Energy policy development in MENA using a technology-driven energy planning approach

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Summary

Countries in the Middle East and North Africa (MENA), a region spanning from Morocco to Iran and encompassing some 20 countries, exhibit different energy consumption levels, but they share their reliance on fossil fuels for energy sufficiency.

- Highest energy consumption in the GCC; countries relying 100% on hydrocarbons for energy supply.
- Contribution of hydro & new renewables to total energy mix less than 2% at MENA aggregate level.

Forecast socio-economic development trends predict a continuation of energy demand growth in the MENA region.

- International Energy Agency projects total energy demand growth of around 2% p.a. through 2035.
- Projections predict no major departure from reliance on fossil fuels for energy sufficiency.

In recent years, MENA countries commenced to more proactively manage (the growing) energy demand and exploit the vast regional renewable energy resources. However, more can and should be done, especially in GCC countries.

This PhD thesis seeks to develop a MENA-specific energy planning and energy policy analysis framework that supports effective, technology-driven energy policy making.

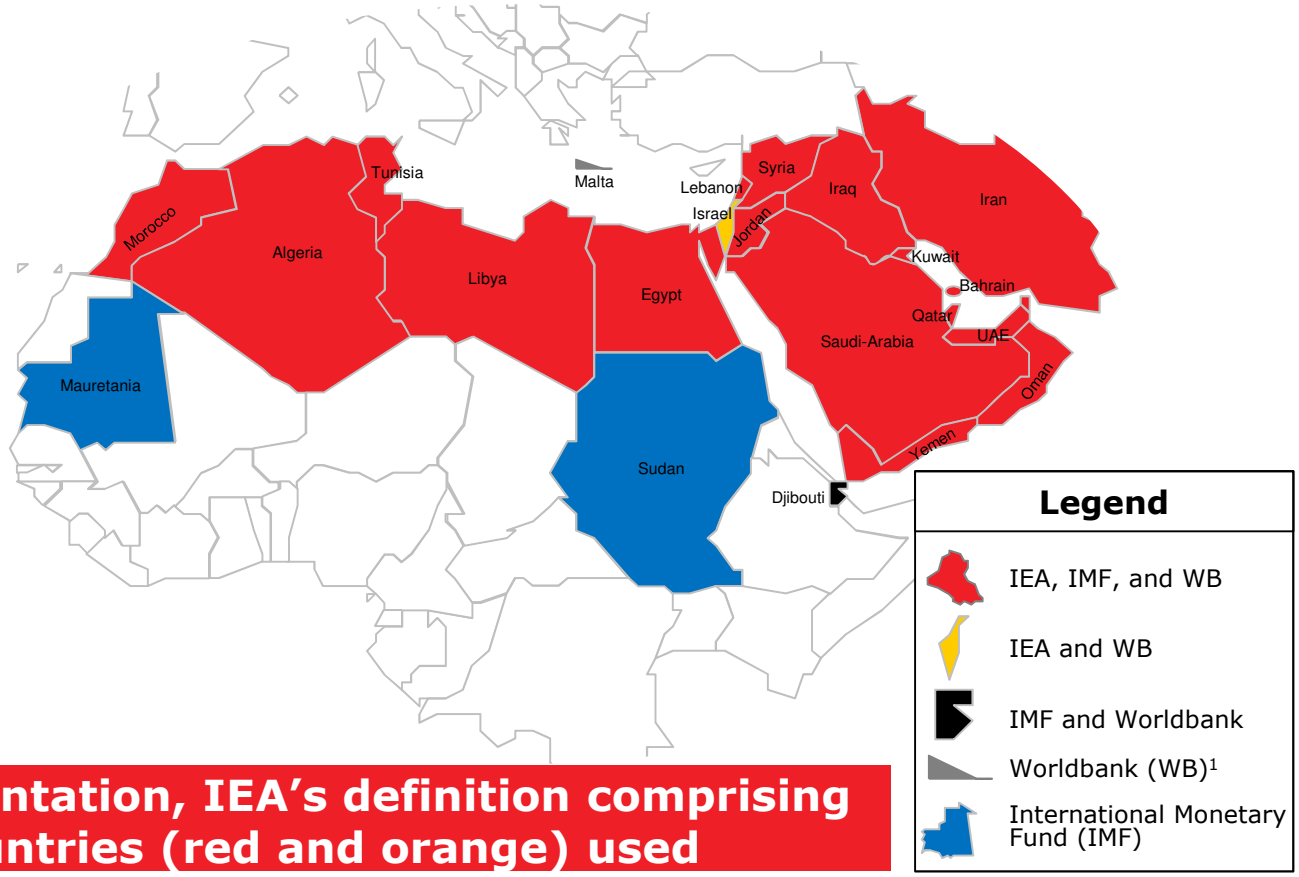
The implementation of the proposed energy policy development framework will be illsutrated by way of a case study applied to the United Arab Emirates.

No unique definition of MENA

Definition on en.wikipedia.org

"The term MENA, for 'Middle East and North Africa', is an acronym often used in academic and business writing. The term generally covers an extensive region, extending from Morocco in northwest Africa to Iran in southwest Asia. […] **MENA has no standardized definition.**"

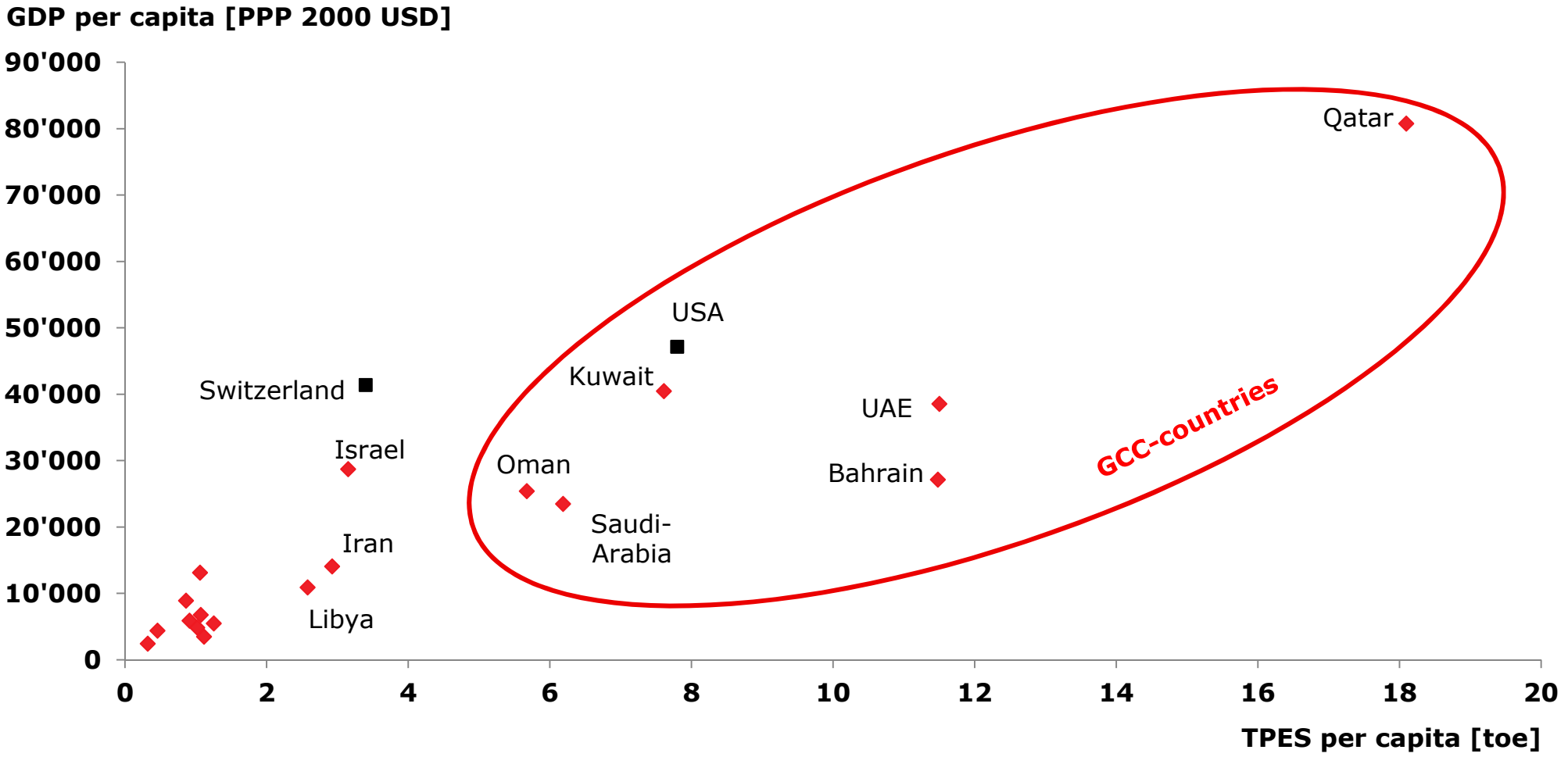
International organizations use various definitions of MENA



In this presentation, IEA's definition comprising 18 countries (red and orange) used

1. Also encompasses the Gaza Strip and the West Bank
Source: IEA; Worldbank; IMF; Arab League

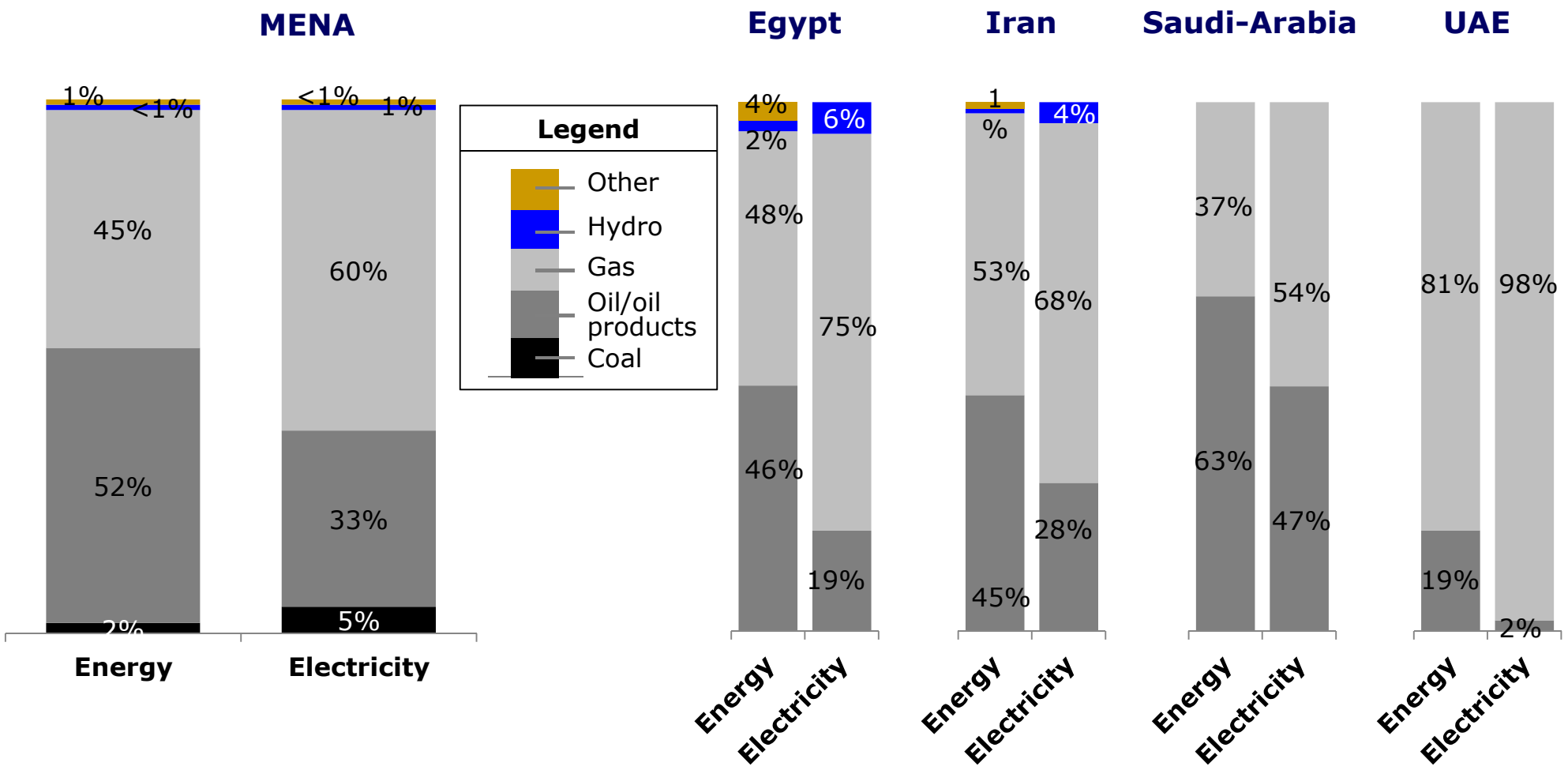
Large differences in per capita energy consumption, high consumption in GCC countries



Note: TPES = Total Primary Energy Supply; all data as of 2008 Source: IMF, IEA

MENA's strategy for energy sufficiency: Domestic fossil fuels

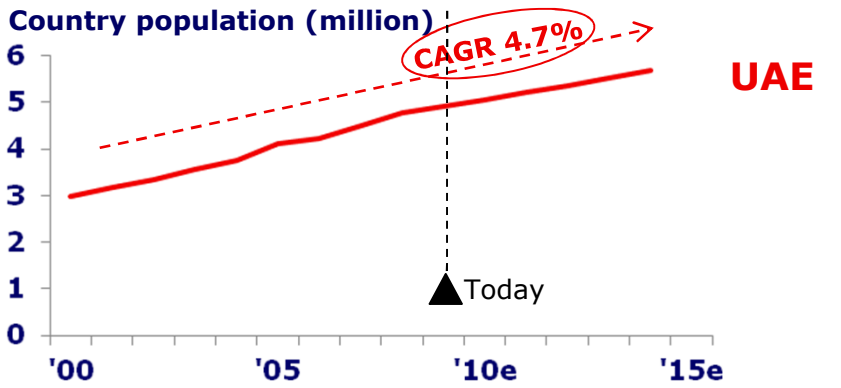
TPES and electricity mix



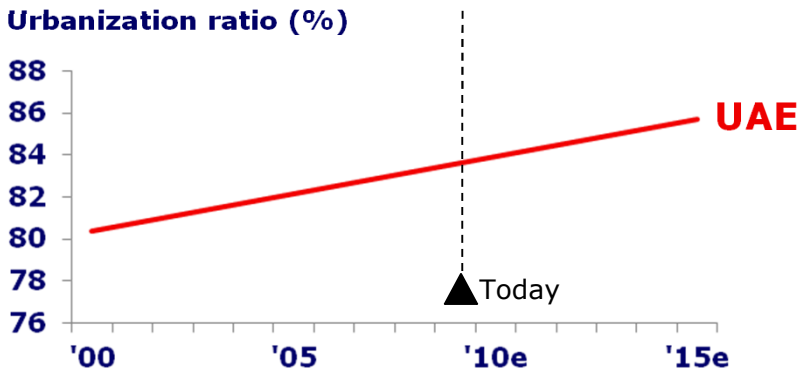
1. Disregarding (negligible or inexistent) electricity imports and exports in MENA
Note: All data as of 2007 Source: IEA

Indicators predict rising energy demand – example UAE

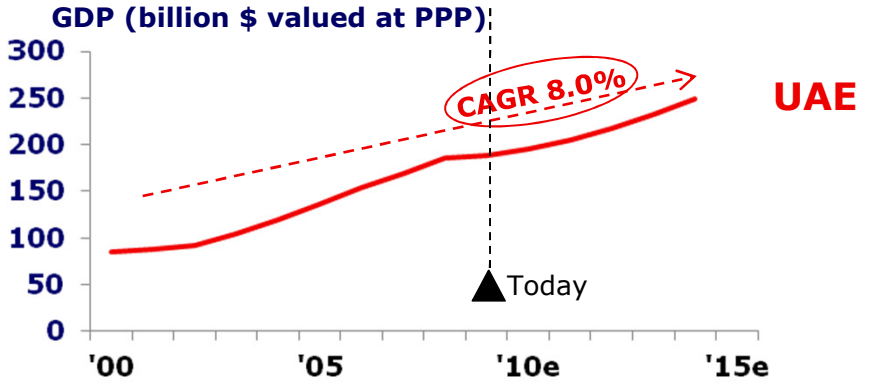
Rising population[1]



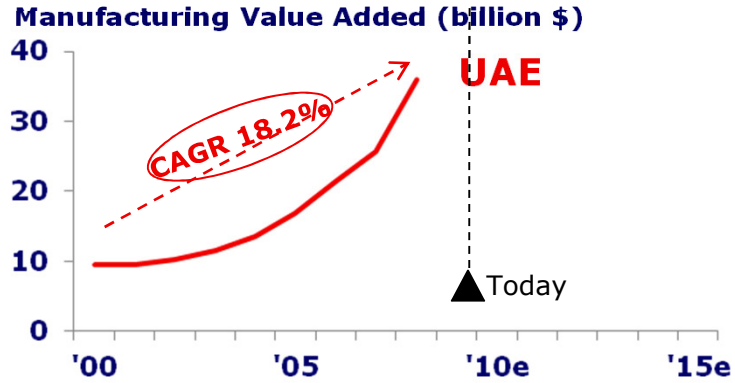
Mounting urbanization[2]



Recovering GDP[1]



Accerlerating Industrialization[2]

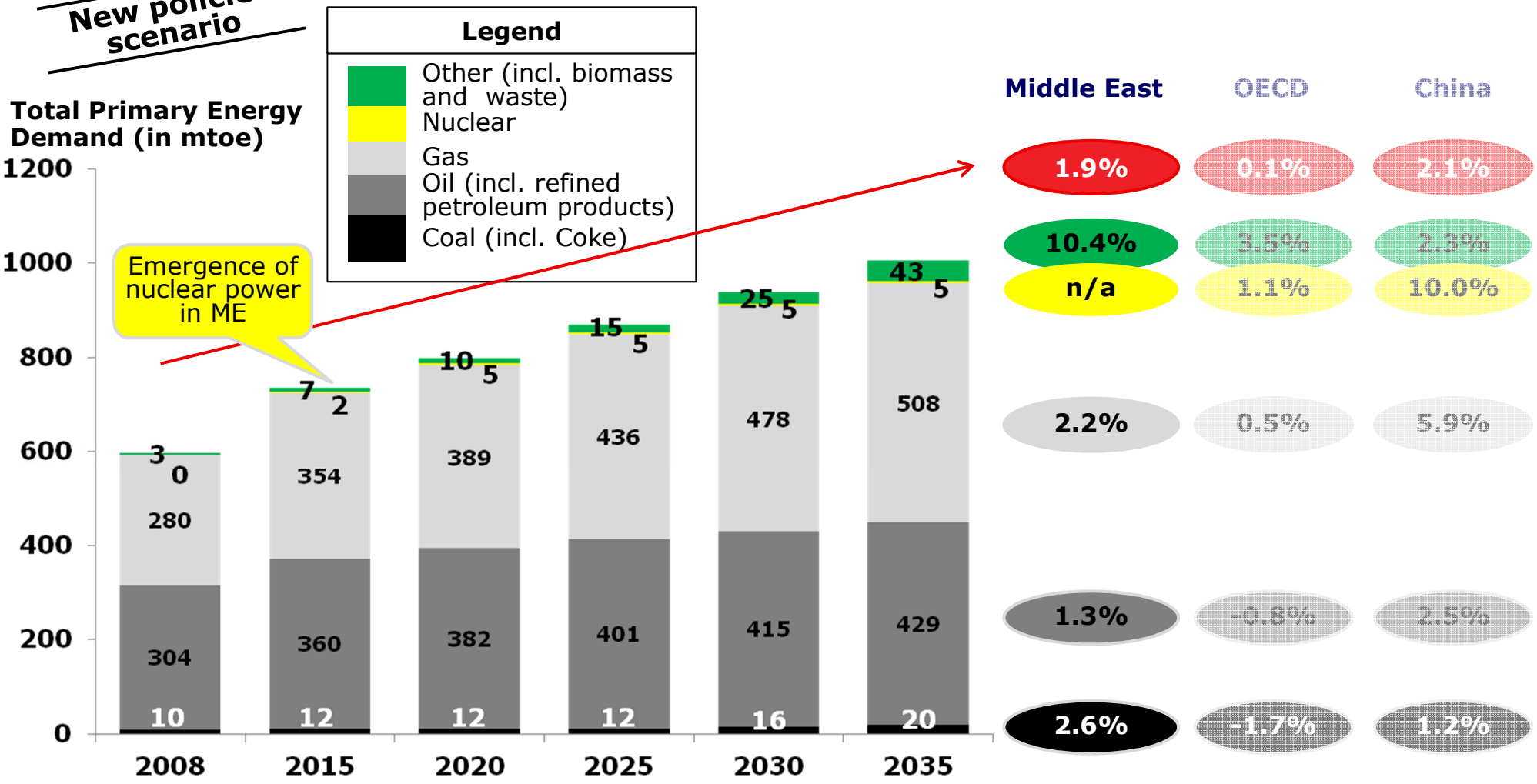


Growing competition between hydrocarbon exports and domestic energy demand

1. IMF WEO 2. United Nations Statistics Department

ME energy demand projected to grow at 1.9% through 2035 - primarily provided by fossil fules

New policies scenario



Note: mtoe = million tons of oil equivalent Source: World Economic Outlook 2010

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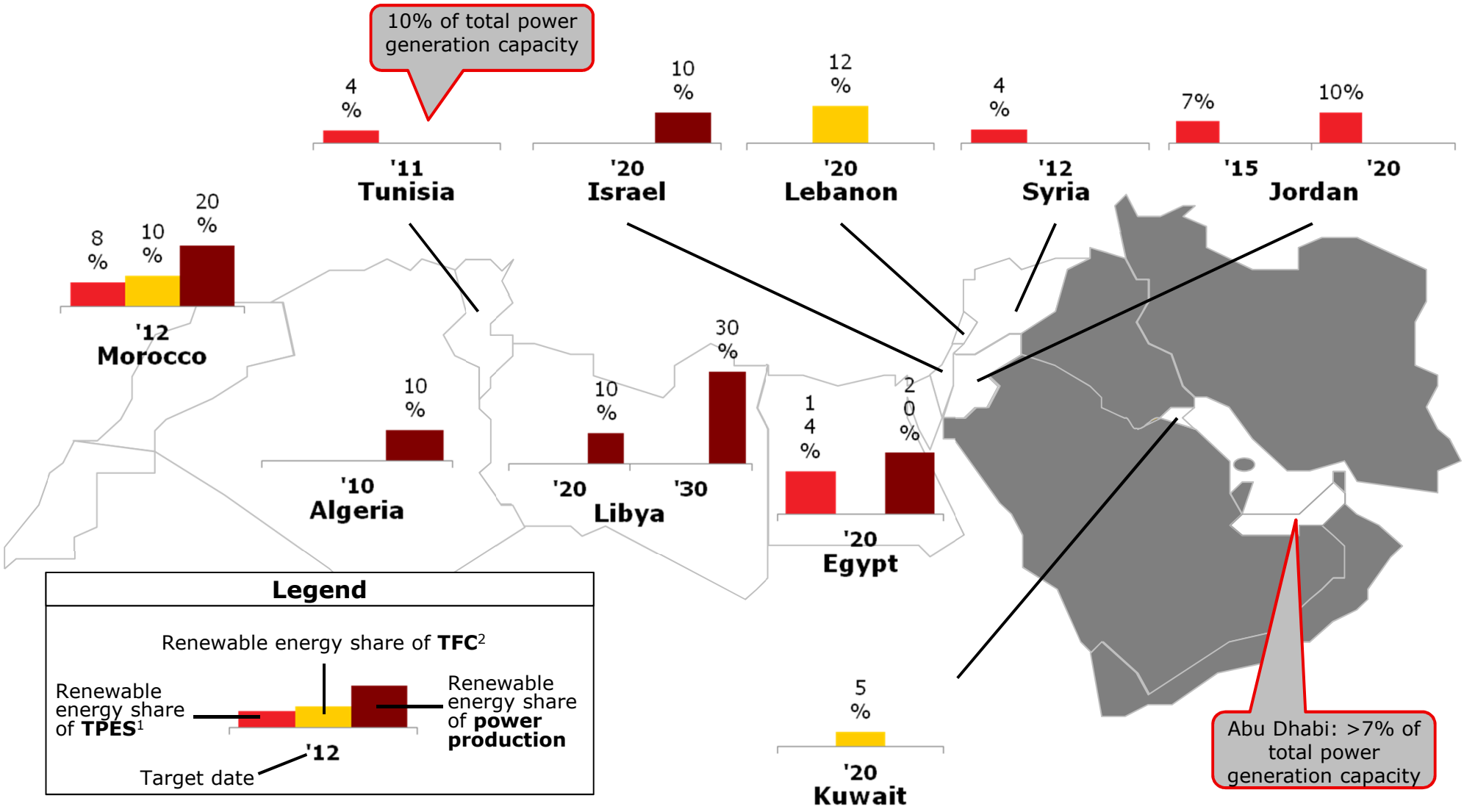
Modest renewable energy targets



1. Total Primary Energy Supply 2. Total Final Consumption
Source: Renewables 2010 – Global Status Report as of September 2010; IEA Policies and Measures Databases

Energy policy analysis framework seeks to answer three questions

- What are ambitious, but realistic energy demand scenarios given today's available technology options and projected technological advances;
- What is the least cost electricity sector expansion scenario taking account of conventional and non-conventional electric energy generation, energy storage, and Demand-Side-Management (DSM) technologies subject to particular fuel[1]- and technology[2]-related constraints; and
- What are feasible public policy options to realize these scenarios and what are related estimated implementation costs?

Key elements

- Methodology focus: MENA; case study focus: UAE
- Technology-driven projection of total final energy demand
- Technology driven optimization of the electricity sector
- Policy recommendations

1. Primarily fuel availability and fuel prices
2. Technical properties, technology status, renewable energy resources, network reliability