Renewable Energy
MARKETS & POLICIES

International Energy Agency

# Deploying Renewables 2011

## Best and Future Policy Practice

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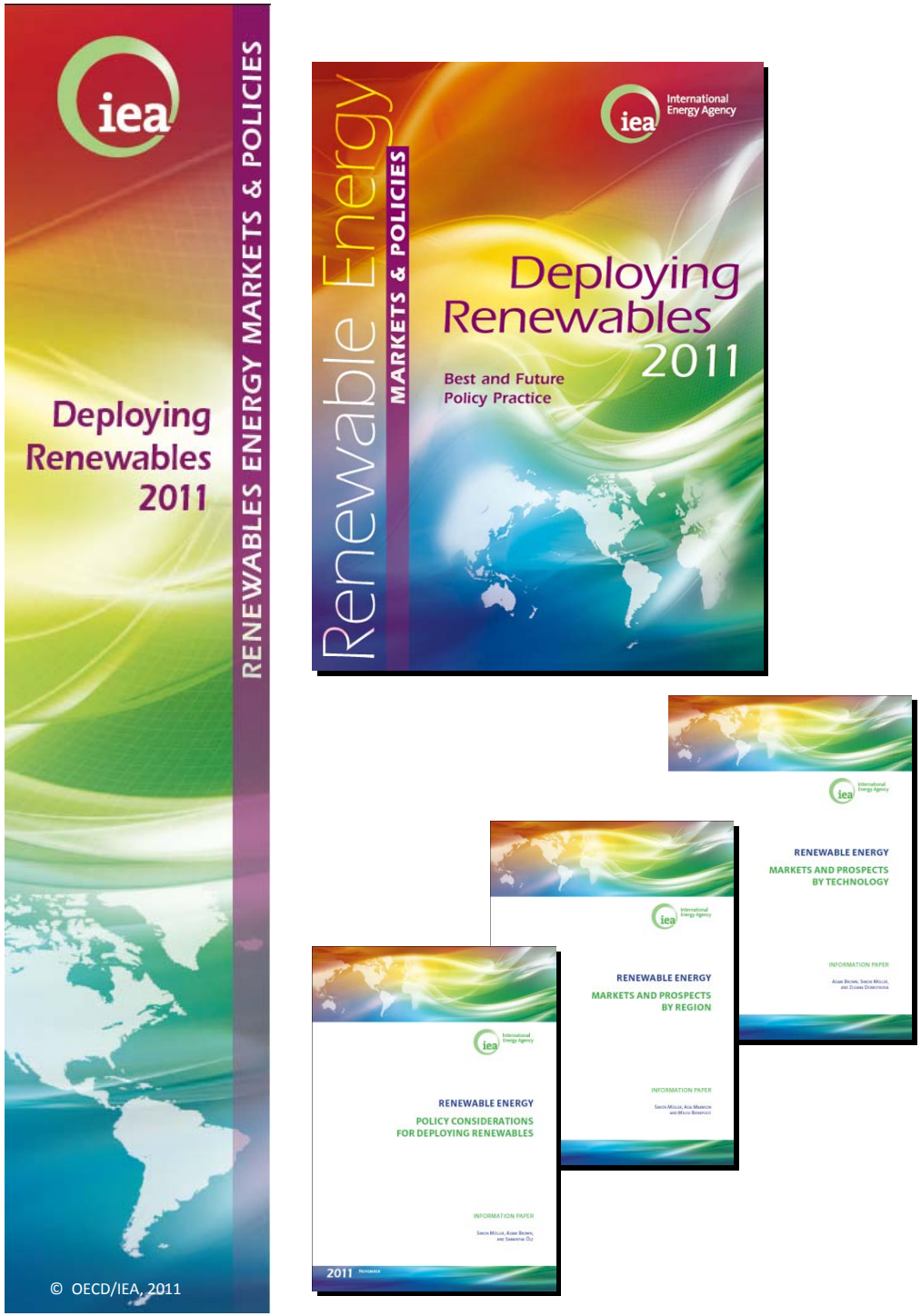
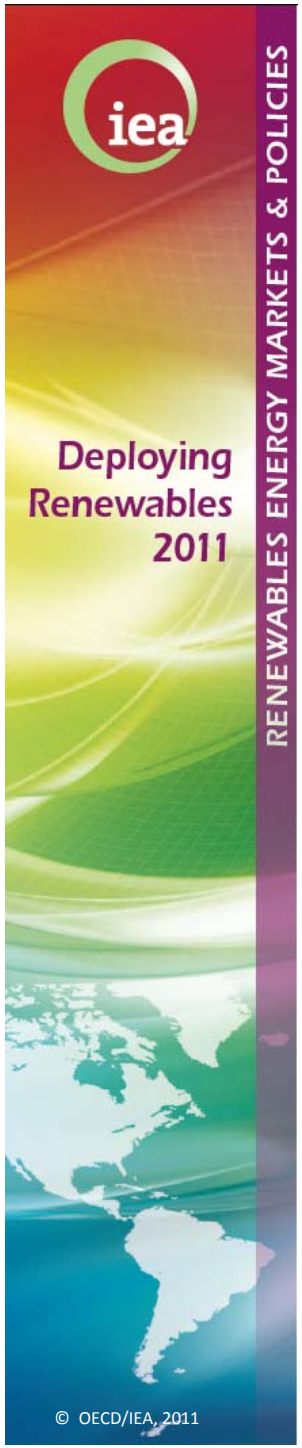
International Energy Agency

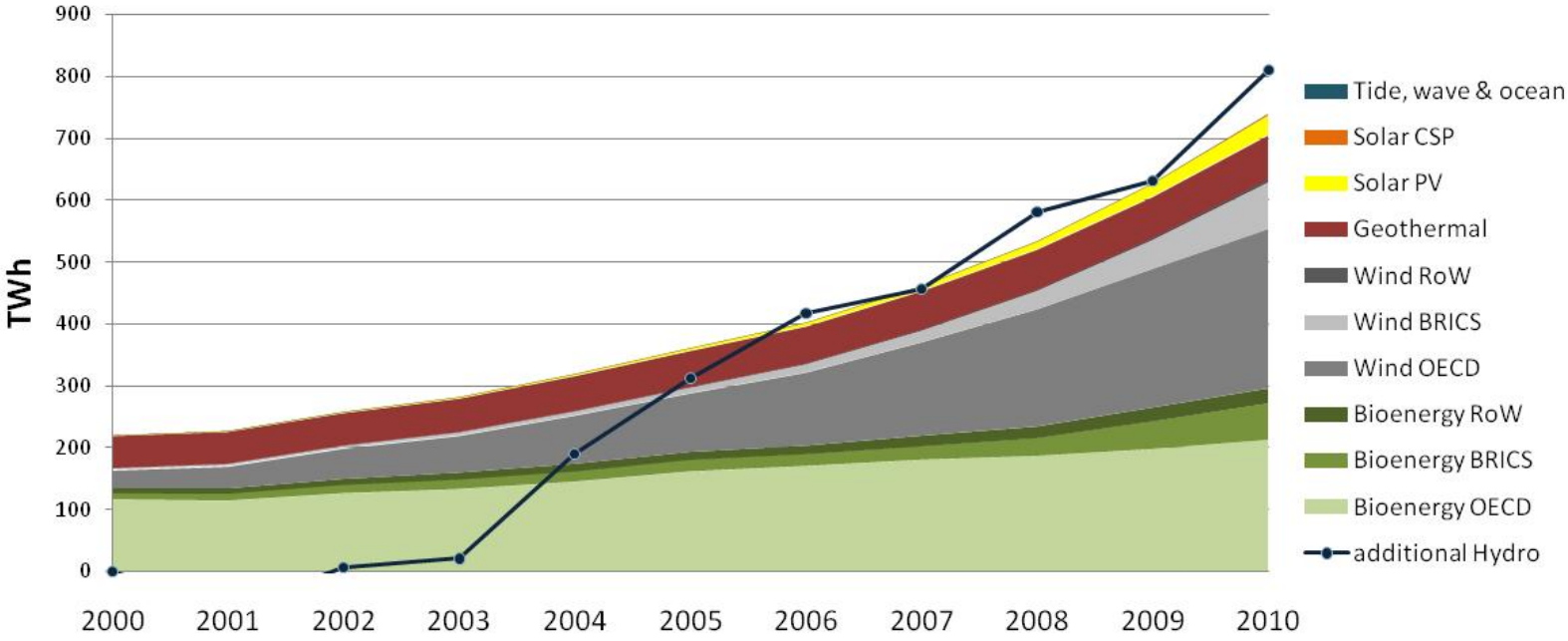
***Institute of Energy Economics, Japan (IEEJ) Energy Seminar***
***Tokyo, 7 March 2012***



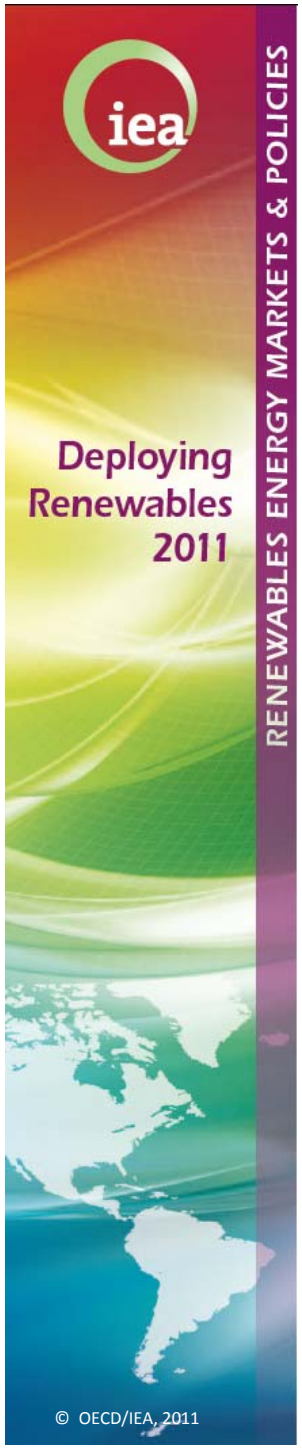

- Analyses market and policy trends for electricity, heat and transport
- Investigates the strategic drivers for RE deployment
- Benchmarks the impact and cost-effectiveness of economic support policies
- Provides best practice policy principles
- Covers **56 countries** and all world regions
- Book and 3 supporting information papers




# Strong Growth in RE Electricity … and shift to Asia

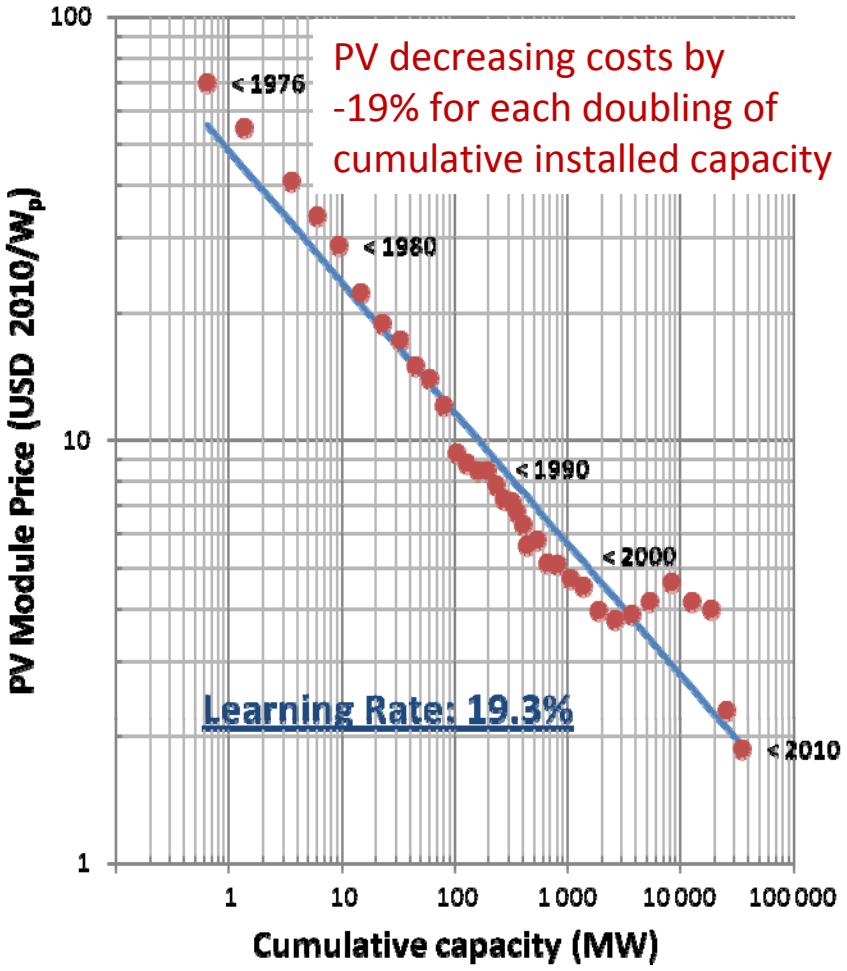



| | Wind | Bioenergy | Solar PV | Hydro | other |
|---|---|---|---|---|---|
| *Generation 2010 [TWh]* | 338 | 296 | 31 | 3503 | 74 |
| *CAGR 2005-2010 [%]* | 26.5% | 8.8% | 50.8% | 3.1% | 4.6% |




# Costs are Reducing

- Hydro and some biomass and geothermal already cost-competitive
- Additional technologies getting **competitive in a broader set of circumstances**
- Opens up **new deployment opportunities**

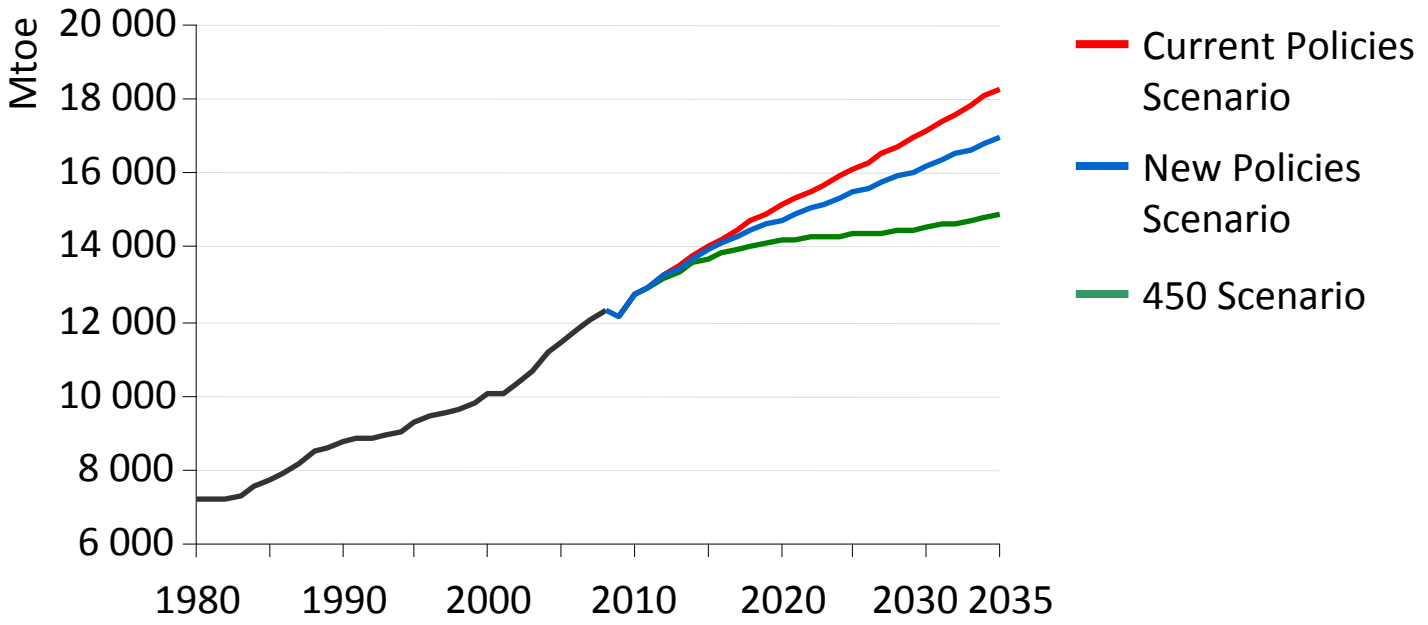



Data from Breyer and Gerlach, 2010

# Policies could radically alter the long-term energy outlook

WORLD ENERGY OUTLOOK 2011

## World primary energy demand by scenario

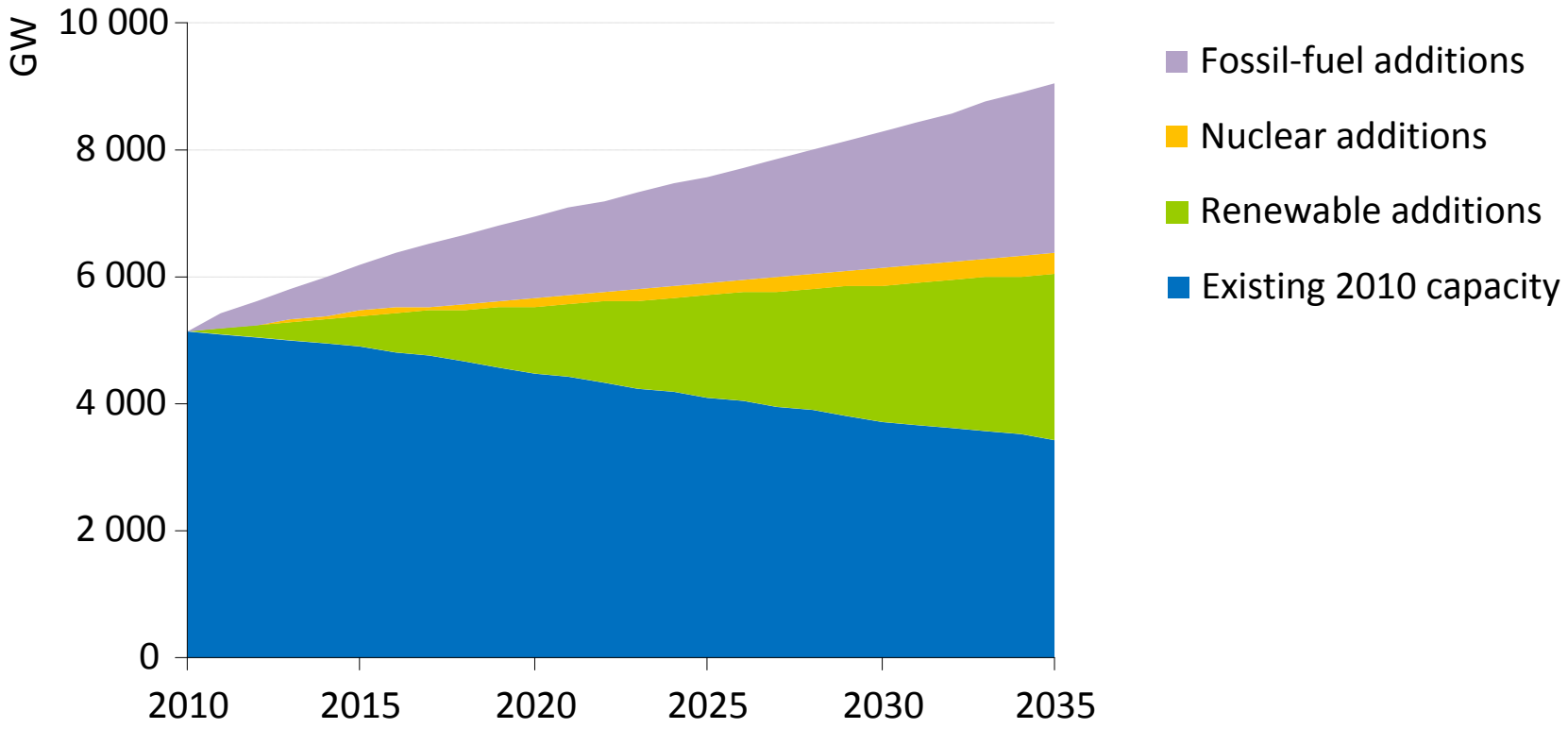



***In the New Policies Scenario, demand increases by 40% between 2009 & 2035***

# Low-carbon power technologies come of age

WORLD ENERGY OUTLOOK 2011

## Global installed power generation capacity in the New Policies Scenario

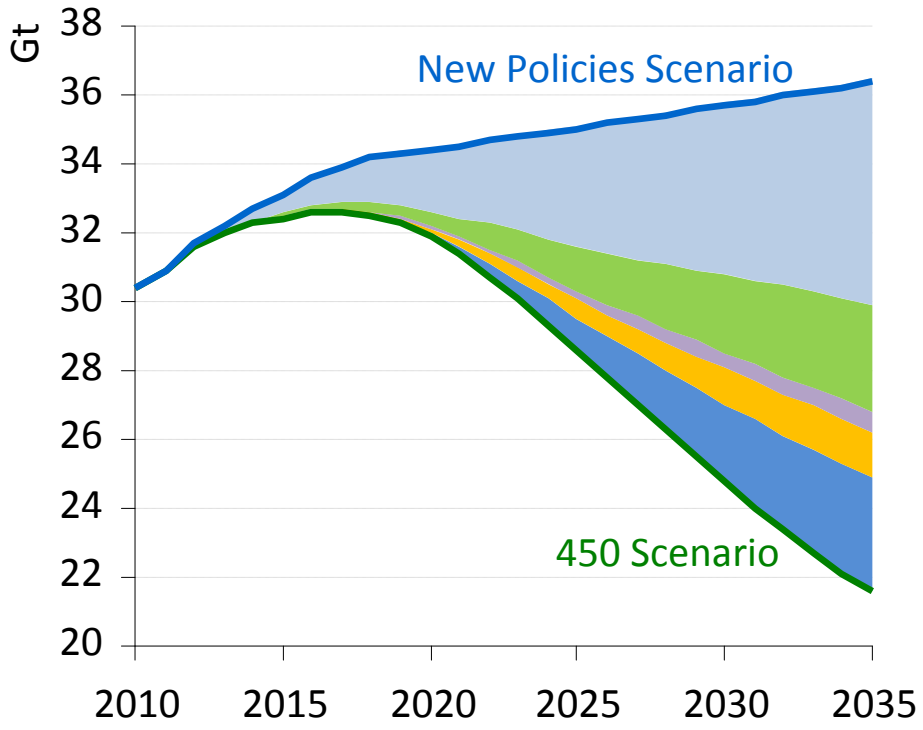



***Renewables & nuclear power account for more than half of all the new capacity added worldwide through to 2035***

# Efficiency gains can contribute most to emissions reductions

WORLD ENERGY OUTLOOK 2011

## World energy-related $CO_2$ emissions abatement in the 450 Scenario relative to the New Policies Scenario



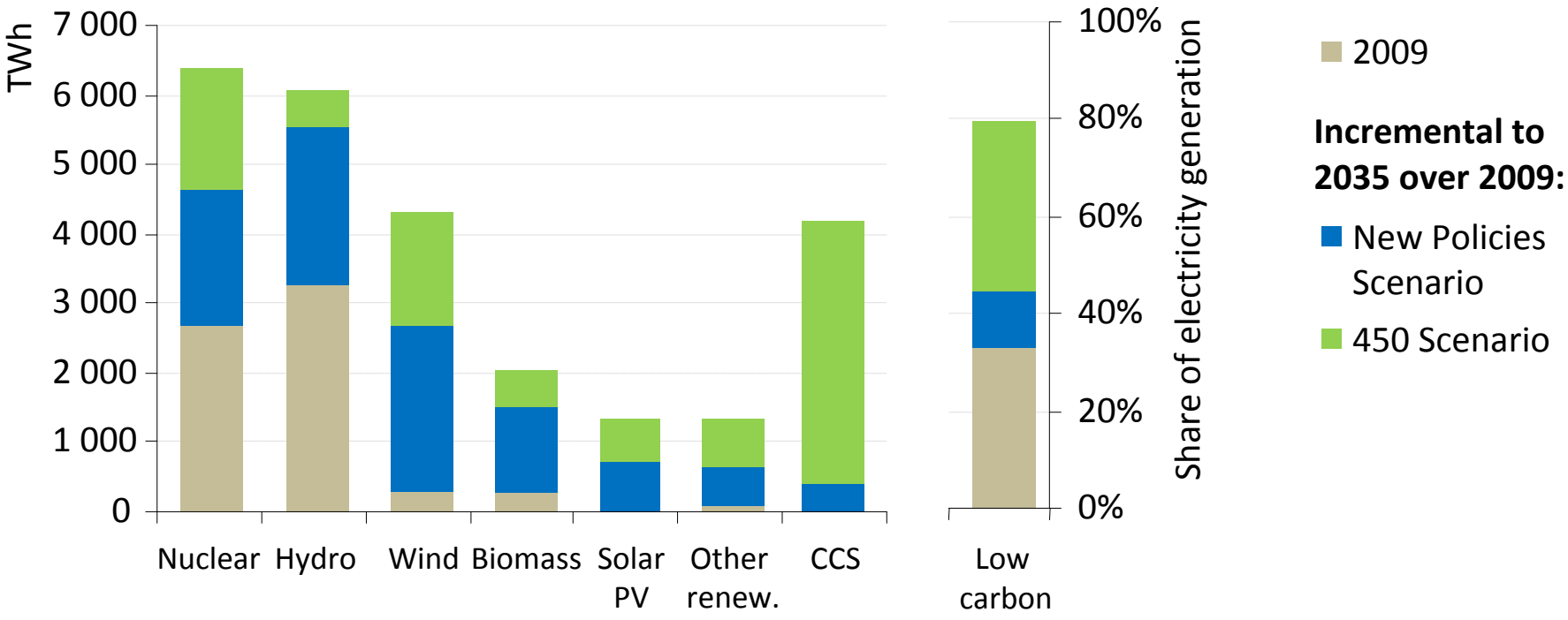

| | Abatement | |
|---|---|---|
| | 2020 | 2035 |
| Efficiency | 72% | 44% |
| Renewables | 17% | 21% |
| Biofuels | 2% | 4% |
| Nuclear | 5% | 9% |
| CCS | 3% | 22% |
| Total (Gt $CO_2$) | 2.5 | 14.8 |

***Energy efficiency measures – driven by strong policy action across all sectors – account for 50% of the cumulative $CO_2$ abatement over the Outlook period***

# Moving towards cleaner forms of electricity generation

WORLD ENERGY OUTLOOK 2011

## Electricity generation by selected low carbon technology & share of electricity generation by scenario, 2009 and 2035

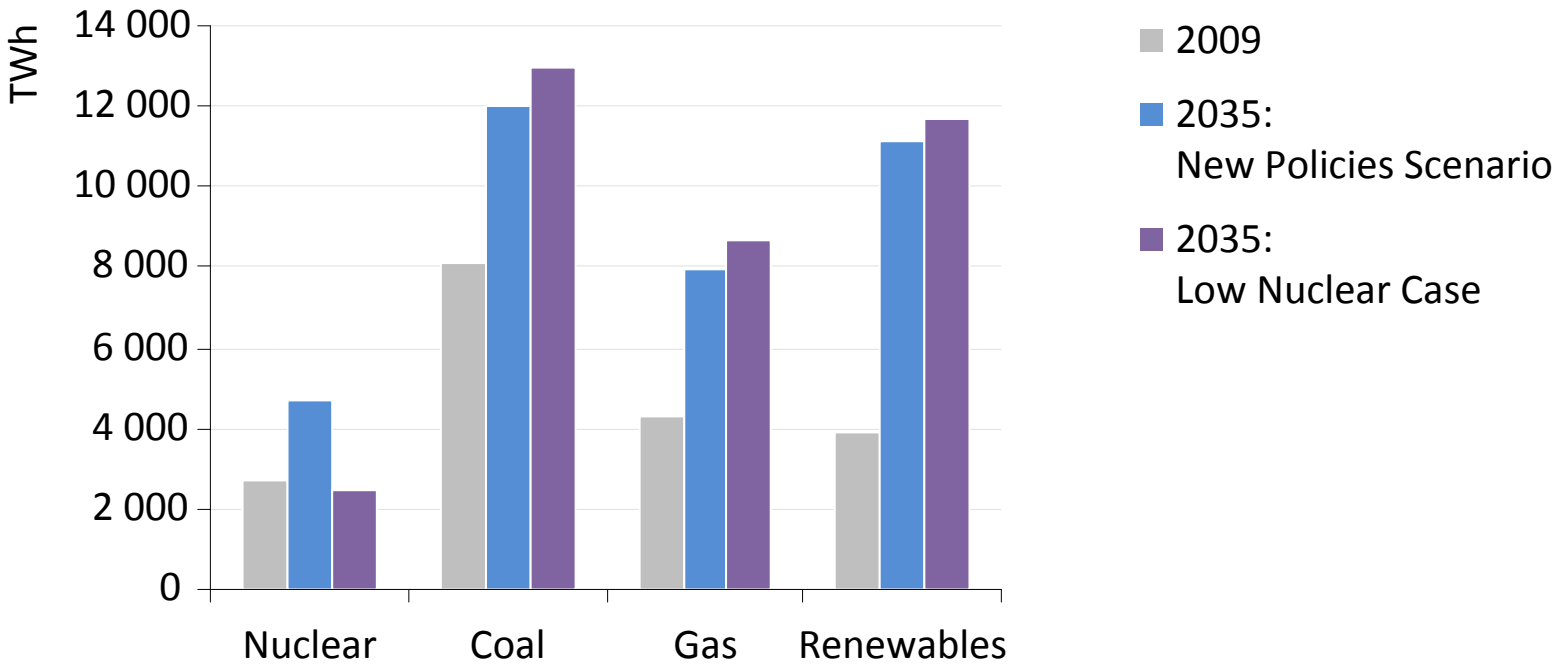



***Low-carbon generation increases 2.5 times between 2009 & 2035 in the New Policies Scenario & almost quadruples in the 450 Scenario***

# Less nuclear means more of everything else

WORLD ENERGY OUTLOOK 2011

## Power generation by fuel in the New Policies Scenario and Low Nuclear Case

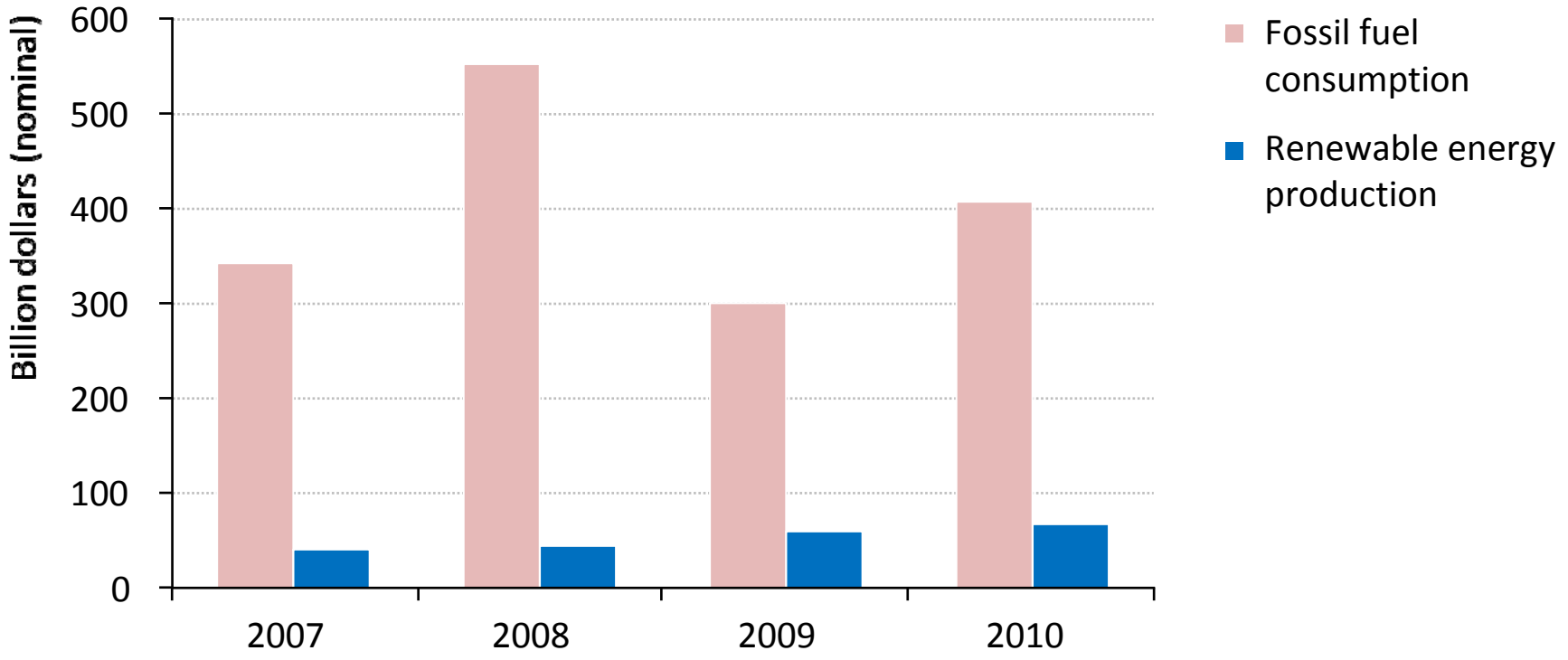



***The biggest chunk of the lost nuclear generation is replaced by power generation from coal, leading to a 6% increase in $CO_2$ emissions in the power sector***

# The majority of energy subsidies still go to fossil fuels

WORLD ENERGY OUTLOOK 2011

## World subsidies to fossil fuels consumption & renewable energy

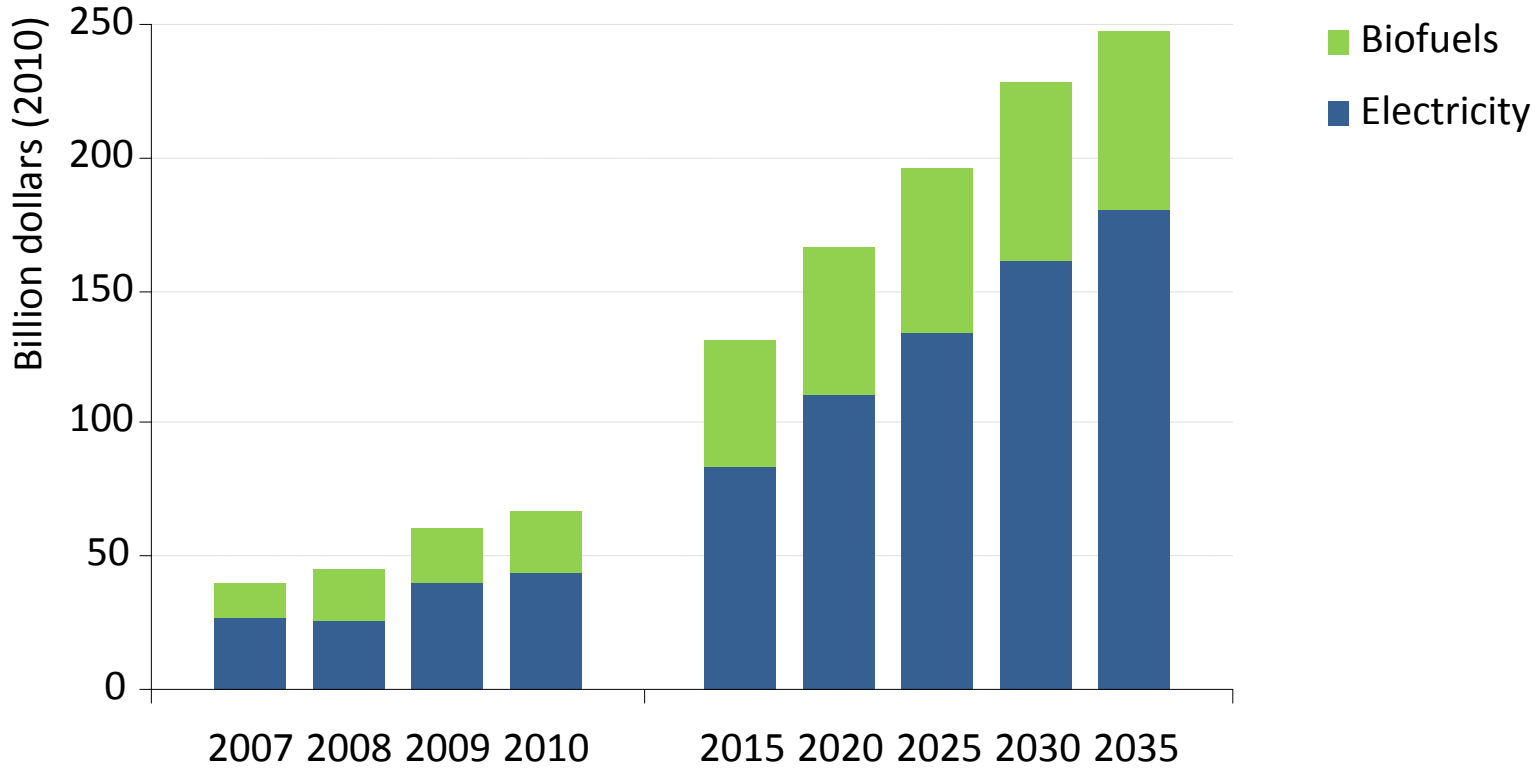



***Fossil-fuels subsidies amounted to $409 billion in 2010 – down from the peak of $550 billion in 2008 but still much larger than subsidies to renewables, which reached $66 billion in 2010***

# The overall value of subsidies to renewables is set to rise

WORLD ENERGY OUTLOOK 2011

## Global subsidies to renewables-based electricity and biofuels in the New Policies Scenario

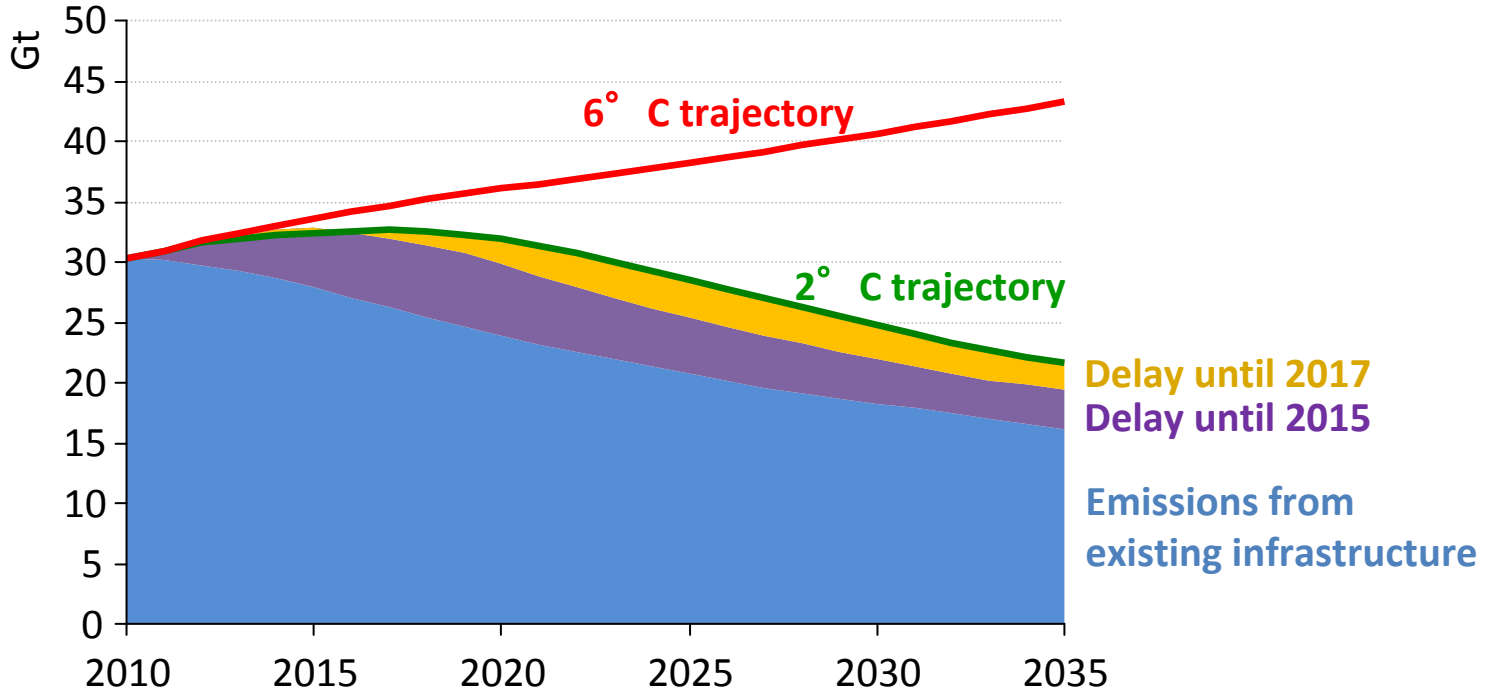



***Renewable subsidies of $66 billion in 2010 (compared with $409 billion for fossil fuels), need to climb to $250 billion in 2035 as rising deployment outweighs improved competitiveness***

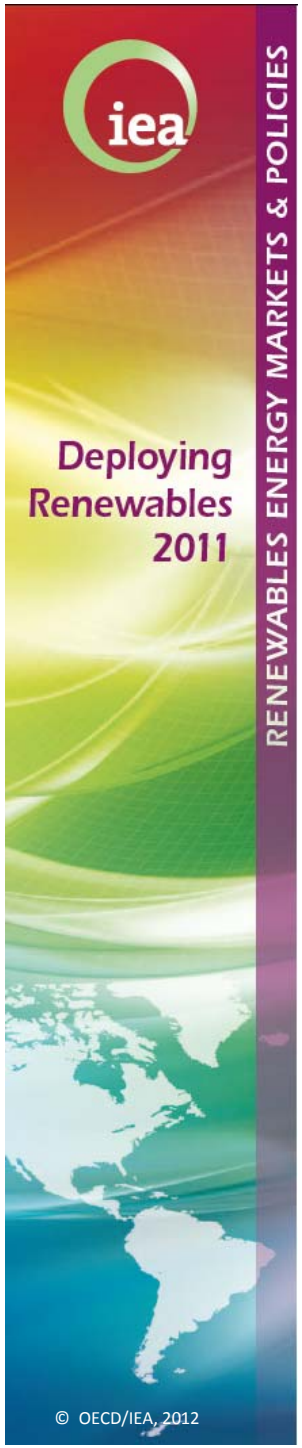
# The door to 2° C is closing, but will we be "locked-in" ?

WORLD ENERGY OUTLOOK 2011

## World energy-related $CO_2$ emissions in the Current Policies and 450 Scenarios and from locked-in infrastructure in 2010 and with delay

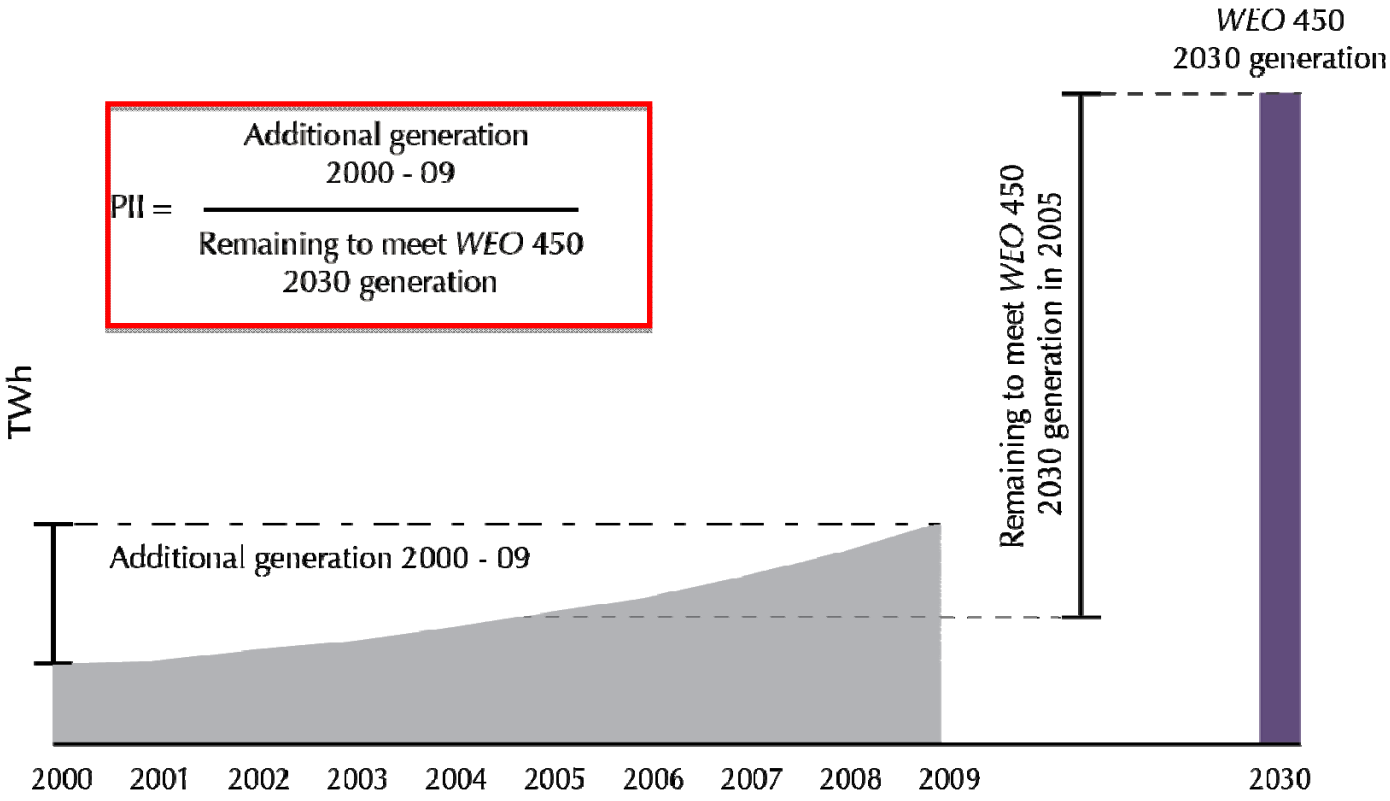


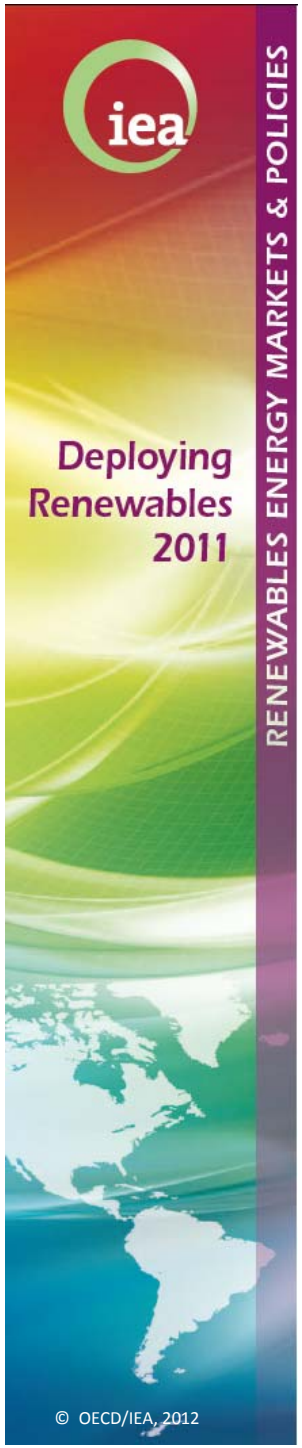

***Without further action, by 2017 all $CO_2$ emissions permitted in the 450 Scenario will be "locked-in" by existing power plants, factories, buildings, etc.***



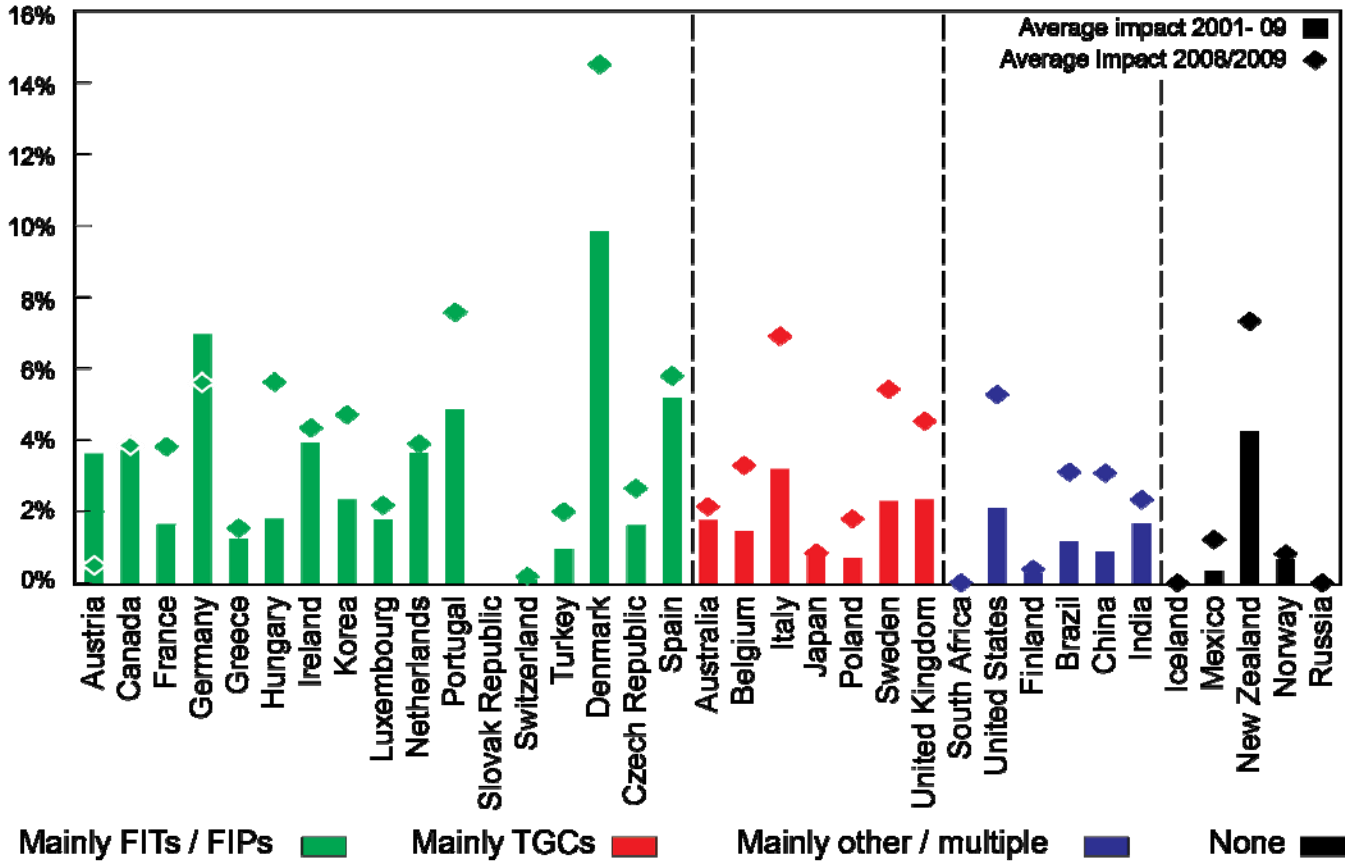

# Measuring Policy Impact - Methodology

$$PII = \frac{\text{Additional generation 2000 - 09}}{\text{Remaining to meet } \textit{WEO}\ 450 \text{ 2030 generation}}$$

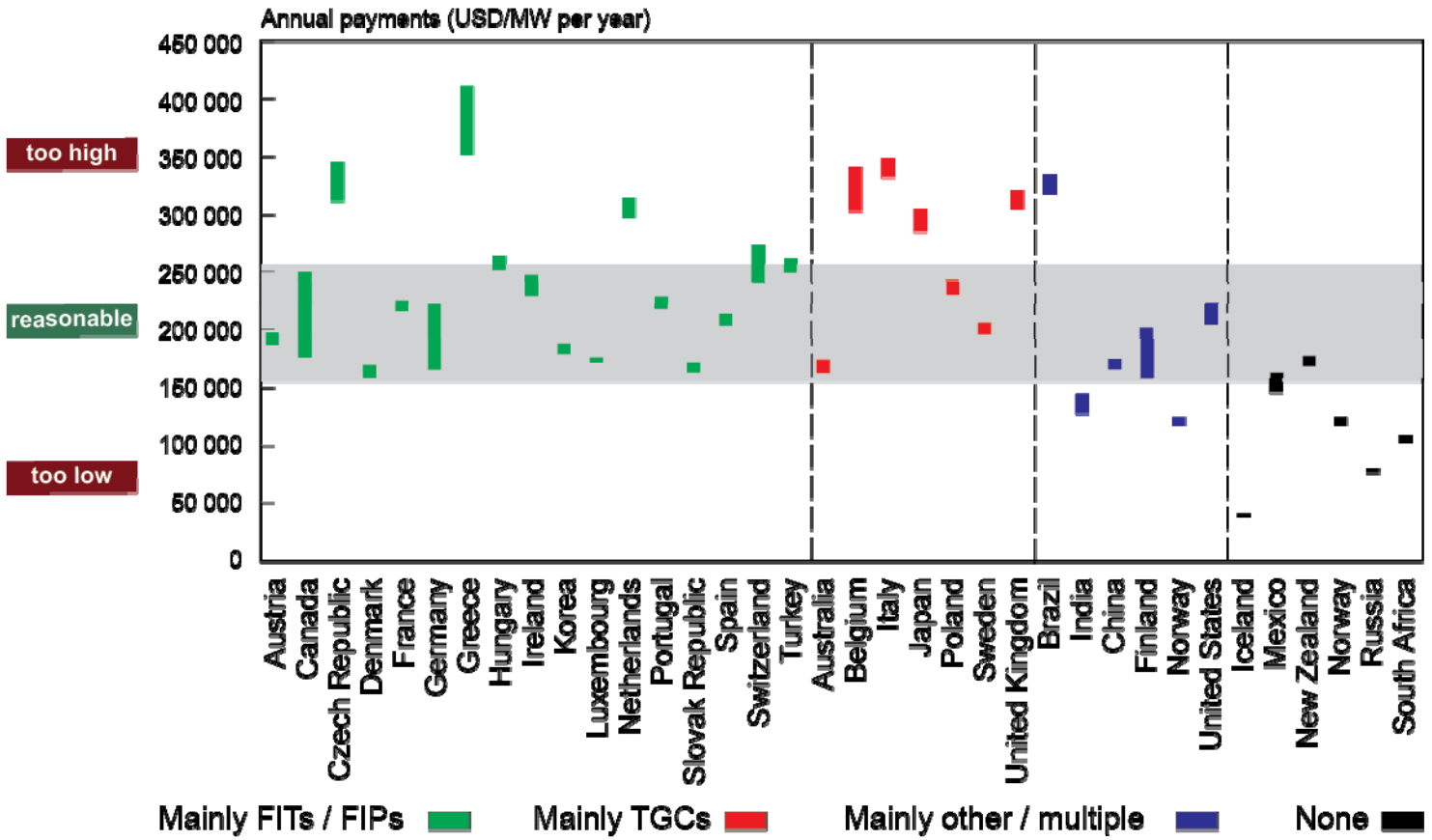


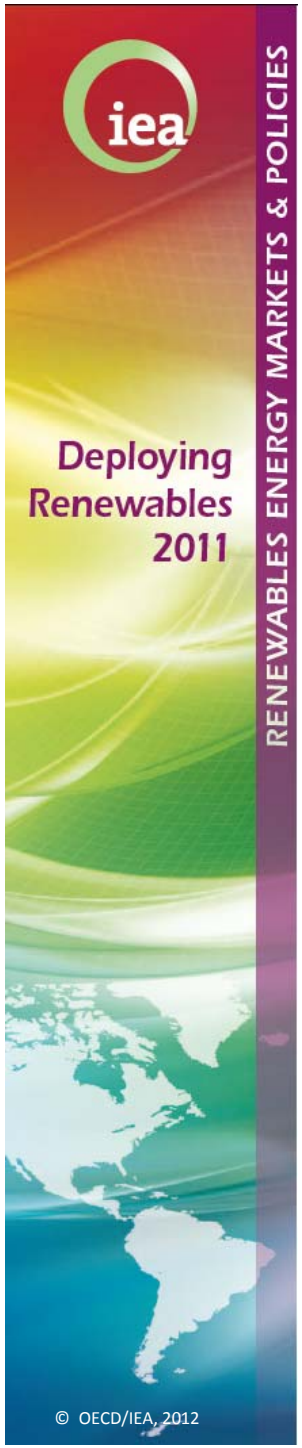



# Are Policies Successfully Encouraging Deployment? *Example: Onshore Wind*



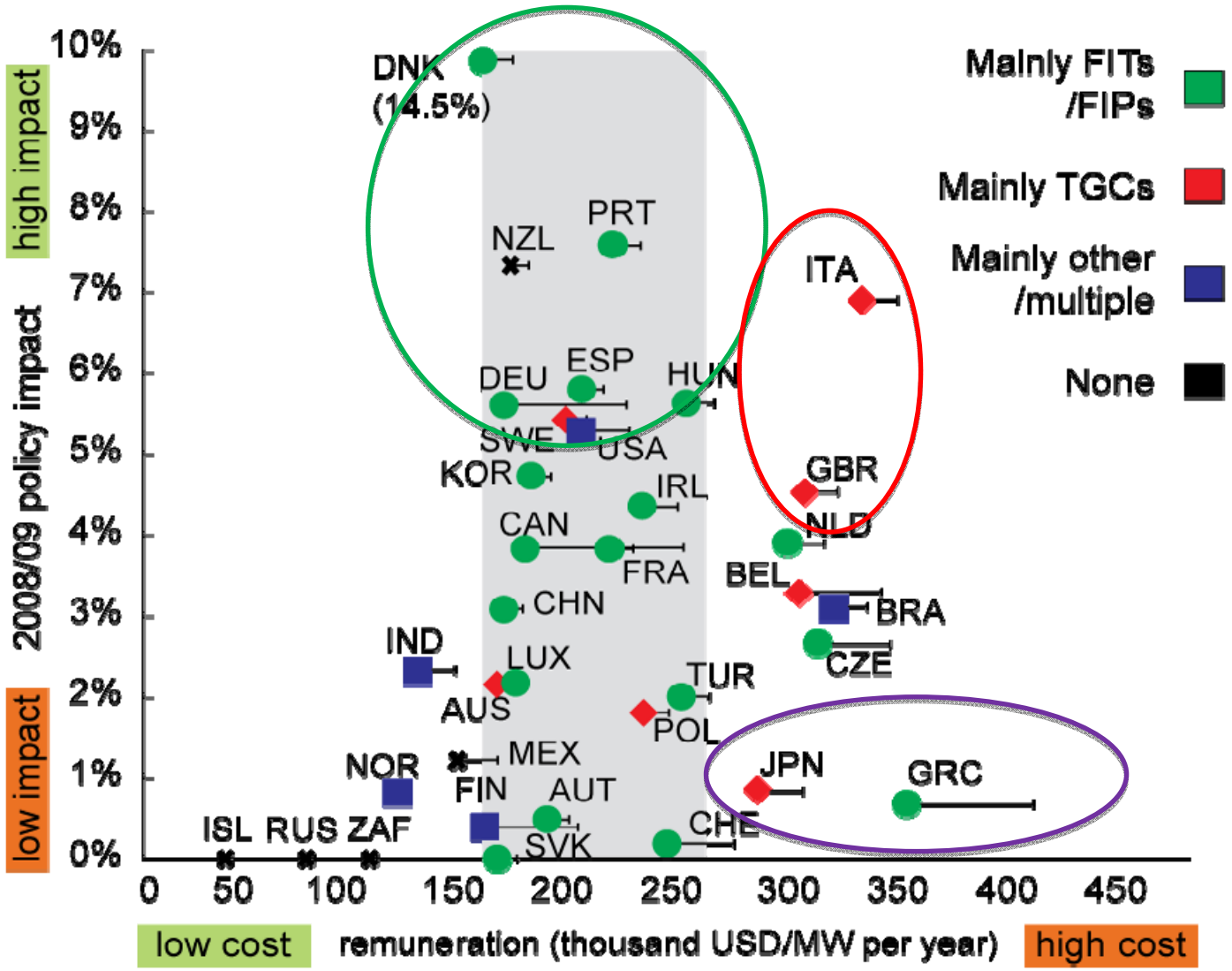
# Are payments for Generators in a Reasonable Range? *Ex: Onshore Wind 2009*

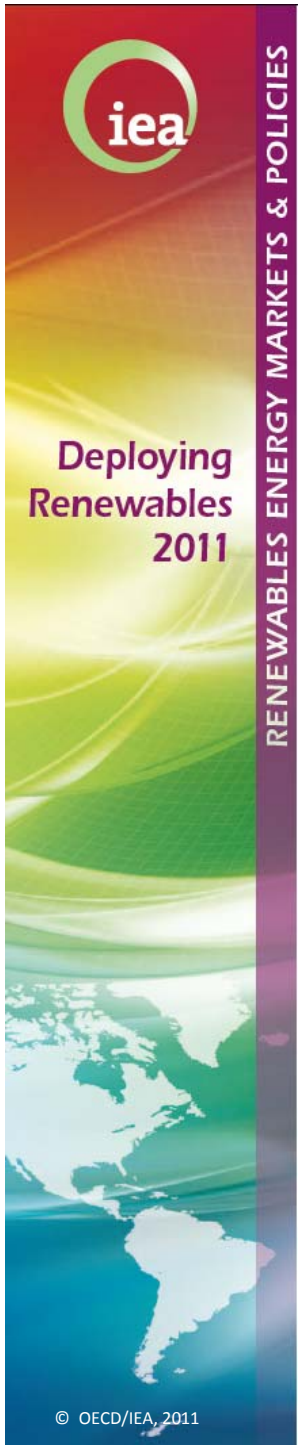





# Impact vs Cost-Effectiveness

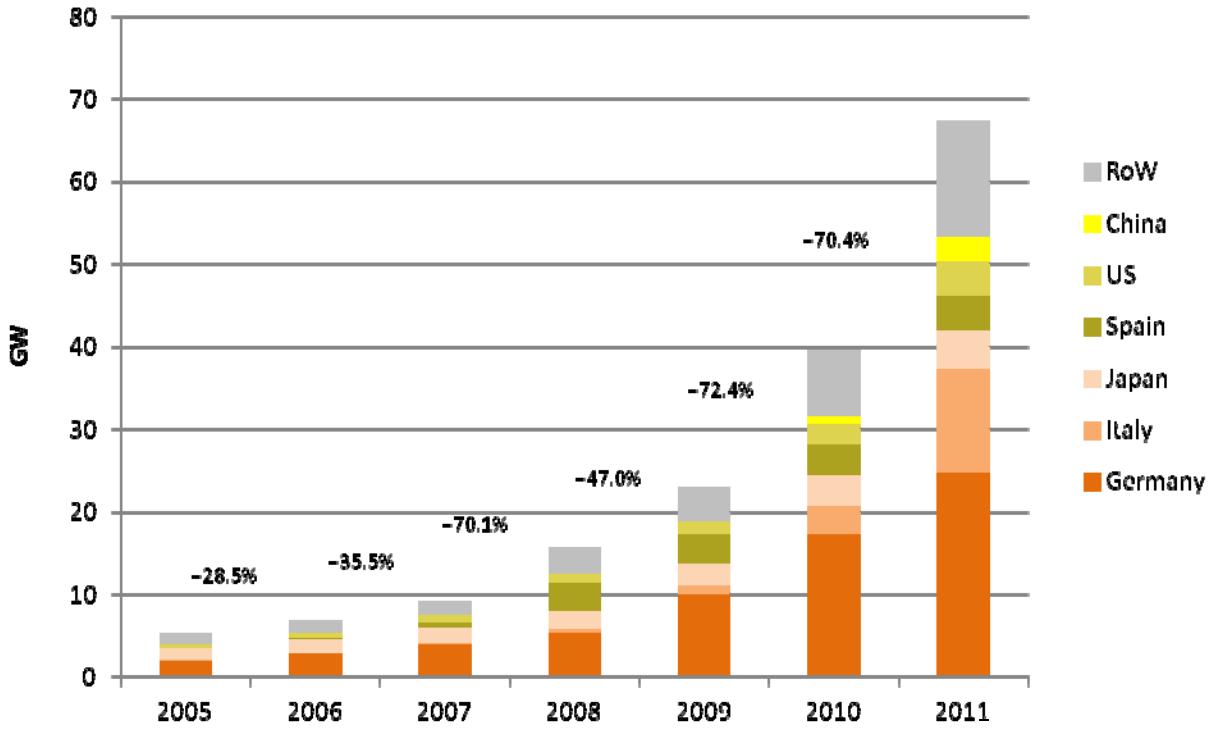
## *Example: Onshore Wind*





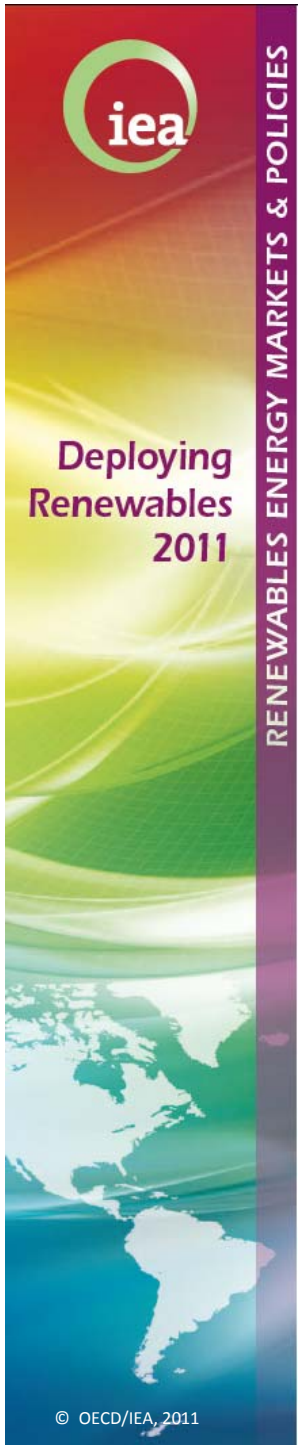

# Emerging Policy Challenges - PV

**Cumulative global PV capacity**

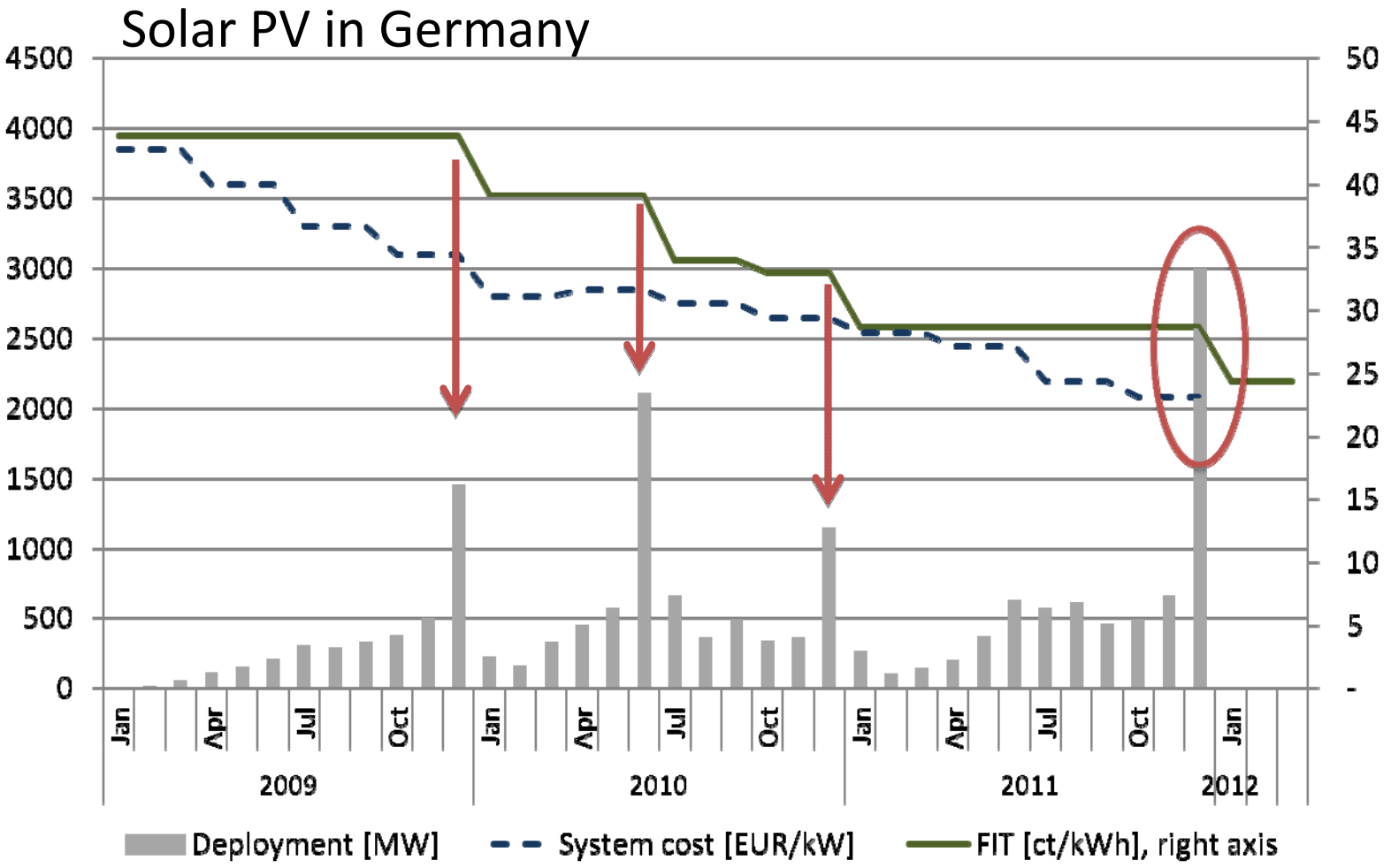



Sources: IEA, EA PVPS, EPIA

- Concentrated booming PV growth raises policy cost concerns in several EU countries
- Policies are not adapting quickly enough
- However, pressure will reduce as new markets emerge



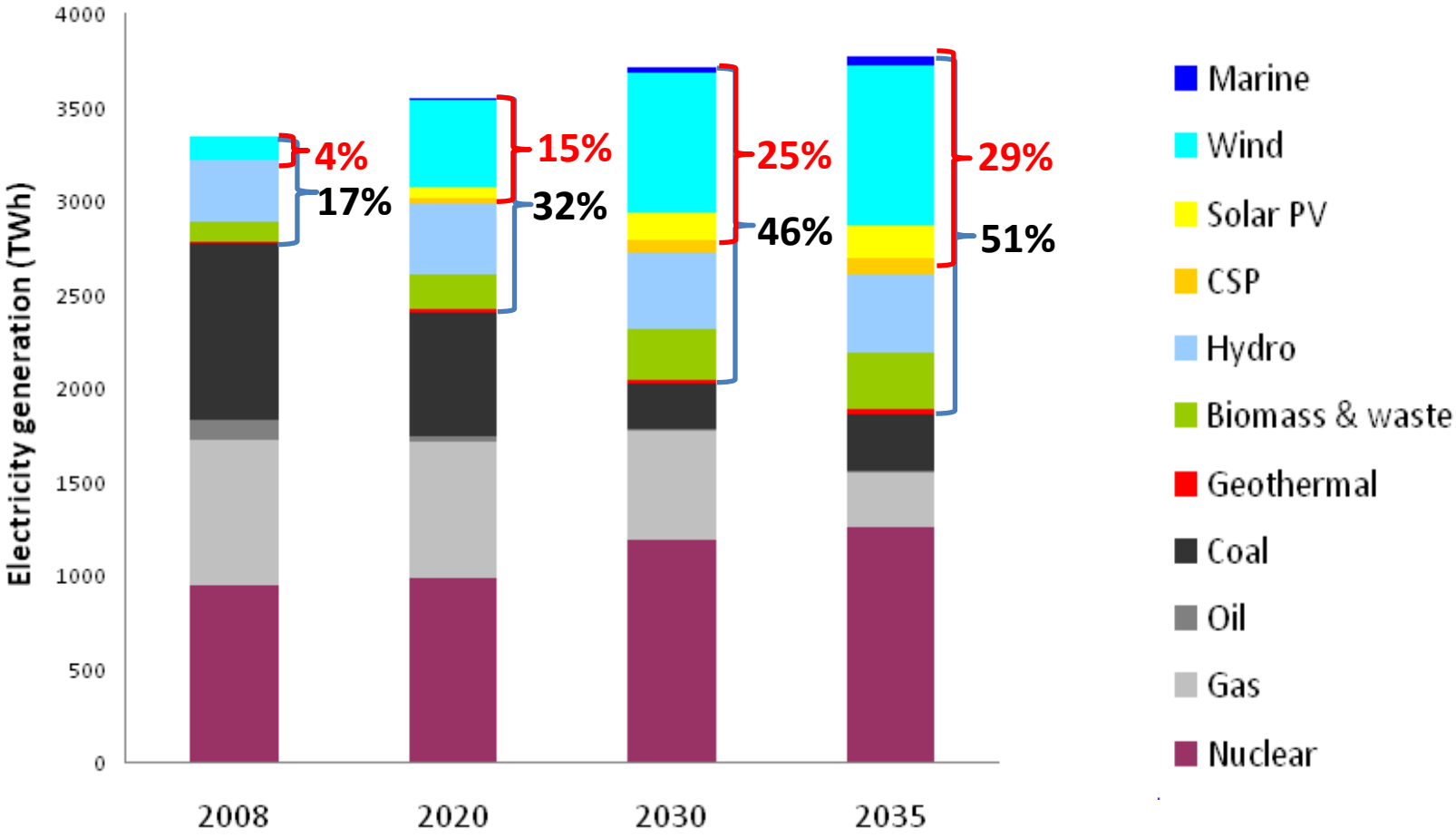

# Adjust Tariffs – On time & Often




***Key point:*** **Gap between incentives and costs and large, one-off tariff decreases can trigger "sales rush"**

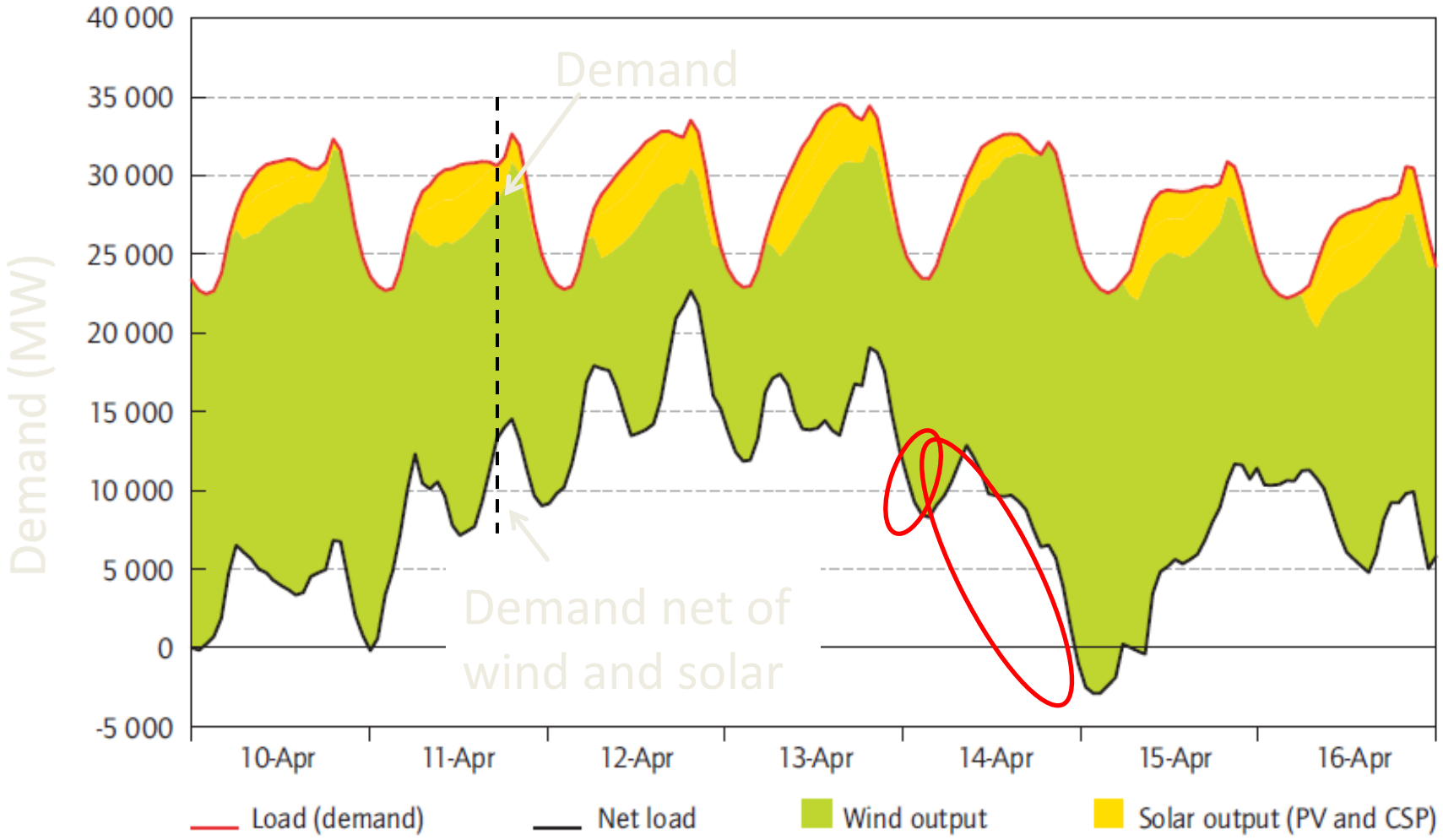

# Importance of var-RE

## 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

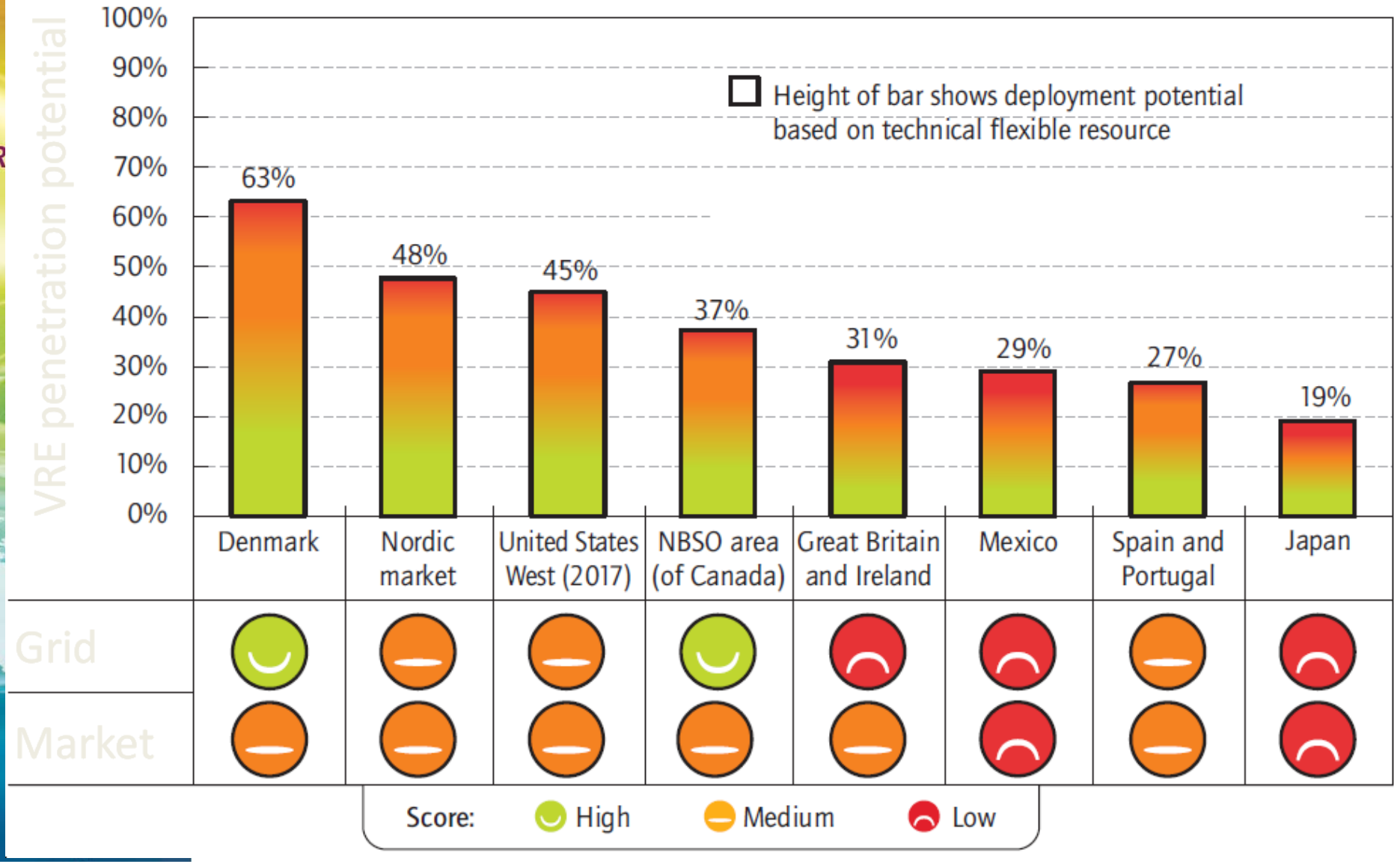
residential

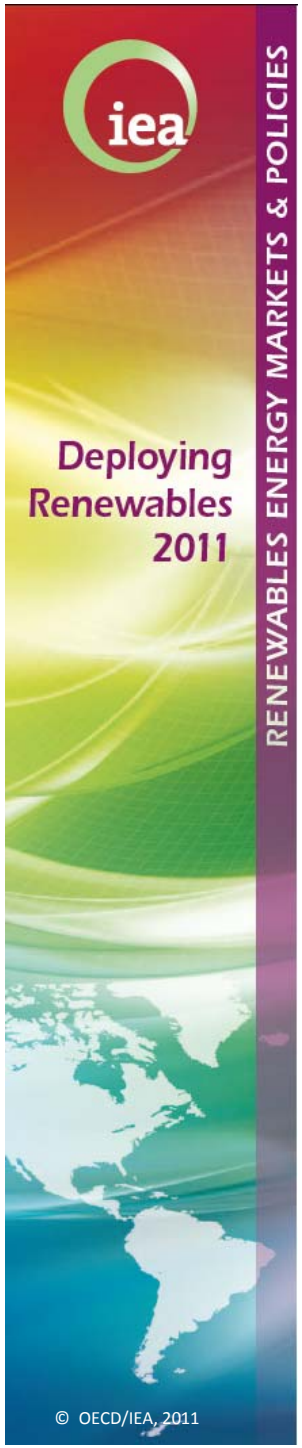
A pumped hydro facility


Scandinavian interconnections

# Grid integration of var-RE

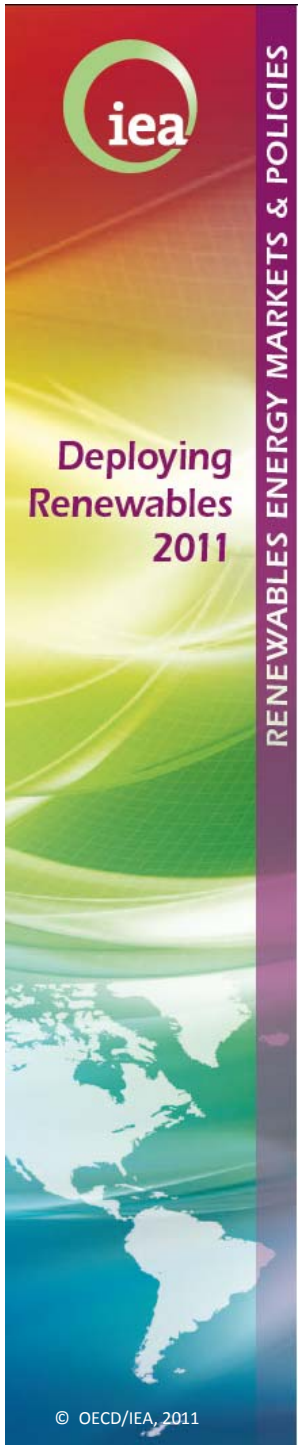
## Snapshot of present penetration potentials



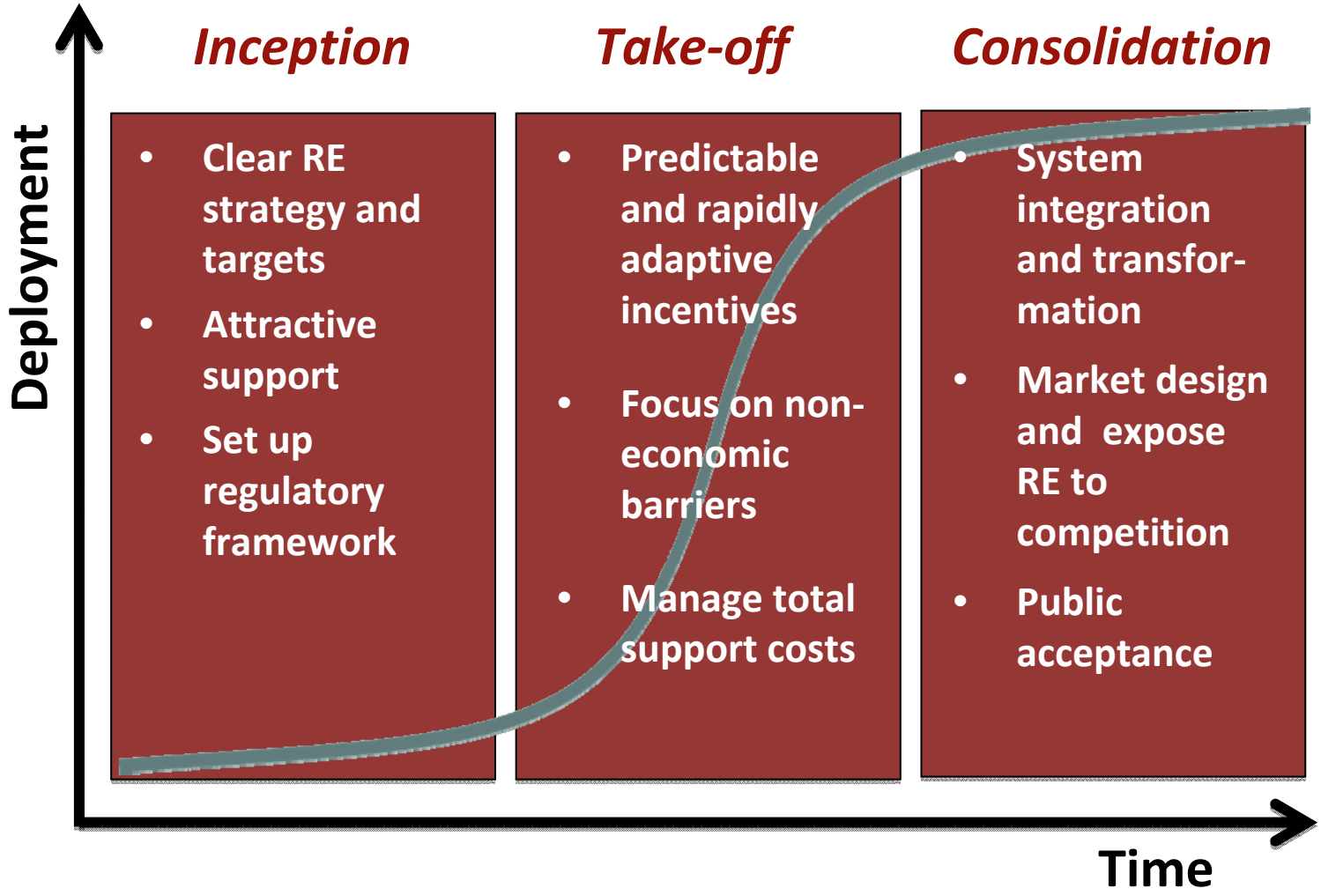


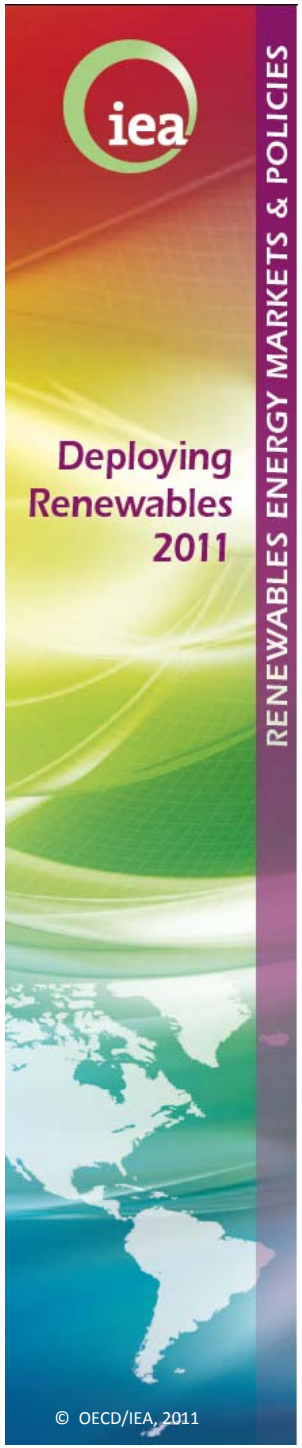

# Best-Practice Policy Principles

- **Predictable** RE policy framework, integrated into overall energy strategy
- **Portfolio** of incentives based on technology and market maturity
- **Dynamic** policy approach based on monitoring of national and global market trends
- Tackle **non-economic** barriers
- Address **system integration** issues

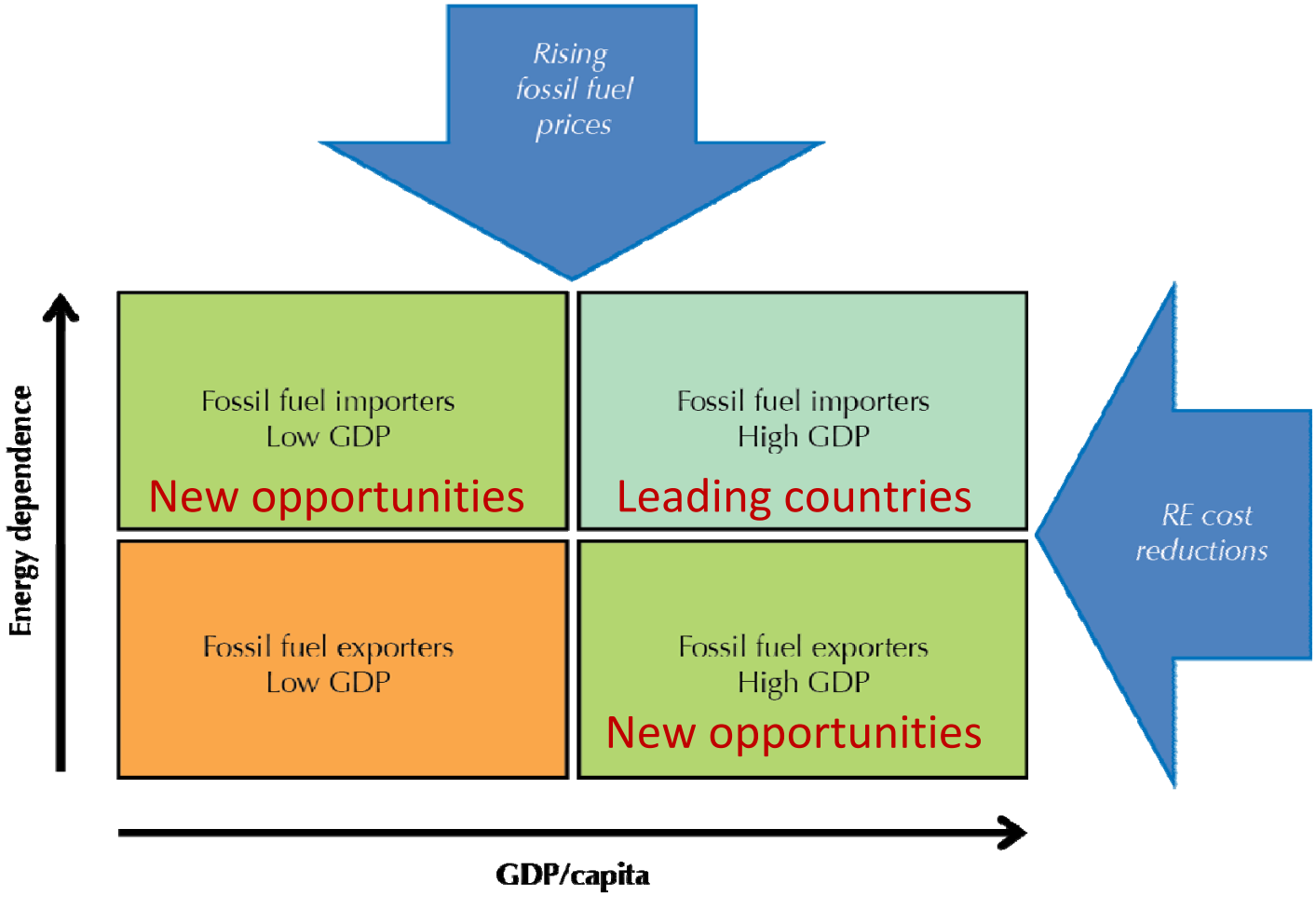


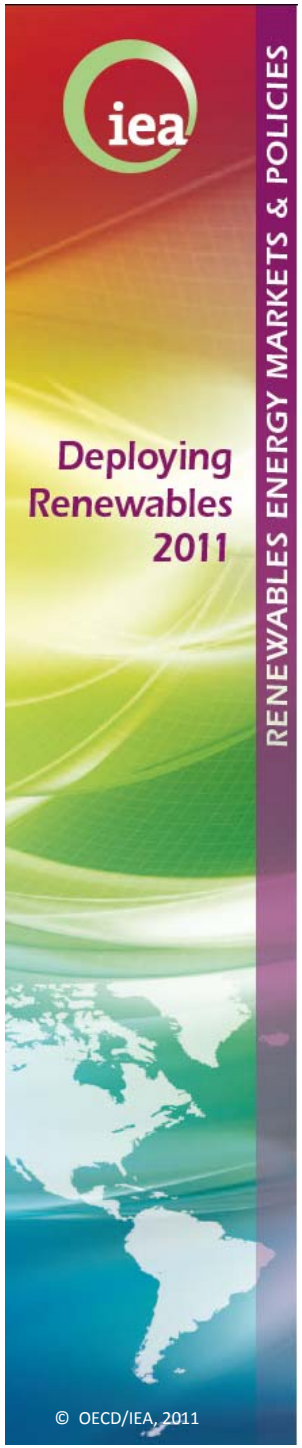

# Policy Priorities: Changing Over Time





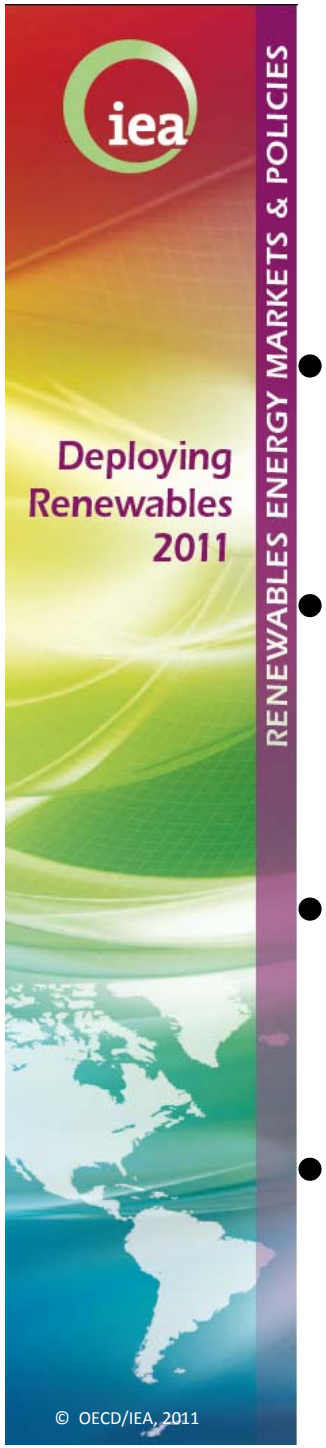

# Market Expansion Opportunities






# Conclusions

- Policies have started delivering in terms of RE deployment and cost reduction
- RE getting competitive in a broader set of circumstances
- However major economic and non-economic barriers persist and sustained policy effort is still needed
- *Deploying Renewables* identifies best-practice policy principles
  - Cost-effective, dynamic, integrated approach
  - Aims to help sharing best practice internationally so that countries can learn from each other

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