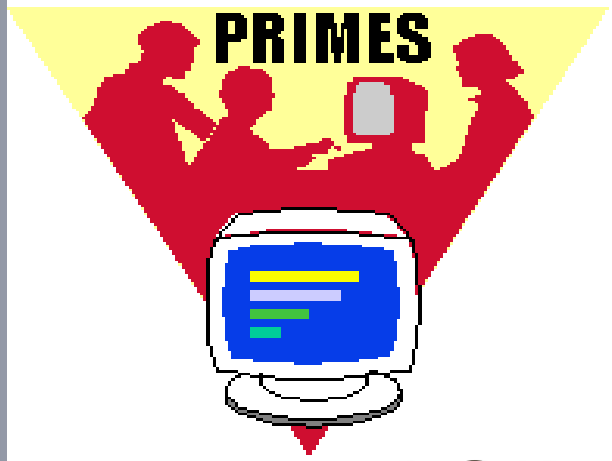

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EUROPEAN MARKETS

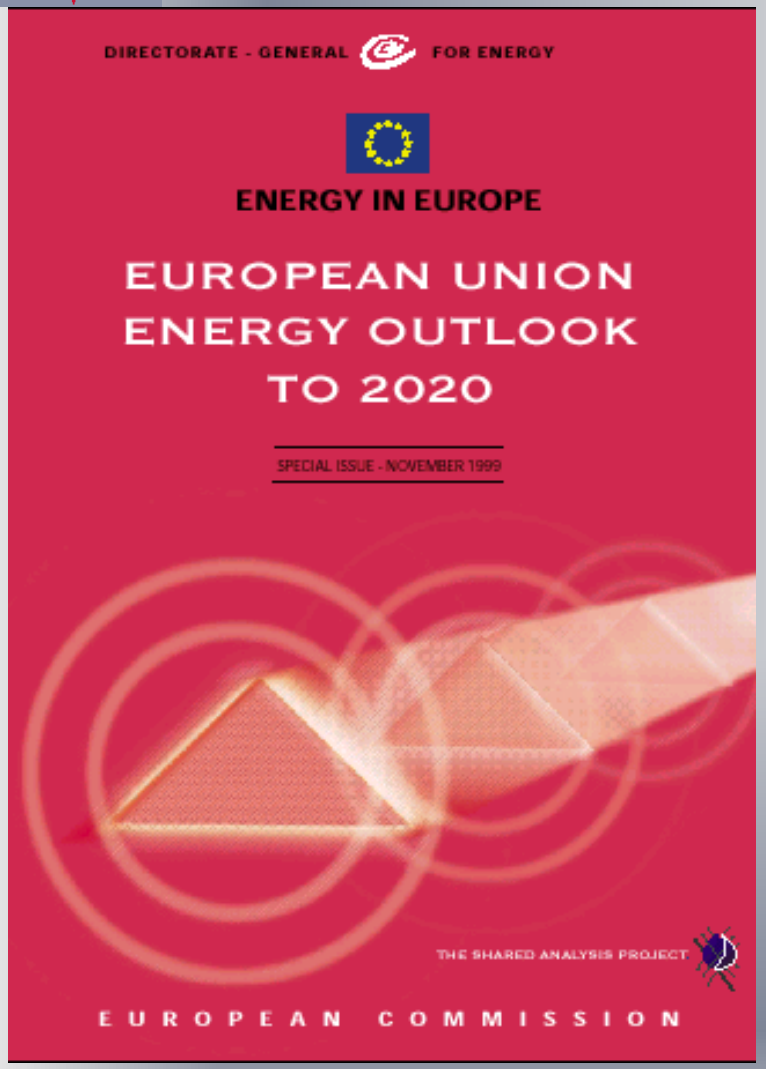
EU Energy and Emissions Outlook to 2020

Final Conference of "Shared Analysis"
Brussels 30.11-1.12.99

Overview of Model Analysis for Europe

- **Policy analysis based on**
  - **Scenarios for the energy system of the EU, 95-2020, 2030**
  - **PRIMES energy model for the EU**
  - **Linked to POLES (world) and GEM-E3 (economic growth)**
- **Main scenarios to 2020**
  - **Baseline scenario**
    - Current policies in place and in the pipeline
  - **Kyoto-compliant scenarios**
    - Stabilisation, -3%, -6%, from 1990 CO_2 emissions
  - **Sensitivity analysis**
    - Transports, nuclear, renewables, world energy prices, structure of growth

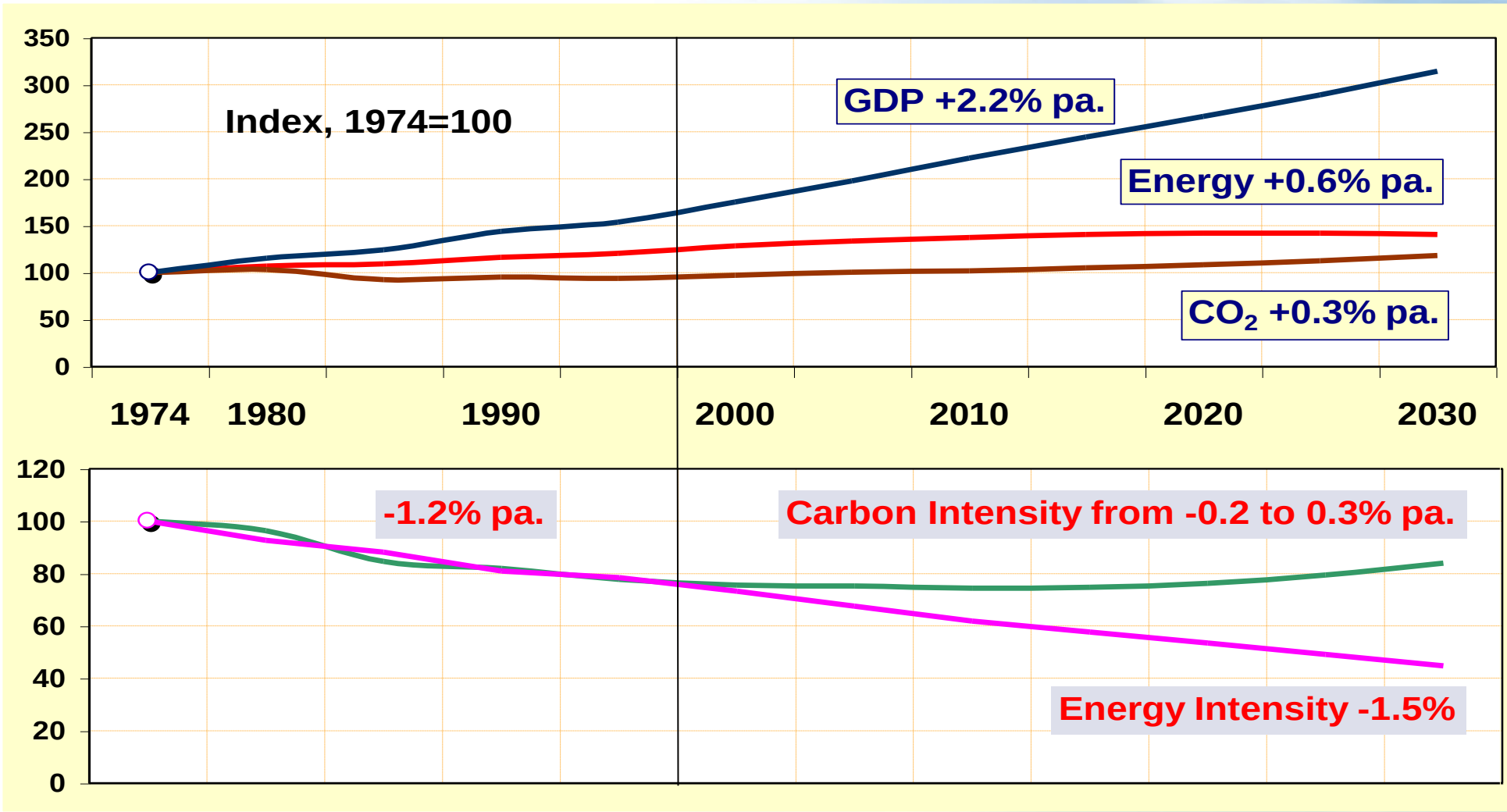
Details in the "EU Energy Outlook"



- **Key Trends of Energy Demand and Supply and their costs and implications**
- **Main findings from CO_2 Emission Reduction scenarios**
- **Issues and Uncertainties**
  - **Baseline scenario: Normative benchmark for current policies**
  - **Natural Gas: Key role in Europe**
  - **Power Sector: Important to Regulate for Energy Policy**
  - **Long-term: Critical Decisions for Power Generation**
  - **Transports: Key sector but difficult to influence trends**

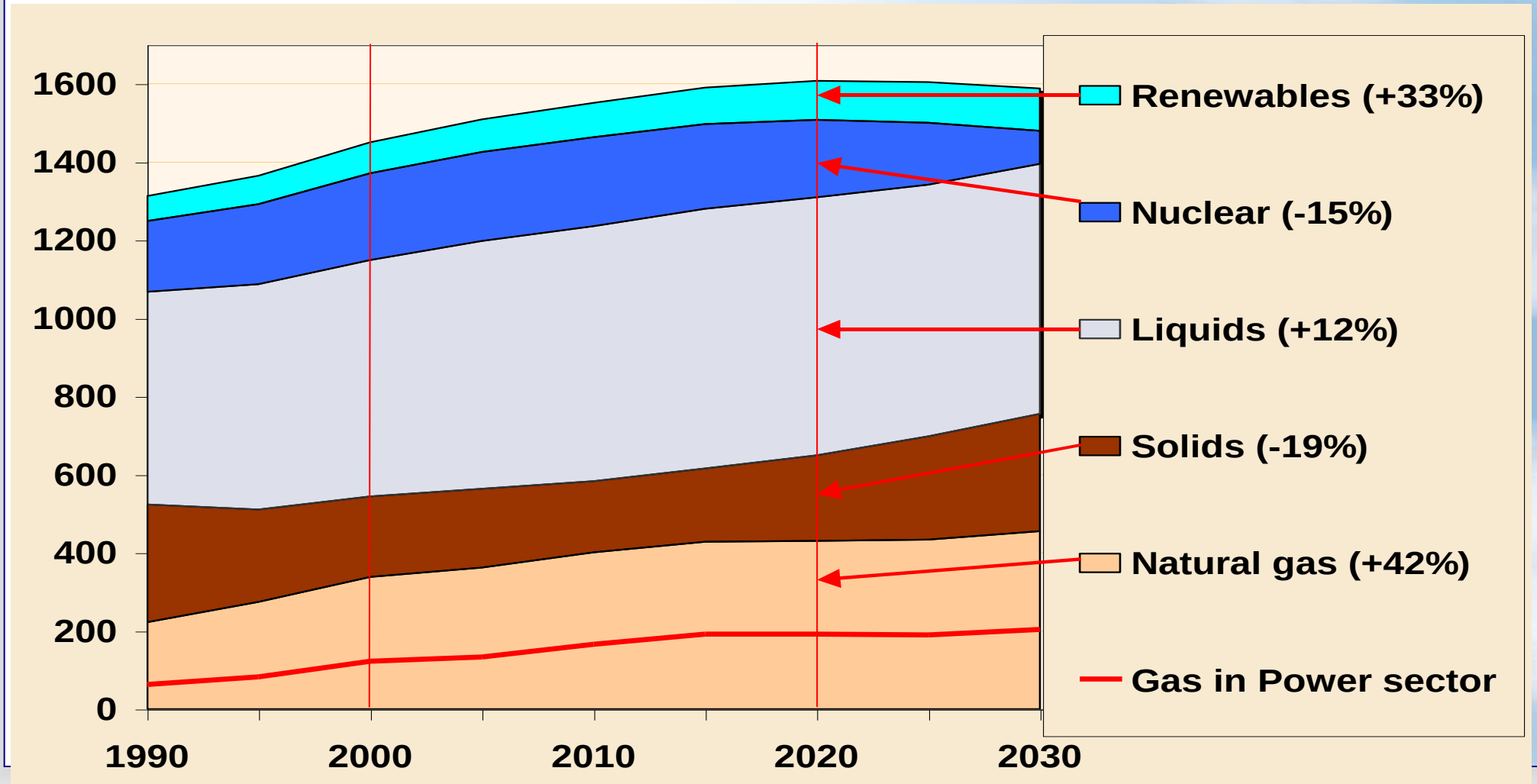
EU Primary Energy Indicators, 1974-2030

- **Primary energy demand grows less than GDP**
- **System dominated by fossil fuels**



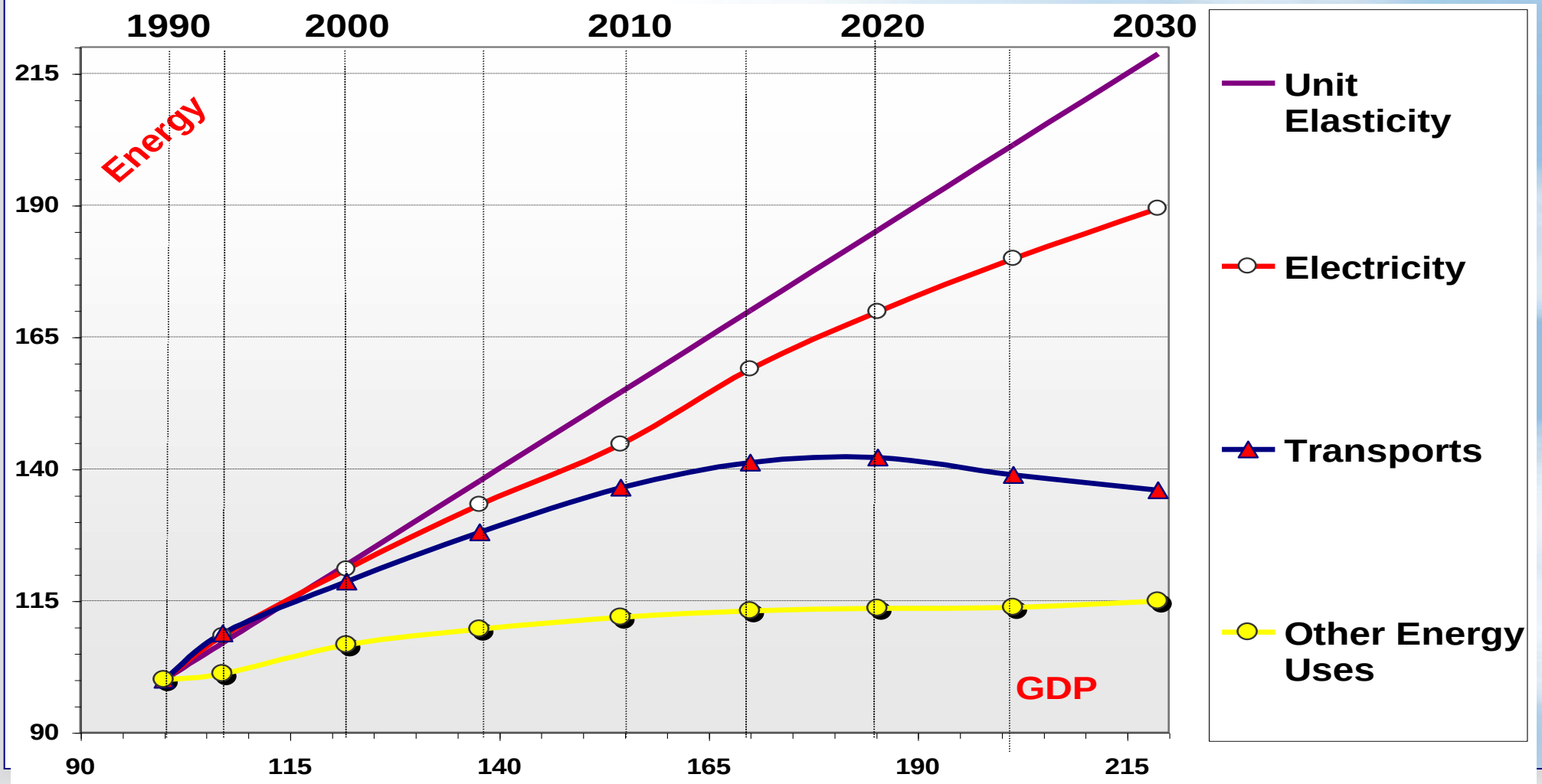
EU Primary Energy Needs by Fuel

- **Decline of Solid Fuels, High growth of Gas driven from Power generation, Renewables grow up but remain small**



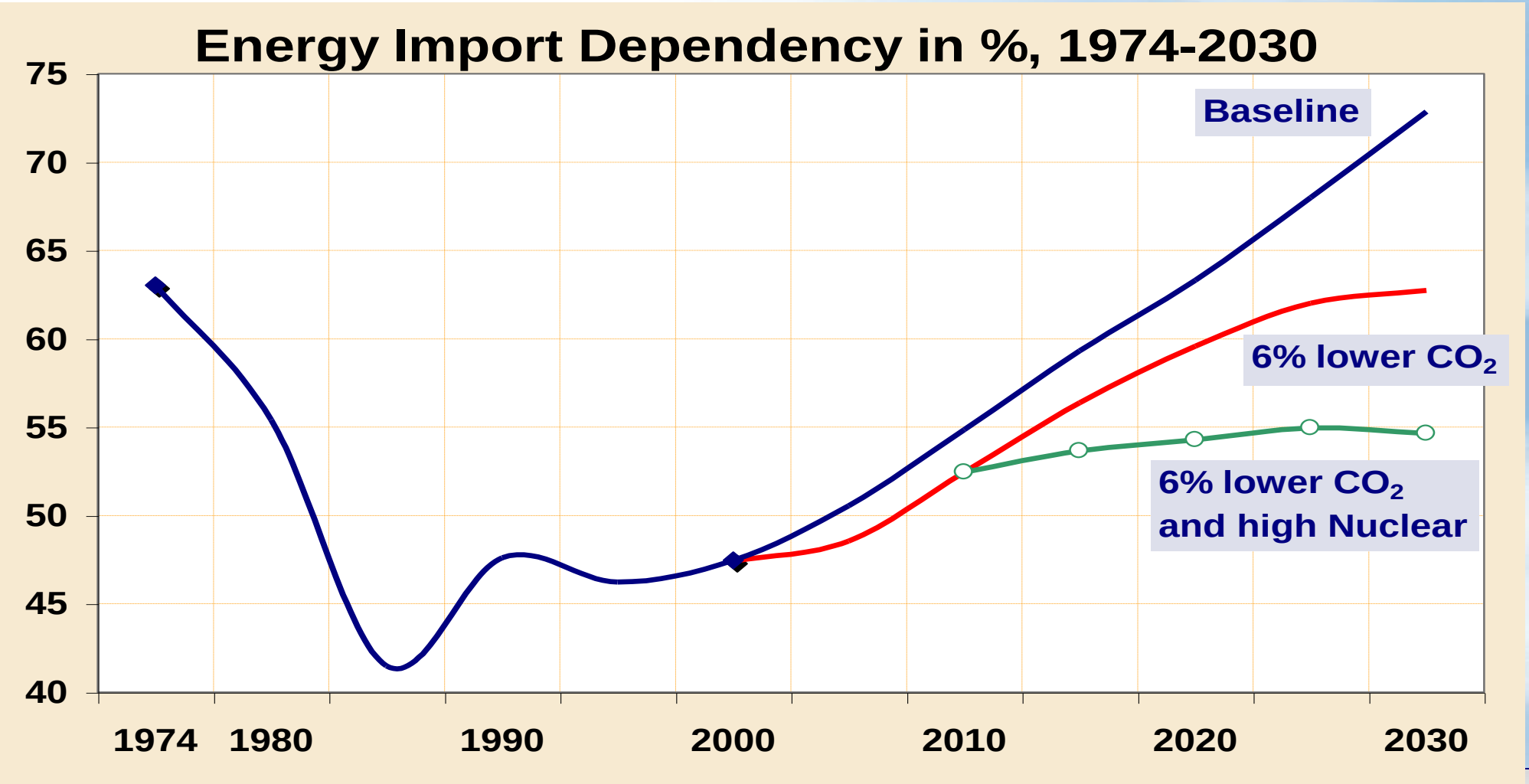
Different Growth Patterns of Final Energy

- **Electricity needs continuously rise, Transports grow but slowdown in long run, Other sectoral needs grow slowly**



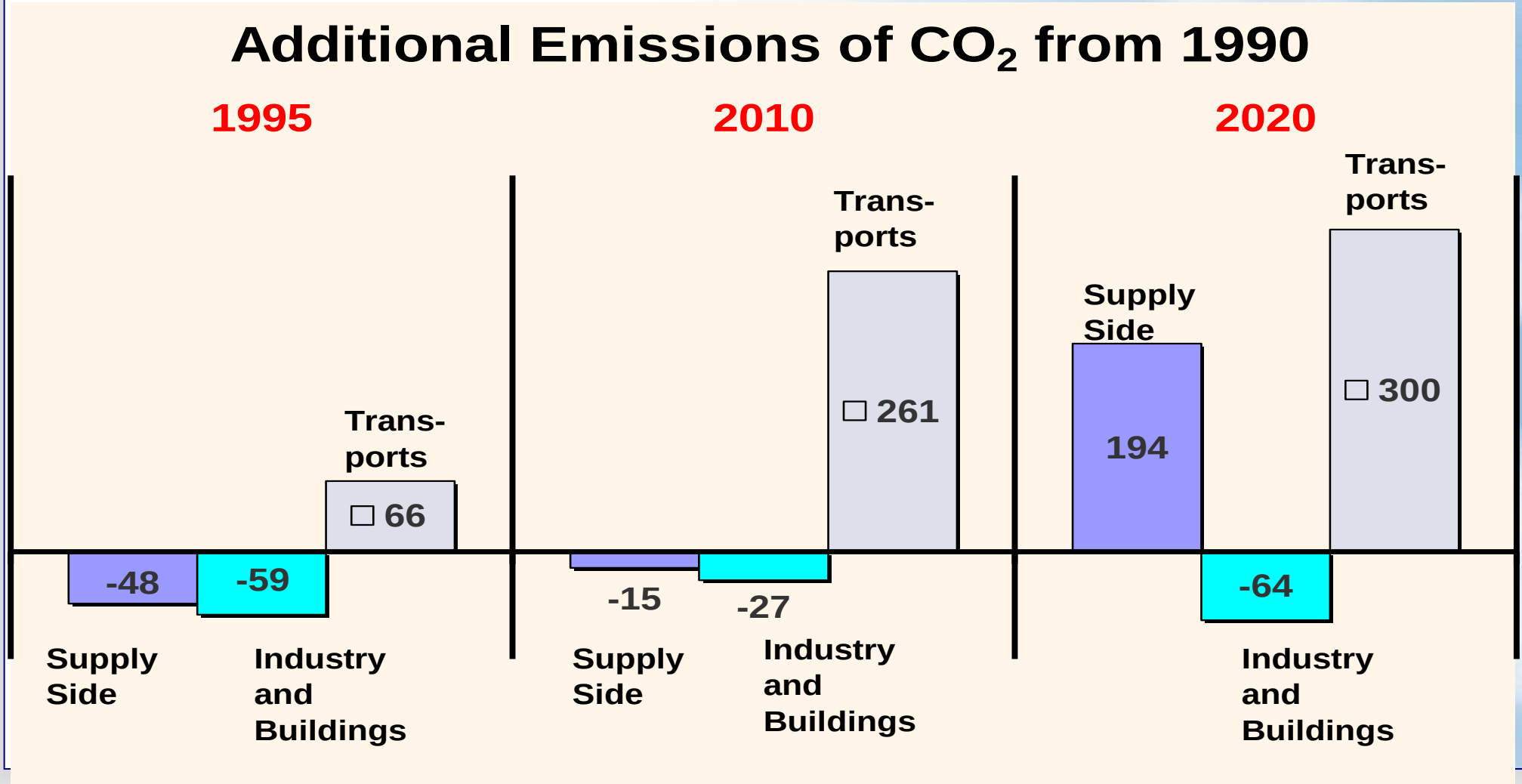
Long-run: Security of Supply Worries

- **After a peak in 2005 indigenous primary energy falls Natural Gas Imports triple in 2030 from today**



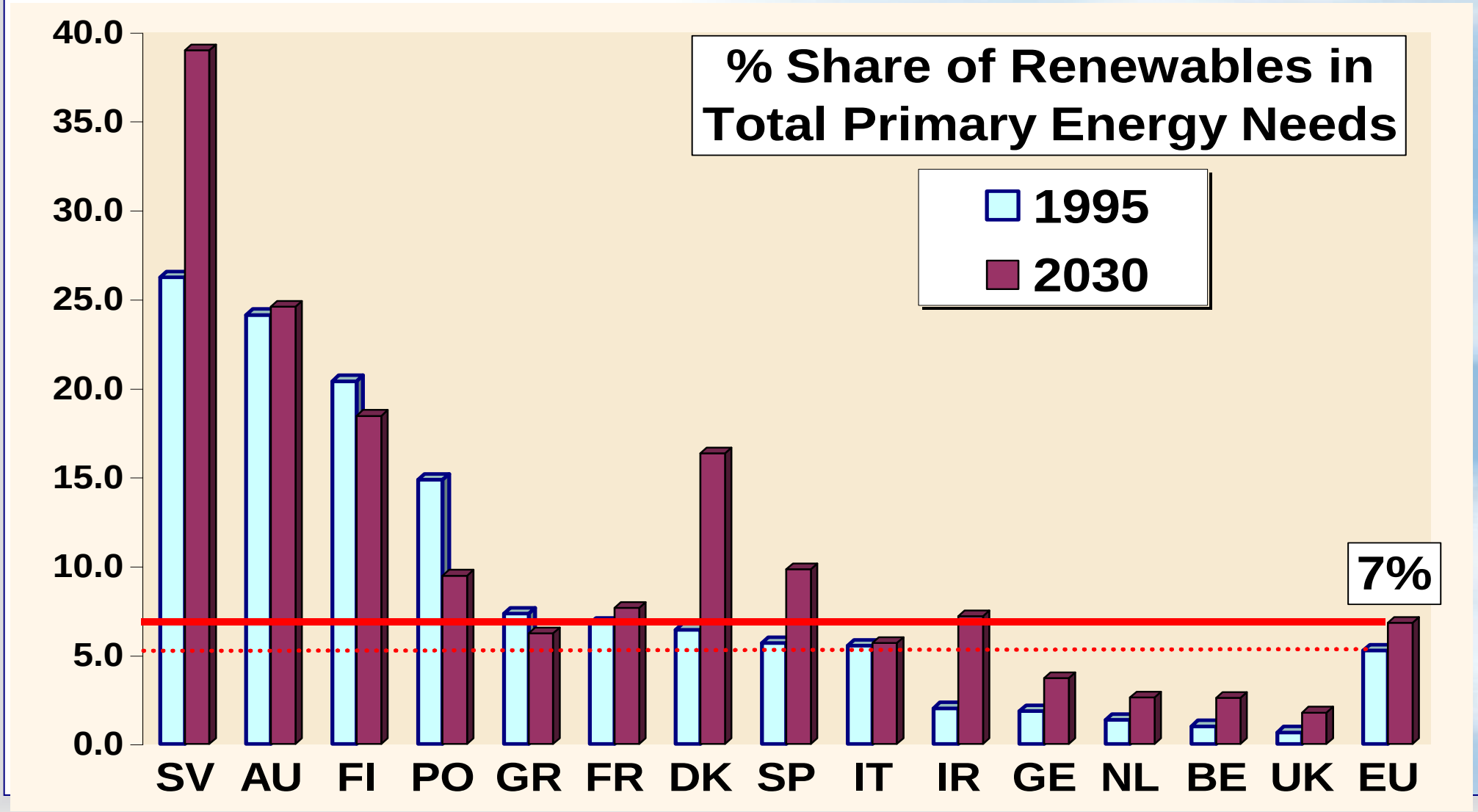
CO_2 Emissions Increase under Baseline

- **From 1990, CO_2 +7% in 2010 (14% 2020), initially due to Transports, after to Power production**



Renewables do not take-off in Baseline

- **Only wind power increases significantly**

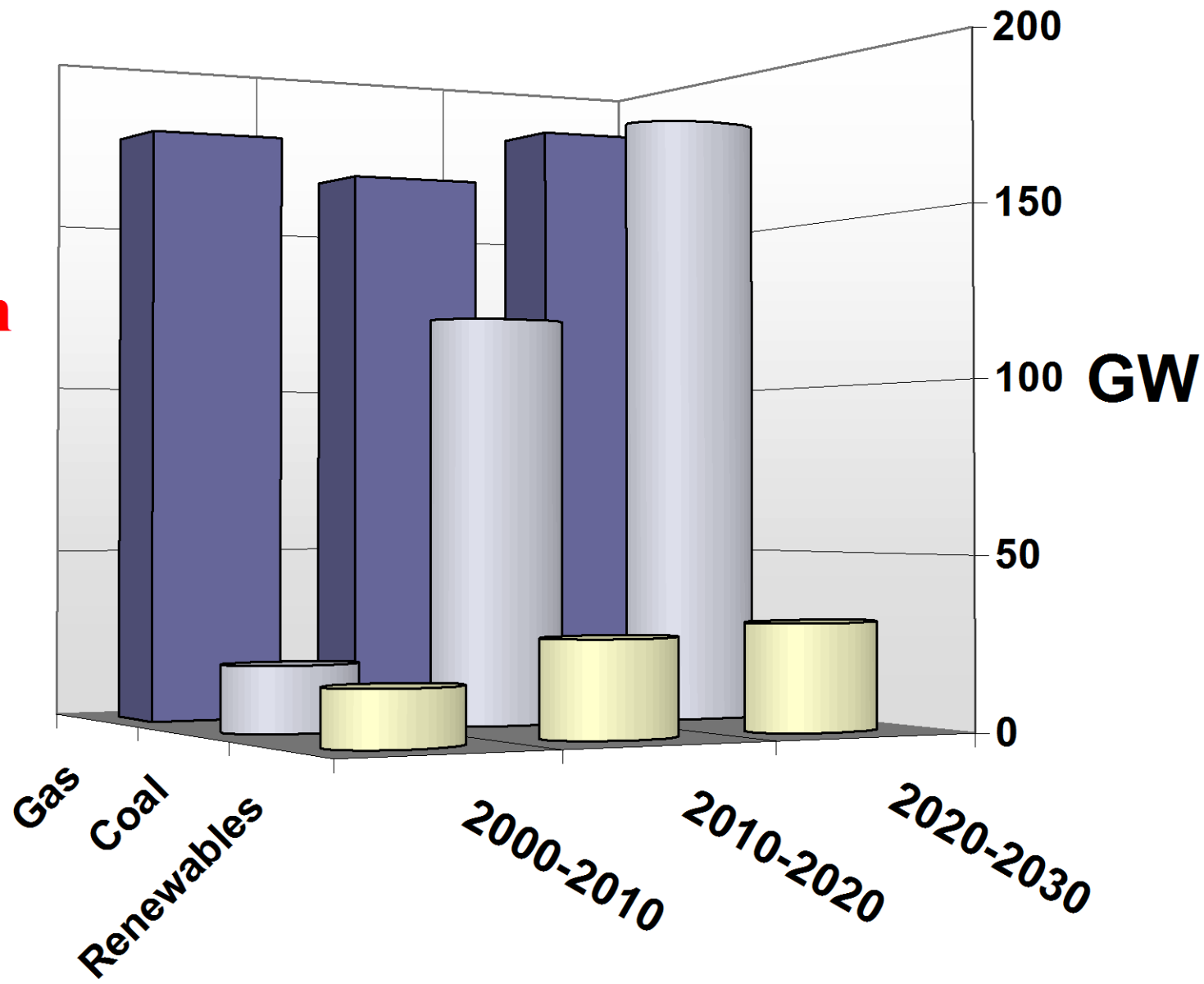


Electricity Market Liberalisation

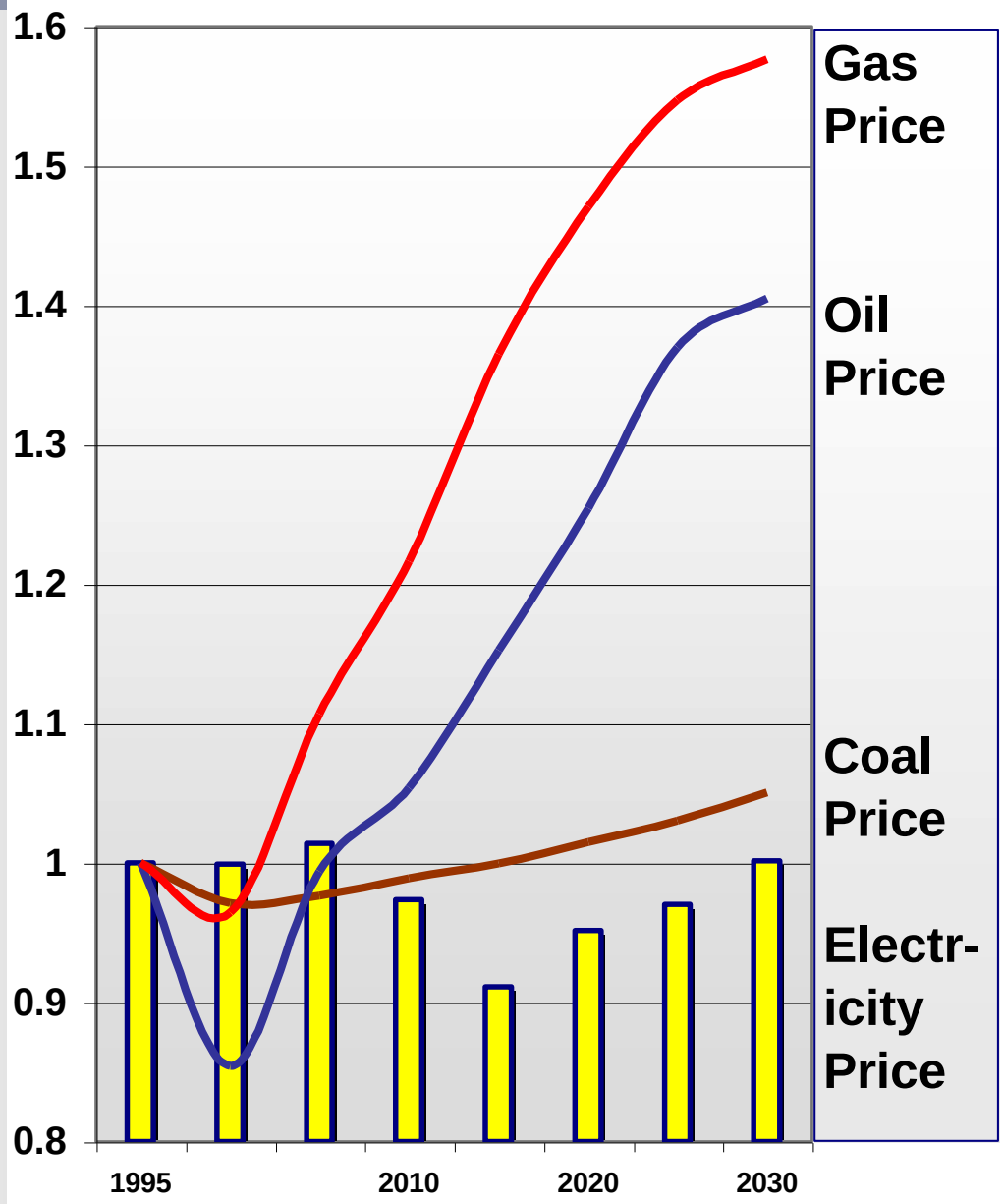
- **A Success Story under the Baseline Scenario; Drivers are Technology (GT and GTCC) and Competitive Gas Prices**
  - **Lower Electricity Prices despite rising fuel prices**
  - **Positive effects for the Environment, up to 2015**
  - **New generators emerge, some are SME, cogeneration is exploited, wind energy progresses**
- **2015-2030: Uncertain for Power Generation and Policy**
  - **Nuclear Decommissioning**
  - **Rising gas prices lead to come-back of Coal**
  - **Renewables and Environment under Pressure**

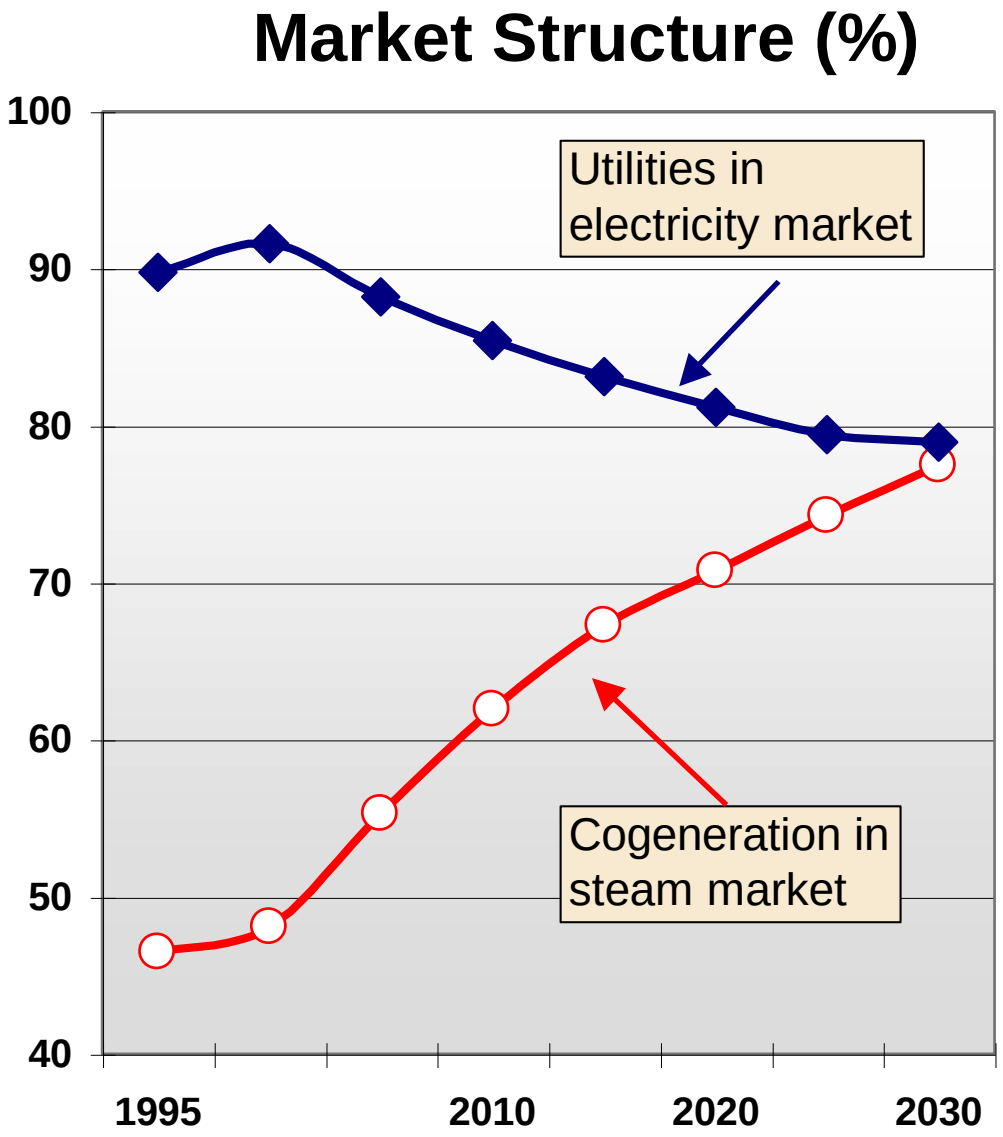
Short-term for Gas, Long-term for Coal

Capacity Expansion for Power Generation

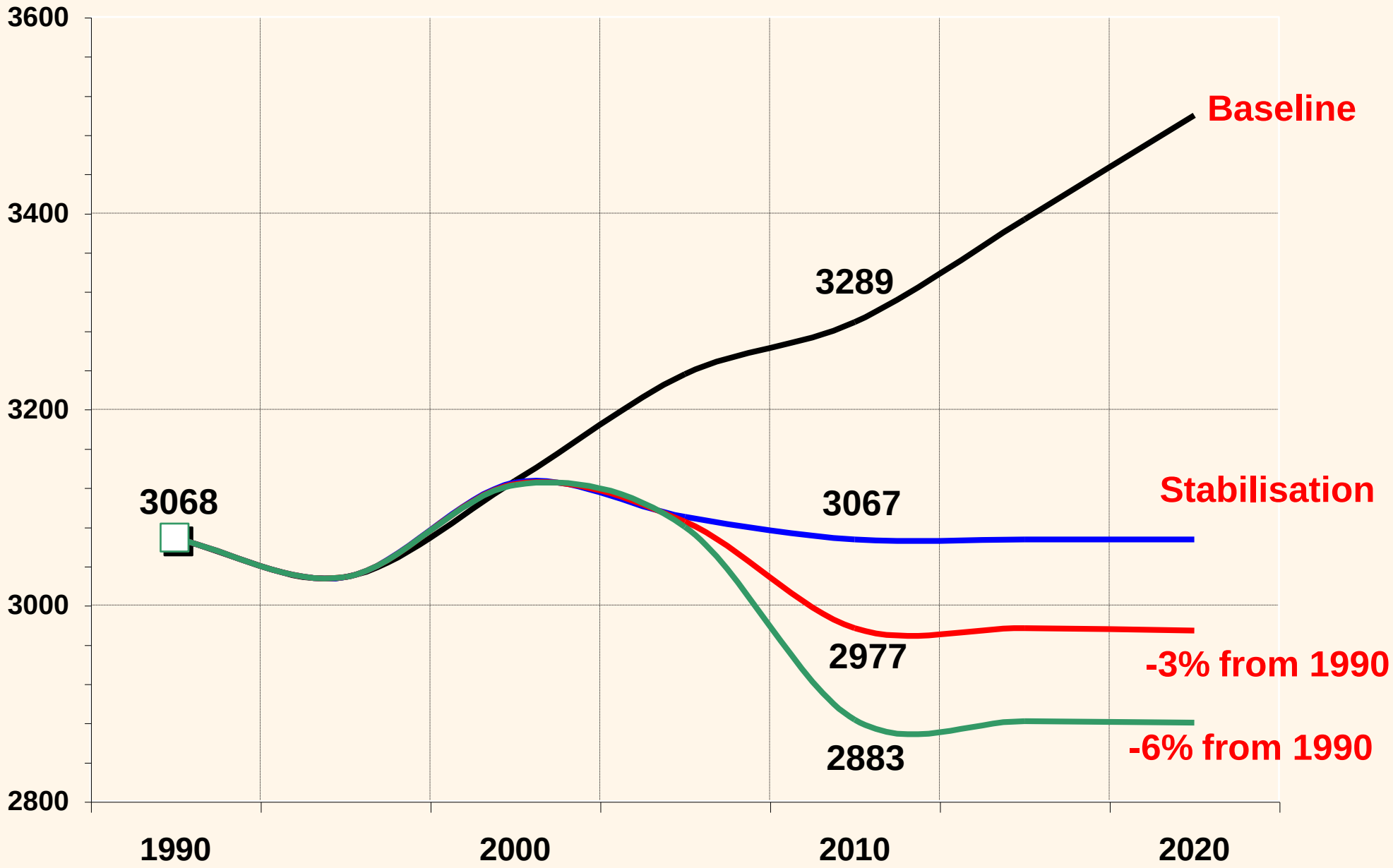


Market structure, Cogeneration and Costs





Baseline and CO_2 Control Scenarios



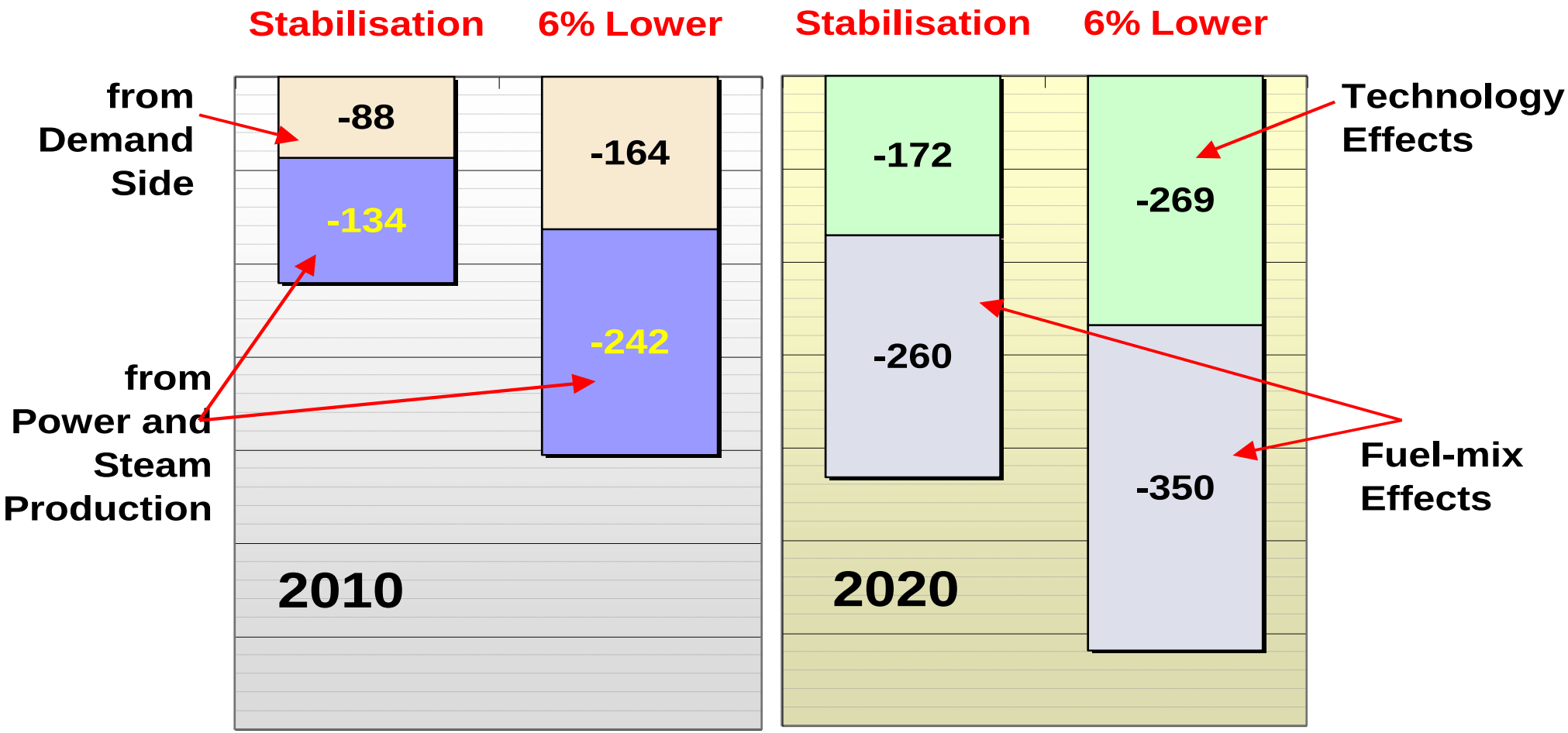
Control of CO_2 Emissions in the EU

- **Which reduction target for the EU energy system?**
  - **Range of emission reduction scenarios (0, -3%, -6% from 1990)**
  - **Presupposes controlling non-CO_2 GHG and trading of CO_2 emission permits**
- **The analysis shows:**
  - **2010 is** short-term **not allowing for technology to develop; stranded costs**
  - Trading **of emissions is by far more efficient than reducing emissions strictly at national level**
  - Mix of **policy instruments**, scope for regulatory policy
  - **Costs and difficulty increases** non-linearly **with higher targets**
  - **Energy System Costs are by no means GDP losses**

How the sectors control emissions?

- **Electricity and Power generation have a Key Role**

Reduction of CO_2 Emissions from Baseline



Effects of CO_2 Emission Control

Indicators of Impact

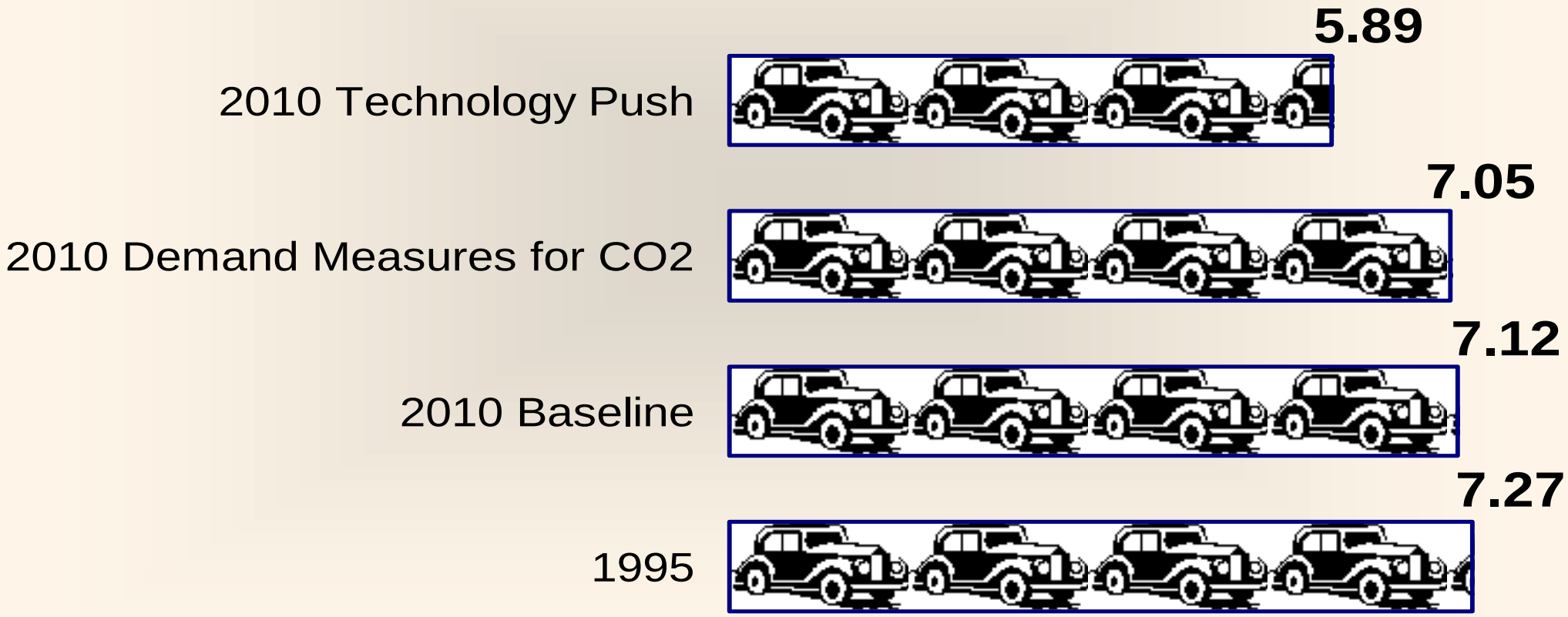
(changes from baseline in 2010)	Emission Reduction Scenario: Stabilisation	Emission Reduction Scenario: –6% reduction
GDP losses (% of GDP)	< 0.1%	0.10 to 0.30%
Energy Systems Costs	10-20 bill. pa.	50-70 bill. pa.
Electricity Tariffs	6%	22%
Cost of Industrial Goods	3%	7%
Fuel costs at home	3%	More than 10%
Marginal Cost per t Carbon	65 Eur	135 Eur
Higher Dependence on Gas Imports	3%	5 to 8%
Higher renewables	9%	21%
Drop in Solid Fuels	-23%	-40%

Issues: Transports

- **Least responsiveness among the sectors**
  - **because of pre-existing taxes and high welfare value attributed to mobility and cars**
- **on the consumers-side the necessary price incentives would be excessively high**
- **Car manufacturers, by redesigning vehicles, can enable considerable cost-effectiveness**
  - **sensitivity model analysis about the EC-ACEA agreement shows clear benefits for climate change policies**
- **Aviation is more responsive, train transports to improve**
- **Potential for optimising freight transports**
- ***New technologies and novel energies are still distant***

Benefits from EC-ACEA Agreement

Effects on Average Efficiency of Cars (in lt per 100 km)



Issues: Current policy setting may fail

- **The baseline scenario assumes that the current policy settings succeed in their objectives,**
  - However environmental issues require additional policies
  - **The baseline conditions can be considerably worse for environment, costs and security of supply if current policies fail**
    - The structure of economic growth (materials) and consumer habits (mobility, comfort, car sizes) may be more energy consuming
    - Adoption of efficient technologies may evolve more slowly than expected in baseline
    - Power market liberalisation may lead to using more old coal plants, and exert pressures on renewables, new SME-generators and nuclear in the longer run
    - Natural gas supply to Europe after 2010 may be limited or high cost
- **The baseline scenario must be seen as a normative benchmark for current policies**

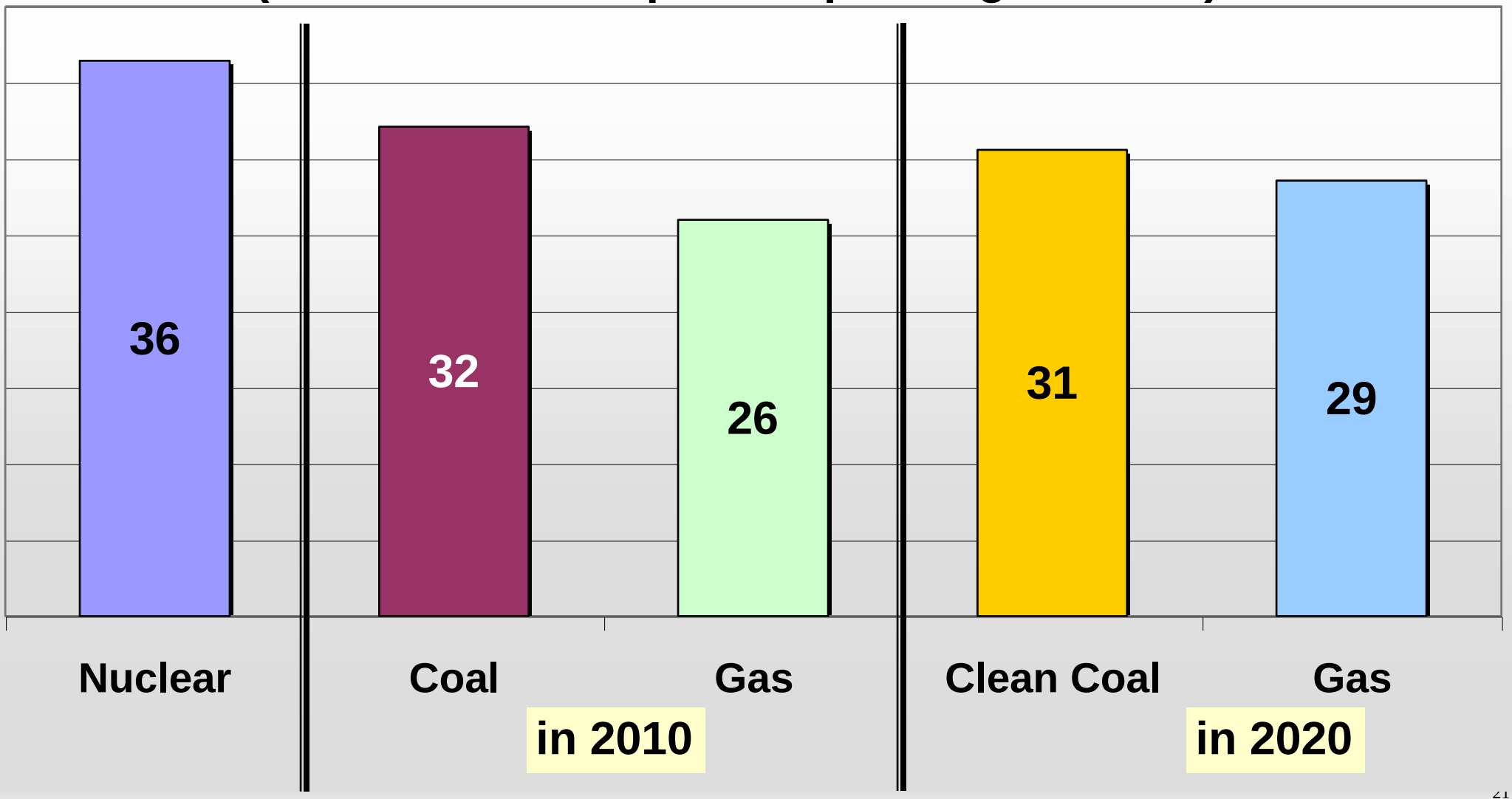
Issues: Power and Gas Liberalisation

- **Main focus for energy policy and strategy**
  - **Electricity: energy efficiency improvement and new services**
    - preserve low electricity prices
  - **privileged internal market for the equipment goods industry**
    - promote accelerated penetration of new technologies
  - **natural gas is a key,**
    - so gas must be cheap and abundant
- **The liberalisation process may deviate from strategic goals of energy policy**
  - **Considerable role for the Regulators**
    - protect and promote renewables, protect SME generators which enable cogeneration, promote energy and carbon efficiency in merit order
  - **Nuclear decommissioning coincides with critical strategic choices for the long term**
    - Hedging strategy

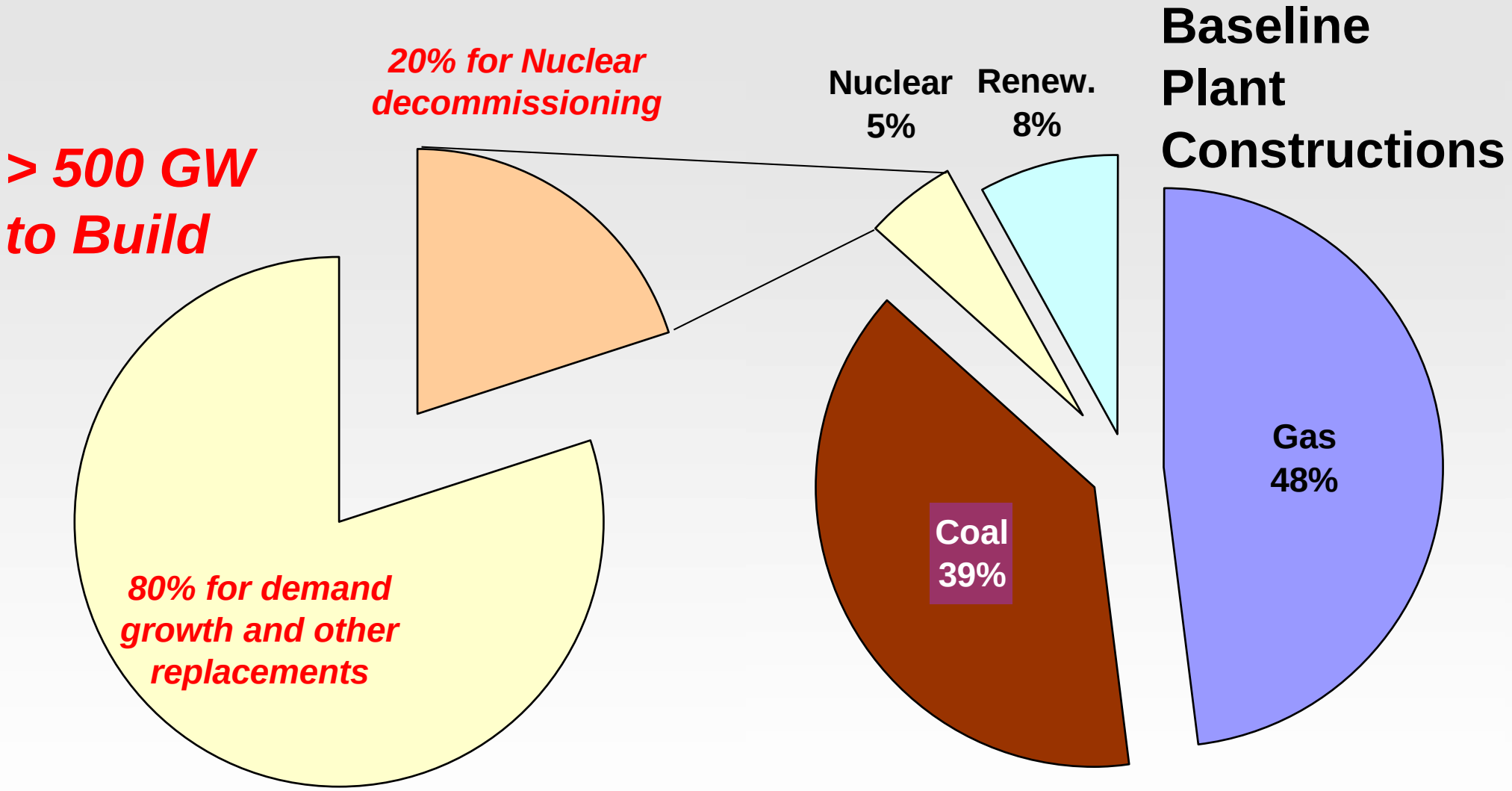
"knife-edge issue": model assumption or reality?

Electricity production costs

(millsEuro/kWh - plants operating at 7500h)



Uncertain Strategy for Power Generation



Power Capacity expansion, 2015-2030

Issues: Climate Change

- **Meeting the Kyoto commitments are manageable for EU**
  - **Reinforce current policy setting to accelerate the adoption of efficient technologies in demand (heat pumps, appliances, CHP, buildings, vehicles)**
    - **All sectors participate, scope for regulatory policy**
  - **Power generation has a key role to play. Preserve cheap gas.**
- **Choice of policy instruments**
  - **Regulator of liberalised electricity markets: e.g. non fossil fuel obligations, dispatching priority for renewable and CHP, ...**
  - **Standards (scope for EU Single Market actions)**
  - **Integration of policies in all sectors, in particular for transports**
- **Pragmatism about policy implementation needs exploiting all Kyoto flexibility possibilities in the short term**
- **Competitiveness of European industry: threat for some sectors but opportunity for equipment goods industry.**

Concluding: Policy Implications

- **Look after policies so as to preserve success stories as projected under baseline scenario**
- **Reflect strategic energy policy goals on the Regulation of the liberalised electricity market:**
  - environment, renewable, SME, security of supply, consumer protection
- **Geopolitics and market policies to preserve cheap and abundant gas supply to the EU**
- **Transports: Policies to push technology and scope for regulatory policy, rather than for new taxes**
- **CO_2 emissions reduction for Kyoto seems manageable**
  - Exploit flexibility mechanisms and non-CO_2 as much as possible
  - Stabilisation at the level of 1990 is a target independently of Kyoto
- **Support the internal market for the EU equipment goods industry to push technology progress**
- **Strategic issues for the EU: Nuclear, Coal/gas, …**
  - need for further investigation