



Politique et sécurité énergétique dans le contexte des nouvelles énergies

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Colloque

L'Énergie : enjeux socio-économiques et défis technologiques

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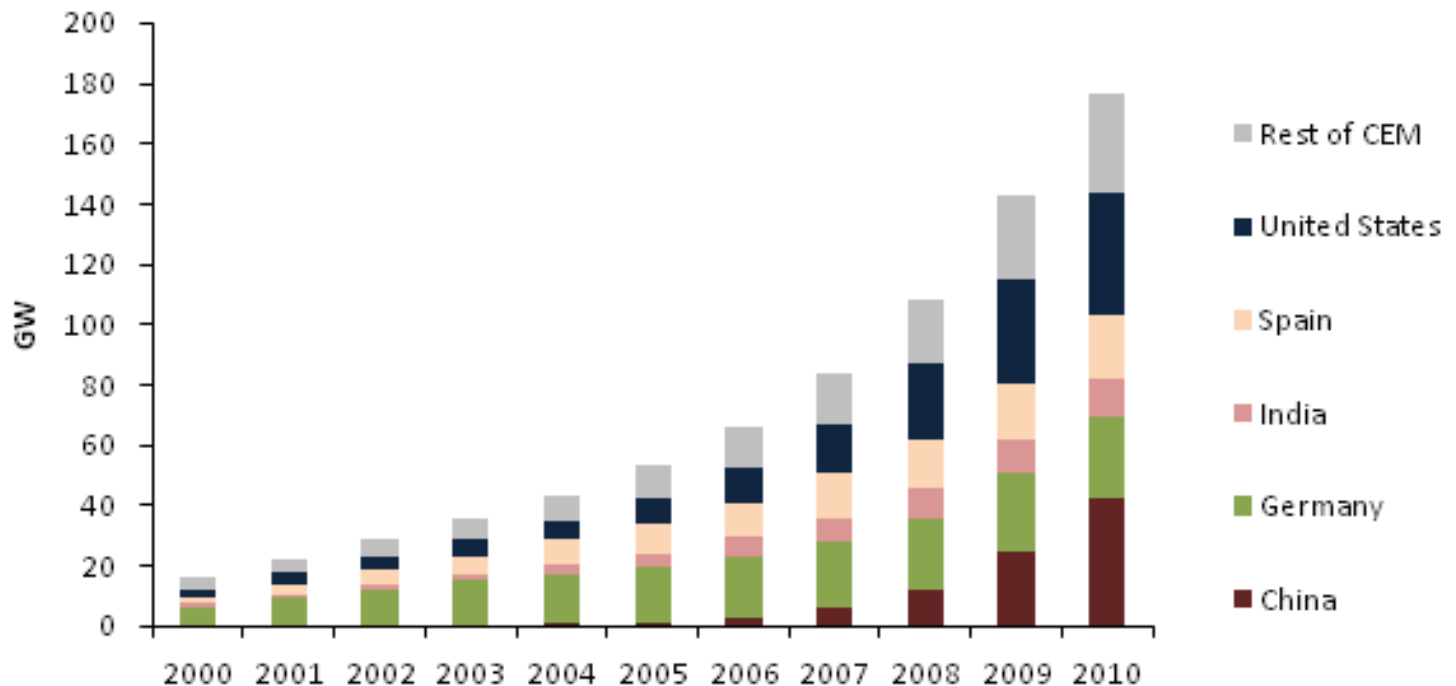


Contents

- Recent trends in renewable energy
- Renewables in IEA world energy scenarios
- Emerging policy issues
- Grid integration of variable renewable power
- R&D and IEA Energy Technology Roadmaps

Renewable energy is growing at its fastest rate ever...

Clean Energy Ministerial countries' wind power capacity



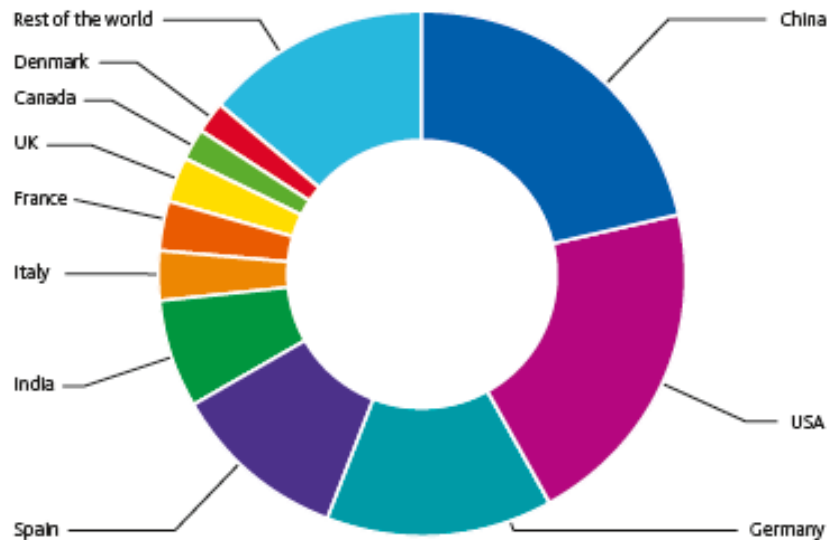
Wind has been growing at 25% average annual growth over a decade



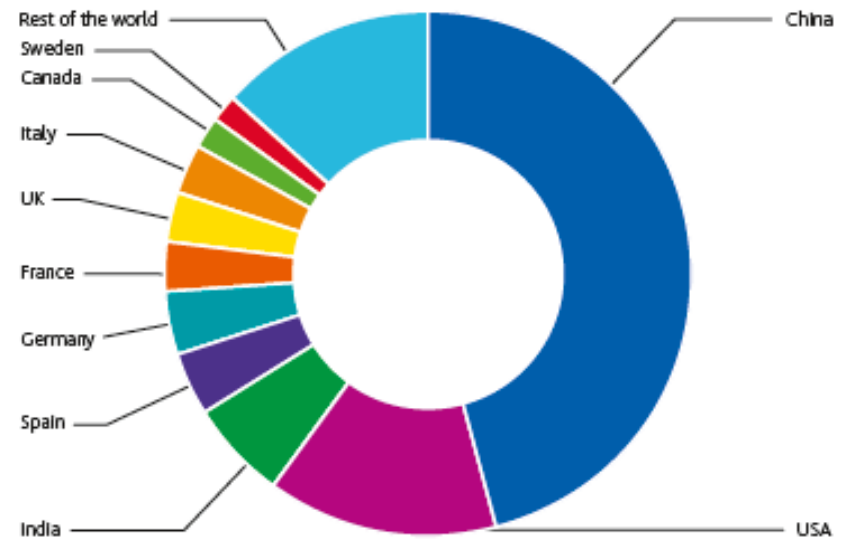
...and moving East

Top 10 wind cumulative capacity and markets 2010

TOP 10 CUMULATIVE CAPACITY DEC 2010



TOP 10 NEW INSTALLED CAPACITY JAN-DEC 2010

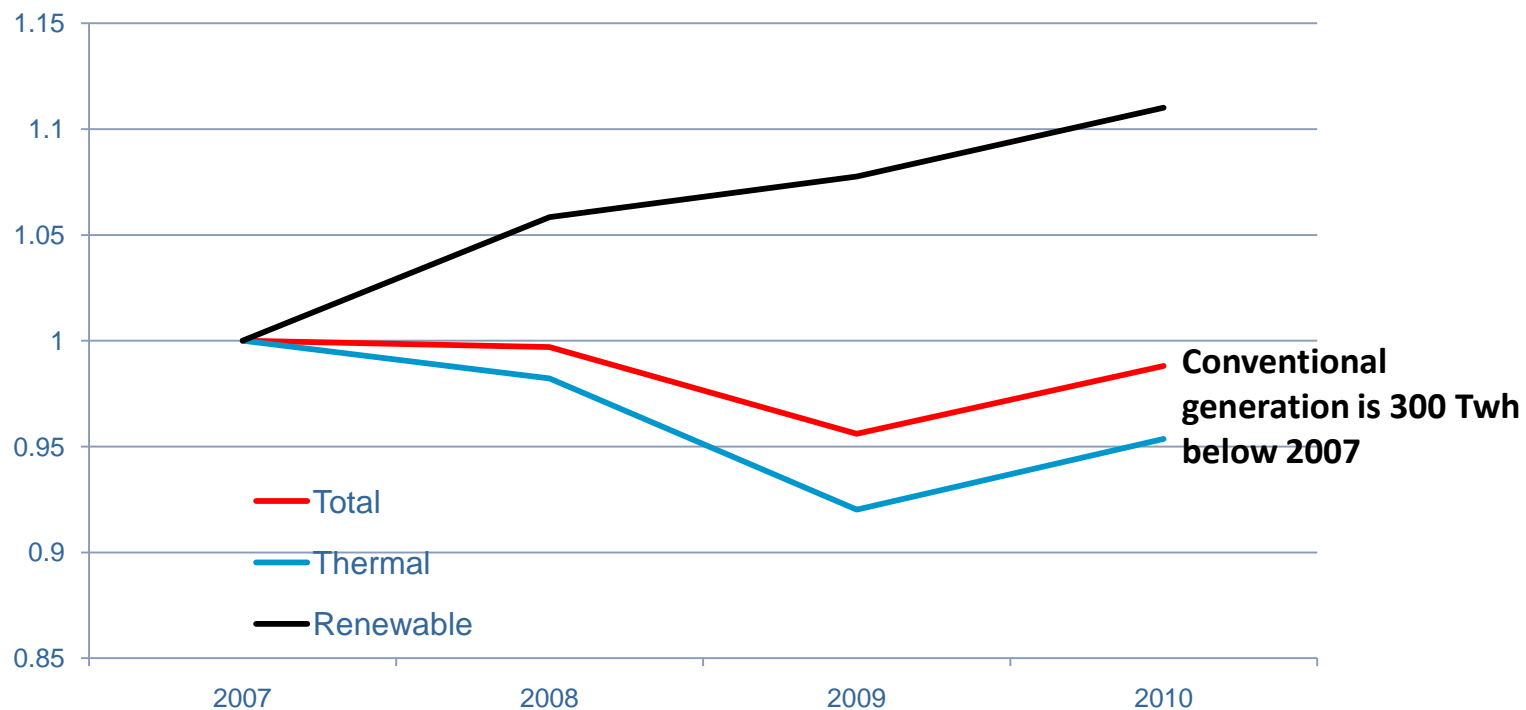


Source: GWEC 2011



Renewable electricity in OECD

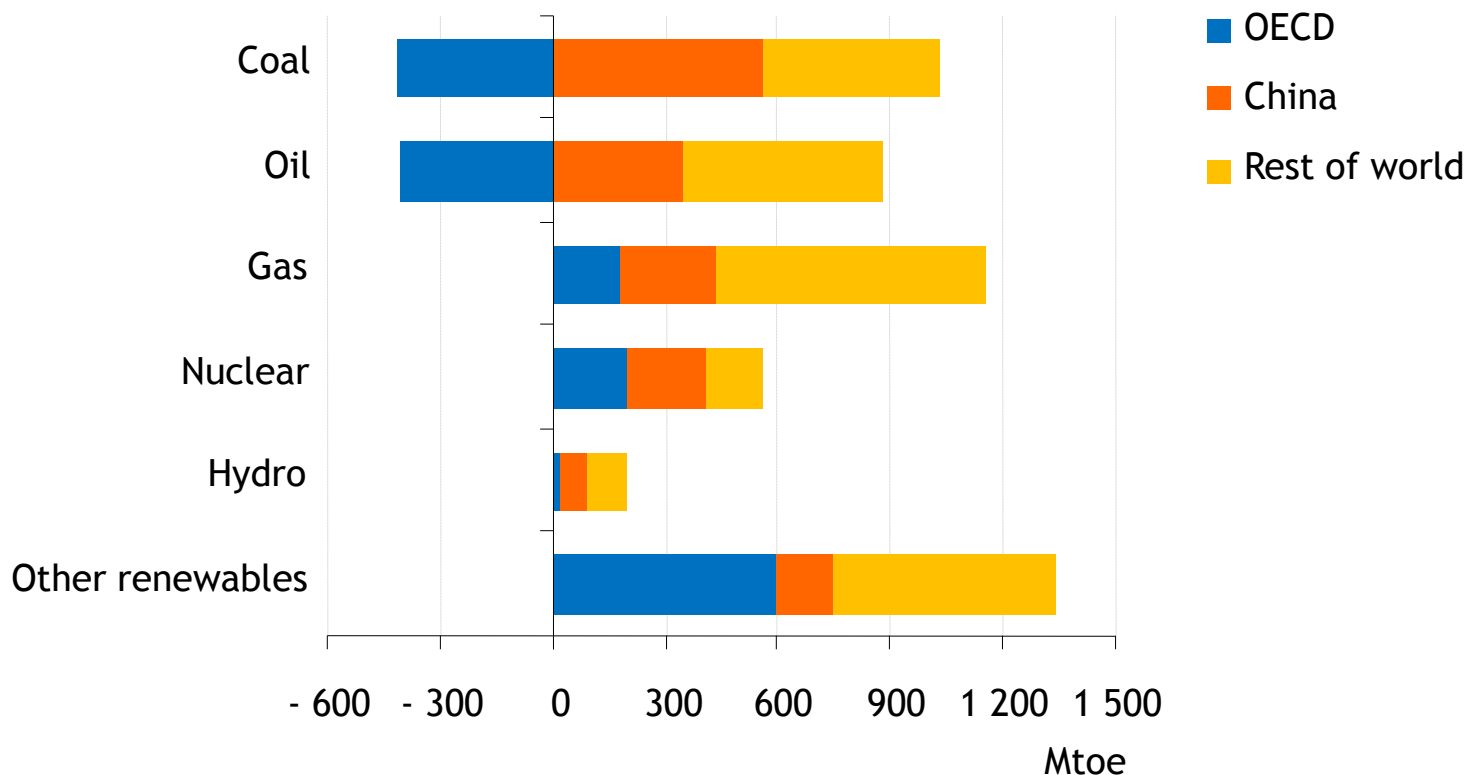
OECD power generation, 2007=1.00



2010 OECD gas demand is 3% over pre-financial crisis levels but largely due to temperature effects

Emerging economies dominate the growth in demand for all fuels

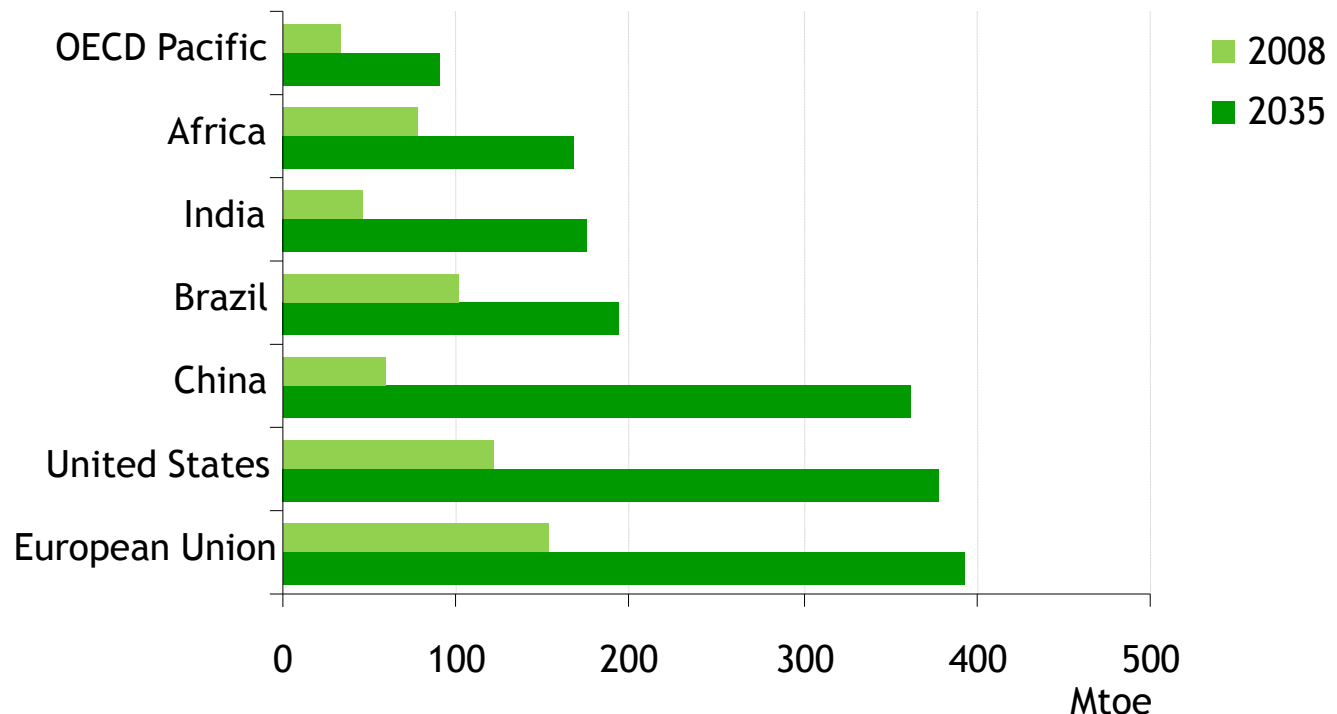
Incremental primary energy demand in the New Policies Scenario, 2008-2035



Demand for all types of energy increases in non-OECD countries, while demand for coal & oil declines in the OECD

Renewables enter the mainstream

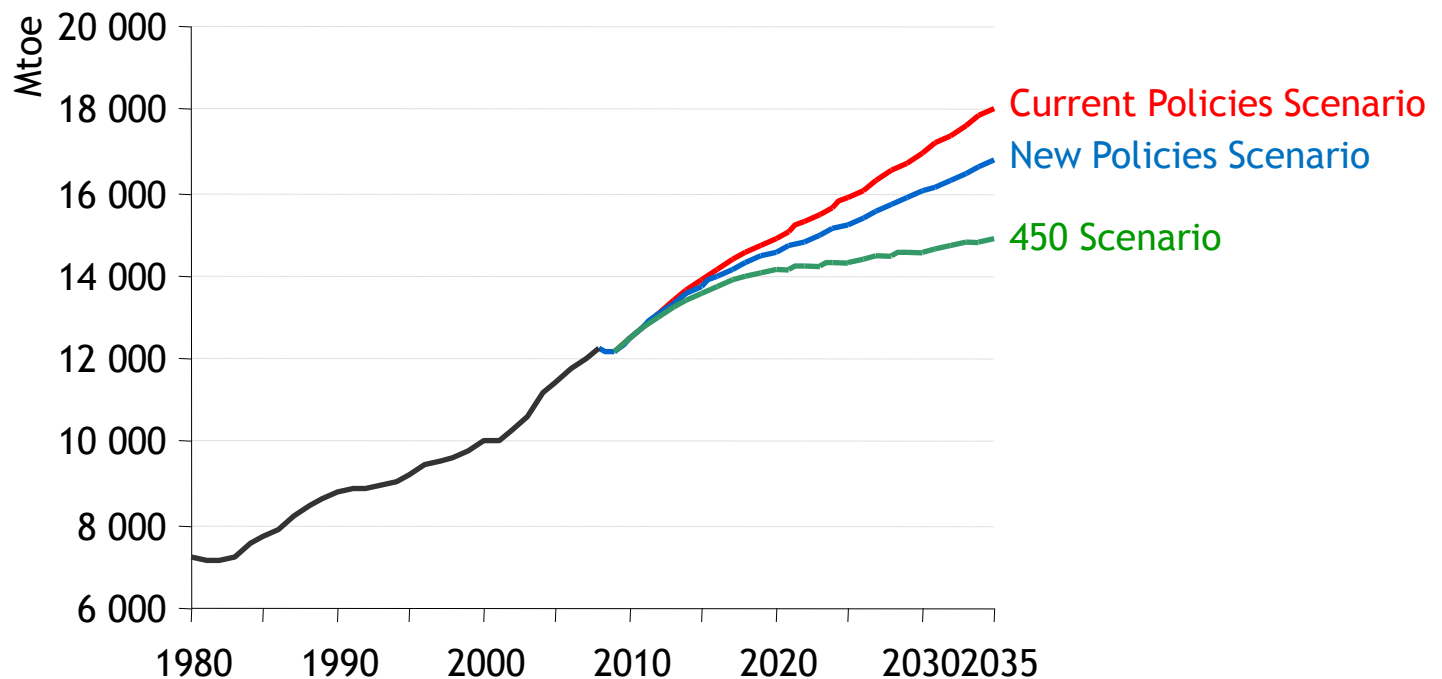
Renewable primary energy demand in the New Policies Scenario



The use of renewable energy triples between 2008 & 2035, driven by the power sector where their share in electricity supply rises from 19% in 2008 to 32% in 2035

Policies can dramatically alter the long-term energy outlook

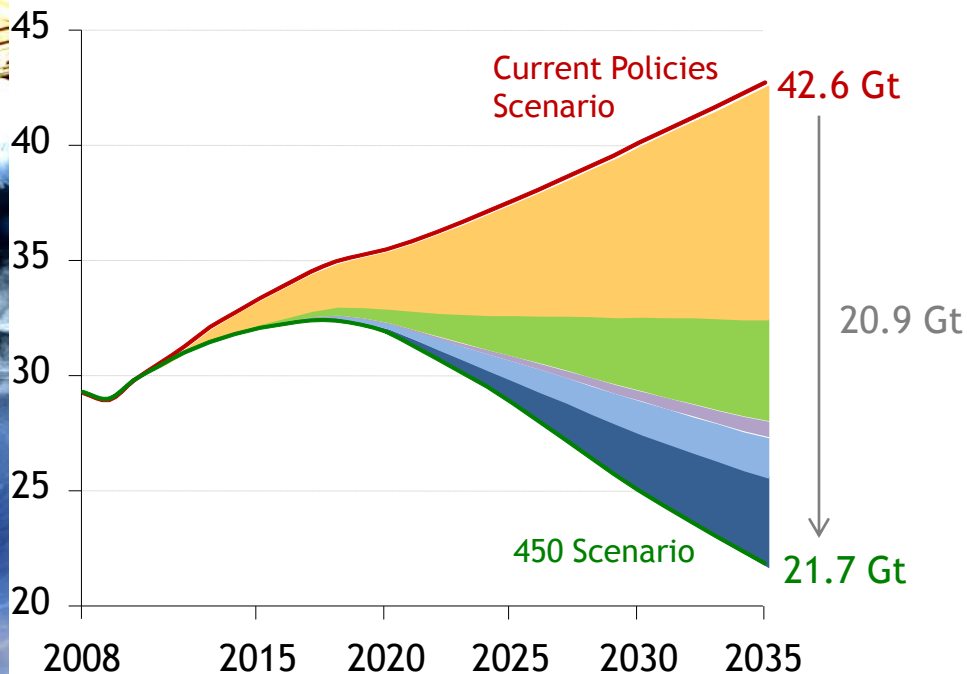
World primary energy demand by scenario



In 2035, energy demand is 8% higher than in the Current Policies Scenario and 11% lower in the 450 Scenario than in the New Policies Scenario

The 450 Scenario: *How do we get there now?*

World energy-related CO2 emission savings by country in the 450 Scenario relative to the Current Policies Scenario

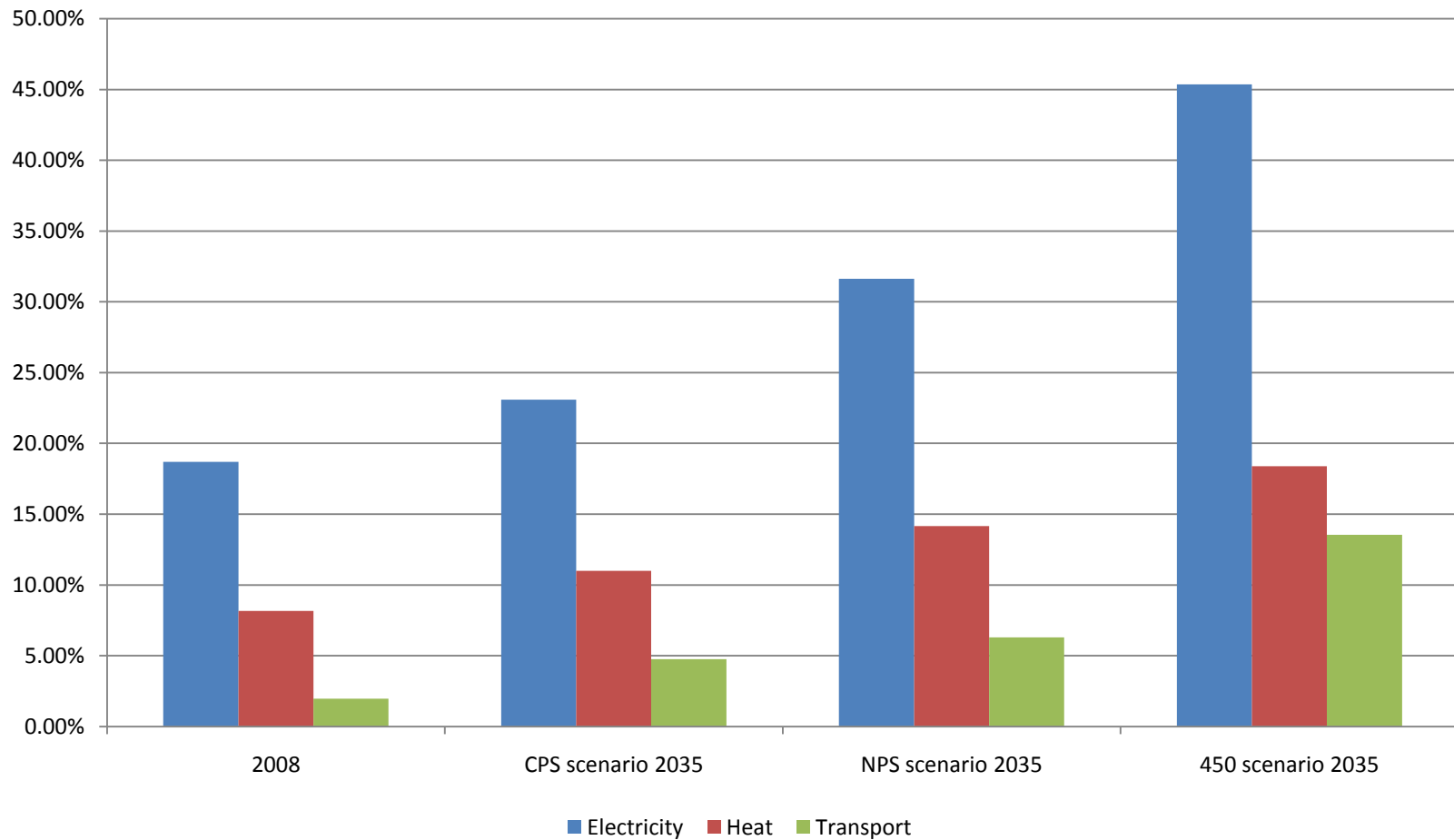


Share of cumulative abatement between 2010-2035

Efficiency	53%
Renewables	21%
Biofuels	3%
Nuclear	9%
CCS	15%

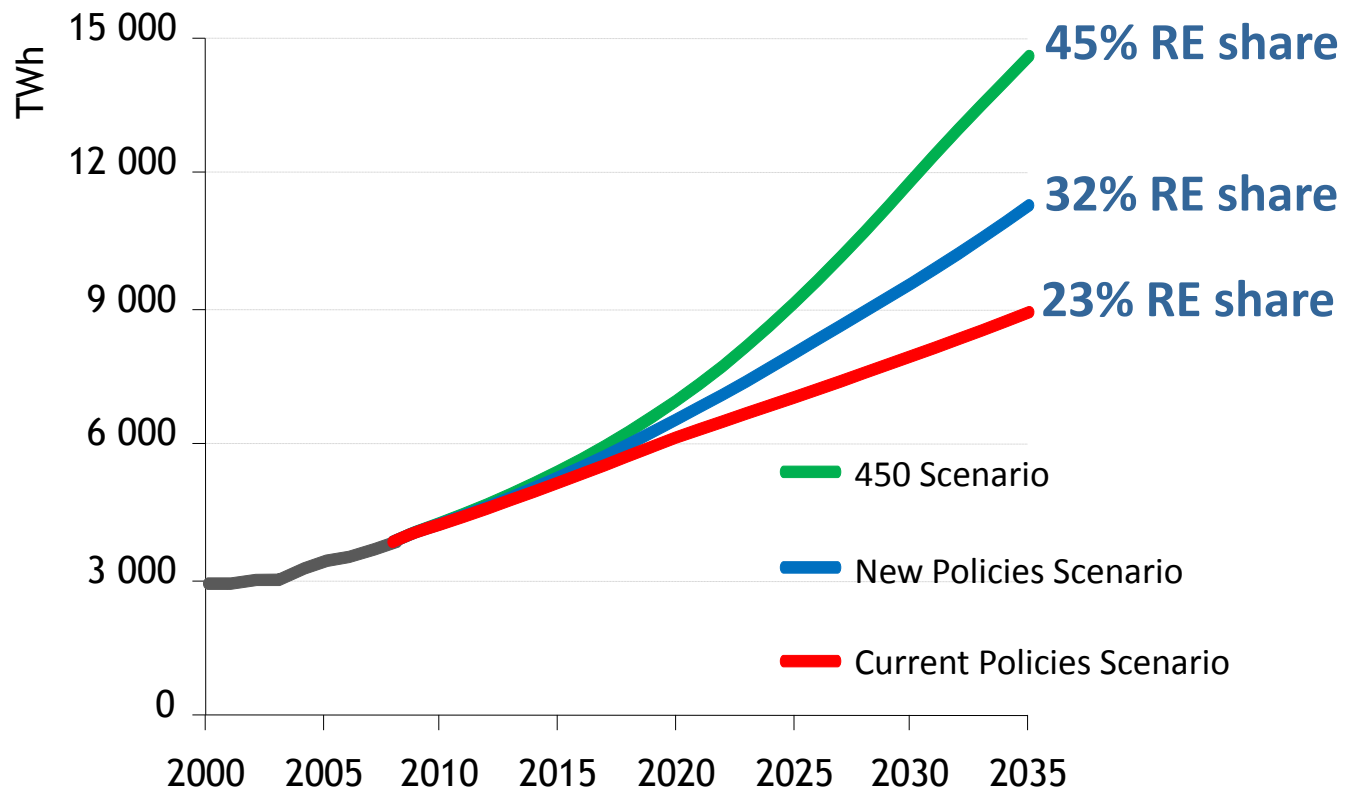
Renewables are the second most important contributors to CO2 emissions reduction

Growing shares of renewables in all sectors, for all scenarios



All scenarios point out a large growth of renewables

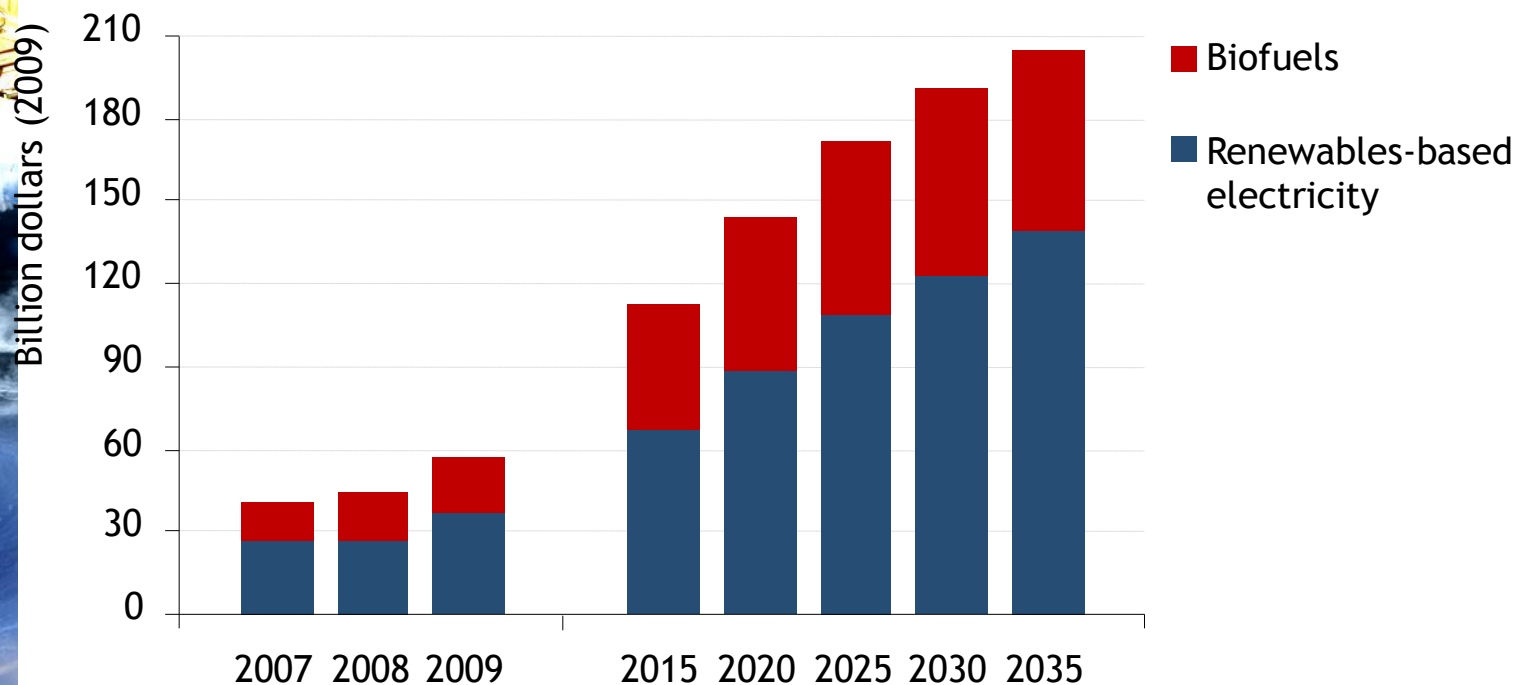
Renewable electricity is vital in all scenarios



Global electricity from RE increases from 3 800 TWh (2008) to 14 500 TWh (2035) in the 450 Scenario

But, at global level, government support will continue to grow

Annual global support for renewables in the New Policies Scenario

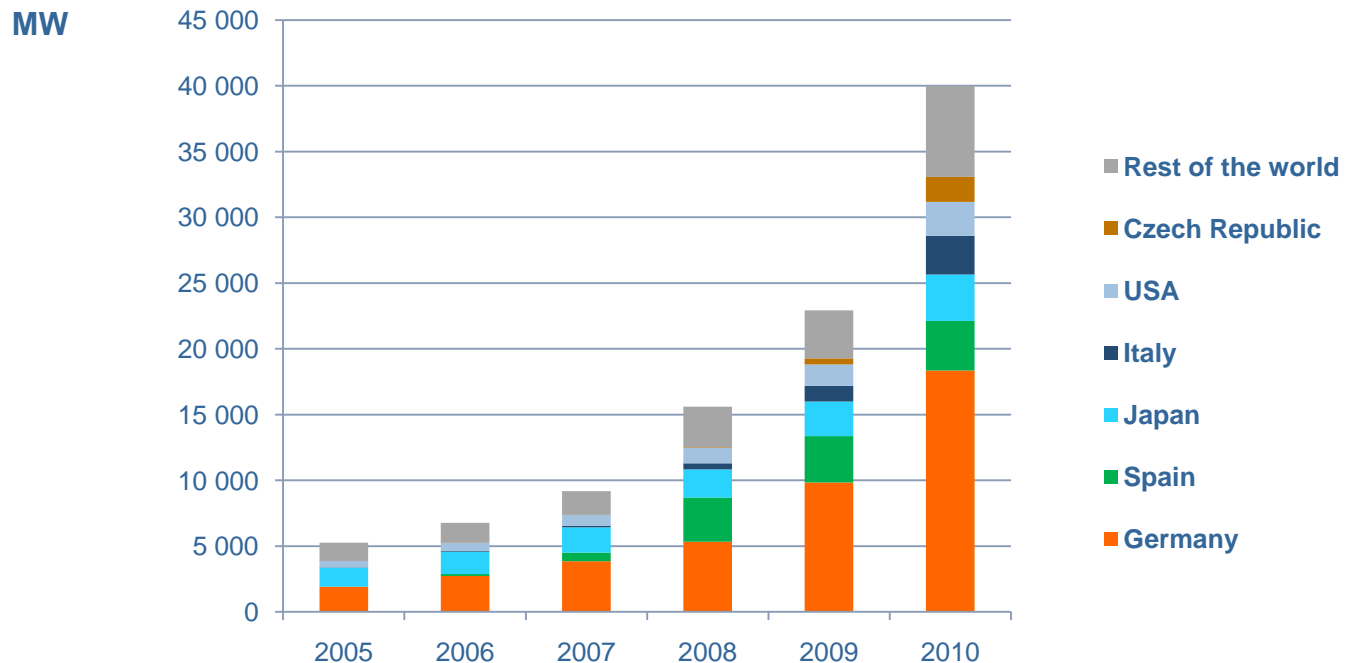


Government support remains the key driver – rising from \$57 billion in 2009 to \$205 billion in 2035 – but higher fossil-fuel prices & declining investment costs also spur growth

However, new issues are emerging

- **Unexpected PV growth raises policy cost concerns in several EU countries (Czech Rep., Spain, France, Germany, Italy)**

Accumulated global PV capacity



Sources: IEA PVPS, BP Statistical Report, BNEF



Principles of good policy design still hold

- Many OECD countries have entered new phase of RE policy which requires dynamic transformation

Inception/
Onset Phase

Take-Off/ Mass
Deployment
Phase

Consolidation
Phase

Deployment

■ Address non-economic barriers

■ **Predictable and transparent incentives**

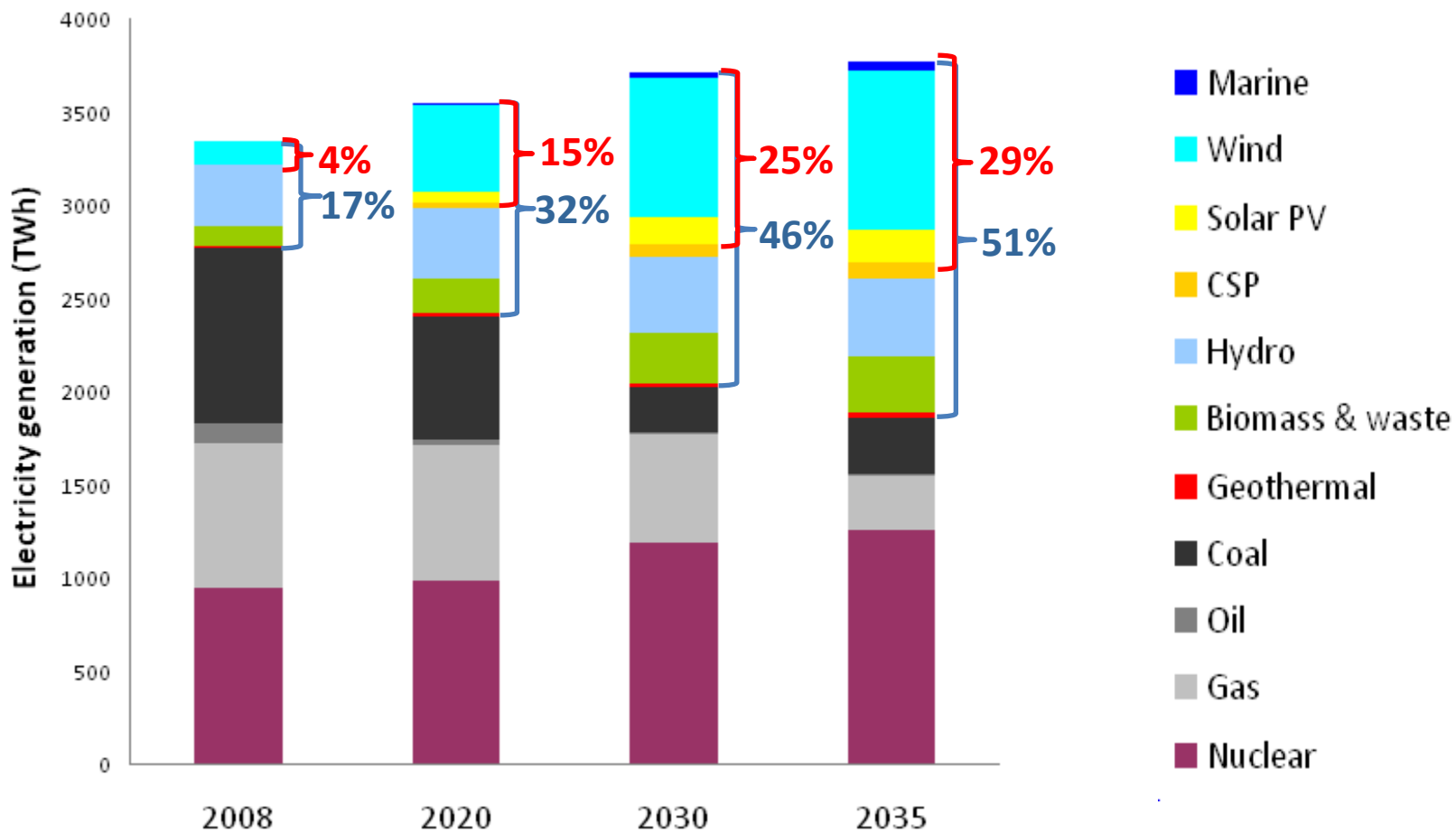
■ **Transitional decreasing over time**

■ Tailored to adapt to technology and market maturity

■ **Take system integration into account**

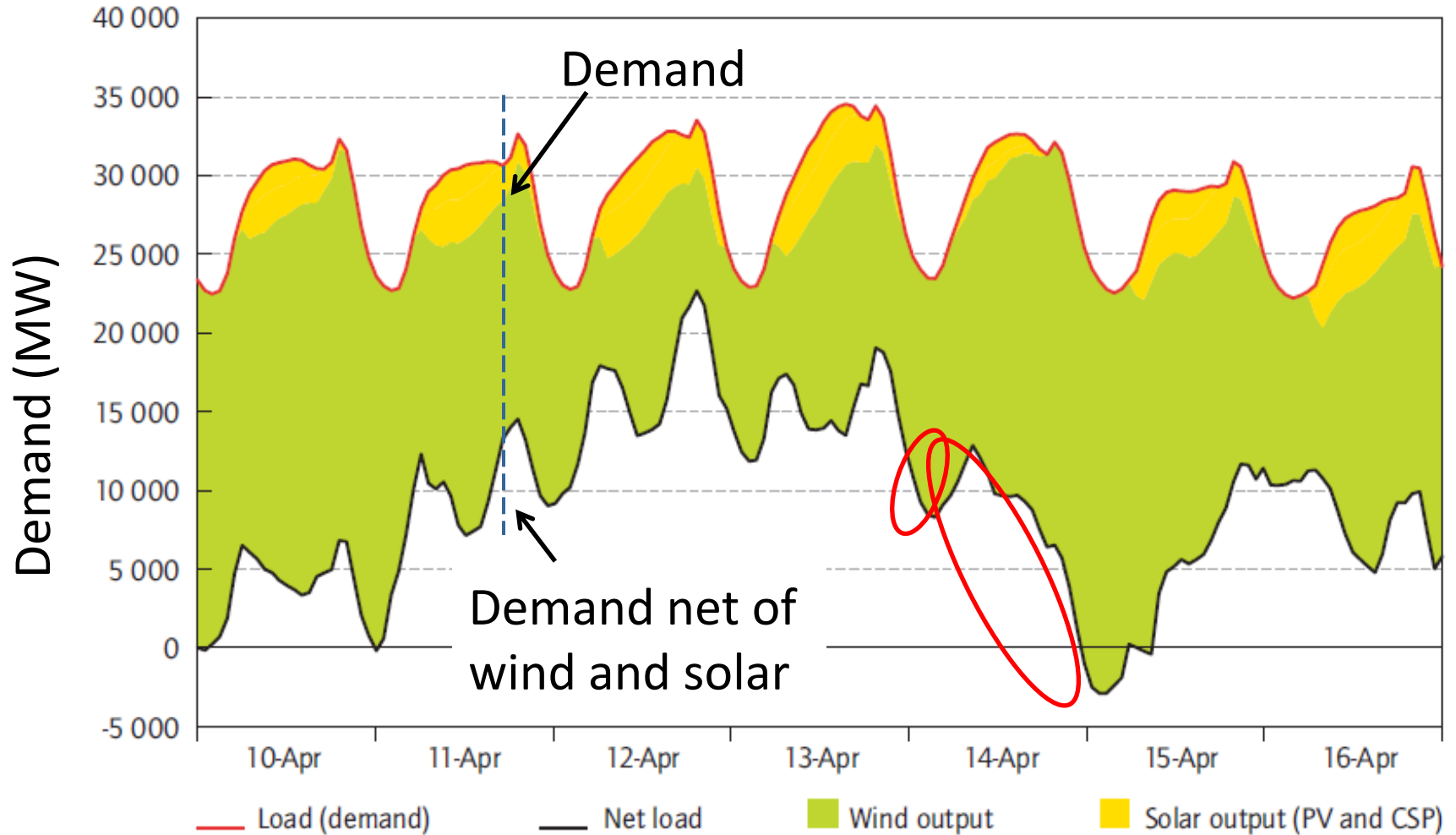
Importance of var-RE

WEO 450 Scenario electricity projections – EU



Emerging challenges: grid integration

Variability is not new, but it does get bigger



Source: *Western Wind and Solar Integration Study*, GE Energy for NREL (2010)

Flexibility is key

There are 4 flexible resources

Dispatchable
power plants

Demand side
Response
(via smart grid)

Energy storage
facilities

Interconnection
with adjacent
markets



A biomass-fired
power plant



Industrial

residential



A pumped hydro
facility



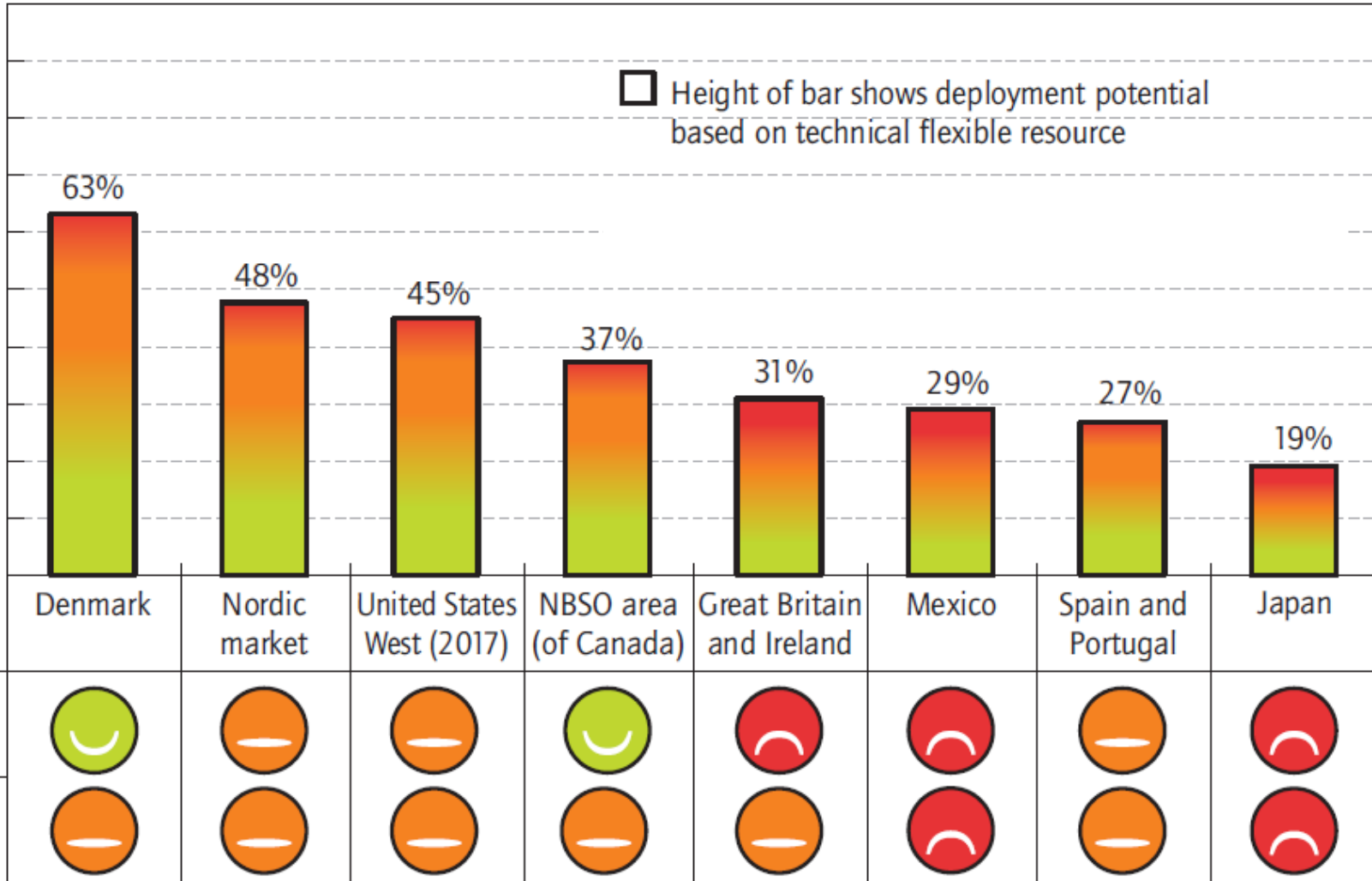
Scandinavian
interconnections

Grid integration of var-RE

Snapshot of present penetration potentials

VRE penetration potential

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%



□ Height of bar shows deployment potential based on technical flexible resource

Grid

Market

Score:

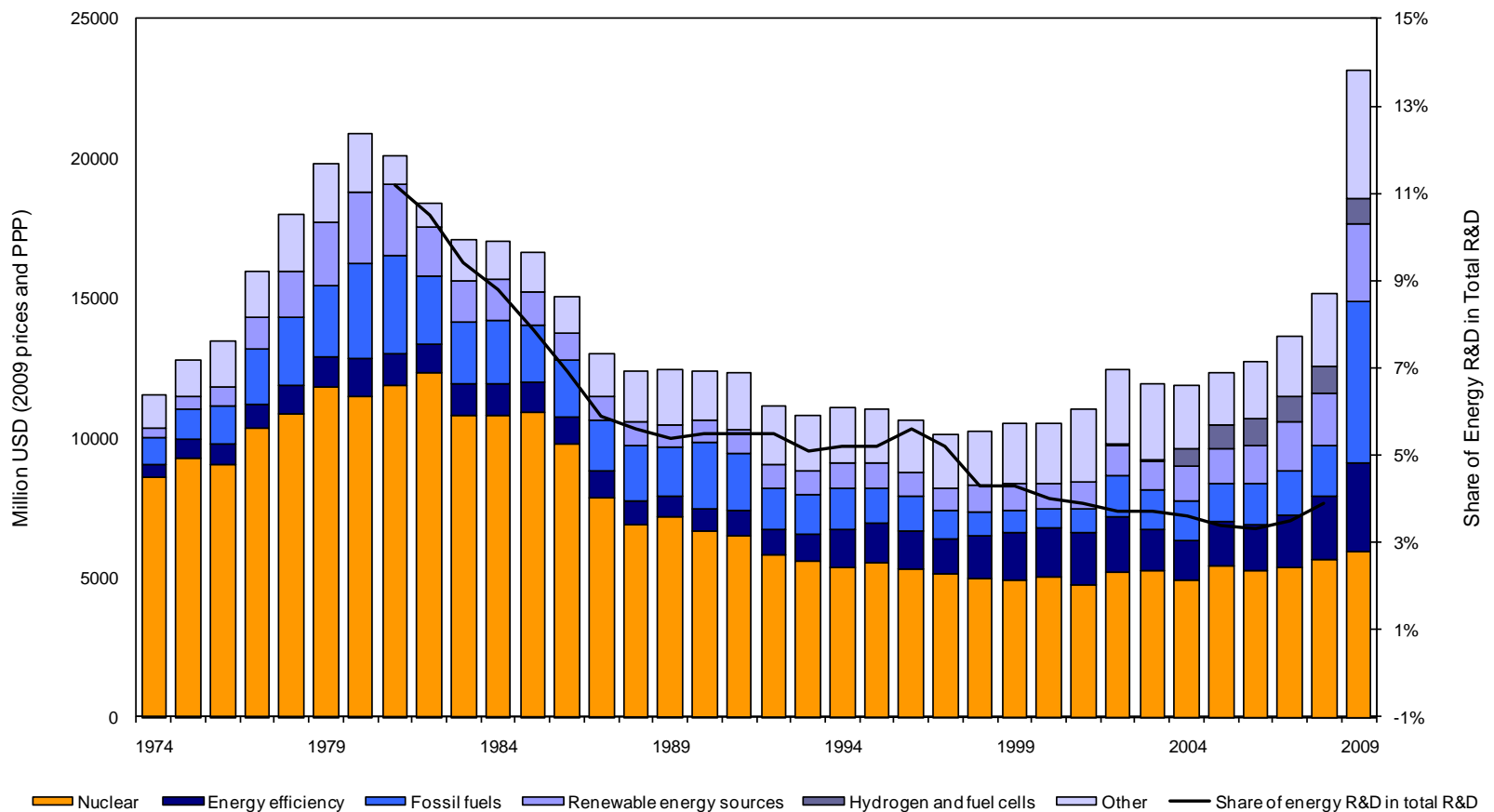
High

Medium

Low

Importance of sustained R&D

Annual global public spending on energy RD&D



IEA Energy Technology Roadmaps

■ 2009 releases

- Carbon capture & storage,
- Electric vehicles,
- Cement sector,
- **Wind energy**

■ 2010 releases

- **Solar PV,**
- **Concentrating Solar Power**
- Nuclear power
- Energy efficient buildings: heating and cooling
- Smart grids, Vehicle efficiency

■ 2011 releases

- **Biofuels**
- **Geothermal (June)**
- **Bioenergy for heat & power (Q4)**
- **Hydropower (Q4)**
- Clean/high-efficiency coal;
- Energy efficiency in buildings: design & operation;
- Hydrogen & fuel cell vehicles

www.iea.org/roadmaps



Technology Roadmap
Solar photovoltaic energy

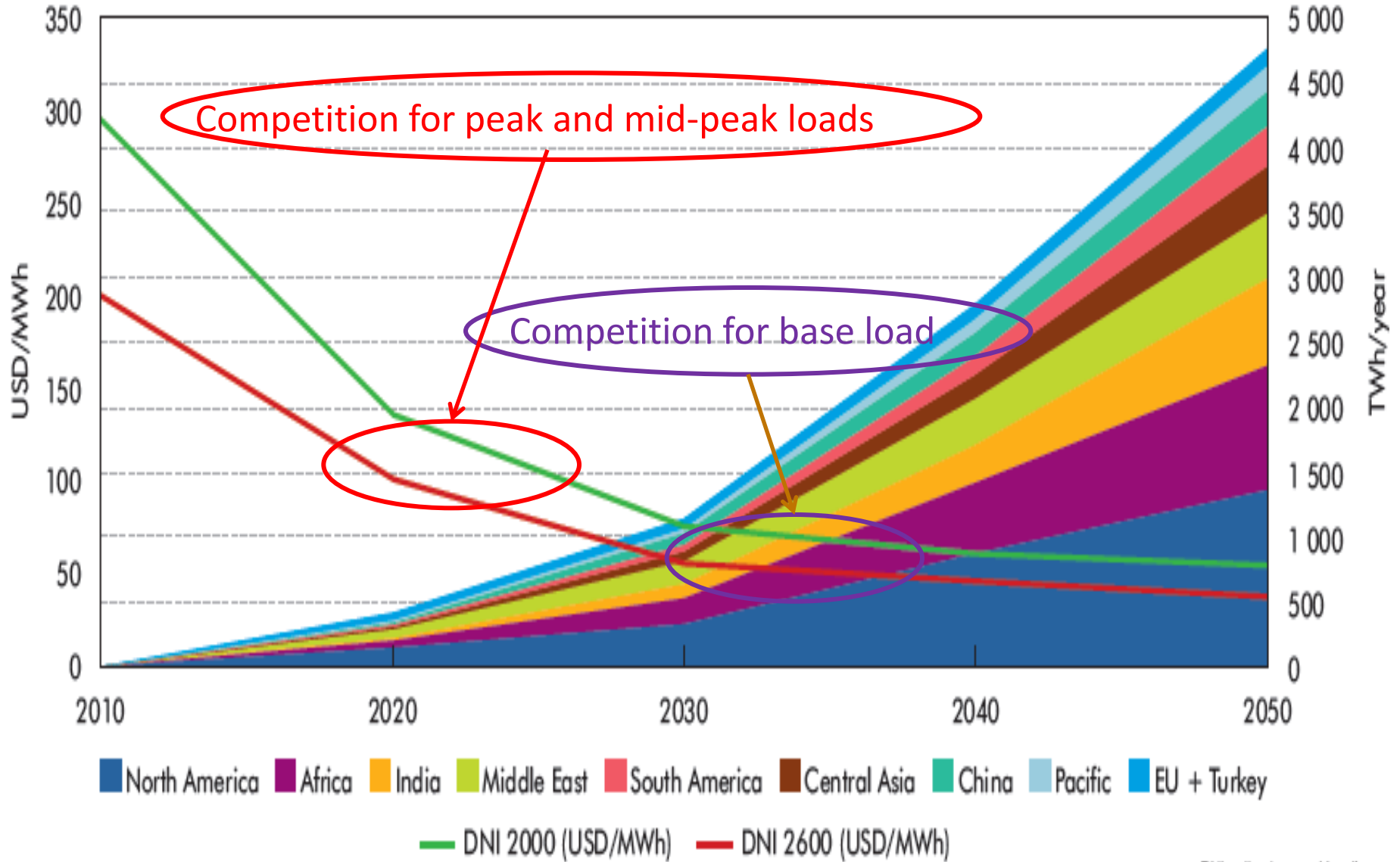


Technology Roadmap
Concentrating Solar Power





Ex: CSP costs and global output



DNI = direct normal irradiance



Conclusions and recommendations

- **Renewables have a global positive outlook:**
 - Can bring large benefits, specially in climate change mitigation and security of supply
 - Are ready to continue delivering if policy support is maintained

- **Asia, China, in particular, has emerged as *the* key market for renewables, both from the supply and demand sides**

- **However, RE policies face new challenges**
 - More dynamic approach to adapt quickly to market changes

- **Sustained support to R&D needed**