

## **ROLE OF ELECTRICITY**

# **A New Path to Secure and Competitive Energy in a Carbon-Constrained World**

*Bonn, 16th May 2007*



# **Role of Electricity project**

- **Energy policy context**
- **Project aims and objectives**
- **Key outcomes – Demand side**
- **Key outcomes – Supply side**
- **Modeling scenarios**
- **Conclusions and policy recommendations**



# Role of Electricity project

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- **Estonian context?**

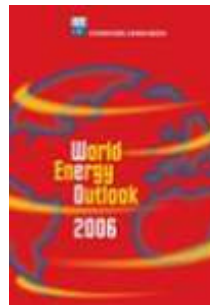


# Our energy landscape has changed

**United States:  
State of the Union 2007**



**The G8, IEA Outlook,  
Stern Review**



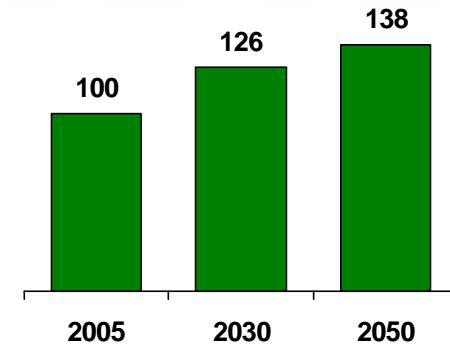
**European Union:  
Energy & Climate Package**





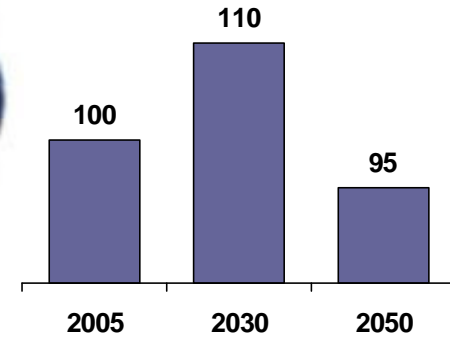
# The Key Drivers

## Security of supply



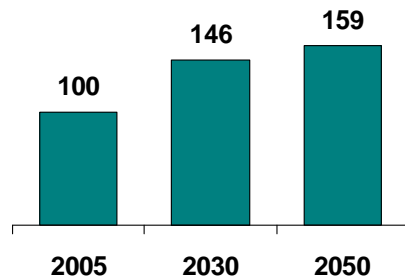
OIL/GAS IMPORT DEPENDENCY

## Climate change

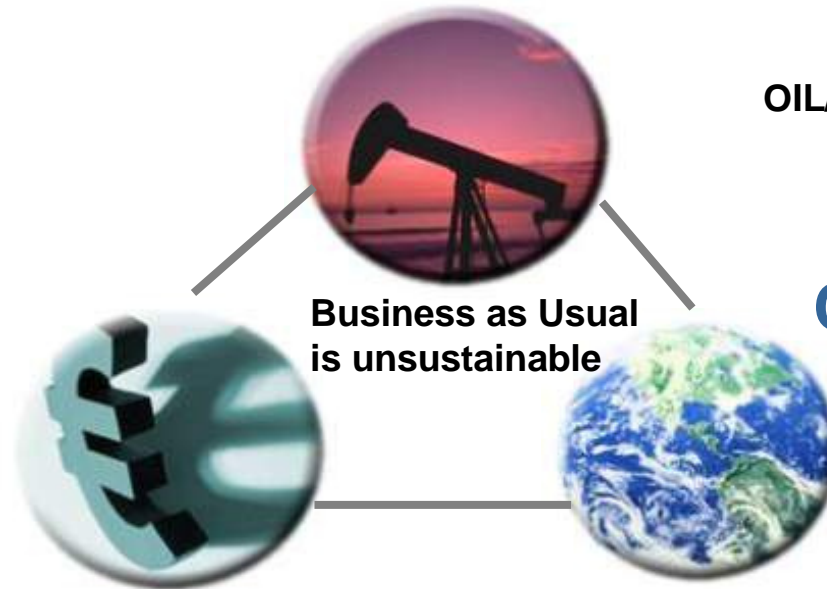


CO2 EMISSIONS

## Competitiveness



TOTAL COST OF ENERGY





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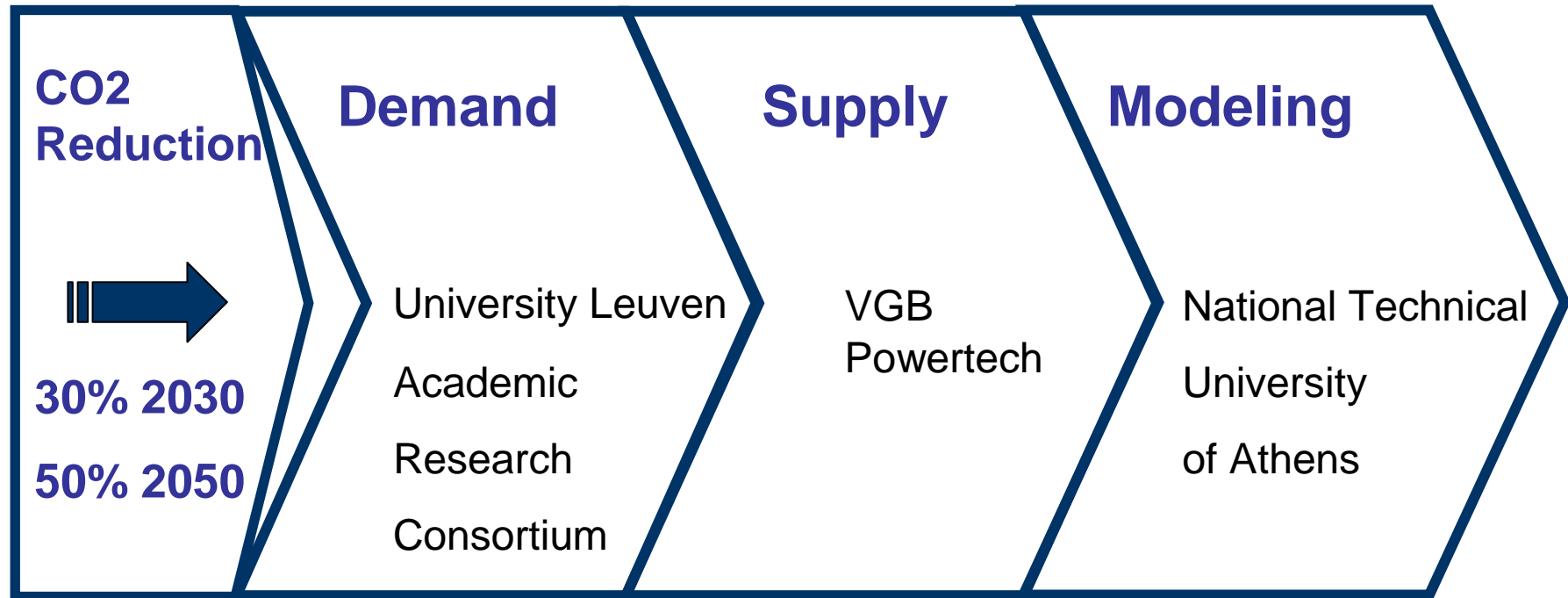


## How to get to a low-carbon and efficient energy economy and meet all three challenges?

- What is the role of electricity and the impact of new:  
Energy-efficient demand-side technologies?  
Low-carbon and electricity supply technologies?
- Which synergies between these technologies?
- What future role of electricity?
- Which policy recommendations?



# Role of Electricity



Project Advisors: McKinsey & Company



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Demand

Supply

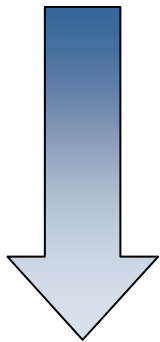
Modeling

## Demand Side

- **LESS ELECTRICITY WHERE POSSIBLE**  
(electricity savings)
- **MORE ELECTRICITY WHERE NECESSARY**
  - Substitution of less efficient processes
  - New developments?
    - » **HEATING and COOLING?**
    - » **TRANSPORT?**



# Unleash energy demand-side efficiency



## Industry



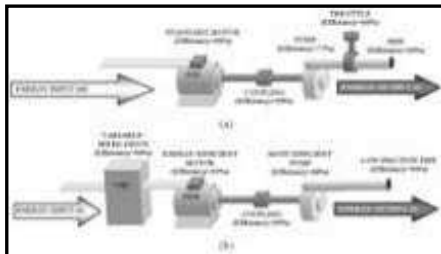
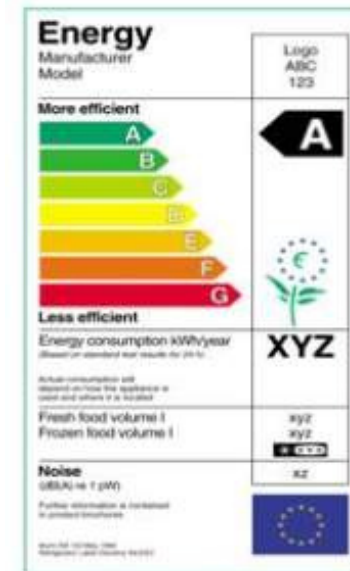
## PHEV



## Rail transport



## Household Appliances



Motor Systems



Heat Pumps

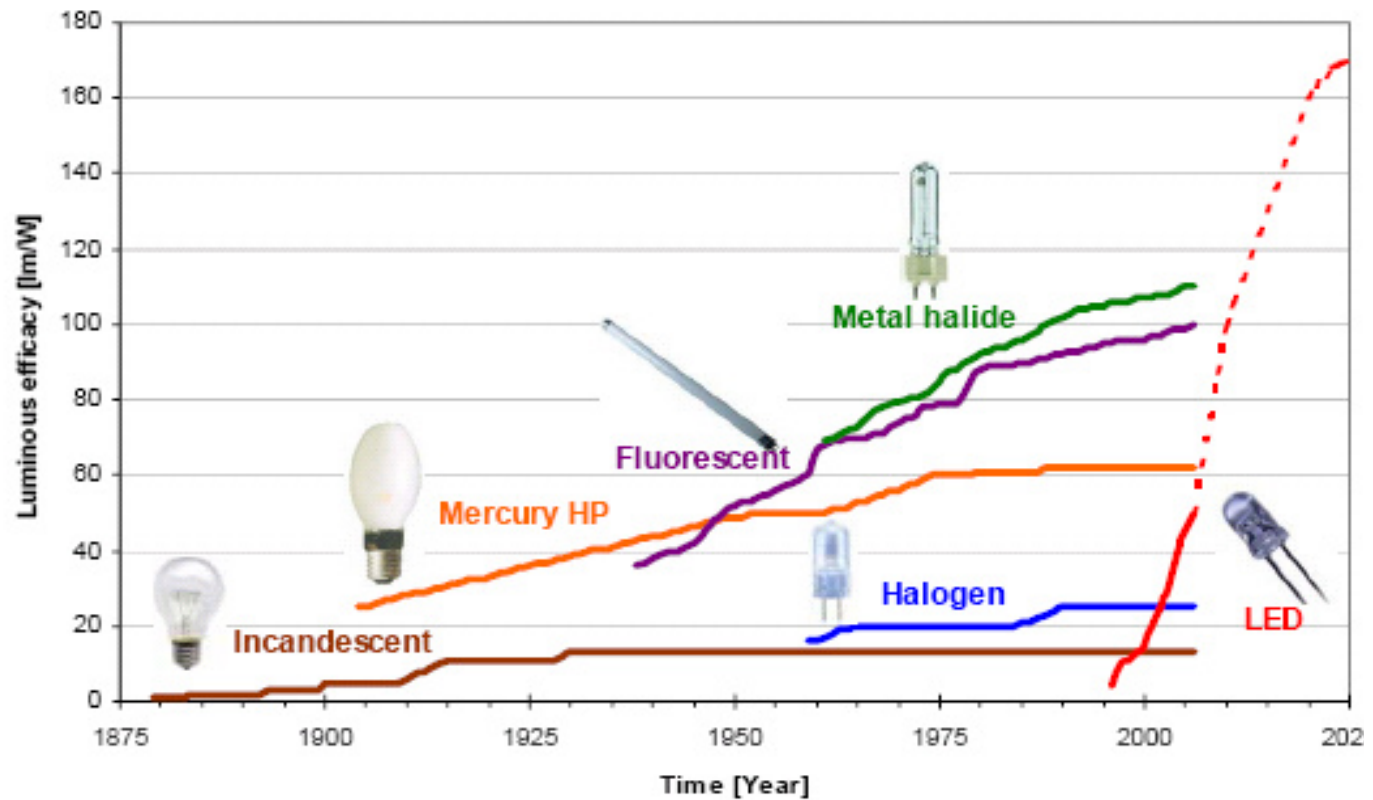


Lighting



# Efficient Lighting with advanced technologies

Today 85% of lamps for residential use are incandescent

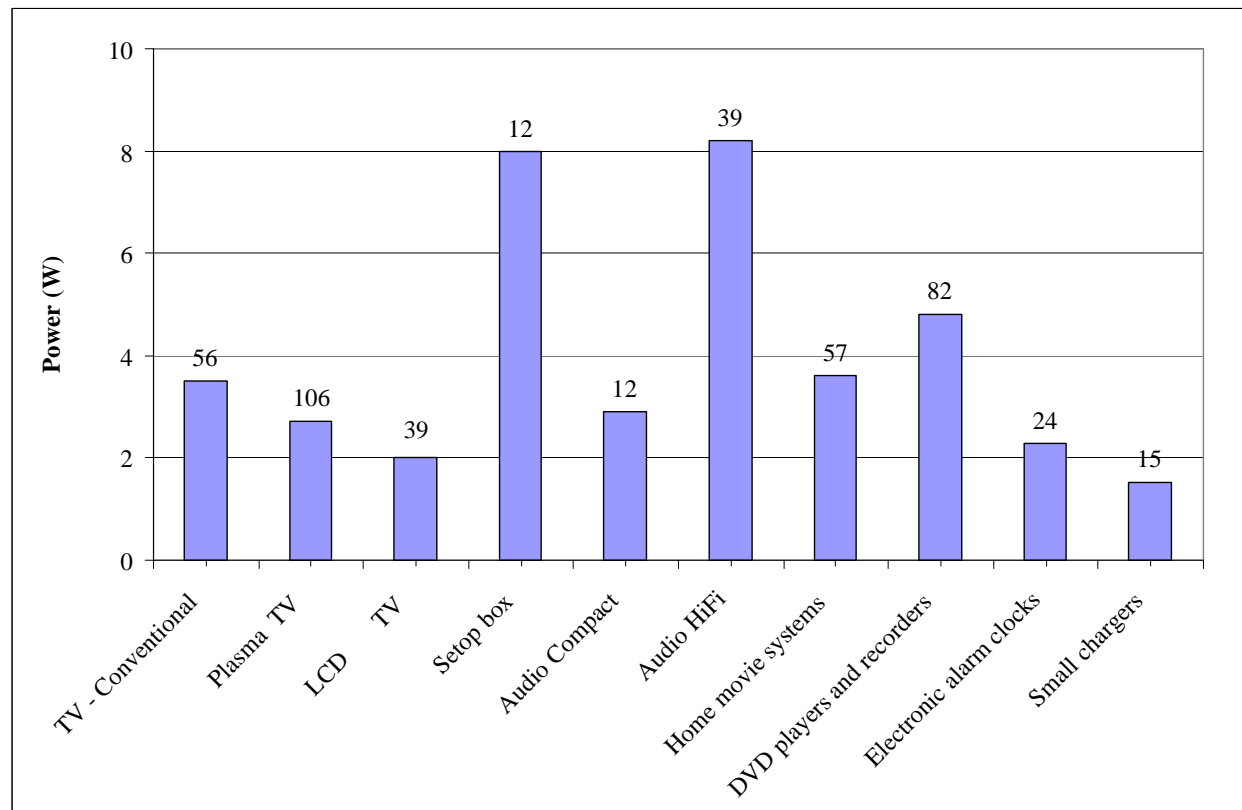
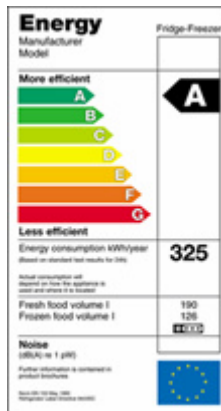


Source: LABORELEC



# Efficient household appliances

Reduce Standby Power and save energy



Source: ISR – Dep. de Engenharia Electrotécnica e de Computadores – Universidade de Coimbra



## The comeback of rail transport

Sustainable, secure  
and competitive urban  
and long distance  
transport

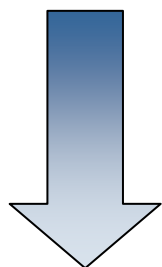




# Developing synergies: Heating Impact of heat pumps

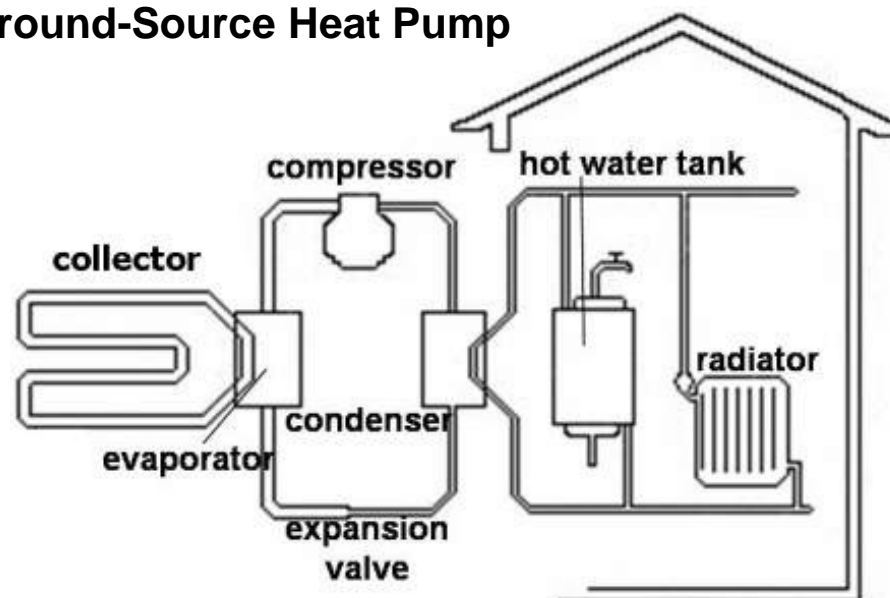


Low-carbon electricity  
substitutes fossil fuels  
in the residential sector  
through heat pumps



Reduces CO2  
emissions and oil/gas  
dependency

Ground-Source Heat Pump



Source: European Heat Pump Association



# Developing synergies: Transport

## Impact of the plug-in hybrid vehicle (PHEV)

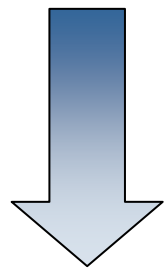
Low-carbon electricity substitutes fossil fuels in the transport sector through PHEVs



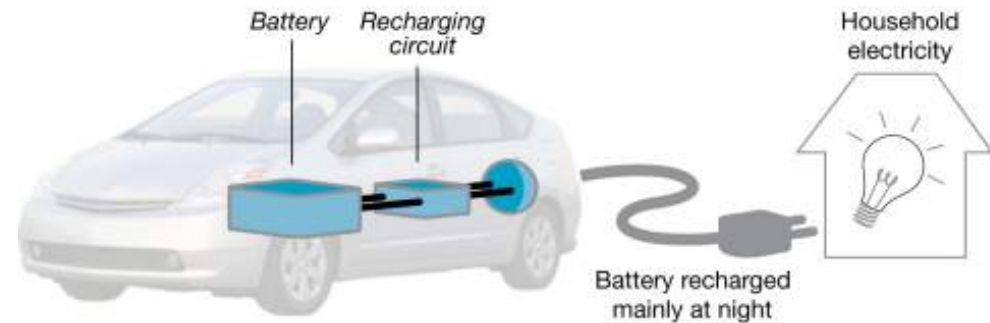
EV (mainly battery) mode used for short distances:  
**CO<sub>2</sub> emissions are nearly zero**



HV (battery plus engine) mode used for long distances:  
**High fuel efficiency**



**Reduces CO<sub>2</sub> emissions and oil/gas dependency**



Source: Toyota



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- Demand
- Supply
- Modeling

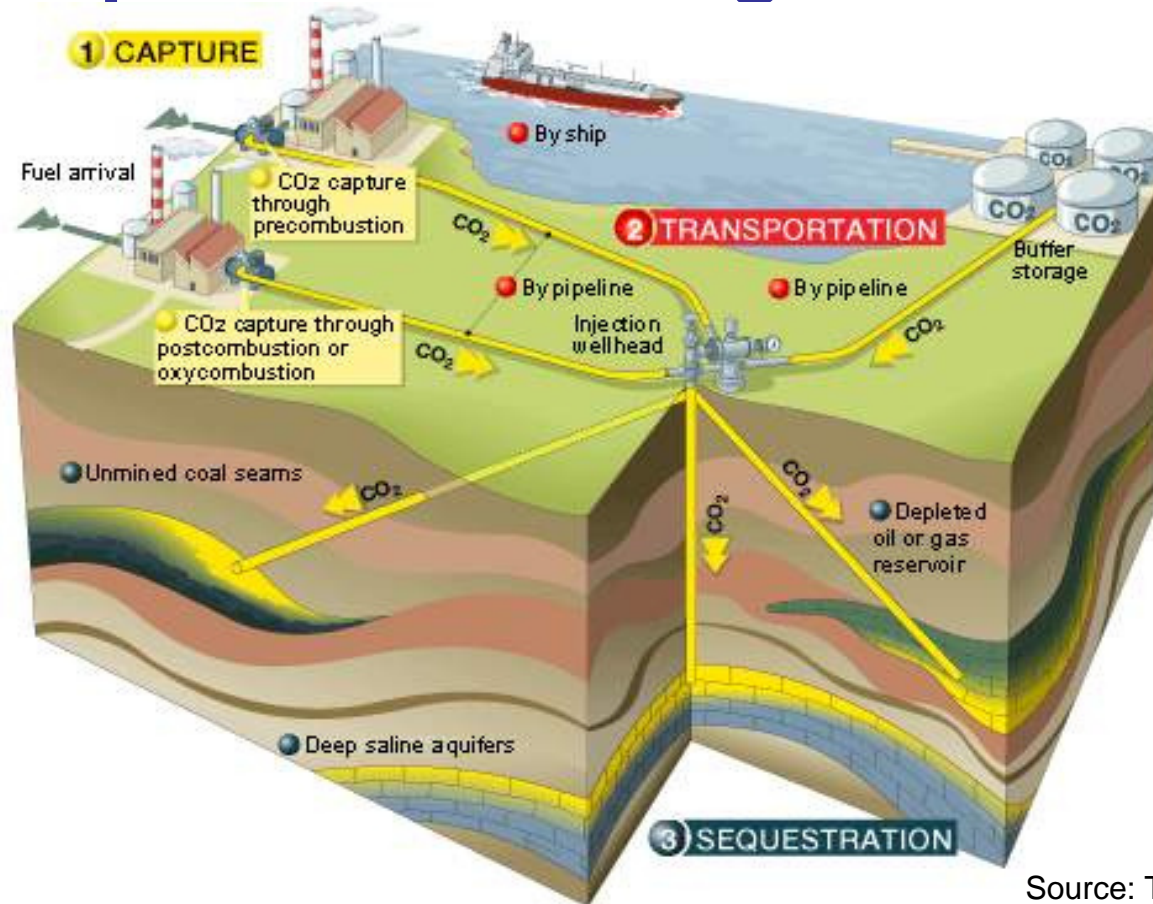
## Supply Side

**Towards low-carbon power generation  
and new technologies in electricity supply**





# CO2 Capture and Storage



Reduces CO<sub>2</sub> emissions in the power generation considerably

At an energy penalty of 5-14% efficiency loss

Enhances oil recovery

Source: Total



## Renewable Power

**Key technologies:**

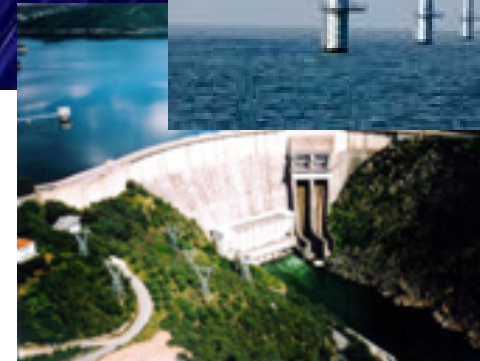
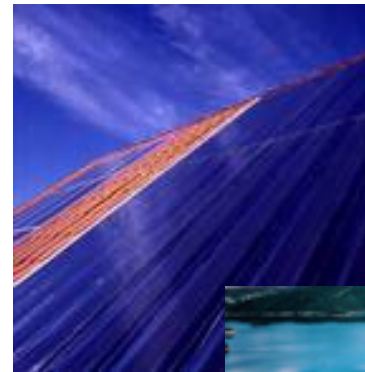
**Hydro power**

**Biomass**

**Wind energy**

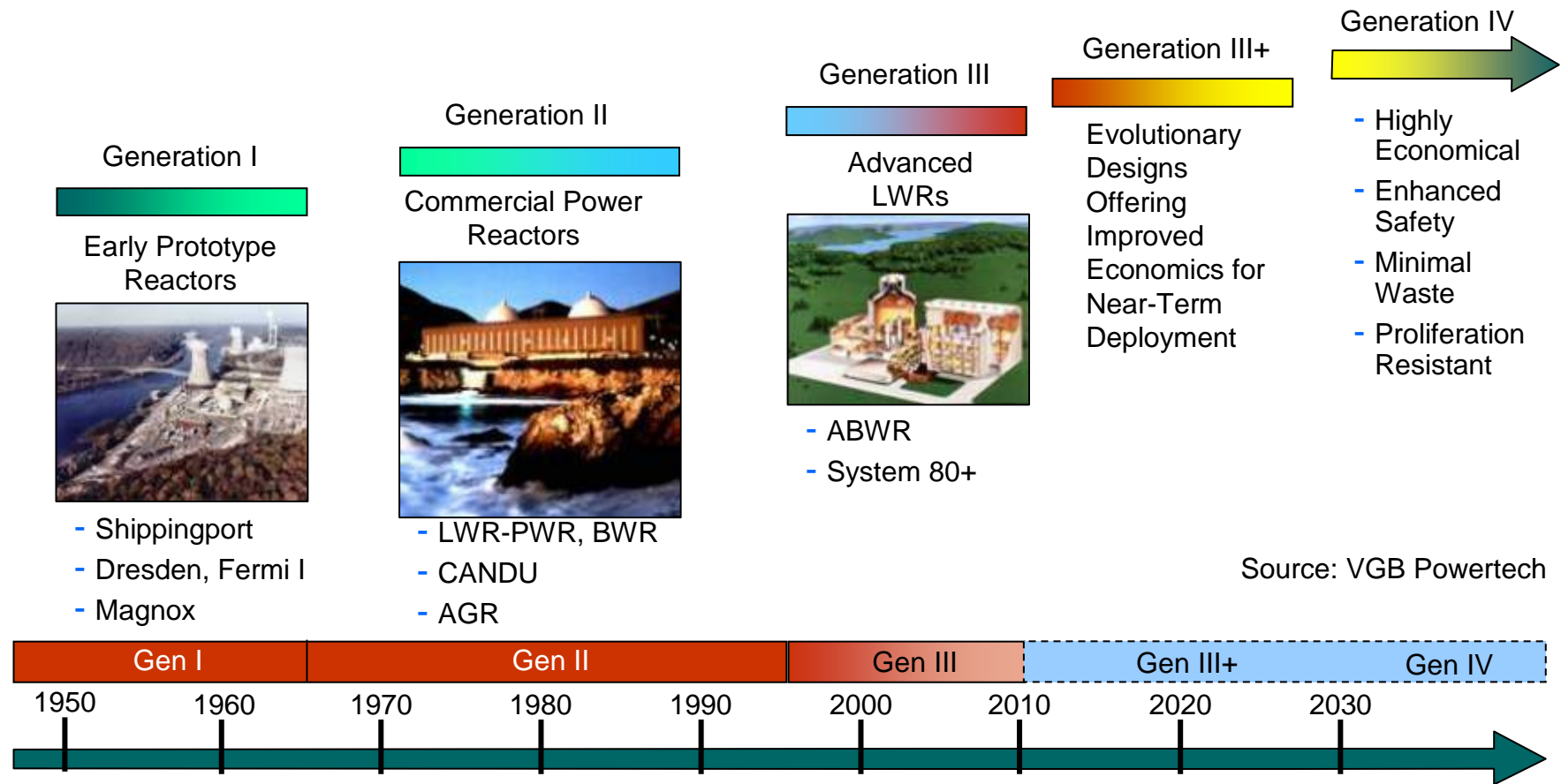
**Solar thermal power**

**Photovoltaic**





# Nuclear Technology Generations





# Role of Electricity project

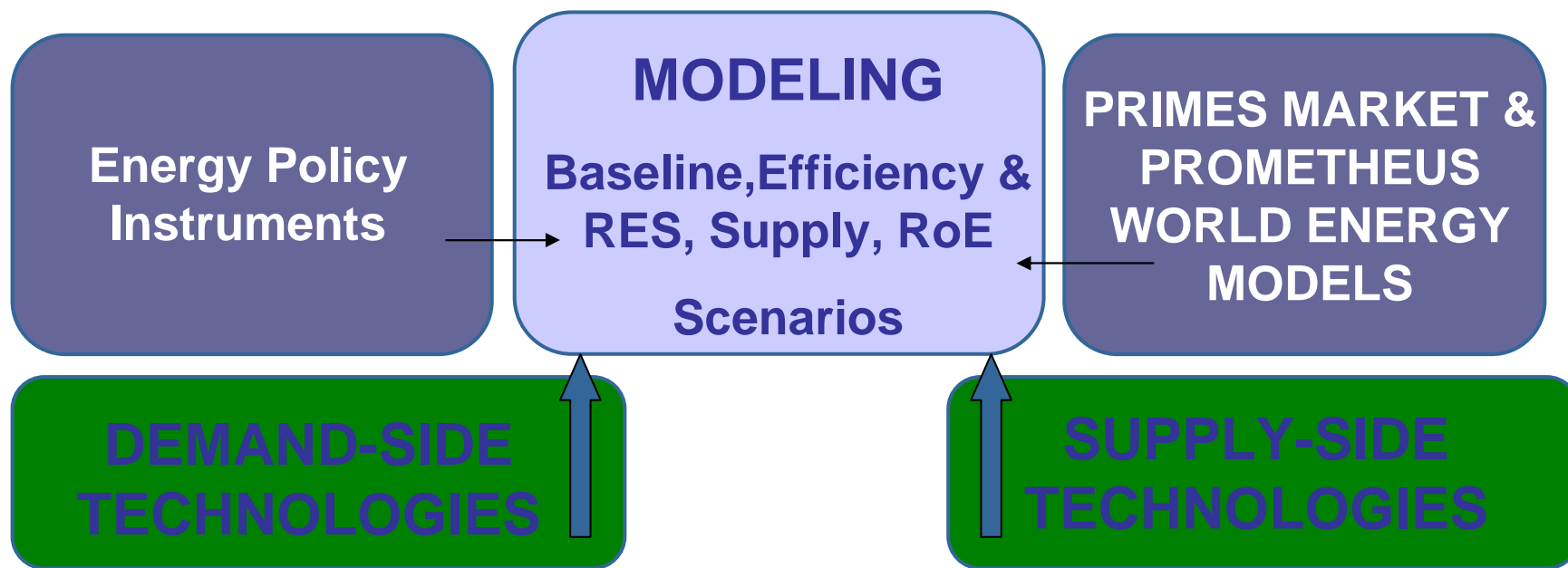
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# Demand and Supply Scenarios up to 2050

The scenario does not provide forecasts about our future energy landscape but allows decision-makers to assess the outcome of policies under certain conditions.





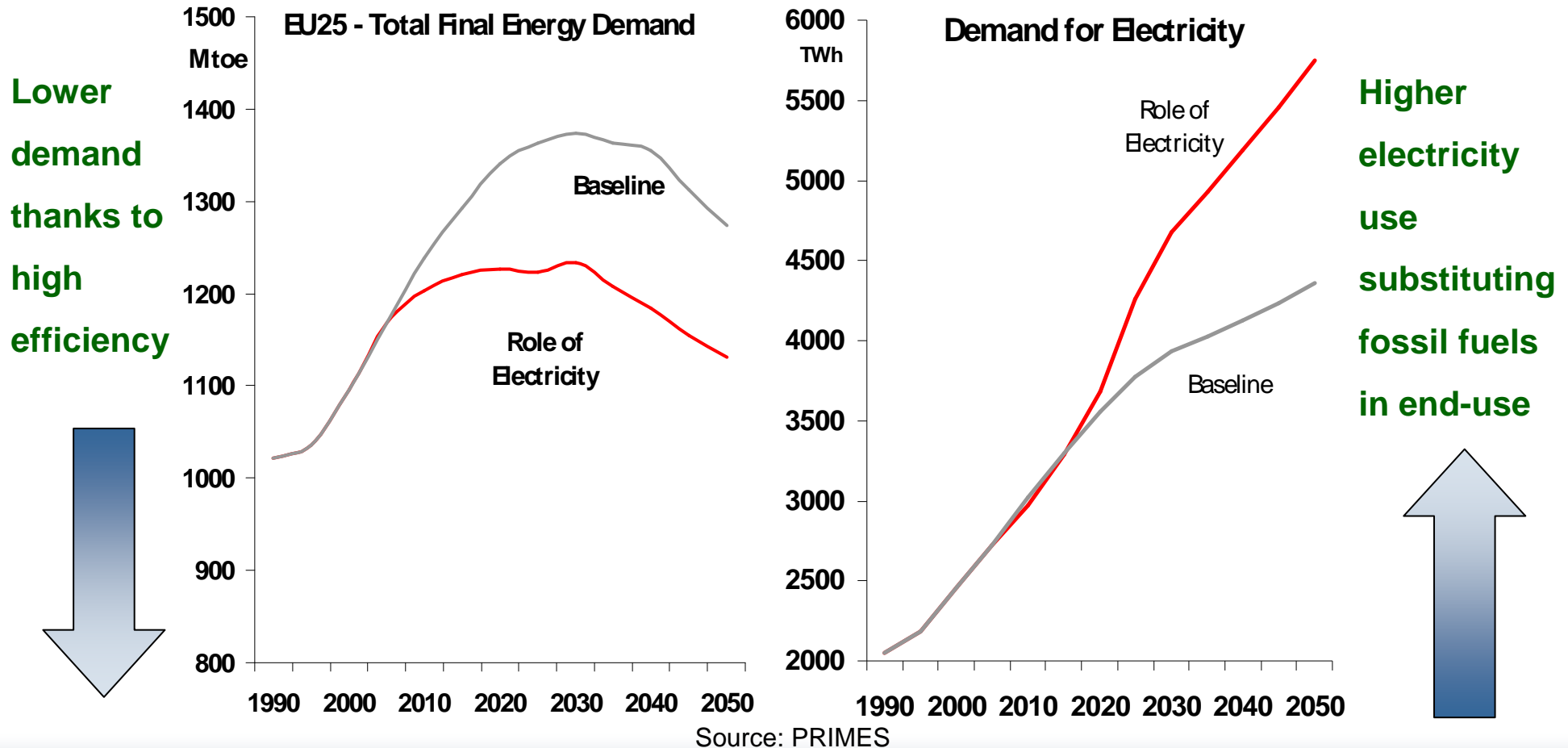
## Changing the baseline

<b>Use all demand and supply options</b>
<b>Energy Efficiency</b>
<b>Electro-technologies</b>
<b>Renewables</b>
<b>Nuclear Energy</b>
<b>Carbon Capture and Storage</b>

Scenario results for 2030 (2005=100)	Baseline	<b>Role of Electricity</b>
CO2 Emissions	110	<b>70</b>
Total Cost of Energy	146	<b>147</b>
Maximum Carbon Value	5	<b>56</b>
Oil&Gas Import Dependency	126	<b>105</b>

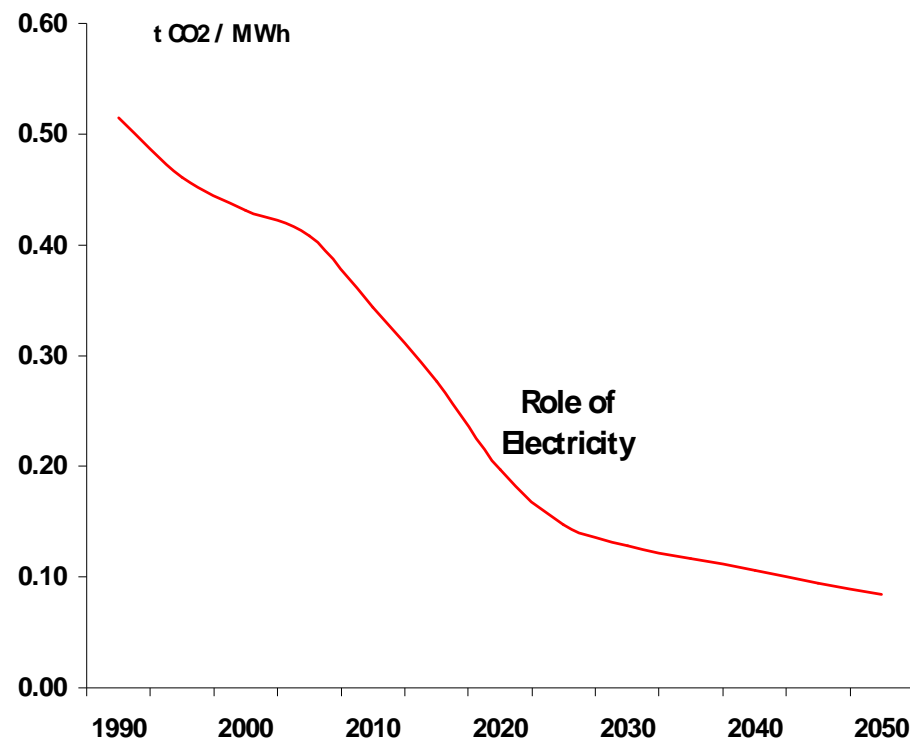
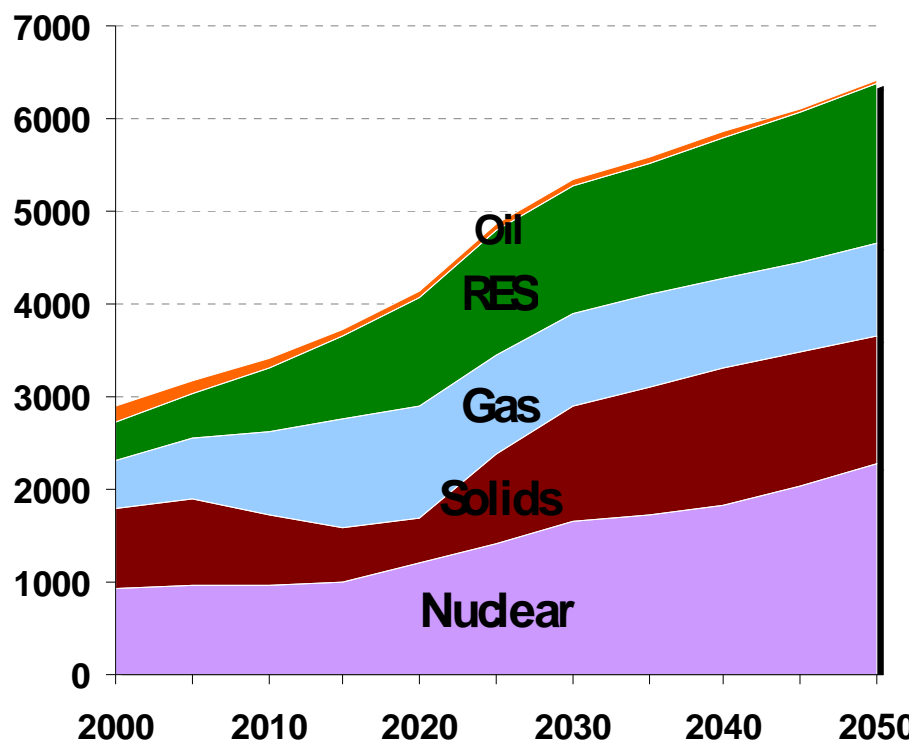


# Intelligent Use of Electricity





# Towards a low-carbon and balanced power mix



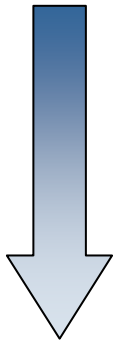
Source: PRIMES



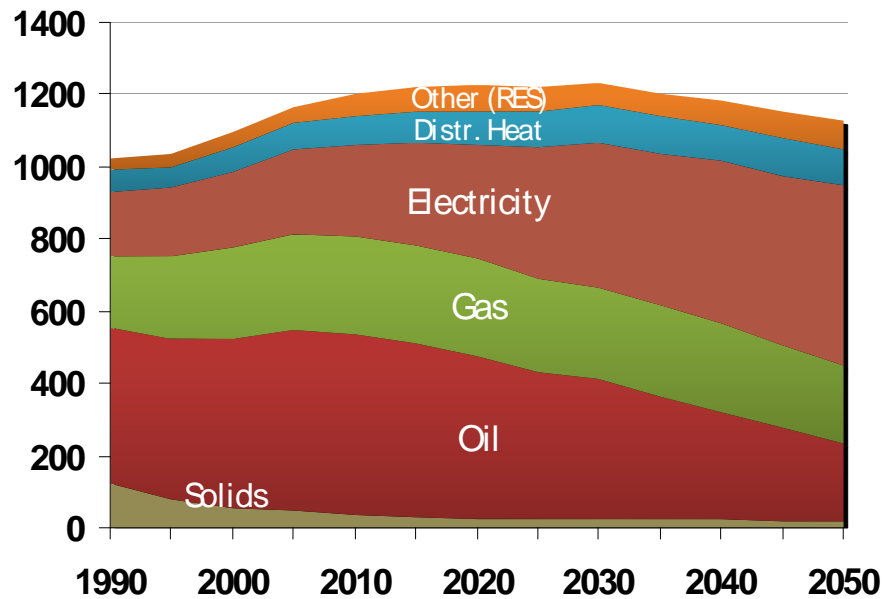
# Reversing oil/gas dependence

**2005-2050**

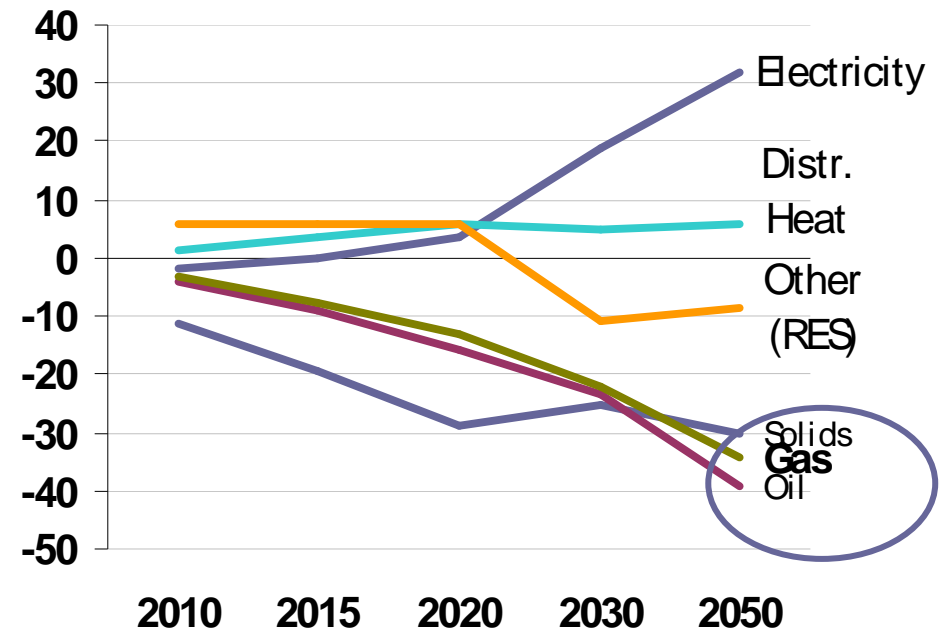
**Oil  
-50%**



Final Energy Consumption in Mtoe



% change from Baseline





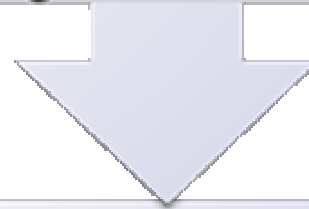
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## **Key to cost-effectiveness**

Higher but intelligent electricity use on the demand-side combined with very low carbon-emitting power generation



## **Success of a series of technologies and policies, such as:**

Plug-in hybrid cars and vehicles

Heat pumps, efficient lighting etc.

Ambitious development of energy efficiency

Higher development of renewables

Carbon Capture and Storage

Nuclear energy



## **CONCLUSION**

**Substantial reduction of GHG emissions  
without unreasonable costs  
together with reduced oil-gas dependency**

**IS POSSIBLE:**



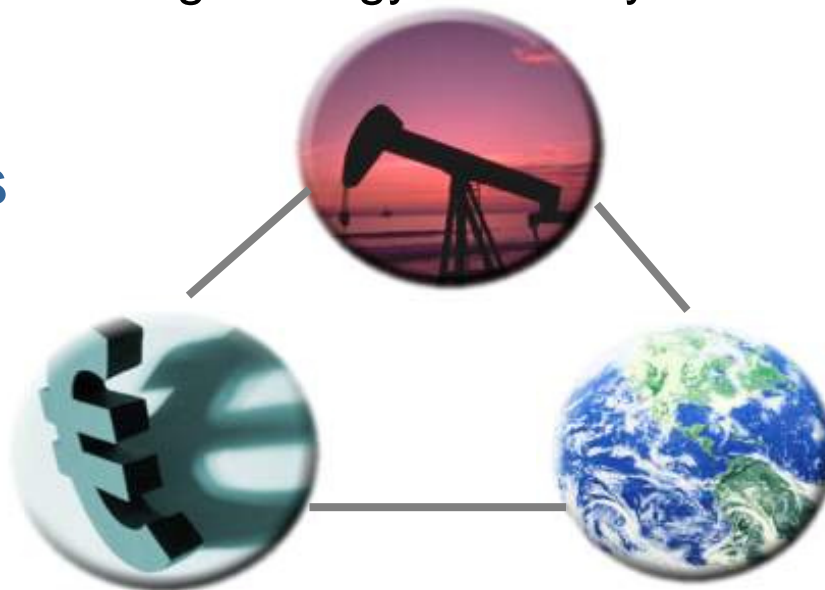
## A positive message

### Security of supply

- Lower Oil/Gas Dependency
- High energy efficiency

### Competitiveness

- Low additional costs
- High investment in generation
- Growth through new electro-technologies



### Climate change

- Lower emissions and carbon intensity of the economy



## **THE PATHWAY: PARALLEL AND PRO-ACTIVE ACTION**

- 1. Unleash the potential of energy efficiency**
- 2. Develop a low-carbon electricity system by using all available options**
- 3. Intelligent electrification of the economy**
- 4. Consistent deployment and a market-oriented approach**
- 5. Global cooperation on global issues**



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***Thank you for your attention!***

**John Scowcroft**

**E-mail: [jscowcroft@eurelectric.org](mailto:jscowcroft@eurelectric.org)**

**More details of project  
are available on:**

**[www.eurelectric.org](http://www.eurelectric.org)**

