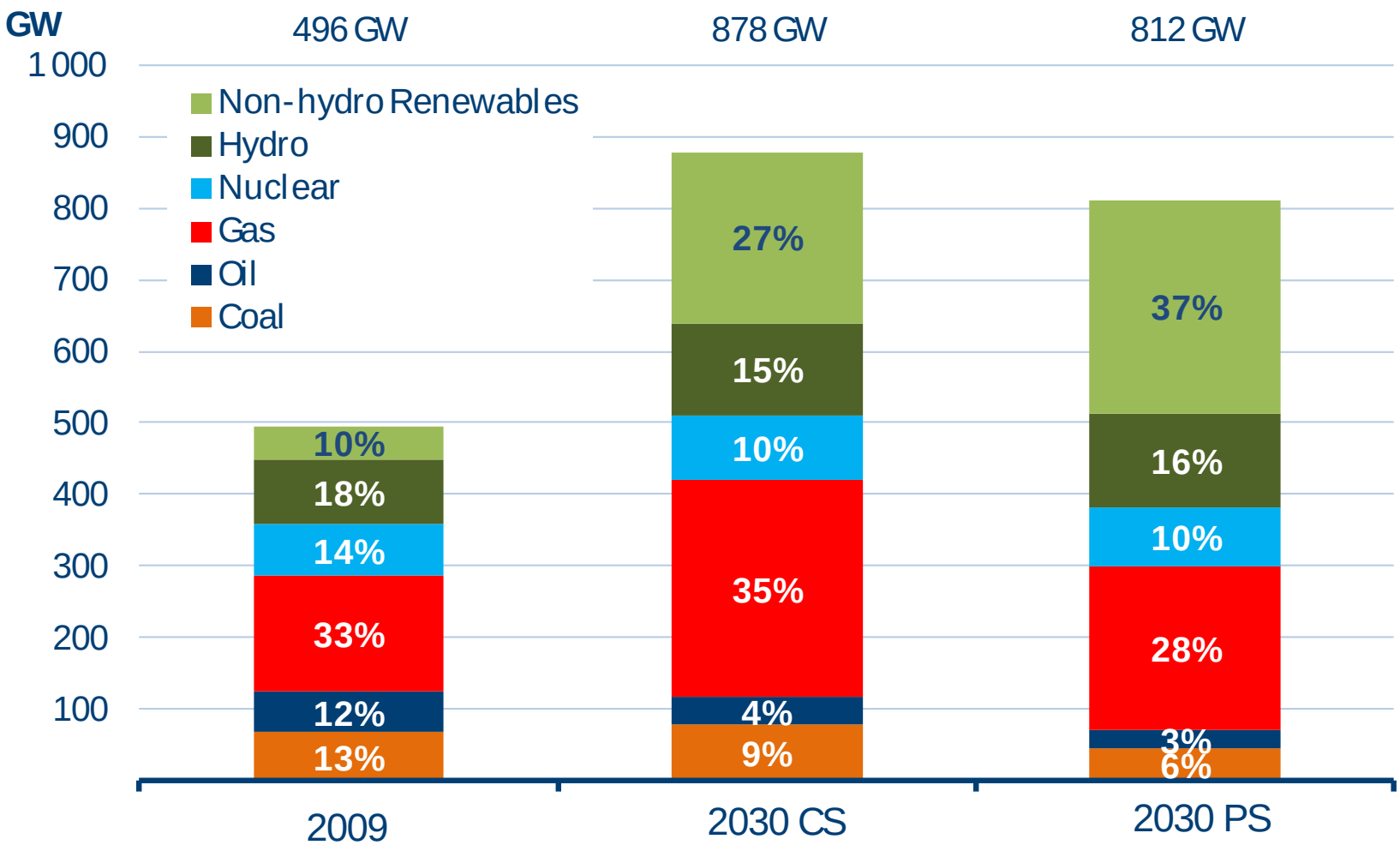
Best prospects

Reinforced gas export potential



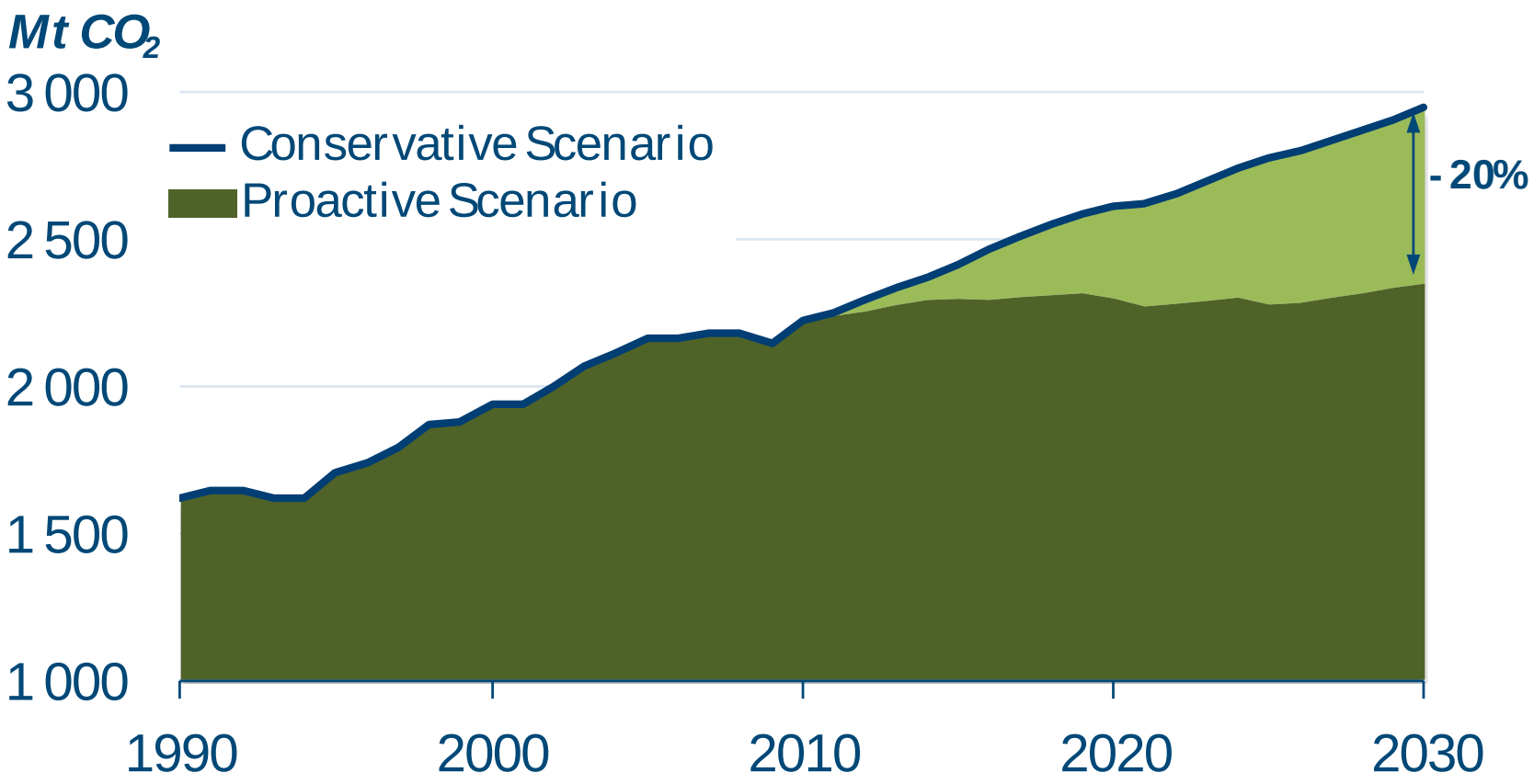
Source: OME, 2011, MEP 2011

Electricity: RE as well as gas era



Source: OME, 2011, MEP 2011

CO_2 emissions : getting better but still a long way to go



Source: OME, 2011, MEP 2011

+40% in CS growth (3000Mt) by 2030
"Only" +9% in PS (a 600 Mt saving)

Towards a more ambitious scenario: a breakdown or rupture scenario

Creating a contrasted scenario reducing strong tensions and leading towards a more sustainable path:

- **The Mediterranean energy supply remains actually very carbonaceus with more than 80% of energy demand based on fossil fuels**
- **Link with security supply**
- **Transport and building sectors are crucial**
- **RE integration not only for electricity sector**
- **Mobilization of the important energy savings potential in the whole region**

Analysis between Conservative and Proactive scenario highlights:

- **Strong progress is envisioned between 2020 and 2030**
- **A rupture scenario could have socioeconomic effects (energy bill, dependency, employment…)**

Breakdown scenario: assumptions

- **Global assumptions:**
  - **For North countries: Proactive scenario assumptions**
  - **More ambitious assumptions for the South, especially <u>from 2020</u>**
  - **Energy intensities decreases as recommended by the MSDD (between -1% and -2% per year)**

- **Exploiting RE potential in SEMCs by a stronger penetration compared to conservative scenario**

Part of renewables (RE)	Breakdown scenario					
	Mediterranean		SEMC		NMC	
	2020	2030	2020	2030	2020	2030
RE part of the primary energy demand	15%	18%	10%	14%	17%	21%
RE part of the electric production	31%	37%	22%	30%	35%	42%
RE part of the final energy consumption	9%	10%	7%	9%	9%	10%

Breakdown scenario: assumptions

- **In the construction sector:**
  - **Around 40% energy saving potential in buildings in the SEMCs compared to refernce scenario;**
  - **A doubling of houses by 2030;**
  - **Control of energy efficiency demand emphasized for electrical households appliances but also in terms of behaviors and construction rules for new housing constructions.**

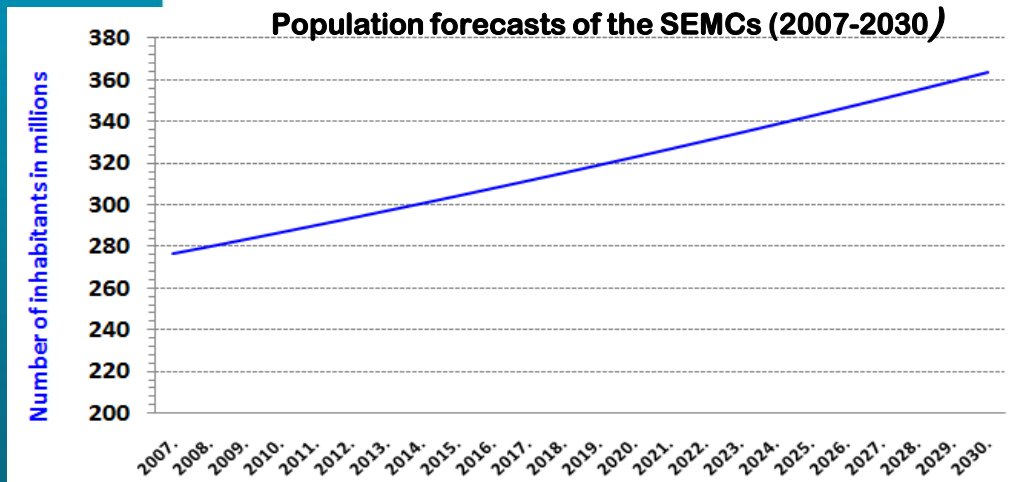
Breakdown scenario: assumptions

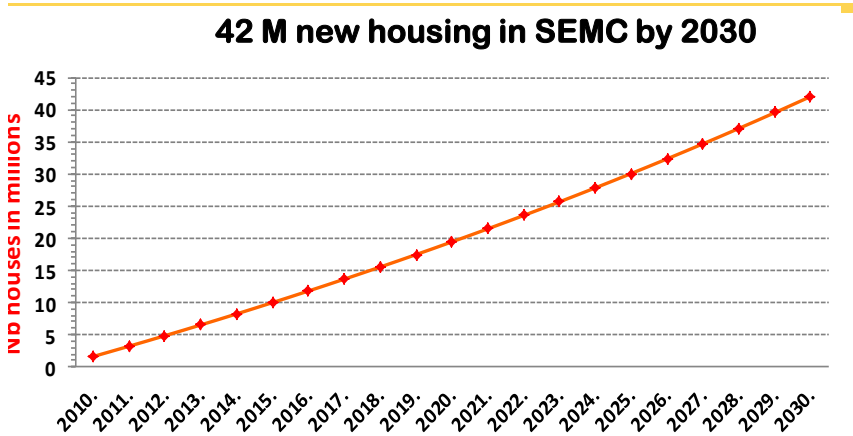
- **In the transport sector:**
  - **An energy saving potential of about 15% in SEMCs (based on more efficient technologies and collective transport)**
    - **NICTs contributes up to 16% in energy consumption reduction in transports**
    - **One ton.km made in Rail mode consumes a third of the same distance compared to road mode (ANME estimation)**
    - **Rail mode in collective to transport one passenger.km consums one third as by individual road mode (ANME estimation)**

Breakdown scenario: assumptions

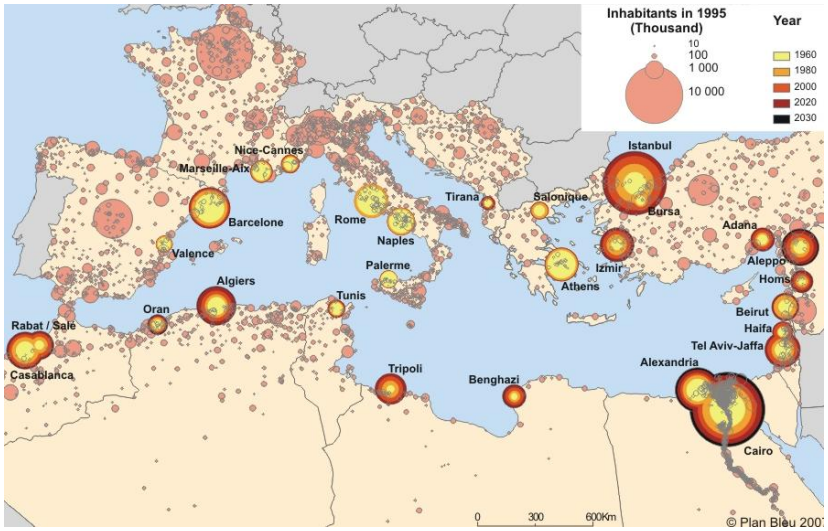
- **Industry and services: Stricter standards**
- **Exploitation of Plan Bleu's data on specific consumption of industry, transport and housing sectors**
- **No nuclear power in South countries by 2030**

Population growth and housing





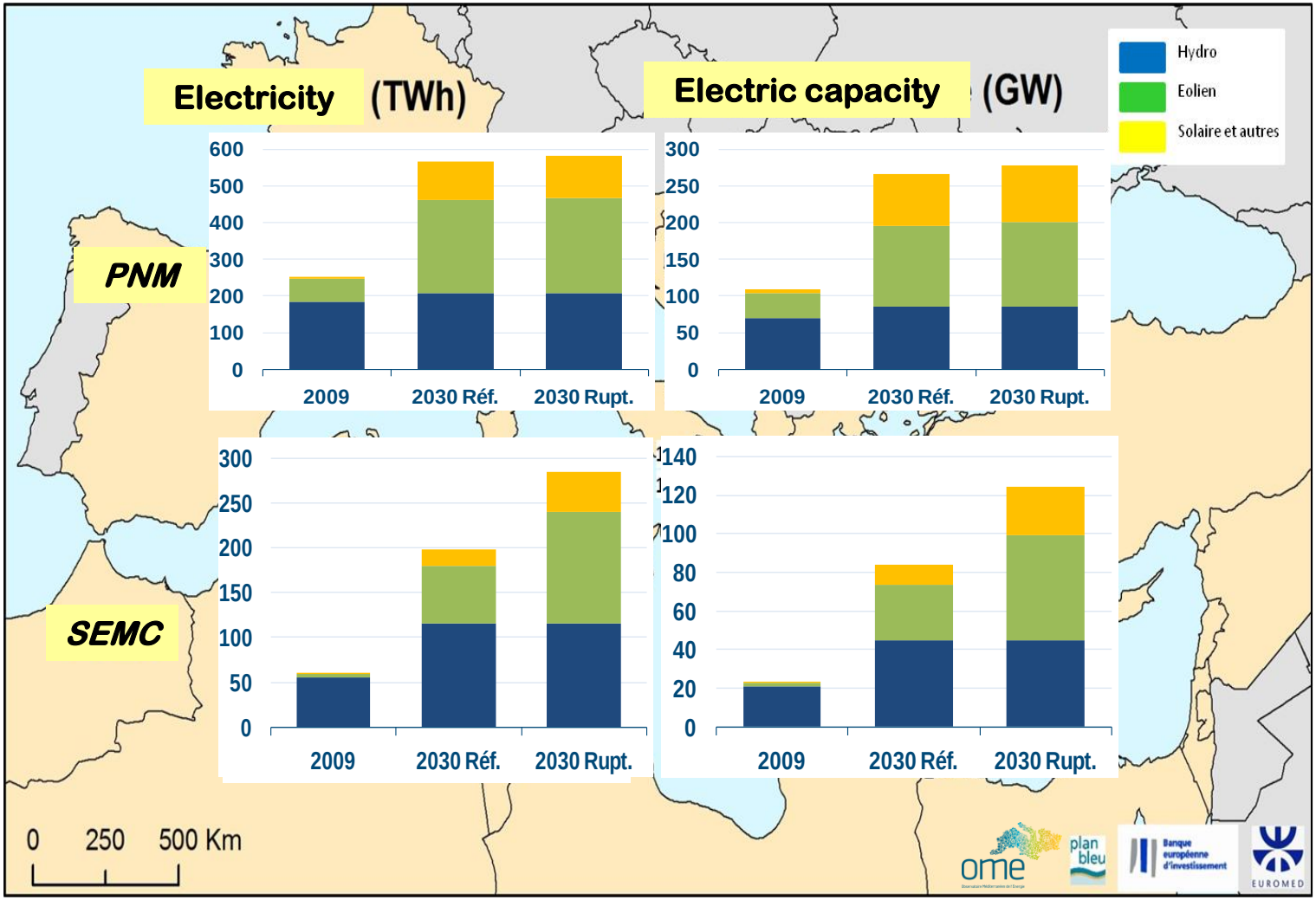
	Population (in millions)						Number of housing (in thousands)	
	2007	2030		% /year	% /year		2007	2030
				1971-2007	2007-2030			
Turkey	73,0	92,5	Turkey	2,0%	1,0%		23550	38528
Algeria	33,9	44,7	Algeria	2,4%	1,2%		6045	11468
Egypt	80,1	104,1	Egypt	2,2%	1,1%		19338	27387
Libya	6,2	8,4	Libya	3,1%	1,4%		919	1760
Morocco	30,9	39,3	Morocco	2,0%	1,1%		4748	7904
Tunisia	10,2	12,5	Tunisia	1,9%	0,9%		2494	3188
Israel	7,2	9,2	Israel	2,4%	1,1%		2087	3053
Palestinian Territories*	3,8	7,3	Palestinian Territories*		2,8%		480	1220
Jordania	5,7	8,6	Jordania	3,6%	1,8%		1199	2516
Lebanon	4,1	4,9	Lebanon	1,4%	0,8%		889	2463
Syria	20,5	29,3	Syria	3,2%	1,6%		3989	7917
SEMCs	**275**	**361**	**SEMCs**	**2,3%**	**1,2%**		**65737**	**107404**



A near doubling of housings between 2007 and 2030
About 42 millions of new housing in 2030 in SEMCs.

Renewable sources for electricity generation in Mediterranean
Breakdown scenario: more than a three-fold

(frome 138 to 431 GW RE)

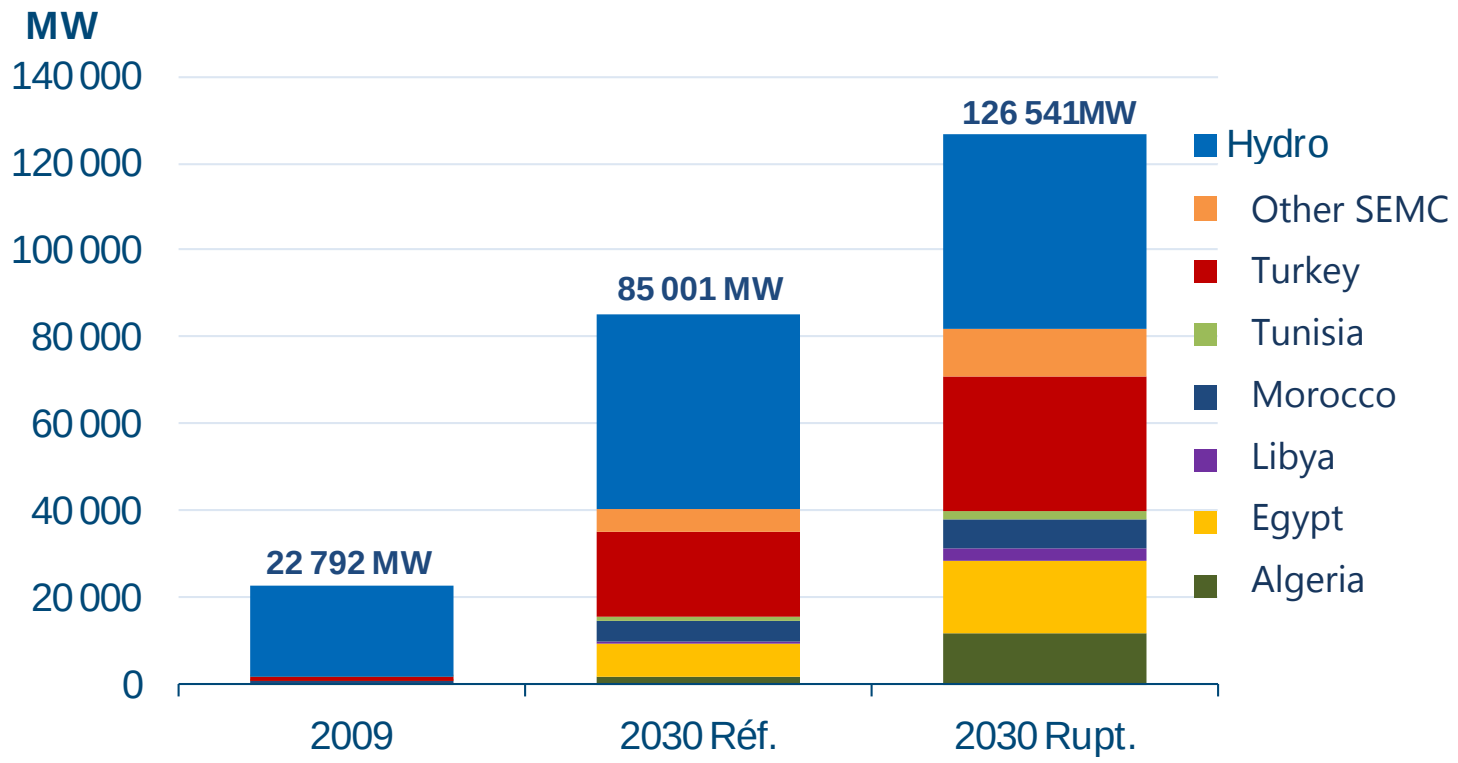


Source : OME, Plan Bleu, 2012

For SEMCs: a multiplication factor of 6

(from 23 to 127 GW EnR)

Additional capacity of renewables sources in SEMCs by 2030: 2 to 4 MSP according to scenarios



Source : OME, Plan Bleu, 2012

In 2030, according to Reference or Breakdown scenarios:

Solar : from 10 000 to 25 000 MW

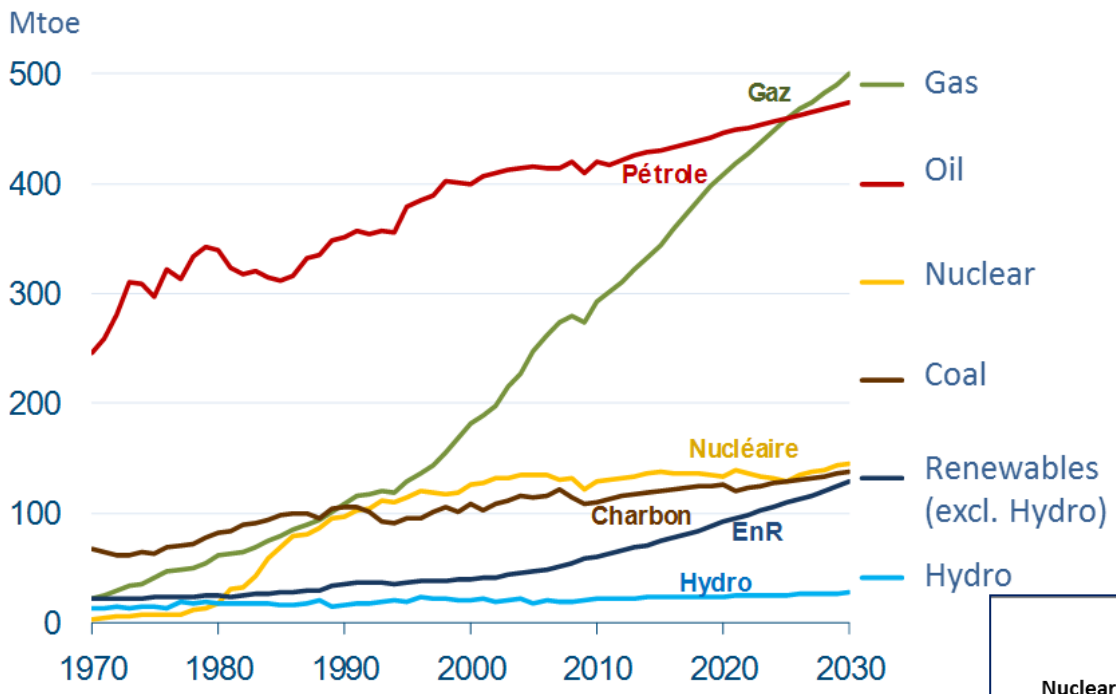
Wind : from de 29 000 to 55 000 MW

from 2 to 82 GW RE exc. hydro

from 23 to 127 GW RE

Compared results between the 3 scenarios

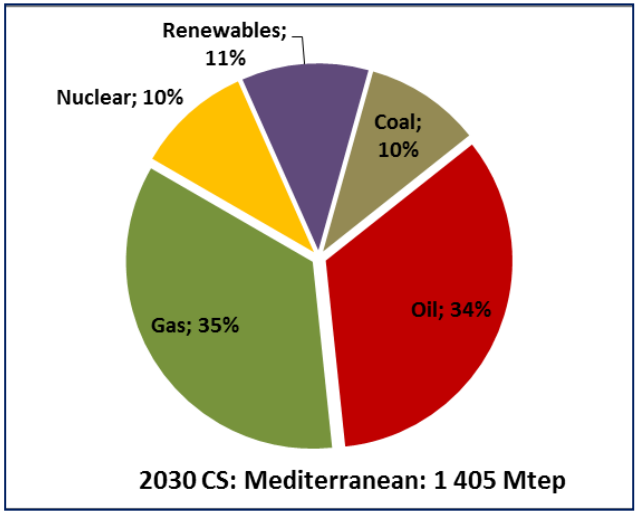
Reference scenario: energy demand in the Mediterranean



Source : OME

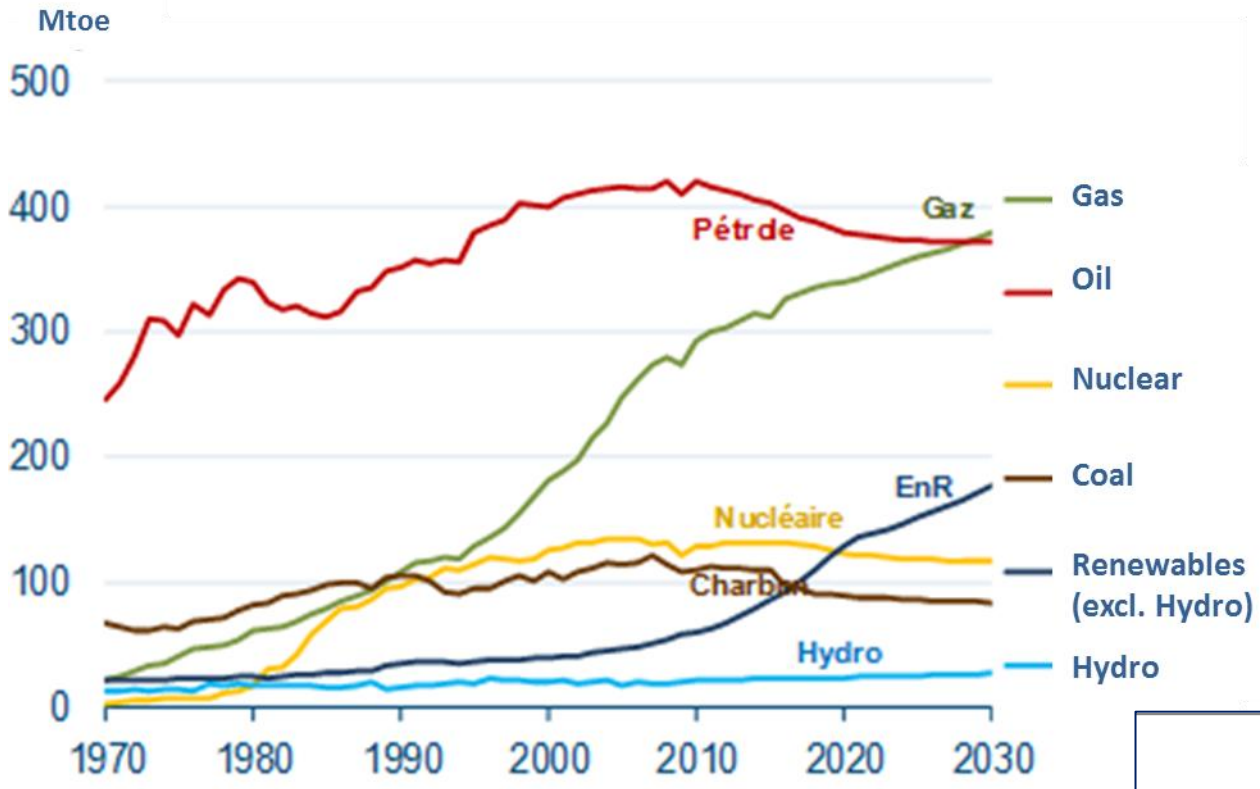
Energy demand in the Mediterranean should have a growth of more than 40 % between 2009 and 2030. It could reach 1406 Mtoe in 2030,

In the reference scenario fossil fuels will constitute the energy mix for more than 80%

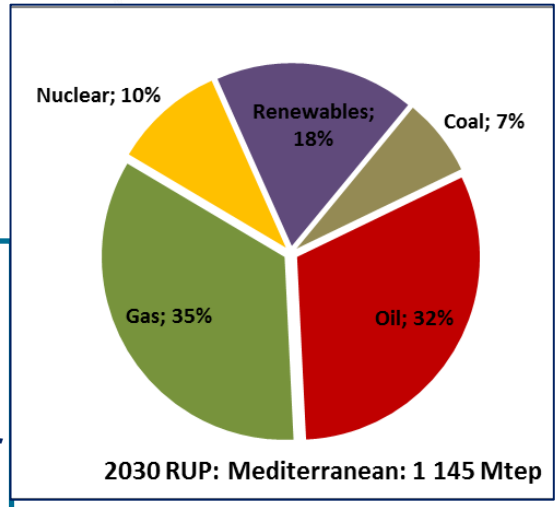


>80% fossil

Breakdown scenario: energy demand in the Mediterranean



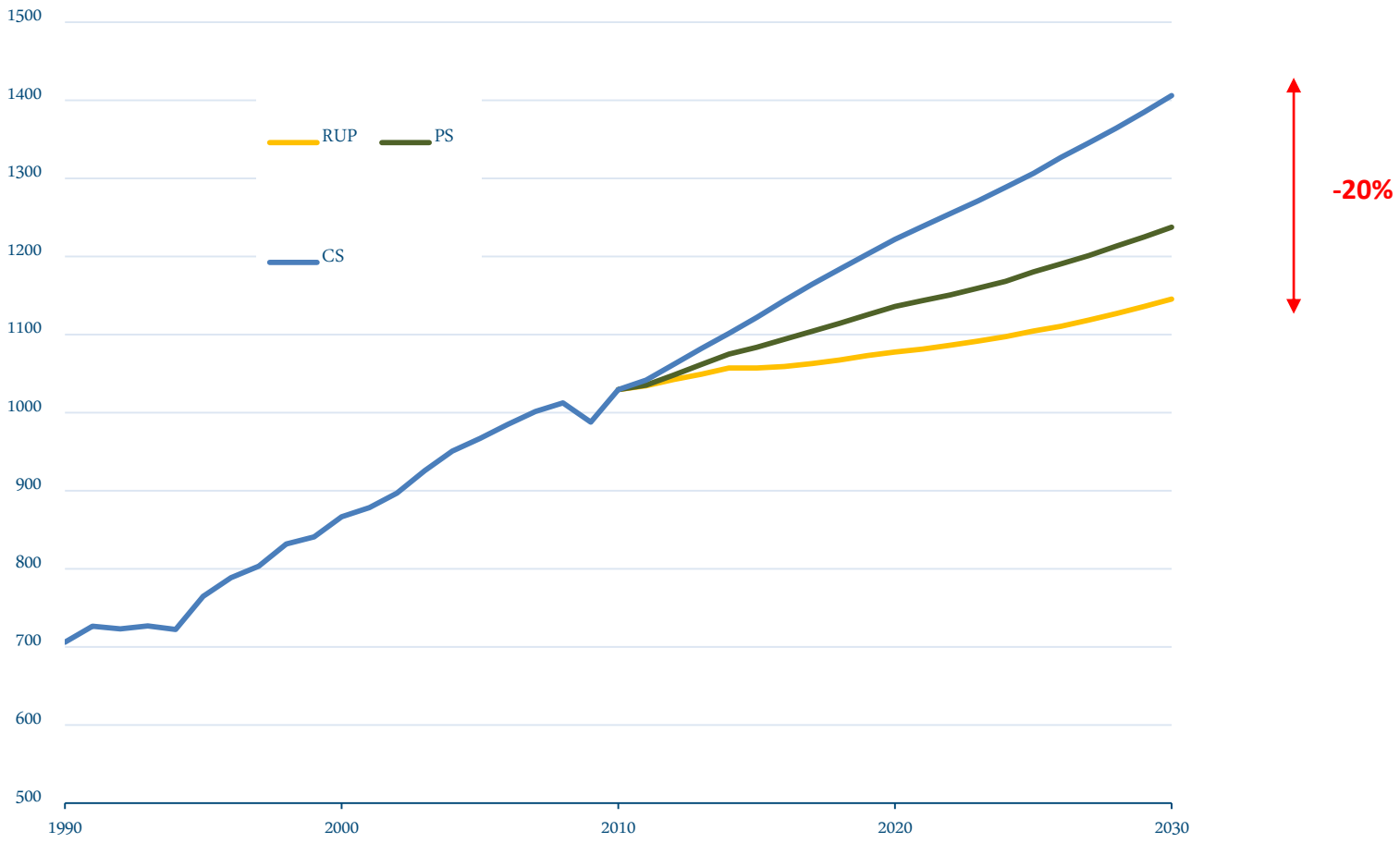
Source : OME, Plan Bleu, 2012



Energy demand in the Mediterranean should have a growth of 16% between 2009 and 2030. It could reach about 1145 Mtoe in 2030,

In the breakdown scenario, RE should represent 18% of energy mix, and fossil fuels 72%

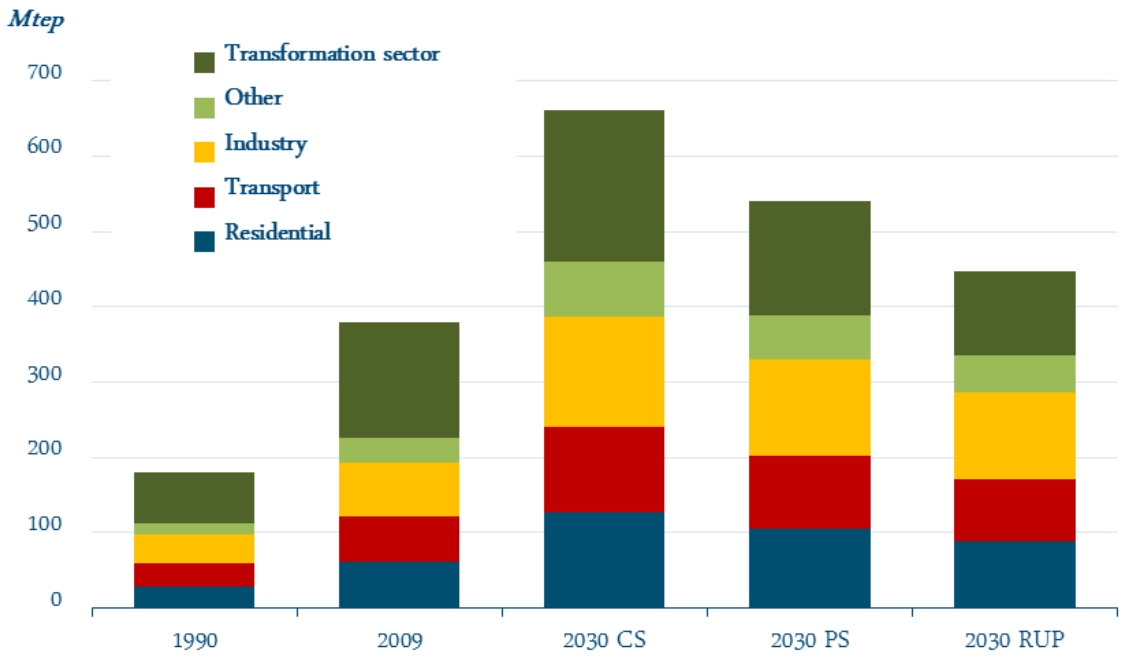
Energy demand in the Mediterranean according to scenarios



Source : OME, Plan Bleu, 2012

Energy savings from 2009 to 2030 will represent 2.8 Gtoe

SEMCs: Primary energy Demand by sector according to scenarios

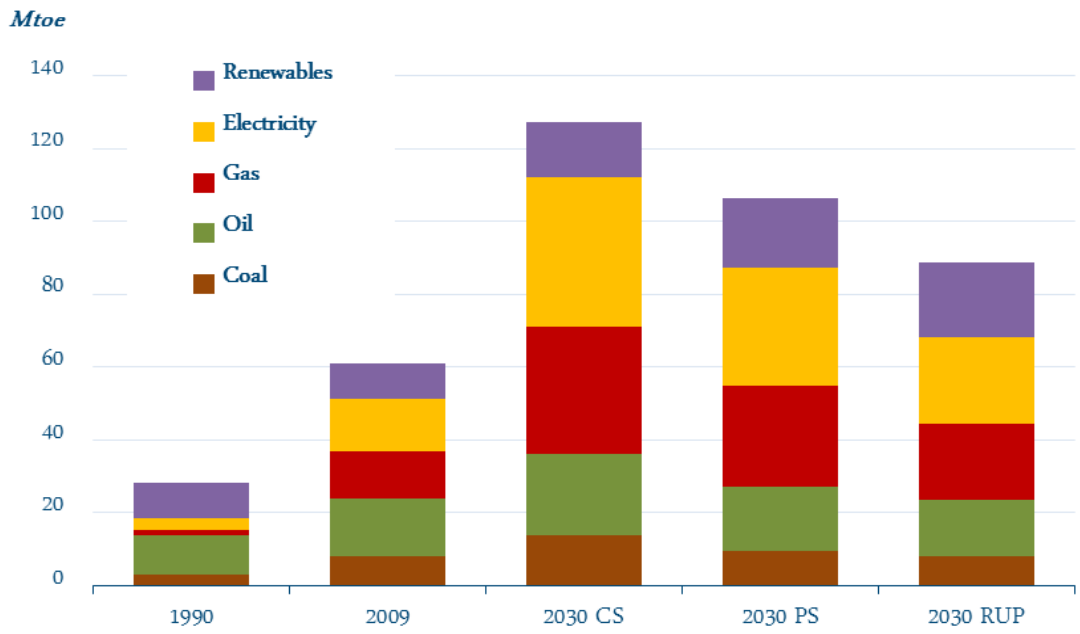


Source : OME, Plan Bleu, 2012

Reference scenario: energy demand in SEMC s should have a growth of around 3,4% per year from 2009 to 2030 (3,7% per year from 1990 to 2009), leading to 661 Mtoe in 2030 Mtep en 2030

In 2030, it should be reduced from 32% for the BS compared to reference scenario; It means 214 Mtoe energy savings in 2030 and a cumulated energy about 2,3 Gtoe (that is more than 7 years consumption)

Buildings in SEMCs: Energy demand in residential sector according to scenarios

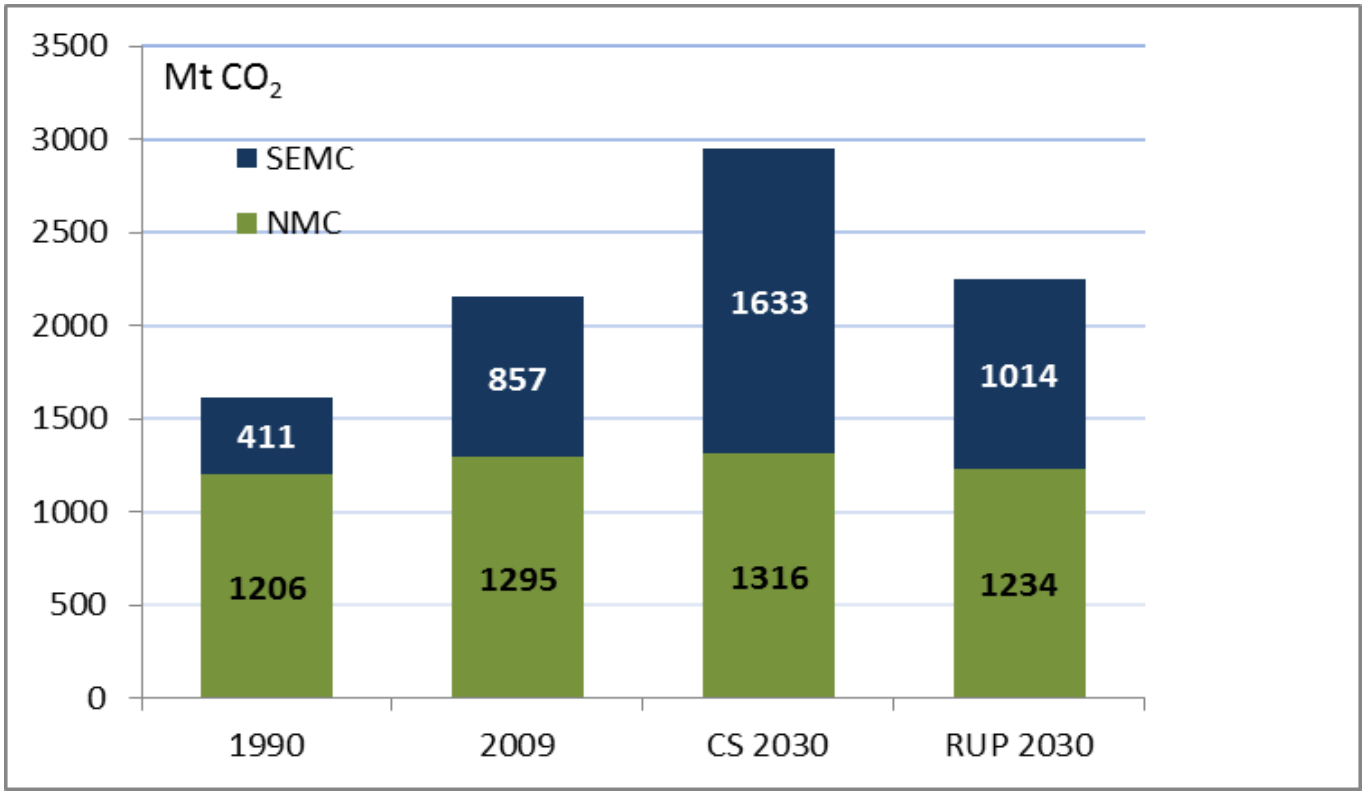


Source : OME, Plan Bleu, 2012

In 2030, residential consumption should be reduced by 30% in the breakdown scenario compared to reference scenario, leading to 39 Mtoe energy savings in 2030.

Energy saving potential will be close to 40 Mtoe in 2030, that is 30% compared to Reference scenario, leading to 40 Mtoe in 2030: 26 Mtoe of fossil fuel savings, 18 Mtoe of electricity savings and 5 Mtep of RE increase

SEMCs: CO_2 emissions according to scenarios



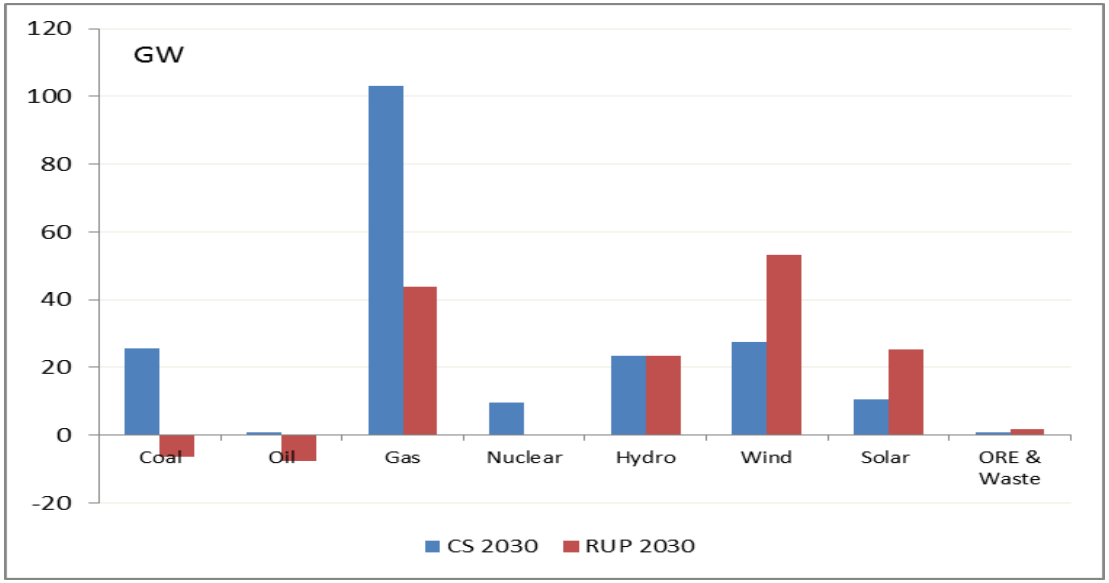
Source : OME, Plan Bleu, 2012

CO2 emissions shall thus be reduced of about one third in 2030 in Breakdown scenario compared to reference scenario

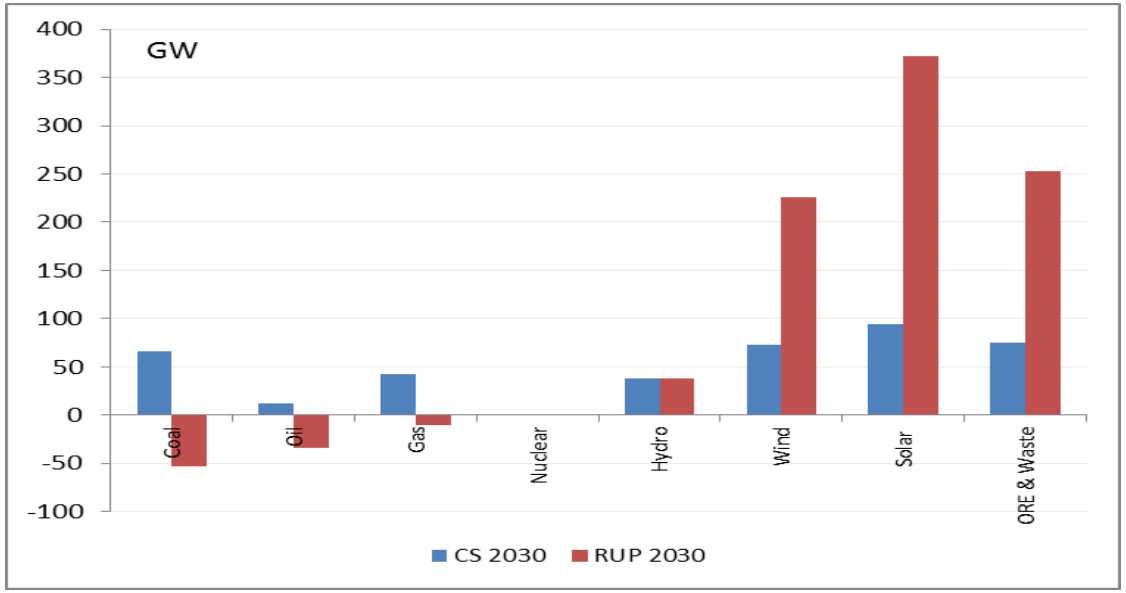
CO2 emissions will double in reference scenario.
The growth in Breakdown scenario will only be 18%

SEMCs: Power production system

Additional electricity generation capacity by 2030 (GW)



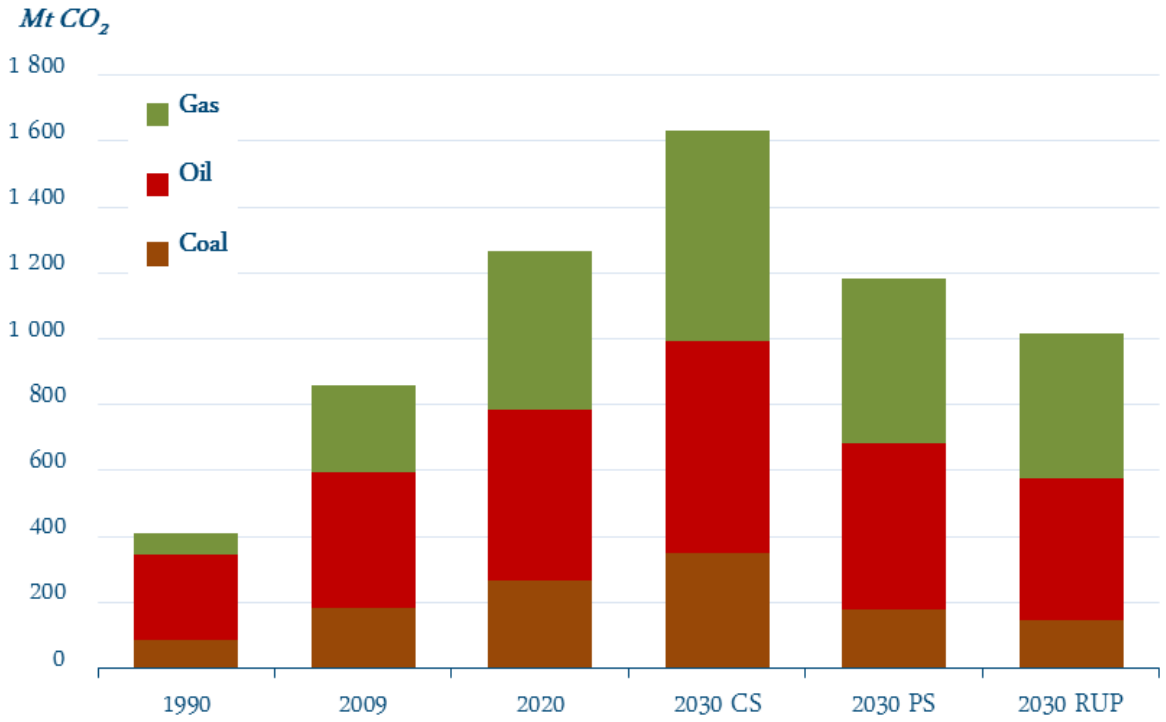
Source : OME, Plan Bleu, 2012



Source : OME, Plan Bleu, 2012

Increase of electric capacity between 2009 and 2030

SEMCs: CO_2 emissions according to scenarios

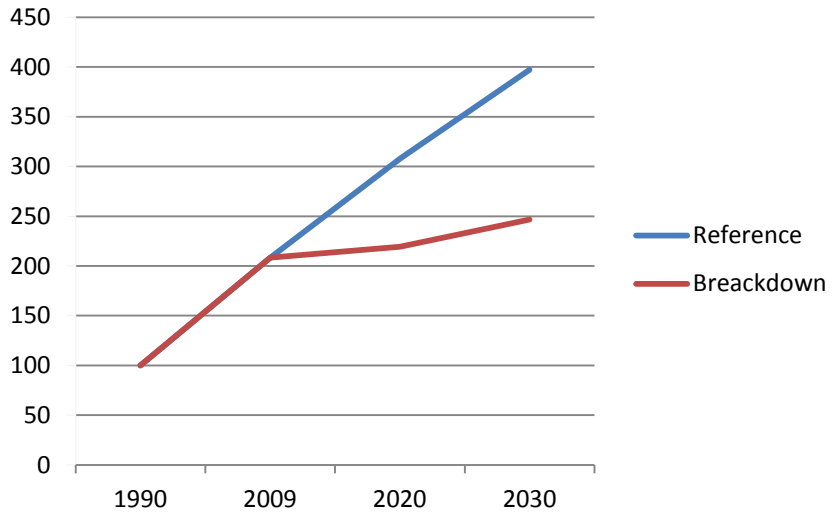


Source : OME, Plan Bleu, 2012

In the Reference scenario, CO_2 emissions PSEM should increase 3,1% per year from 2009 to 2030, reaching 1633 Mt in 2030 (+40%)

In the Breakdown scenarios CO_2 emissions should increase of only 18 %

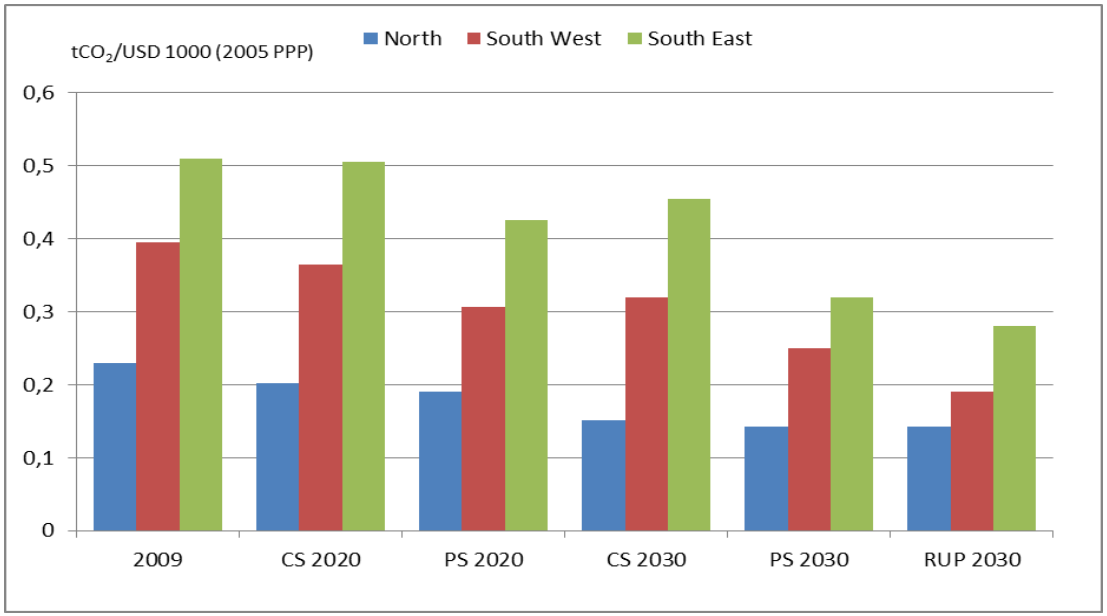
SEMCs: CO_2 emissions according to scenarios



SEMCs: CO_2 emissions trends from 1990 to 2030 (base 100 in 1990)

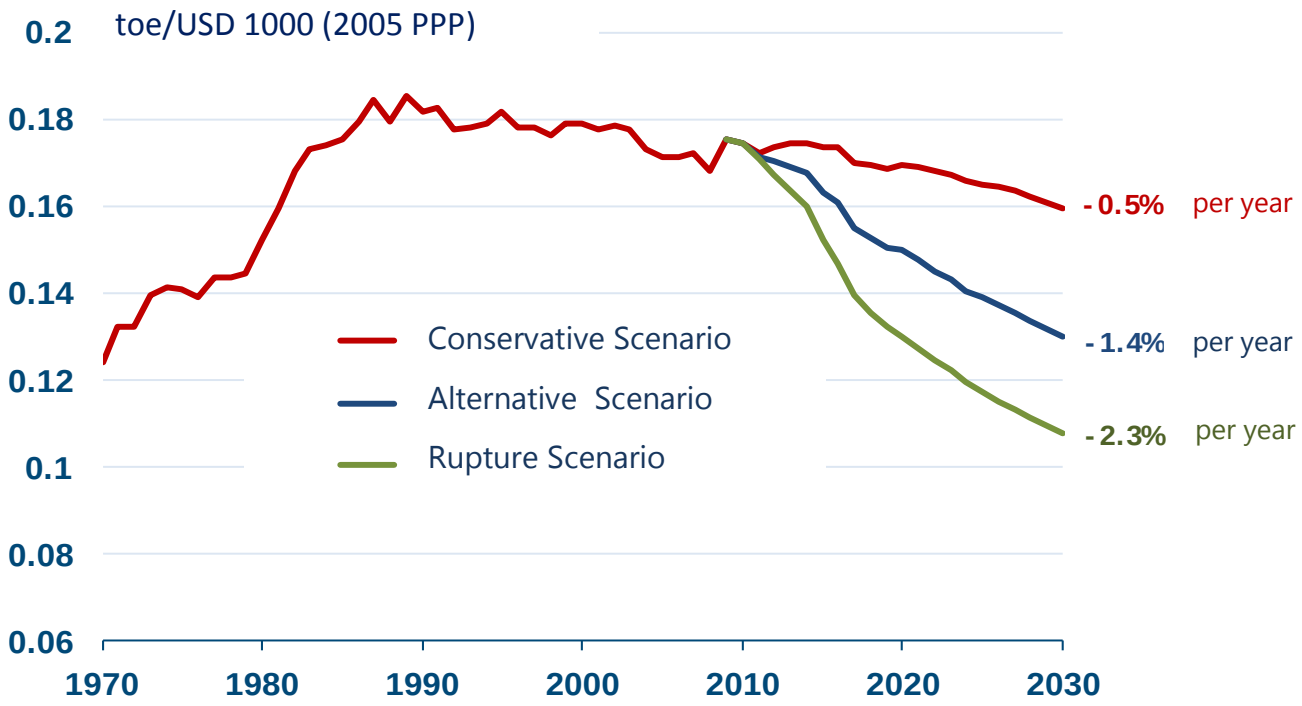
Source : OME, Plan Bleu, 2012

Carbon intensity by sub region



Source : OME, Plan Bleu, 2012

Energy intensity in SEMCs



Source : OME, Plan Bleu, 2012

Energy intensity will decrease in all scenarios, but more especially in the Breakdown scenario, leading to rates below levels of the 1970s

Recommendations

- Improving scenarios assumptions
- Organizing data reporting
- Realizing simulation on the basis of scenarios
- Evaluating the energy strategies sensitivity to different scenarios
- Articulating prospective regional work with national and local prospectives
- Imagining a major breakdown scenario for a more distant future?