UNECE Ad Hoc Group of Experts on Cleaner Electricity Production from Coal and Other Fossil Fuels
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Investing in Cleaner Fossil Fuel Power Generation and in Transmission in the ECE Region: The Issues

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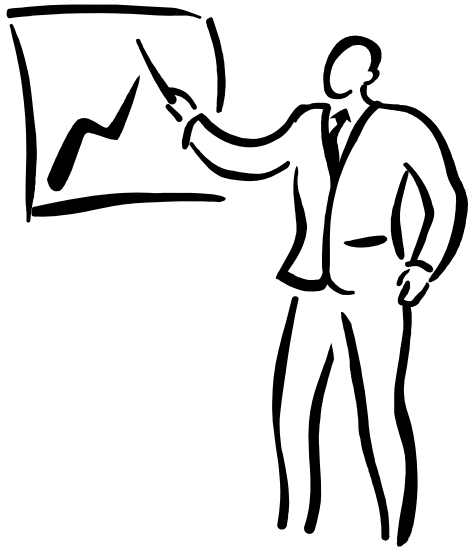
CONSEIL MONDIAL DE L'ENERGIE

The presentation:

1. The perspectives
2. The problems
3. The reasons behind
4. The option CCS*
5. The policy agenda
6. The role of ECE

* Carbon capture and storage



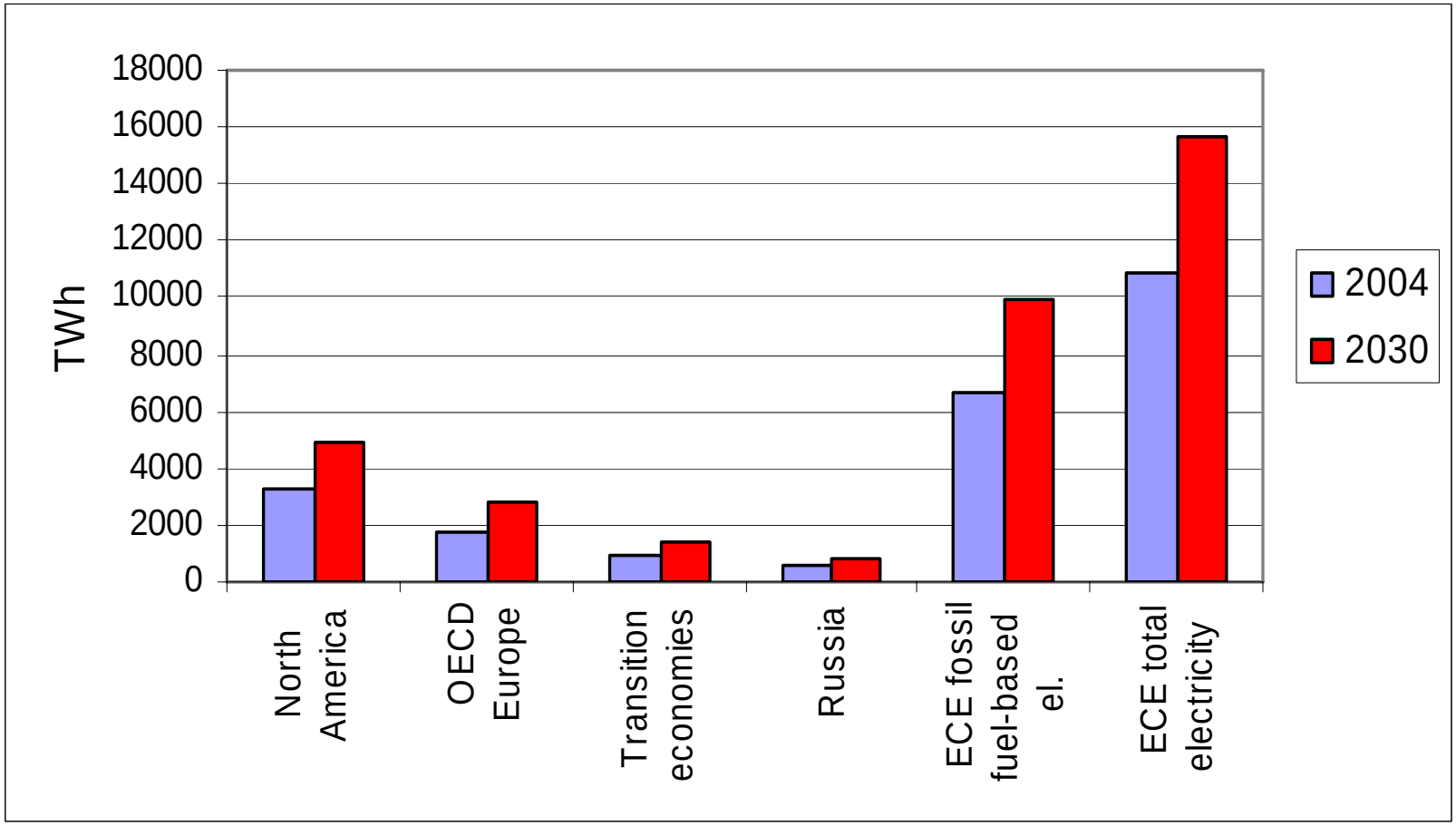
1. The perspectives: thermal generation and investments

- ECE: electricity demand growth 2004-2030*:
  - total: +45 % (+1.4 %/year) to 15.7 GWh
  - of which thermal: +50 % (share rising!) to 9.9 GWh

- ECE: cumulative new and replacement generation capacity 2005-2030:
  - total: 2189 GW**
  - of which thermal: 1400 GW+
    50-60 GW/year at $0.5 billion)
- ECE: cumulative investments in generation, transmission, distribution 2001-2030***:
  - total: US$ 4249 billion
  - of which thermal: US$ 2677 billion

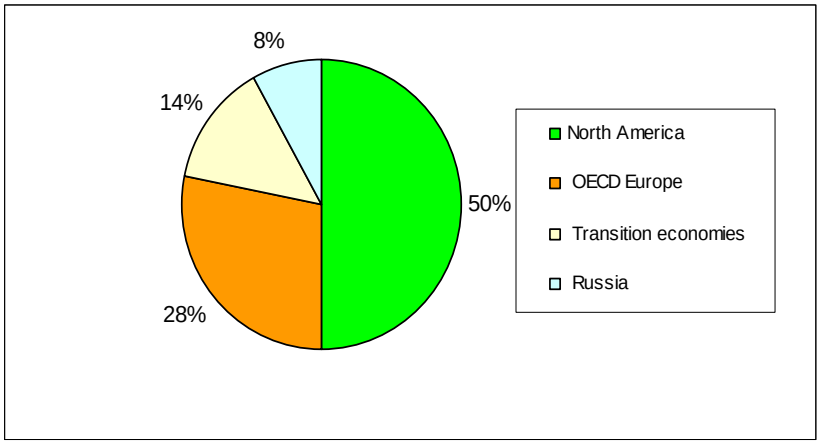
*IEA World Energy Outlook 2006, Annex, reference case; ** IEA WEO 2006, p. 148; + investments in thermal generation = 63 % of total investmentsin 2030; *** IEA World Energy Investment Outlook 2004, p. 342, 344

- Thermal generation in the various ECE regions, 2004-2030*

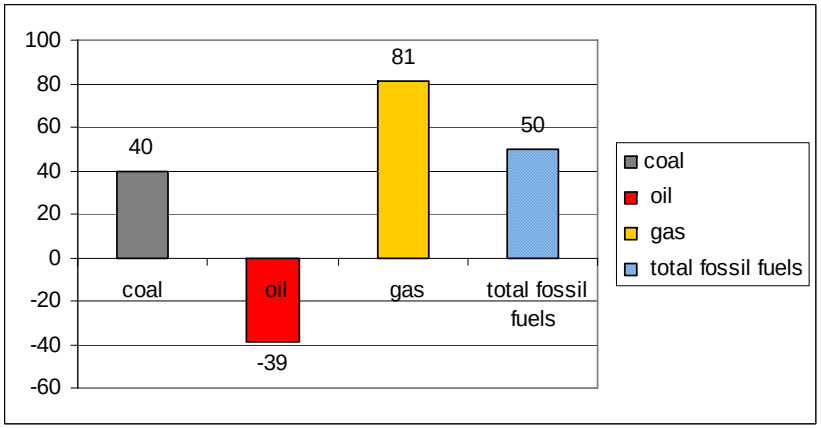


*IEA WEO 2006, op. cit., Annex A, p. 497, 505, 509, 511

- Geographical pattern, thermal generation, ECE 2030 ≅ 2005*



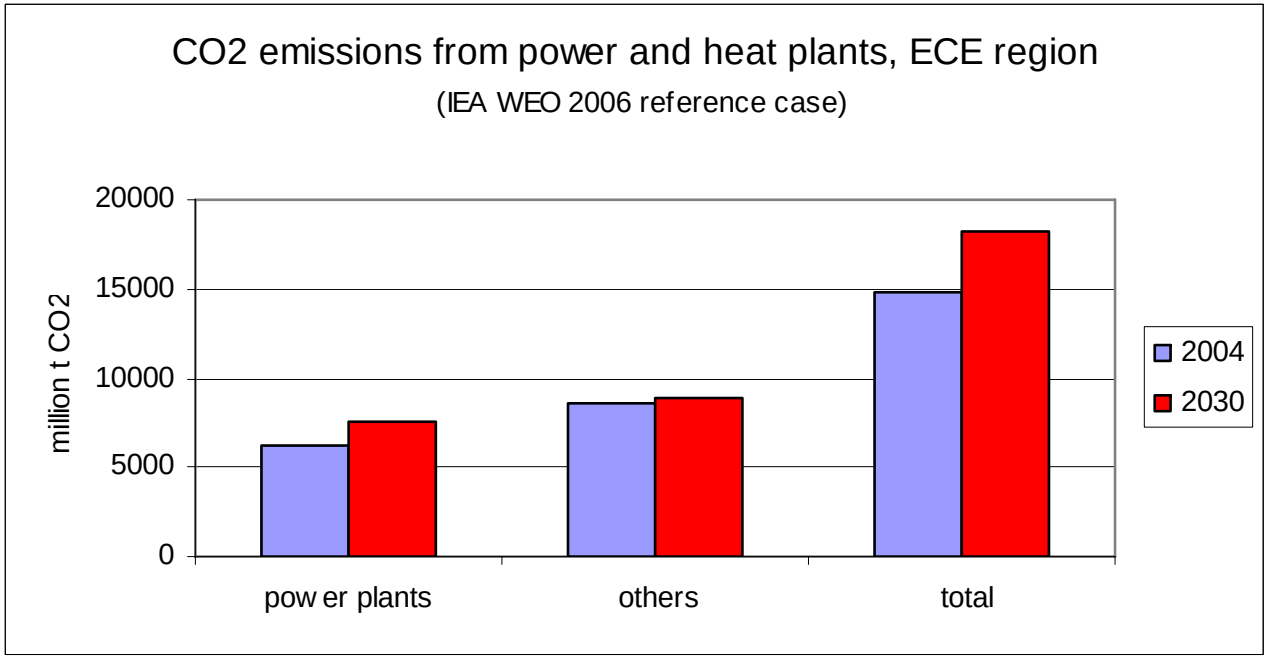
- Fuel growth, thermal generation, ECE 2004-2030*



*IEA WEO, op. cit. Annex A, p. 497, 505, 509, 511

2. The problems: first a challenged fossil fuel base …

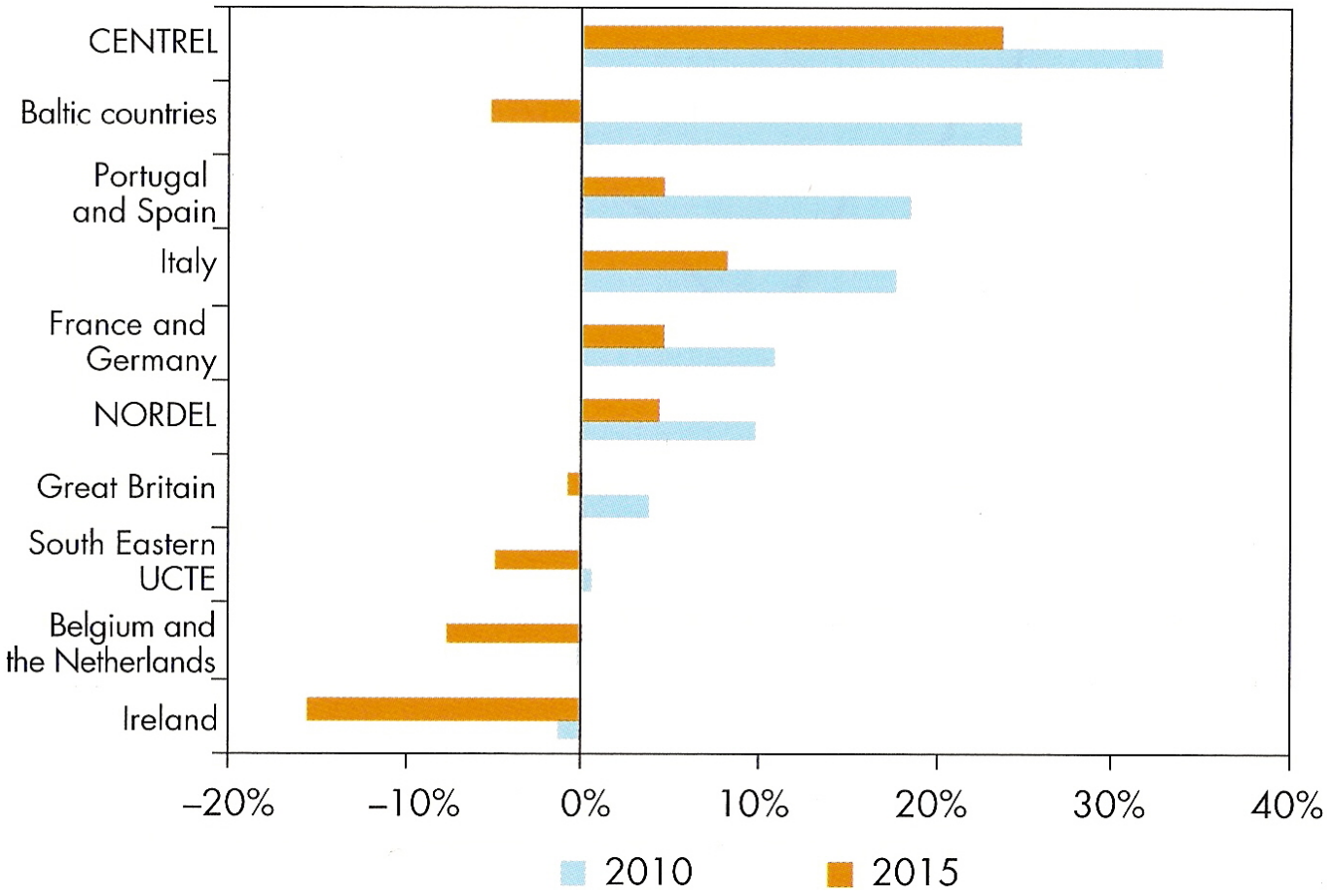
- Rising dominance of thermal power generation in ECE (2004 61 %, 2030 63 %)
- Related growth of CO_2 emissions from power and heat plants: + 22 %



- Thermal generation = 41 % of all energy-related CO_2 emissions, ECE

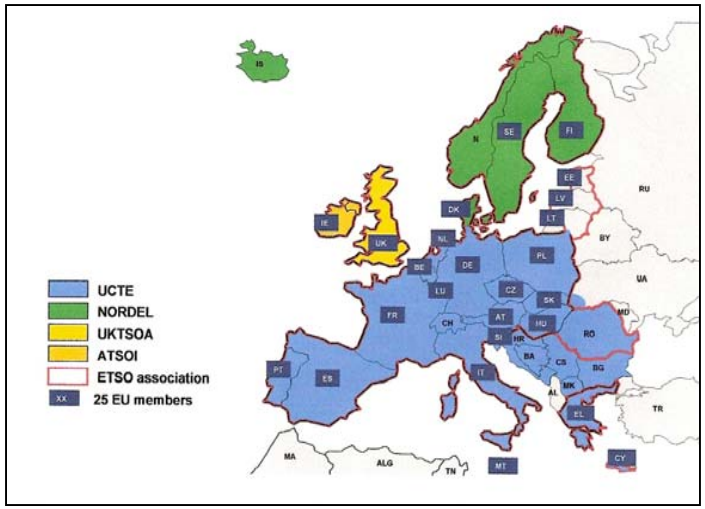
… and secondly declining reserve margins

Winter peak load reserve margins*



*IEA WEO 2006, op. cit., p. 151; ETSO Generation Adequacy 2008-2015: a 5 to 10 % margin considered needed

- EUROPE*
  - Investments in generation insufficient as of 2015
  - In 2020, 7 % of net installed capacity lacking (50 GW out of 699)
  - Cross-border transmission capacities locally constrained
  - No assurance for investments to be decided in time



- NORTH AMERICA**
  - Margins down to 5 % by 2015

- CIS***
  - Exportable capacities stable till 2015

*Europe: UCTE Union for the Coordination of Transmission of Electricity: System Adequacy Forecast 2007-2020, p. 25, 29; ETSO European Transmission System Operators Association: Generation Adequacy 2008-2015, p.13;
**North America: IEA WEO 2006, p. 152; ***Commonwealth of Independent States: see ETSO, p. 19

3. The reasons behind

The operators view *

- Uncertainty about the future role of fossil fuels in power generation
- Growth of back-up needs for renewables
- No rules for cost/benefit-sharing of cross-border investments
- Regulatory constraints:
  - on margins (wholesale, cross-border, grid fees)
  - on supply structure (renewables, cogeneration, distributed generation, demand management)
- Multiple layers of regulatory authority
- International incompatibility of national regulatory systems
- Lenghty permission and licensing procedures (EC: goal 5 years)

*ETSO Cross-border framework for transmission network infrastructure (ETSO-net.org); EREG European Regulators Group for Electricity and Gas

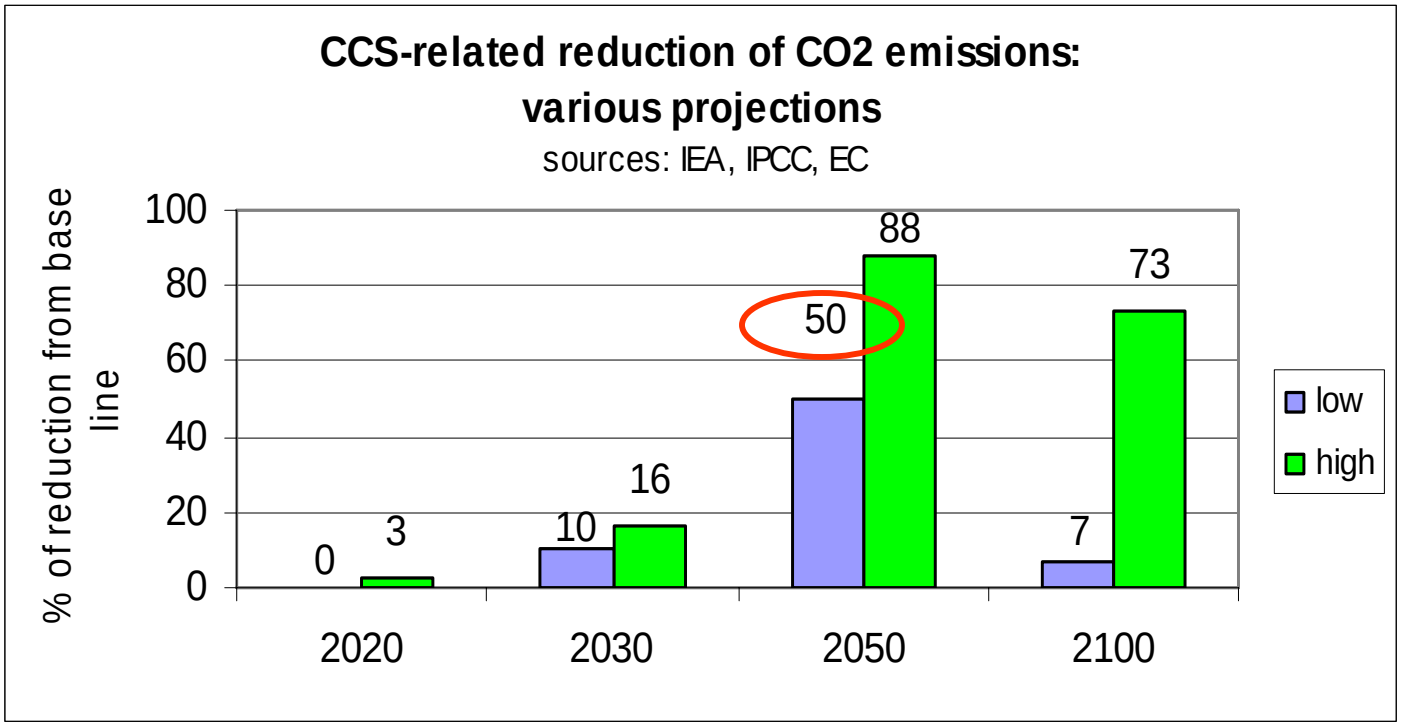
The policy makers view*

- Lack of competition
- Discrimination of new market entrants
- Market distortions due to different national policies
- Lack of transparency on transfer capacities, capacity calculations and allocation procedures

*EU Directive 2005/89/EC of 18. 1. 2006 on safeguarding electricity supply and infrastructure investments;

4. The option: carbon capture and storage (CCS) …

- CCS reality: 33 mill. t CO_2/year; 3000 km pipelines
- Potential:



Explanations and sources: 2020: OECD region, IPCC 2005, p. 358; 2030/2050 low: reduction of global energy-related emissions compared with a base line without CCS (IEA WEO 2006, p. 358; and IEA 2004, p. 101); high: reduction of emissions from EU coal power plants compared with 2005 (EC, p. 71); 2100: average 2000-2100 reduction of global energy-related emissions compared with a baseline without CCS (IPPC 2005, p. 350, 354)

• Speed dependent on carbon value: benchmark $ 25 –30 t/CO_2
(and higher if externalities are taken into account)

• Reduction at 50 % = stabilisation of concentrations

at 450 ppm = + 2°C

= IPCC WG II and EU* goal for 2050

• CCS no panacea; best as part of a portfolio
(efficiency, renewables, nuclear…)

*EC, Limiting global climate change to 2 °C , COM(2007) 2 final

CCS - an investment opportunity

- Investment needs:

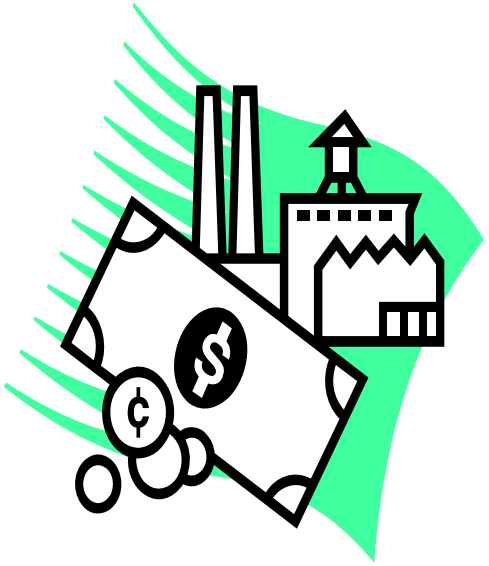
  - Demoplants: $ 0.5 to 1 billion for first 250 MW*
  - Power sector OECD: $ 350-440 billion for new 750 GW through 2030**

  (for comparison: Gulf oil revenues 2006: $500 bill – FMI)

- Investor benefits:

  - continued thermal generation
  - enhanced oil recovery (value per tCO_2 $40-150)***
  - enhanced gas recovery: gas-to-liquids
  - route to hydrogen economy, synfuels

  + improved air quality, health, security, soil fertility



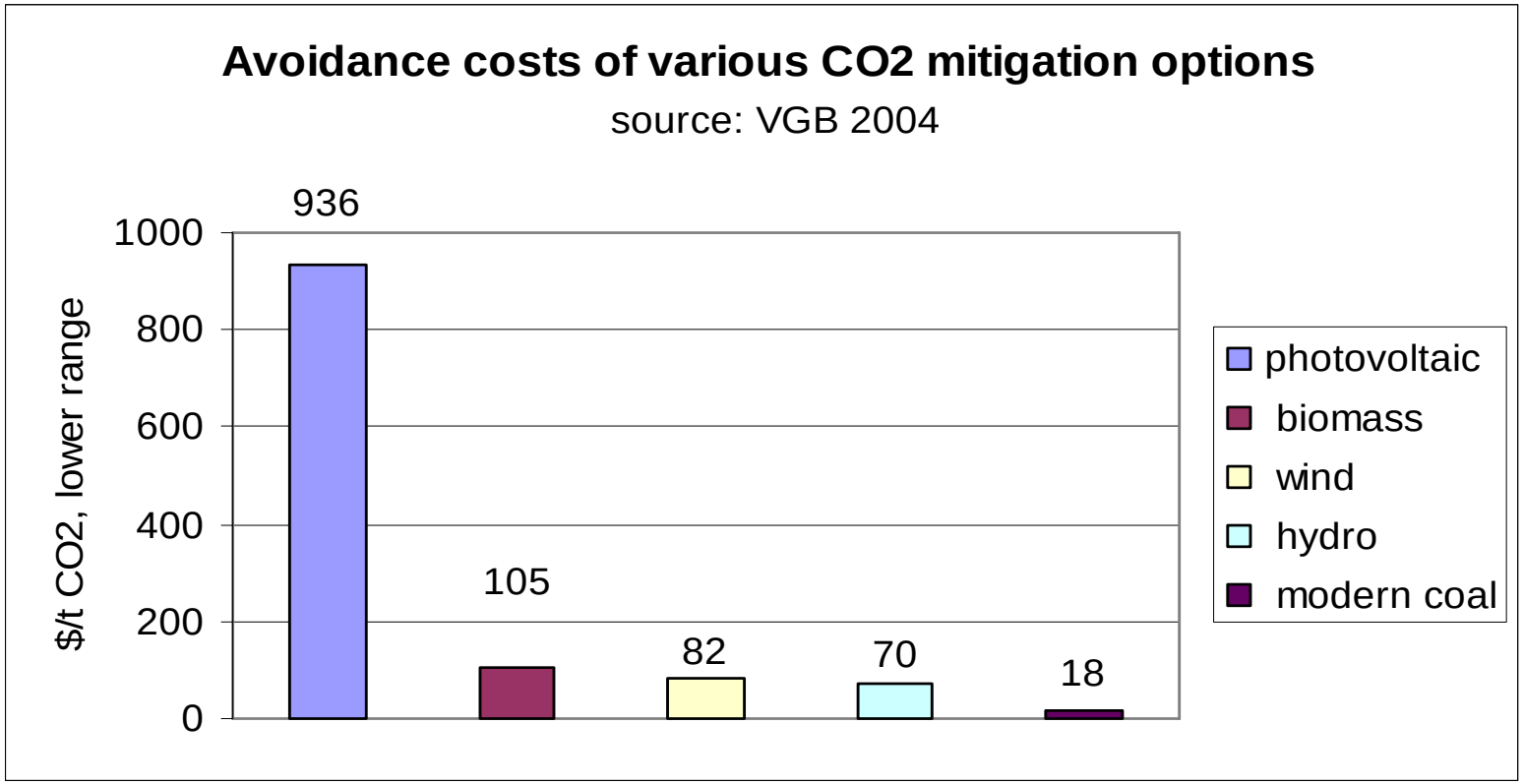
* IEA Prospects for CO2 Capture and Storage, 2004, p. 21; **IEA World Investment Outlook 2004, p. 419, 421; *** Dr. Zarah Khatib, Opportunities for CCS in MENA region, lecture at WEC CFFS meeting, 6. 12. 2006 (Zara.Z. Khatib@shell.com

- System costs:

  At present: \$50-100/tCO_2, to be brought down by half (≙1 to 3 US cents/kWh)

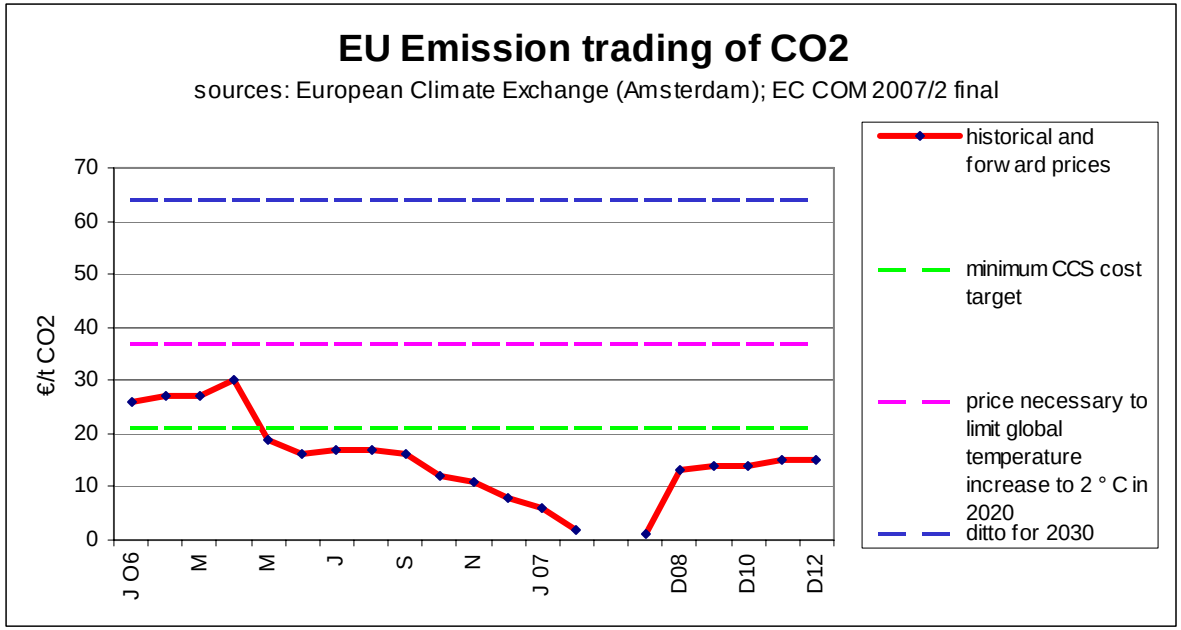
- Competitiveness:

  CCS costly, but competitive with other mitigation options



5. The policy agenda: stimulating investments

- Reduce investor uncertainty regarding CO_2 control beyond Kyoto



- Extend CO_2 emission trading schemes globally

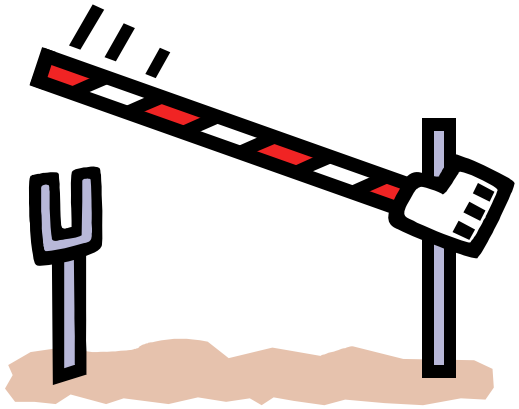
* EC Limitring global climate change to 2 ° (COM 2007) 2 final

- Promote carbon capture and storage as a mitigation option

1. Establish national regulatory frameworks for CCS
2. Strengthen cooperative international RD&D
3. Support CCS demonstration plants and « early players »
4. Consider incentives if initially carbon value too low to attract investors
5. Render CCS projects eligible for emission trading, CDM, JI
6. Adapt international maritime and environmental conventions to enable CO_2 storage

- Render regulations market-oriented and internationallycompatible *

1. Strengthen market mechanisms, competition, market entry, transparency
2. Avoid interventions on price formation (wholesale, cross-border, grid services)
3. Build coherent and internationally compatible regulatory frameworks
4. Clarify sharing of costs of cross-border investments in one system that benefit another
5. Streamline planning and licensing procedures
6. Reduce multiple layers of authority in regulations
7. Incentivise cross-border investments
   (secure long-term returns, best locations)



*EU Directive 2005/89/EC of 18. 1. 2006 on safeguarding electricity supply and infrastructure investments;
ETSO Cross-border framework for transmission network infrastructure (ETSO-net.org)

6. The role of ECE: complement ongoing cooperation

Ongoing international (✓) and possible (✻) ECE activities to secure investments in sustainable power generation and in transmission

Issue	North America	of which USA	OECD Europe	of which EU	Transition economies	of which Russia	ECE	World	References
1. Analysis, projections									
• el. demand, supply	✓	✓	✓	✓	✓	✓	✻	✓	IEA WEO 2006
• interregional trade			✓	✓	✻	✻	✻		UCTE
• capacity (GW)	✓	✓	✓	✓	✓	✓		✓	IEA WEO 2006
• investments ($)	✓	✓	✓	✓	✓	✓		✓	IEA WEIO 2004
• capacity adequacy	✓	✓	✓	✓	✓	✓		✓	ETSO
				✓	✻	✻	✻		
• CO_2 emissions	✓	✓	✓	✓	✓	✓		✓	IEA WEO 2006; IPCC
2. Regulations									
• on investments									no intra- or interregional regulatory frameworks; ERGEG, CEER, ETSO
• transparency cross-border transmission				✓			✻		
• cost/benefit sharing									
3. CCS									
• analysis	✓	✓	✓	✓			✻	✓	IEA CCS 2004,WEC 2007
• research, demo	✓	✓	✓	✓					CSLF, IEA GHG R&D, EU FP, FutureGen etc. (see WEC 2007)
• incentives									not at present
• eligible for emission trading, CDM, JI									not at present
• regulations								✓	IEA/CSLF
• adaptation of intern. conventions								✓	London Convention on the Prevention of Marine Pollution
4. Policy guidelines		✓		✓			✻		EU Directives 2005/89/EC and 2003/54/EC

Transition economies = former Soviet Union, South-Eastern Europe; ETSO = European Transmission System Operators Association; CEER = Council of European Energy Regulators; ERGEG = (EU) European Group of Regulators for Electricity and Gas; CSLF = Carbon Sequestration Leadership Forum; FP = 6th and 7th EU Framework Programme; WEC = World Energy Council: Carbon capture and storage – a WEC interim balance, 2007 (in preparation)

- Possible ECE activities

1. **Analysis**: Review prospects of thermal generation and reserve margins in the various ECE regions; compare related policies and regulations

2. **Trade**: Explore long-distance east-west electricity trade opportunities and interconnector capacities; determine regulatory prerequisites

3. **Norms**: Develop ECE-wide guidelines for measuring capacity adequacy in generation and transmission; enhance transparency of cross-border transmissions

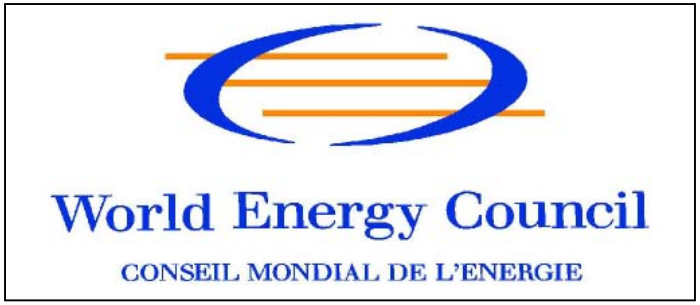
4. **Business strategies**: Appraise the comparative advantages of investments in new capacities, plant and end-use efficiency, structural adjustment of fuel use or CCS

5. **Innovation**: Survey CCS awareness and readiness particularly in ECE emerging economies; assist the development of compatible regulatory frameworks

6. **Policy guidelines:** Create a ECE-wide consensus on enhancing investments in thermal generation and in transmission, particularly cross-border transfer capacities and procedures

Thank you.

More?



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