

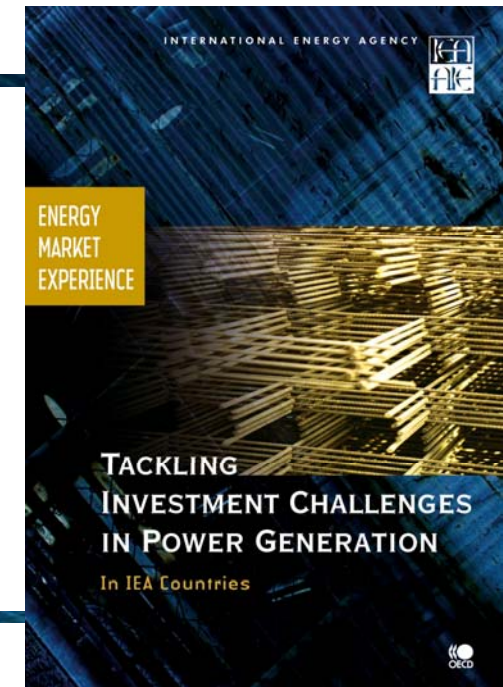
Tackling
Investment
Challenges in
Power
Generation
In IEA Countries

Universidad Internacional Menéndez Pelayo

Energía Eléctrica: Garantía de suministro, sostenibilidad y seguridad

Santander, 2 July 2007

Tackling Investment
Challenges in Power
Generation
in IEA Countries



ENERGY
MARKET
EXPERIENCE

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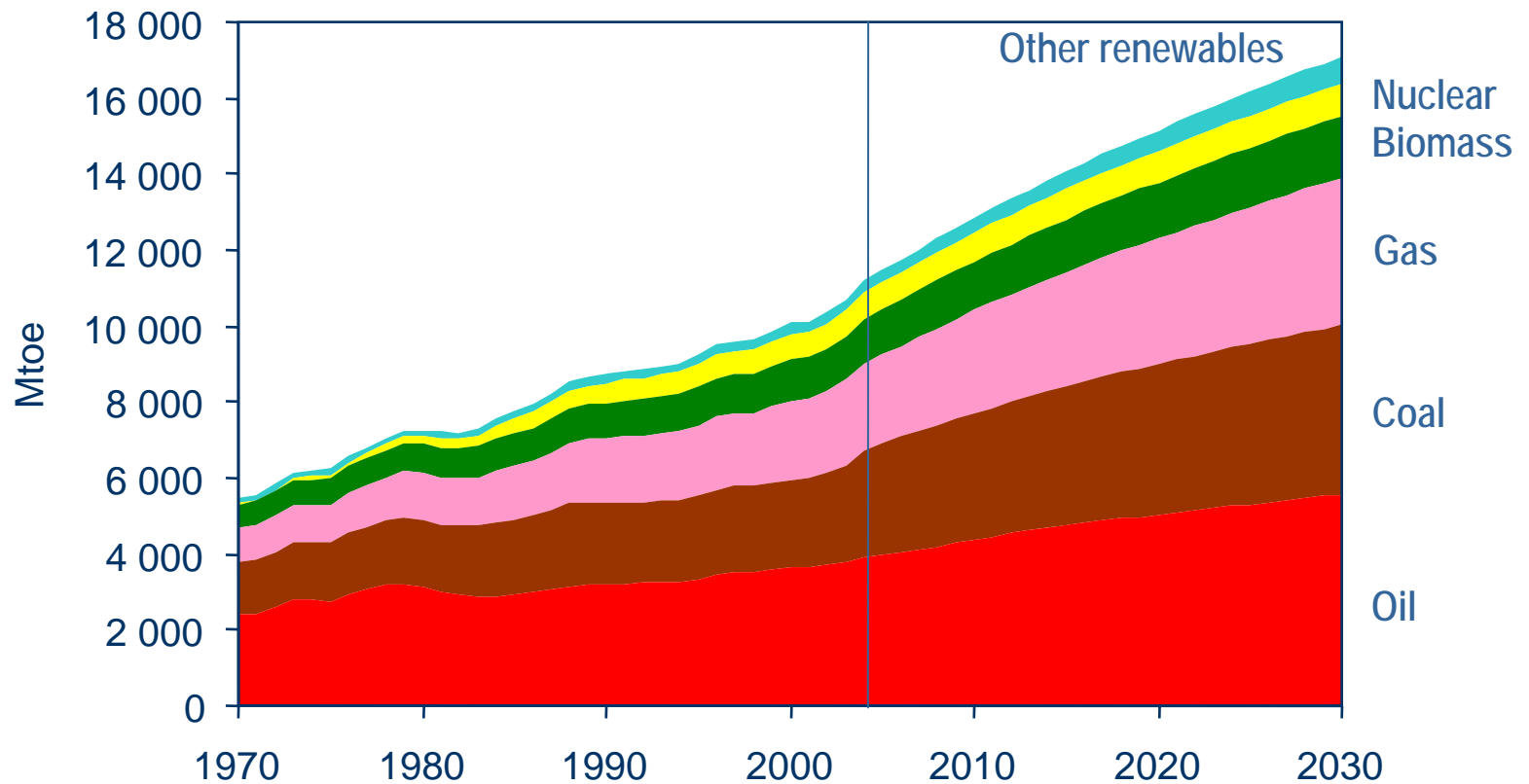
Outline

- Investment requirements
- A window of opportunity
- Costs and risks
- The role of competition
- NIMBY and power plant approval
- Reliability of supply



Increasing global primary energy demand towards 2030

World Energy Outlook 2006: Reference Scenario

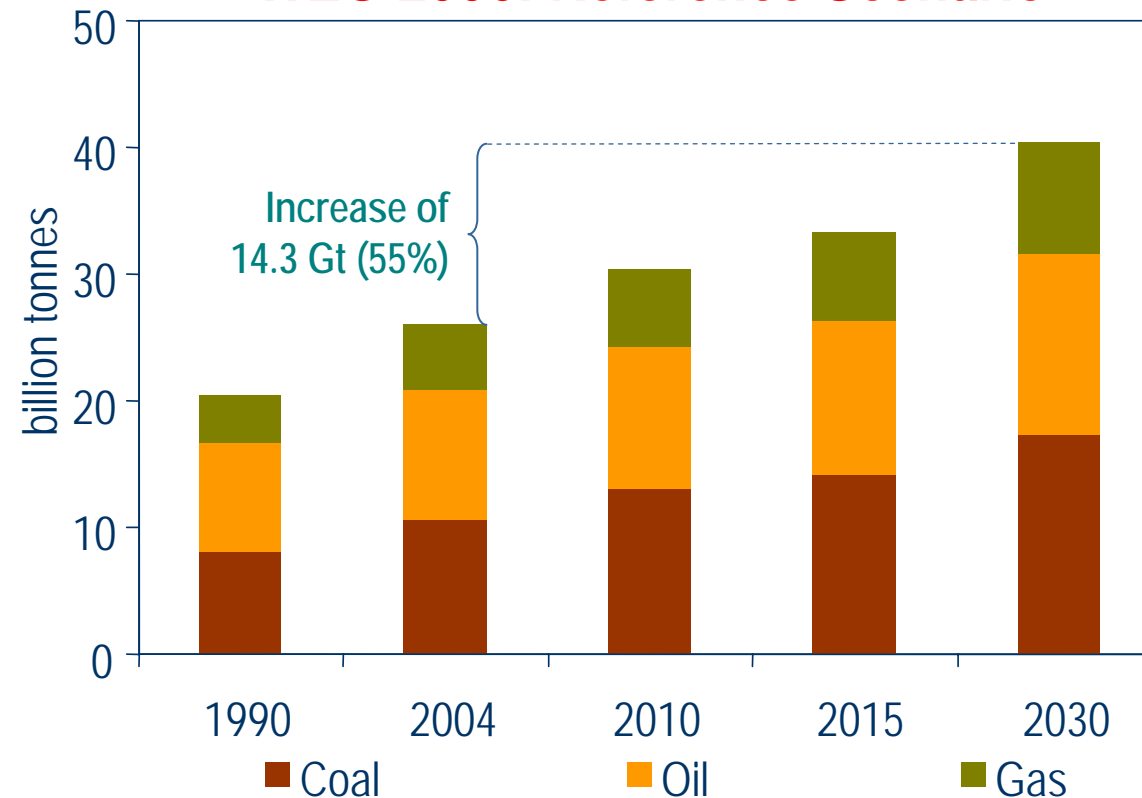


- Global primary energy demand grows 53%
- Global electricity demand grows 94%



Increasing global energy related CO2 emissions

WEO 2006: Reference Scenario

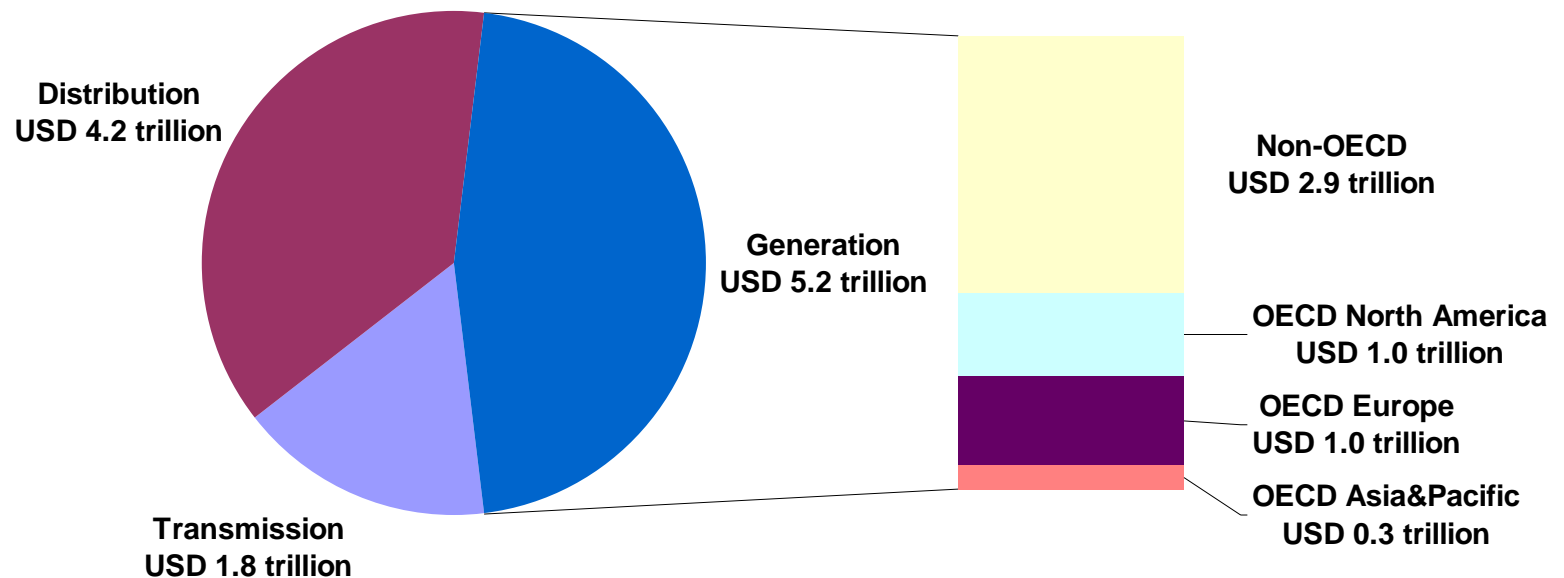


- Half of the projected increase comes from new power plants
- China overtakes the US as the world's biggest emitter by 2010
- Per capita emissions in China will still be 60% of OECD ones by 2030



Global energy investment requirements

WEO 2006: Reference Scenario Electricity sector investment requirements by 2030



- Global energy investment requirements at USD 20 trillion, up from USD 17 trillion in WEO 04 mainly due to cost inflation
- Global investment requirements in the electricity sector by 2030 at USD 11 trillion

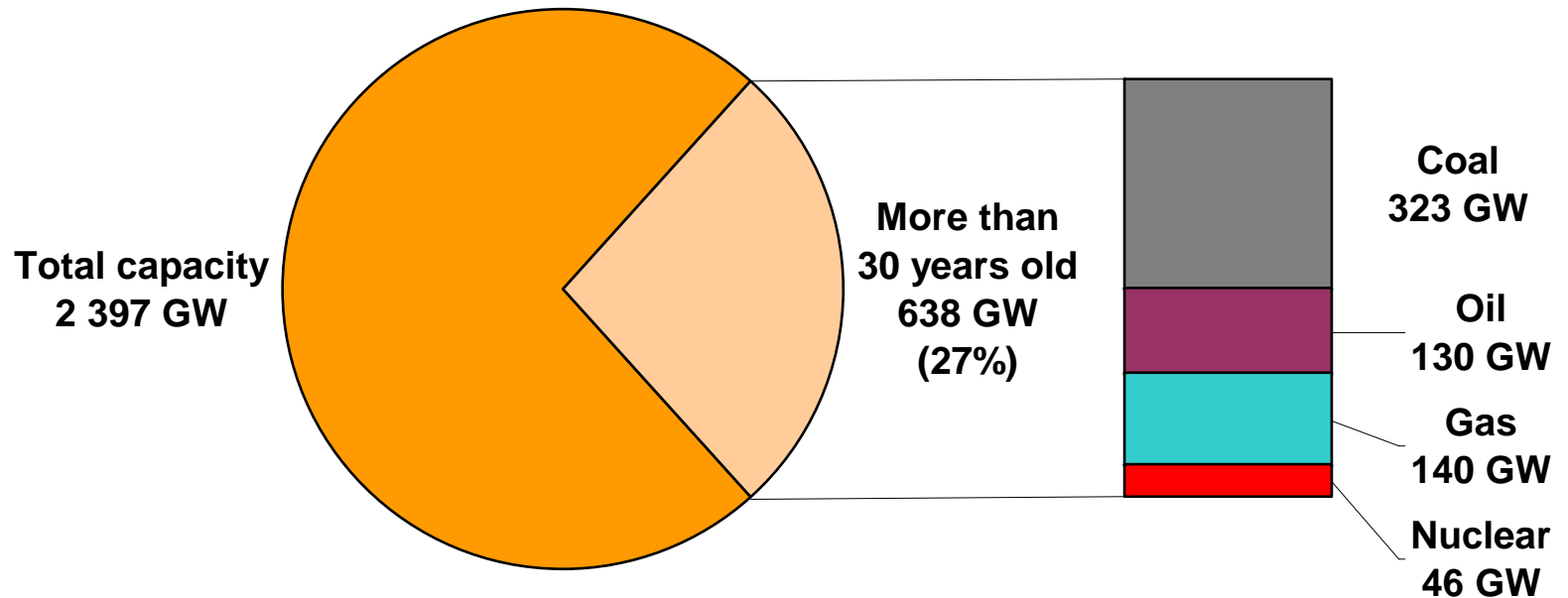


Heavy investment cycle looming in power generation

- **Demand increasing**
- **Liberalisation delayed investments**
 - Improved use of existing resources
- **Need for replacement**
 - Ageing power plants and tight environmental controls
- ➔ **Risk of under-investment**
 - Great uncertainty breeds considerable risks for investors



Power plants are ageing



Source: IEA and Platts

- Age of existing plants, technological development, tighter environmental controls, and nuclear phase out policies drives the need for replacements



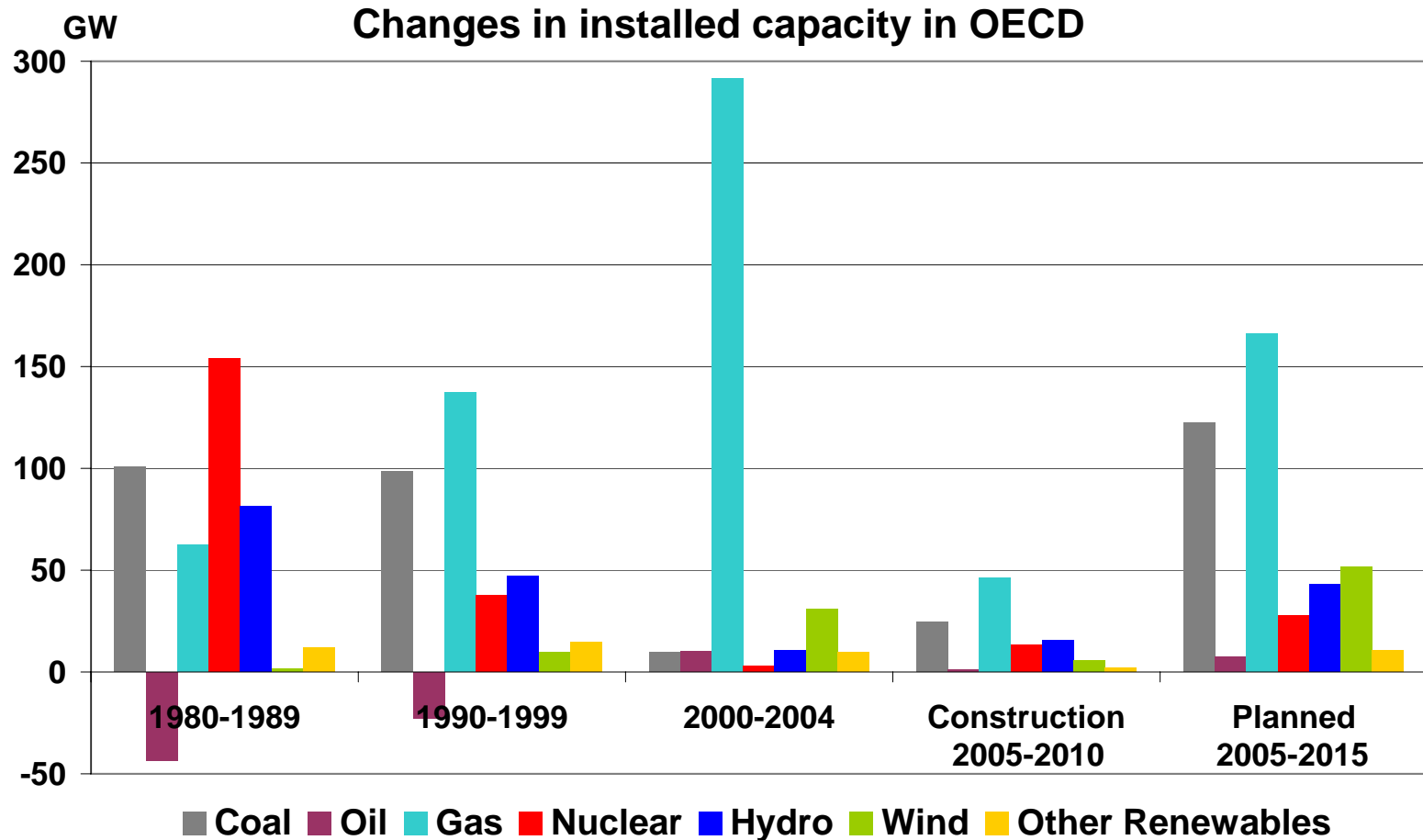
Replacements and increasing demand drives investments

World Energy Outlook 2006 Projected investments in OECD by 2015, GW

	<i>Existing (2004)</i>	Demand increase	Replacement	Total investment
Reference scenario	2360	466	207	673
Alternative policy scenario	2360	357	209	566

- Investments in OECD corresponding to at least 25% of existing capacity needed by 2015

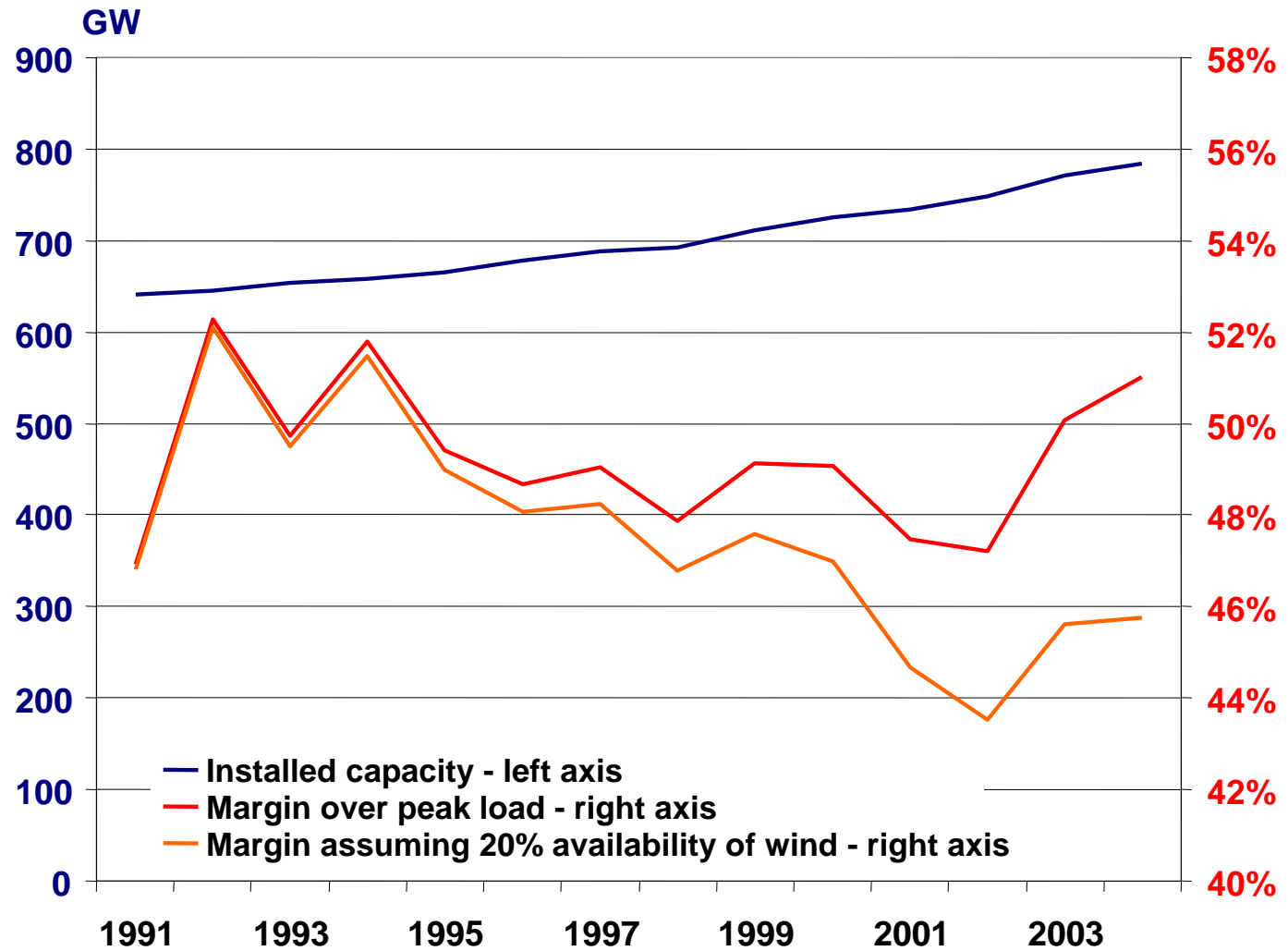
Gas-fired generation dominates but increased focus on coal



Source: IEA and Platts



Margins of available capacity in Europe are decreasing



Source: IEA statistics



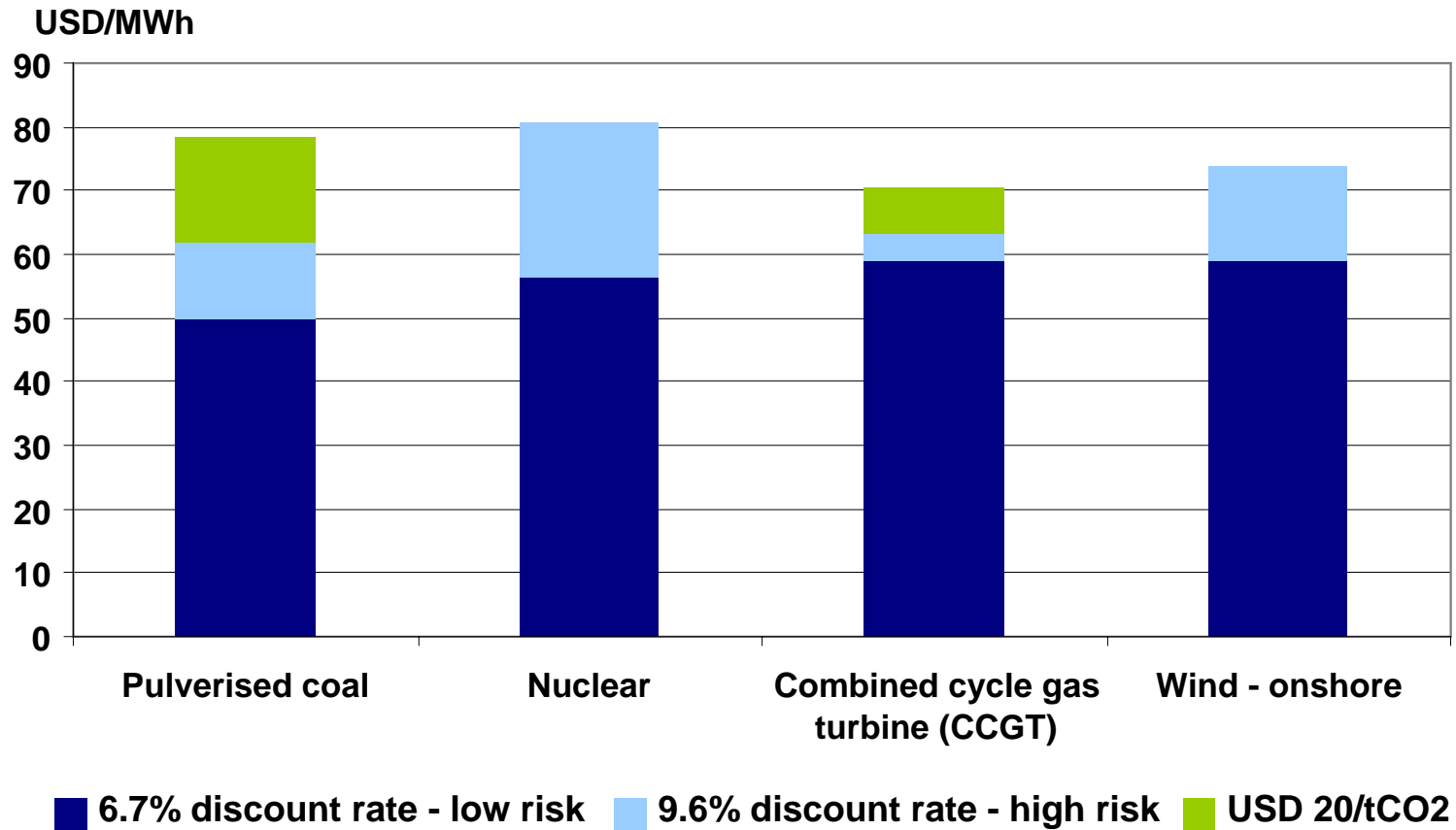


Now is a window of opportunity

- **Opportunity for cleaner electricity**
 - **Investments today will stay for 30-50 years**
- **But investors need firm policy signals**
 - ➔ **Put a price on CO₂**
 - ➔ **Credible, long-term, market-based support mechanisms for clean technologies**
 - ➔ **Avoid picking winners**

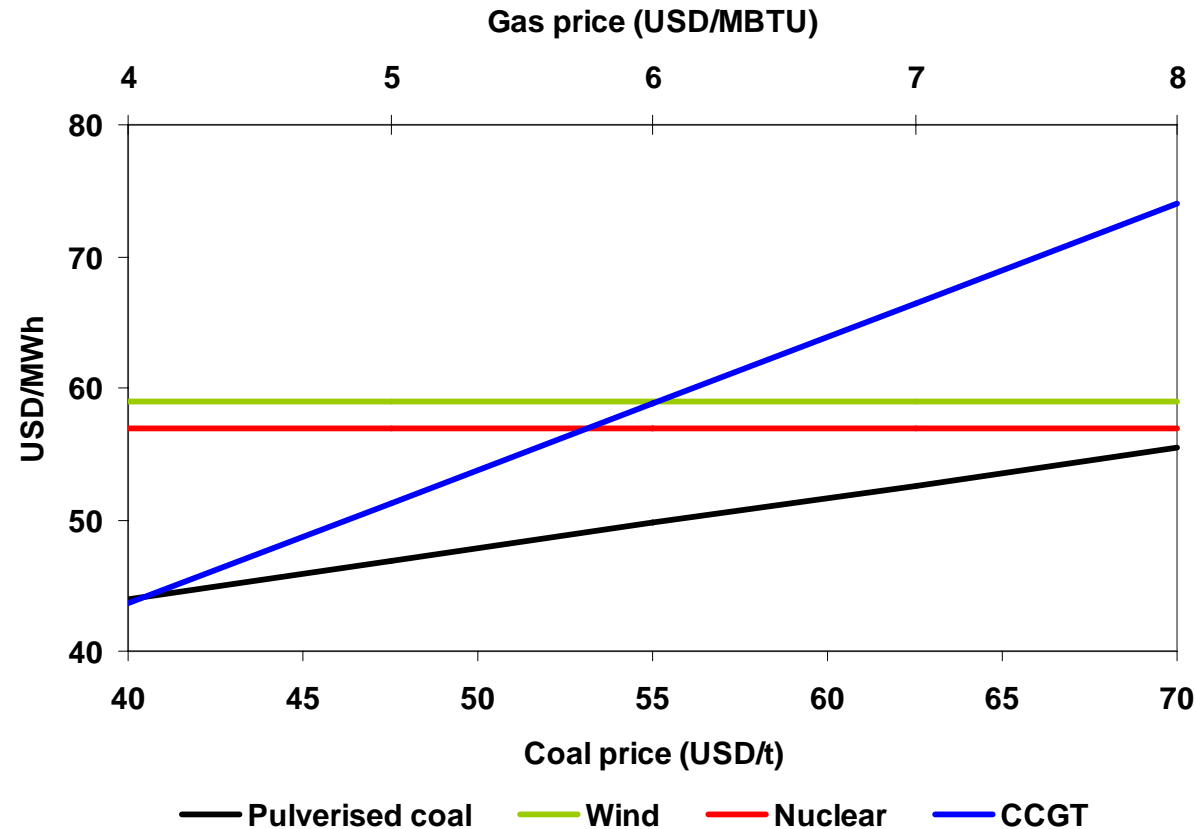
Policy signals decisive for costs and choice of technology

Levelised costs



Costs of CCGTs sensitive to fuel costs but still low risk

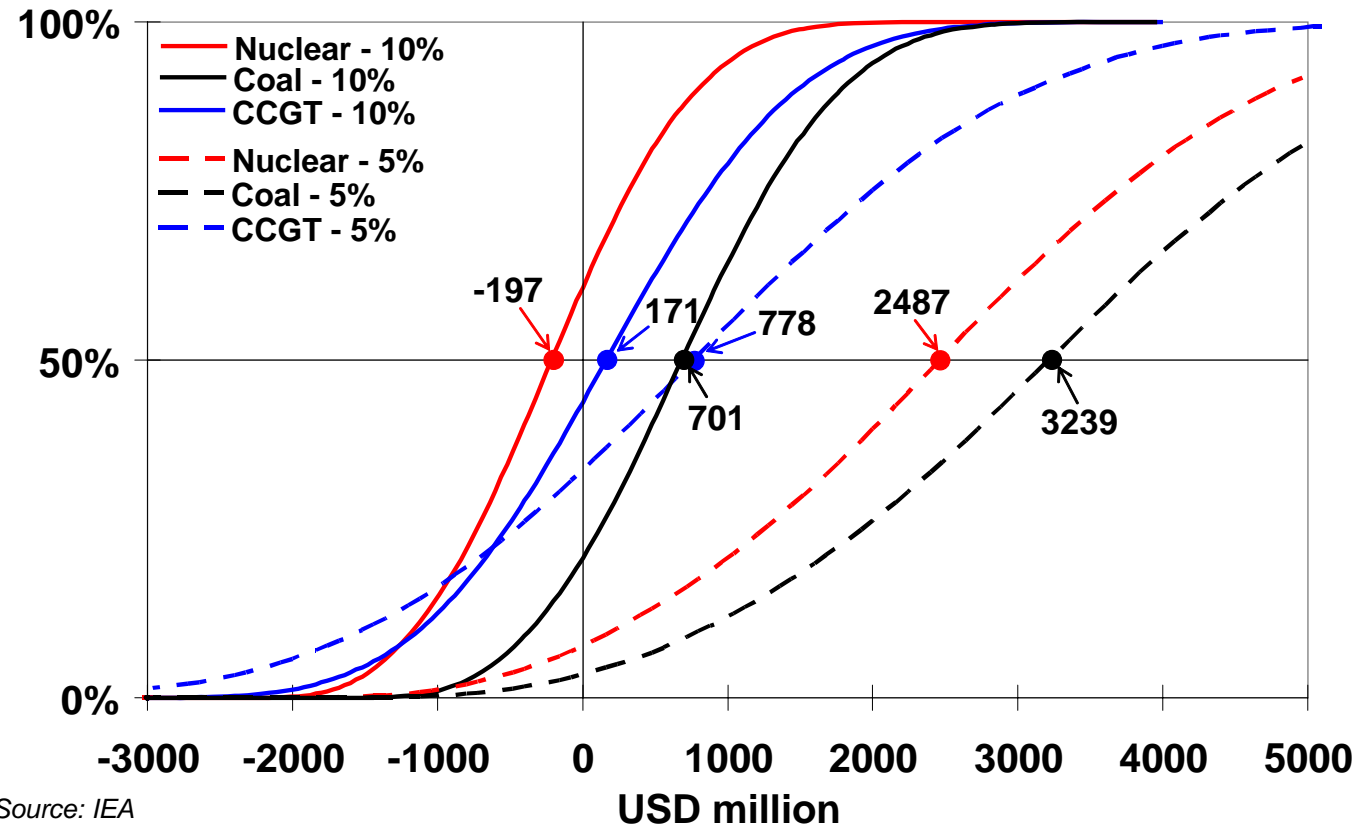
Levelised costs at 6.7% discount rate



- Low investment costs and relatively light environmental footprint still makes CCGTs the low risk default option in environment with great regulatory uncertainty.

Multiple risks may change technology choice

Distribution of net present values



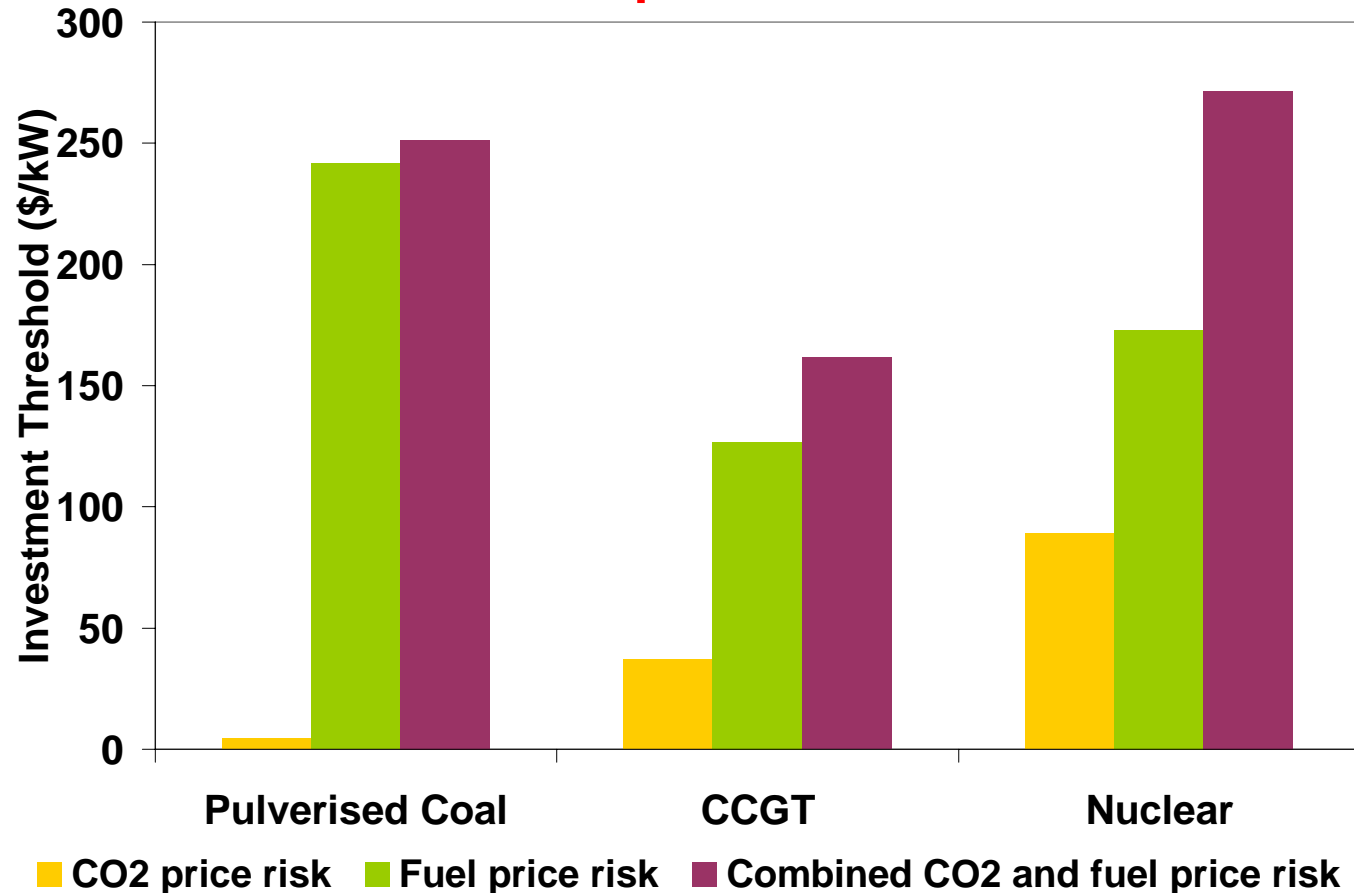
Source: IEA

- Monte-Carlo simulations at 5% and 10% discount rate with uncertainty about electricity price, fuel price, investment cost, construction time, capacity factor and O&M costs
- Operational flexibility not taken into account. This adds considerable value to CCGTs.



Climate change uncertainty adds costs & alters technology choice

Real option values



Source: IEA

- Option value of waiting with investment decision
- CO2 and fuel price risk = price chock in 5 years time

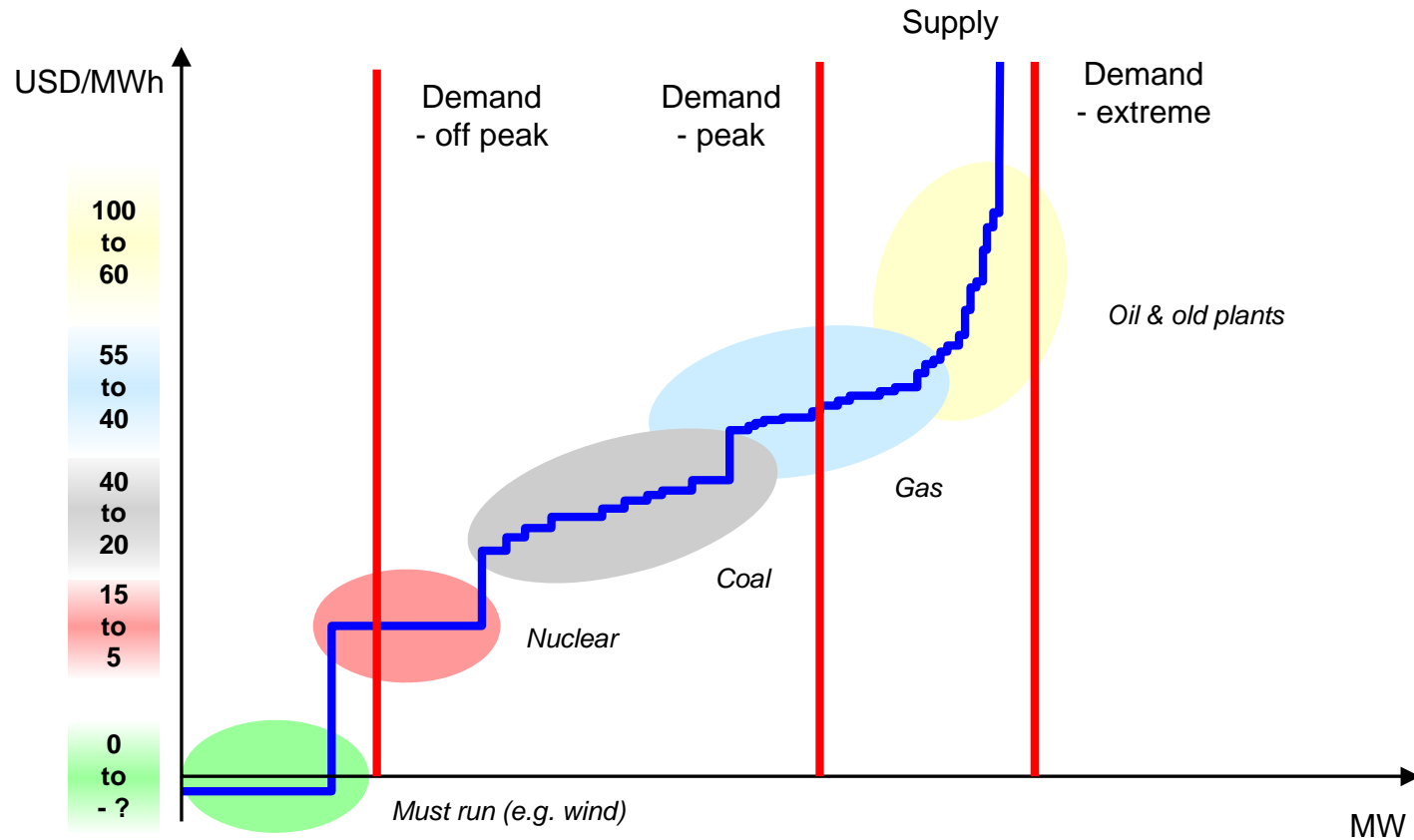


Cost reflective prices are the corner stone of efficient market response

- **Establish competitive market framework**
- **Contracts and competition regulation protects consumers**
 - Refrain from price caps and market interventions
- **Capacity measures are last resort**
 - Capacity markets proven poor medicine
 - Transitional arrangements may be necessary

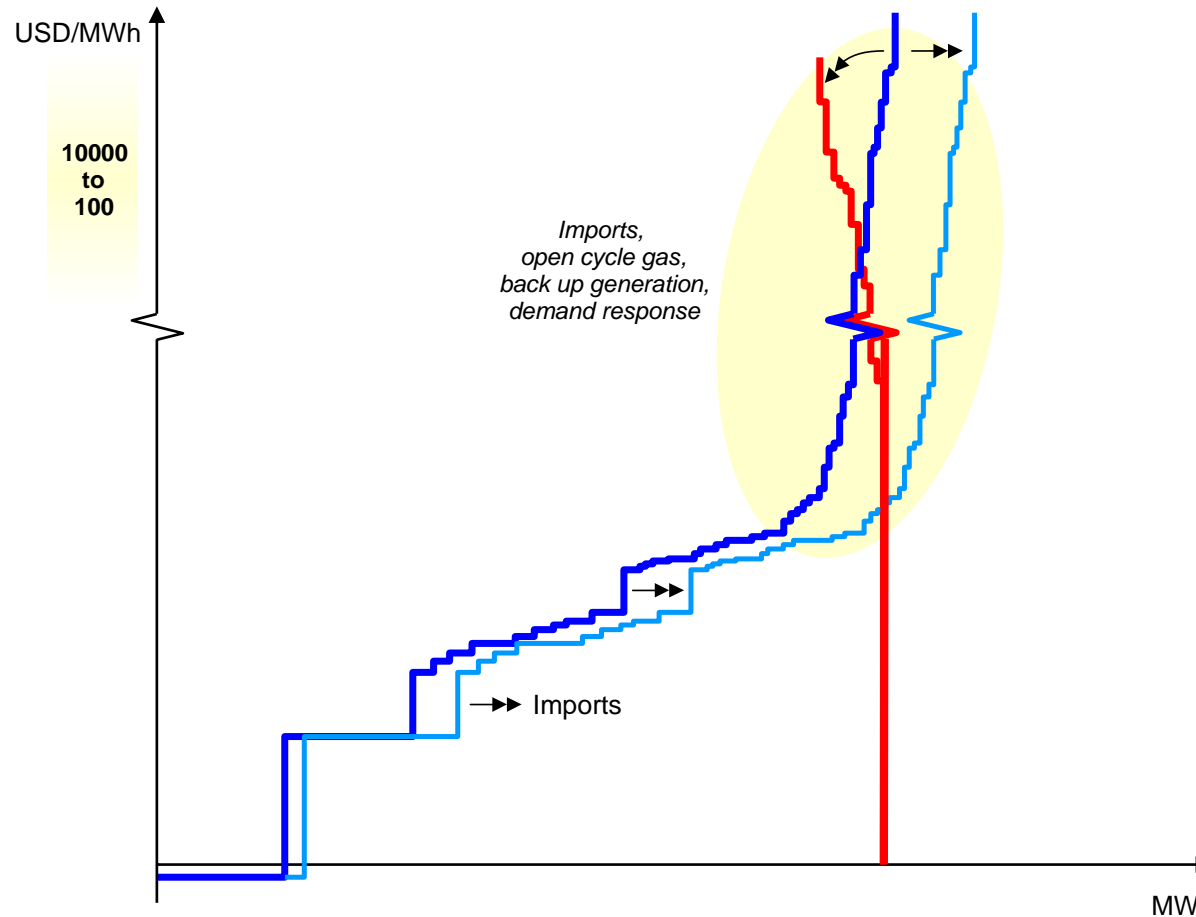


Marginal costs determine the price in competitive markets



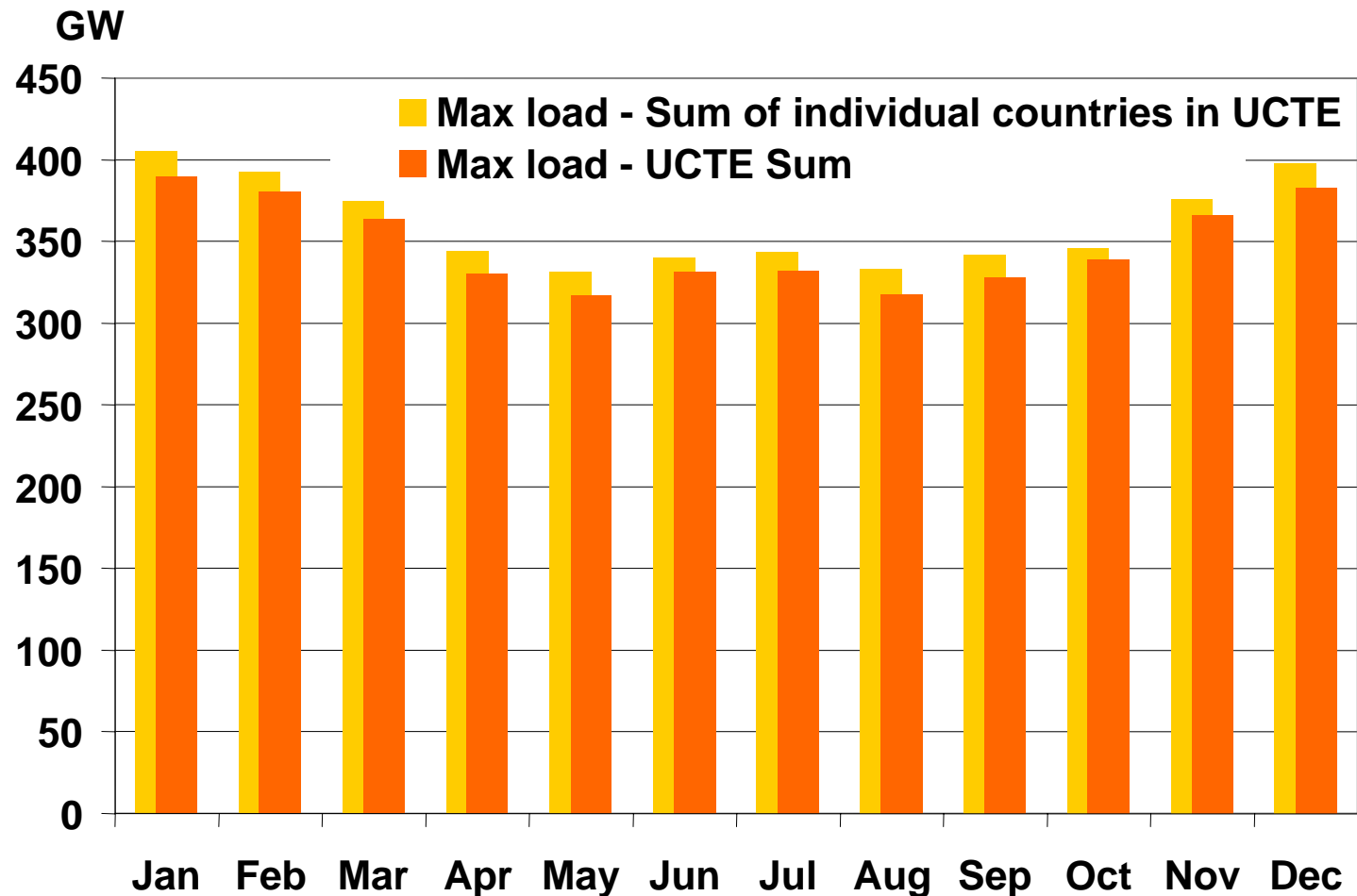
- Decentralised decision making in competitive markets is a strong instrument to ensure optimal dispatch
- Lack of price elasticity on the demand side may be the critical market failure for a robust price settlement at all times

Flexibility is critical for market clearing in tight situations



- Cost reflective pricing creates incentives for flexible resources to meet peak-load particularly in situations of scarcity
- Price caps and other market intervention mute incentives

Cross border sharing of reserves saves investment

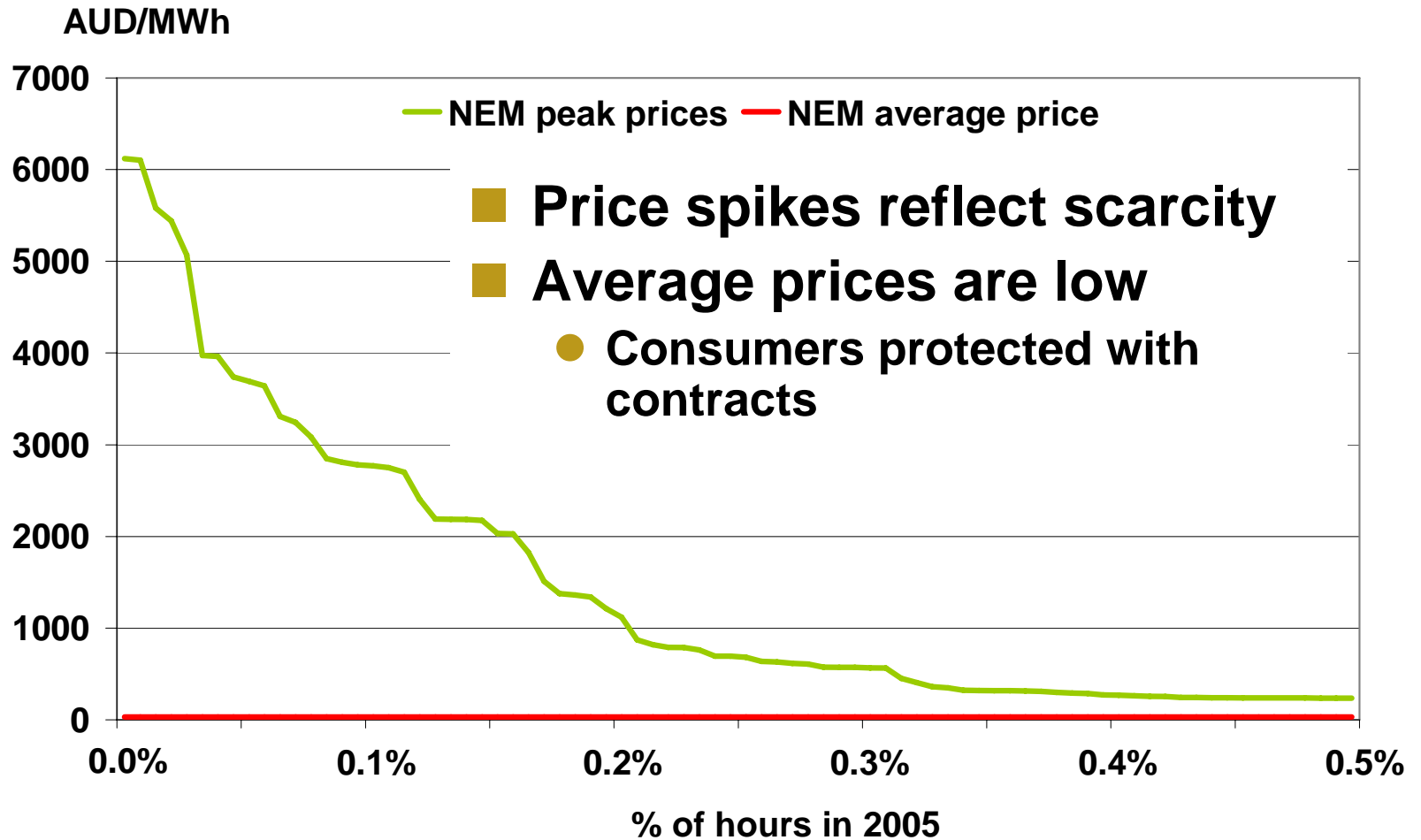


Source: UCTE hourly load data for 2006

- Sharing of reserves in UCTE potentially saved 22 GW peak load resources in 2006, subject to availability of transmission capacity



Cost reflective prices triggered critical investments in Australia



Delays frustrate markets

- **NIMBYism undermines licensing and approval processes**
- **Clearer, simpler and faster licensing and approval procedures needed**
- **Open public debate essential**
- **Particularly critical for nuclear**



Reliability of supply in electricity is more than secure fuel supply

Reliability of electricity supply

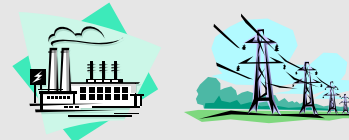


Energy security



Coal, natural gas, uranium...

Adequacy



Generation capacity,
transmission and
distribution networks

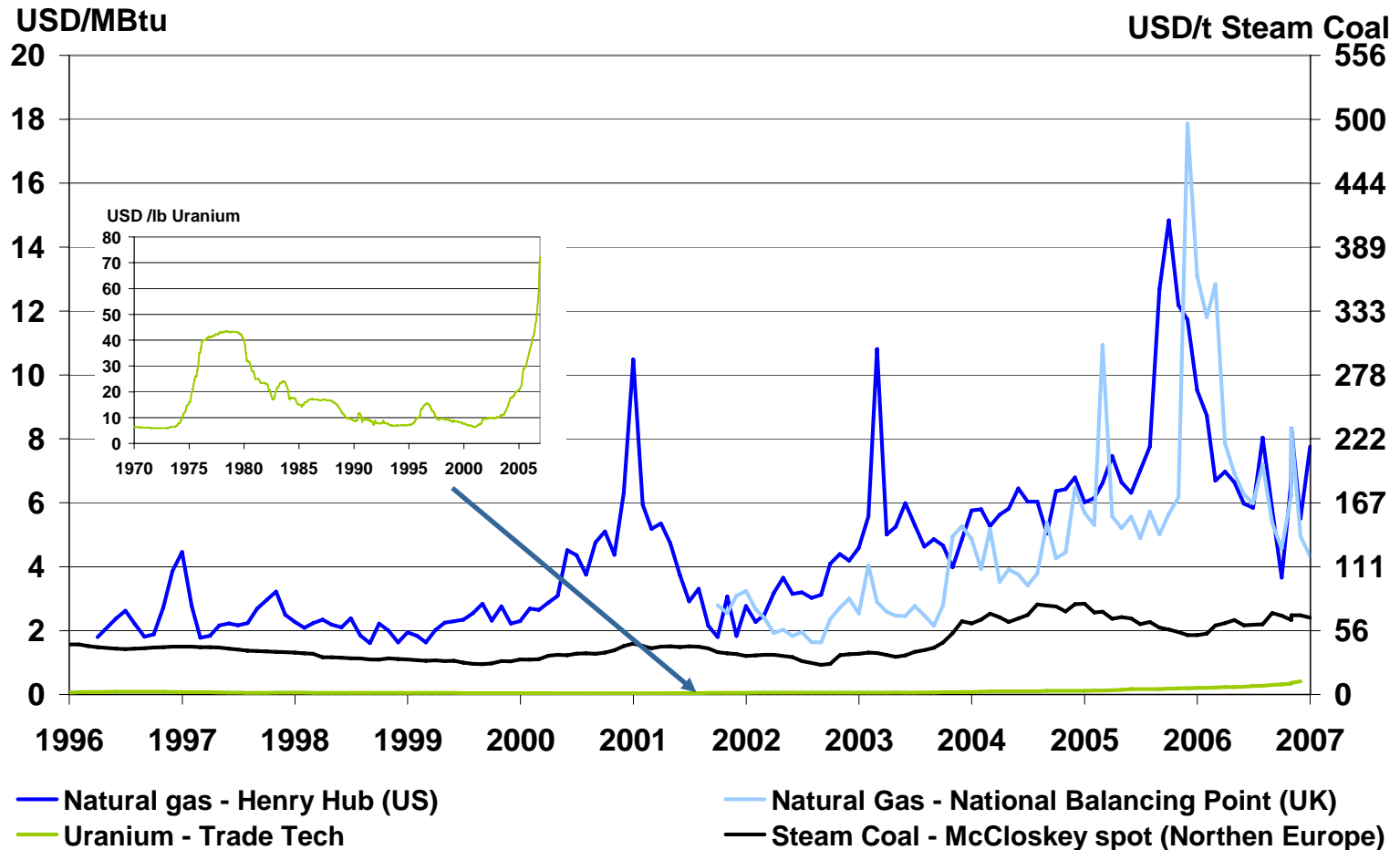
System security



Operation, control,
contingency management...

- Roles and responsibilities must be carefully specified to keep the entire supply chain intact
- Effective markets is a strong instrument to ensure reliability in many, but not all, parts of the supply chain

Diversification is essential for reliable supply



- Fuel and electricity prices creates incentives for diversification
- Government intervention to promote diversification should re-enforce the role of competitive prices





Key Messages

- **New investment cycle => a window of opportunity**
- **Government action is urgent**
 - **Implement competitive framework for cost reflective price signals**
 - **Improve regulatory predictability**
 - **Faster licensing procedures needed**
- **Short-termism in policy leads to short-termism in investor response**

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Thank you for your attention!

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**INTERNATIONAL
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