# Nuclear Power And Climate Change

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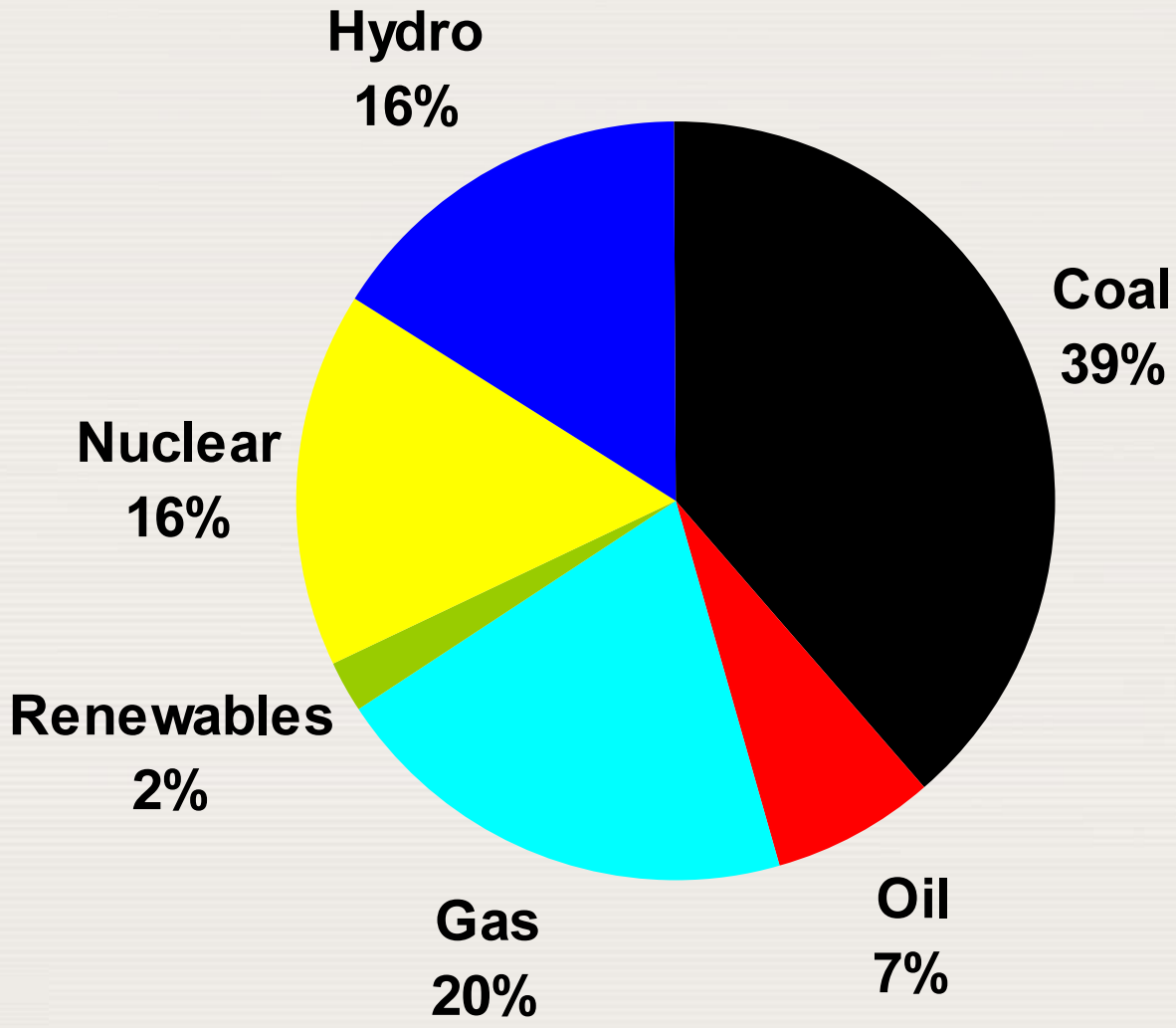
# Summary of nuclear power today:

- A proven technology that provides clean electricity at predictable and competitive costs
- More the 12,000 years of accumulated reactor experience
- Operation of nuclear installations have safety as highest priority
- Lessons learned from past mistakes or accidents have been acted on
- The industry's safety record is second to none
- Nuclear takes full responsibility for all its waste

# Global electricity generation in 2004: 17,400 TWh or 16% of global supply

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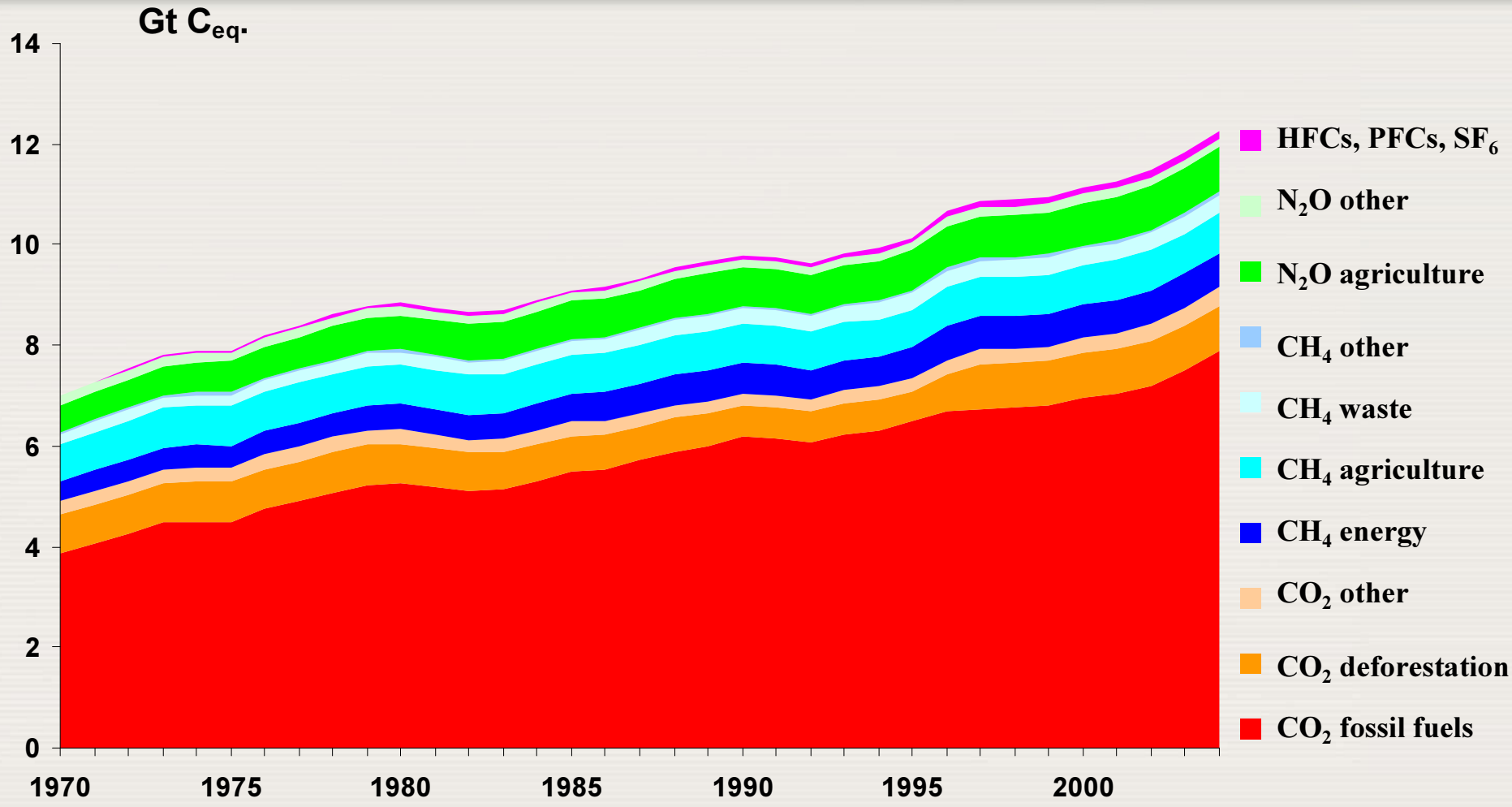
# Kyoto GHG Emissions, 1970 - 2004




Data sources: 1970-2000: EDGAR 3.2, EDGAR 3.2 FT 2000; 2001-2004: IEA, USGG, AFEAS, RAND, FAC

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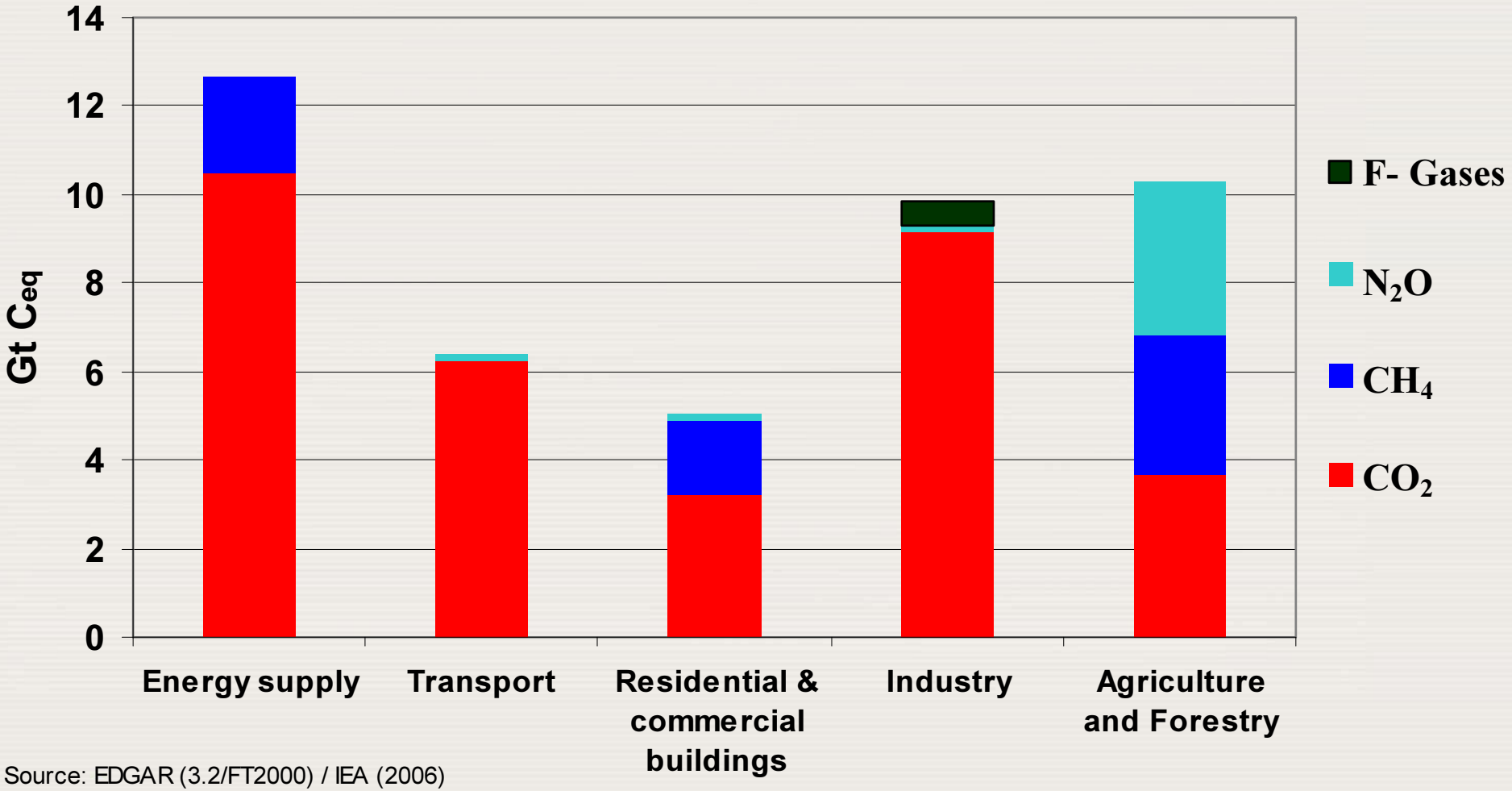
# Sectoral breakdown of global GHG Emissions, 2004




Source: EDGAR (3.2/FT2000) / IEA (2006)

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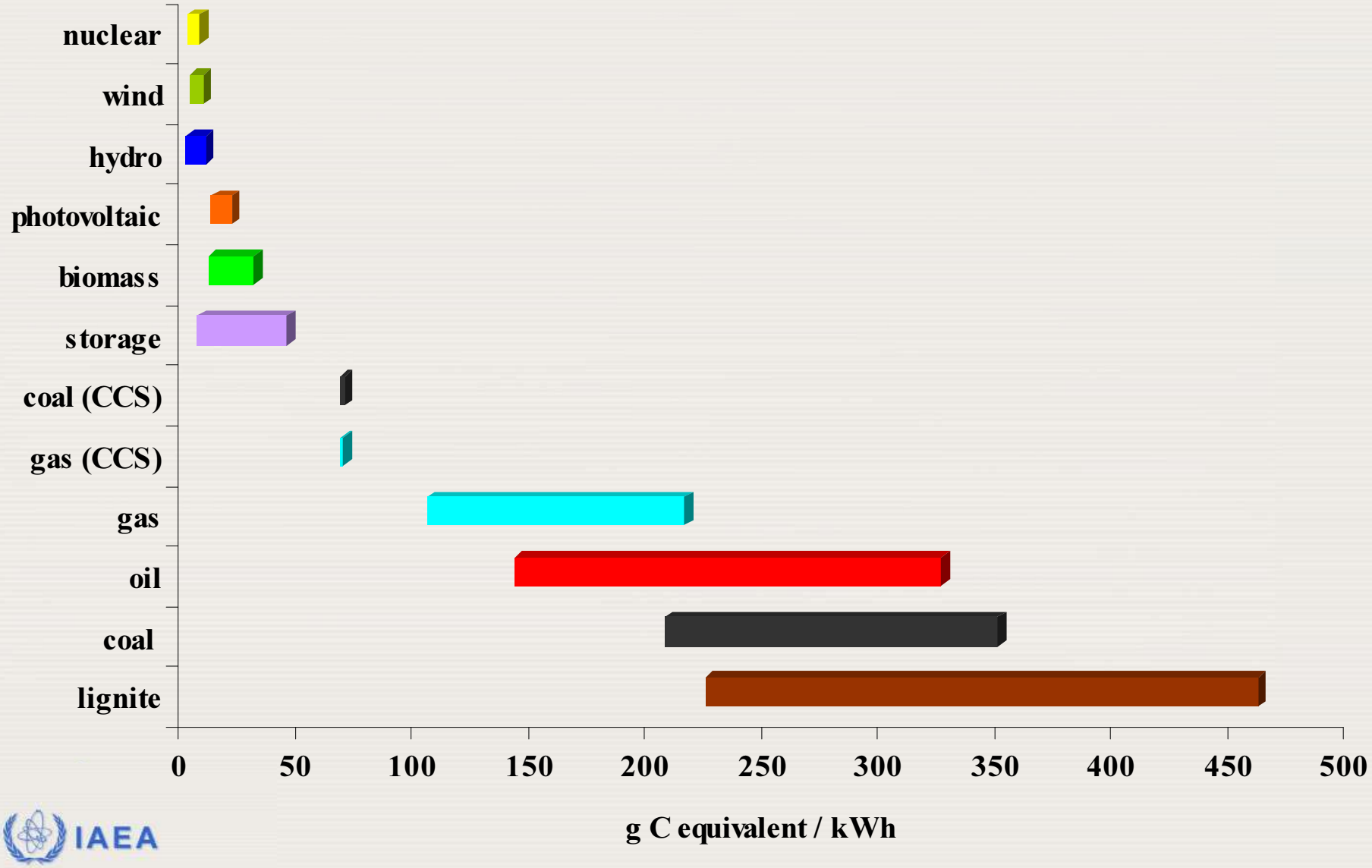
# Greenhouse Gas Emissions ($gC_{eq}$ per kWh)

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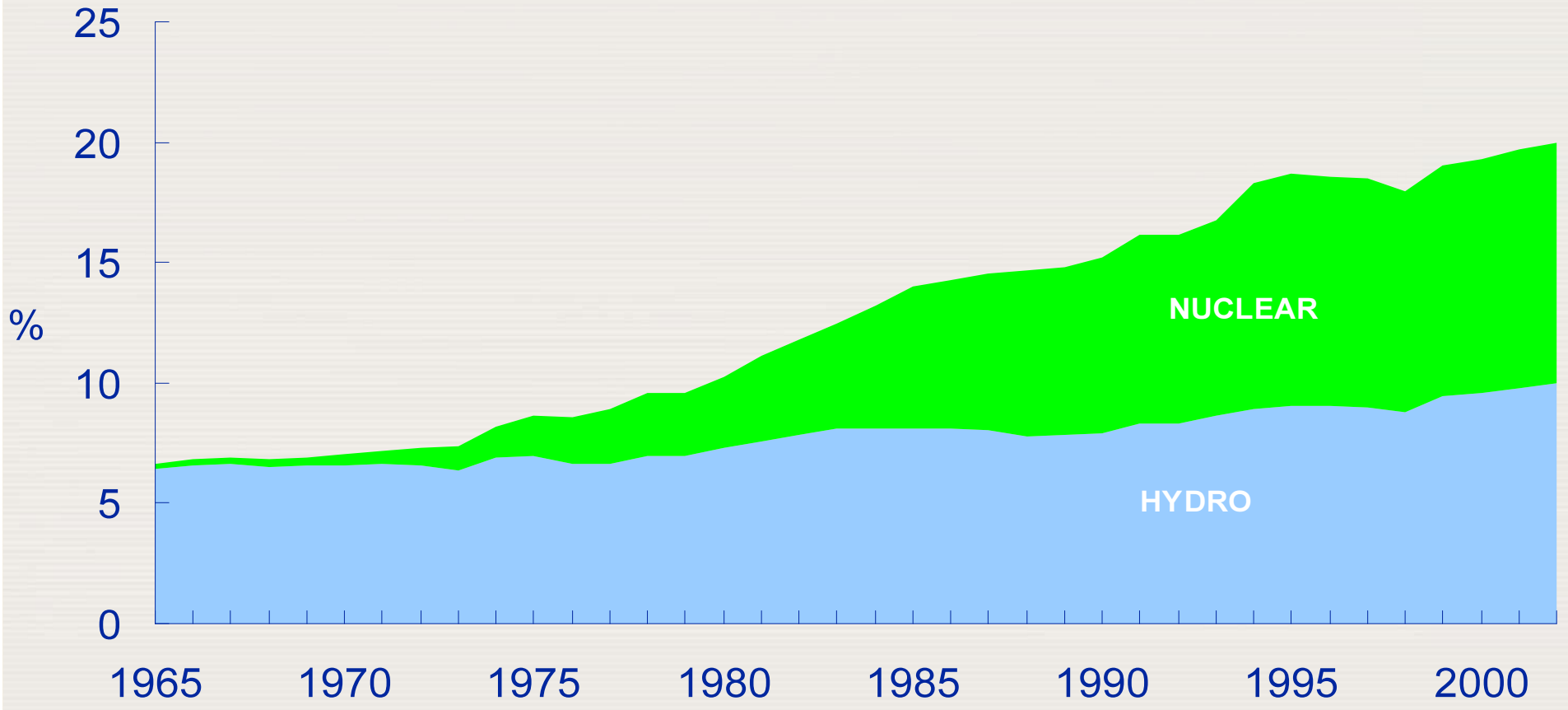
# $CO_2$ Avoided by Hydro and Nuclear Energy
## (% of total $CO_2$ emissions from the energy sector)

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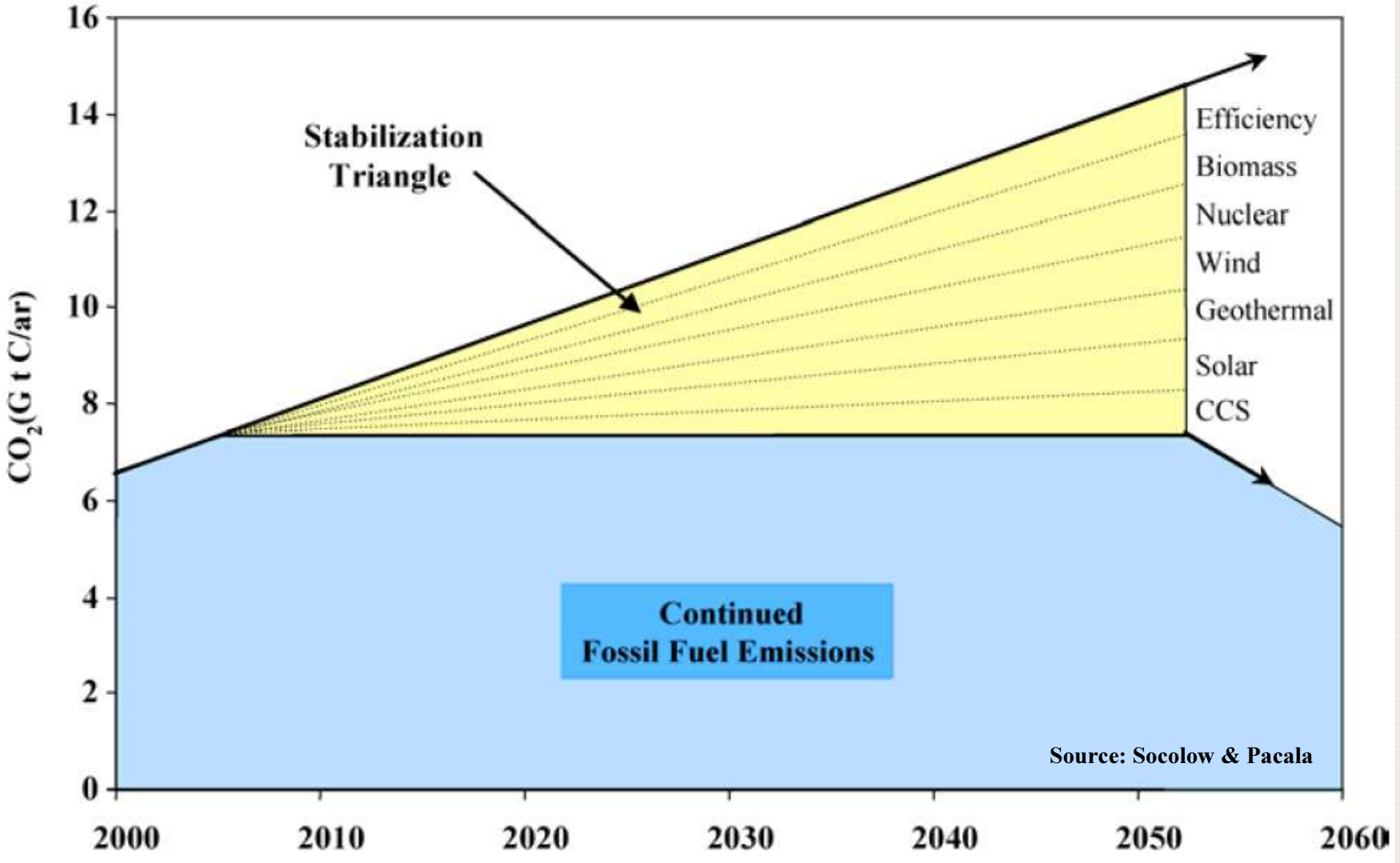
# Technology Options Towards a Sustainable Energy Future

- **Improved Energy Efficiency throughout the energy system**
- **More Renewable Energy**
- **Advanced Energy Technologies:**
  - **clean fossil fuel technologies including carbon capture & storage (CCS)**
  - **next generation nuclear technologies**

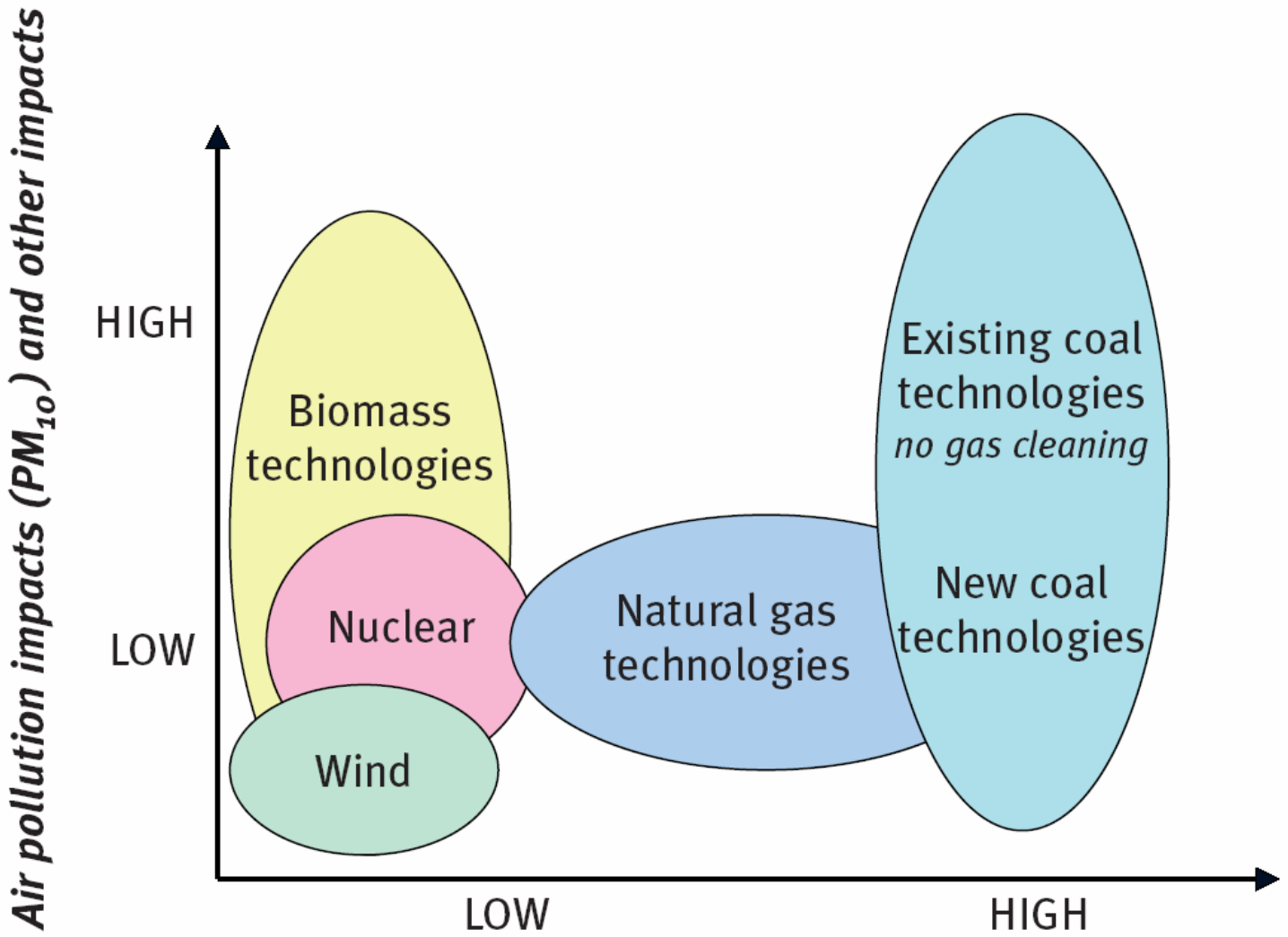
# All Demand And Supply Options Are Needed



# Nuclear Power and Sustainable Energy Development

- There is no technology without risks, wastes or interaction with the environment.
- Therefore, it does not make sense to discuss a particular technology in isolation.
- Rather, one has to compare the performance of a particular technology with its alternatives on a life cycle (LCA) basis.
- Nuclear power compares favourably with alternatives

# Externalities of Electricity Generating Technologies




Source: EU-EUR 20198, 2003

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# Economics – Nuclear power

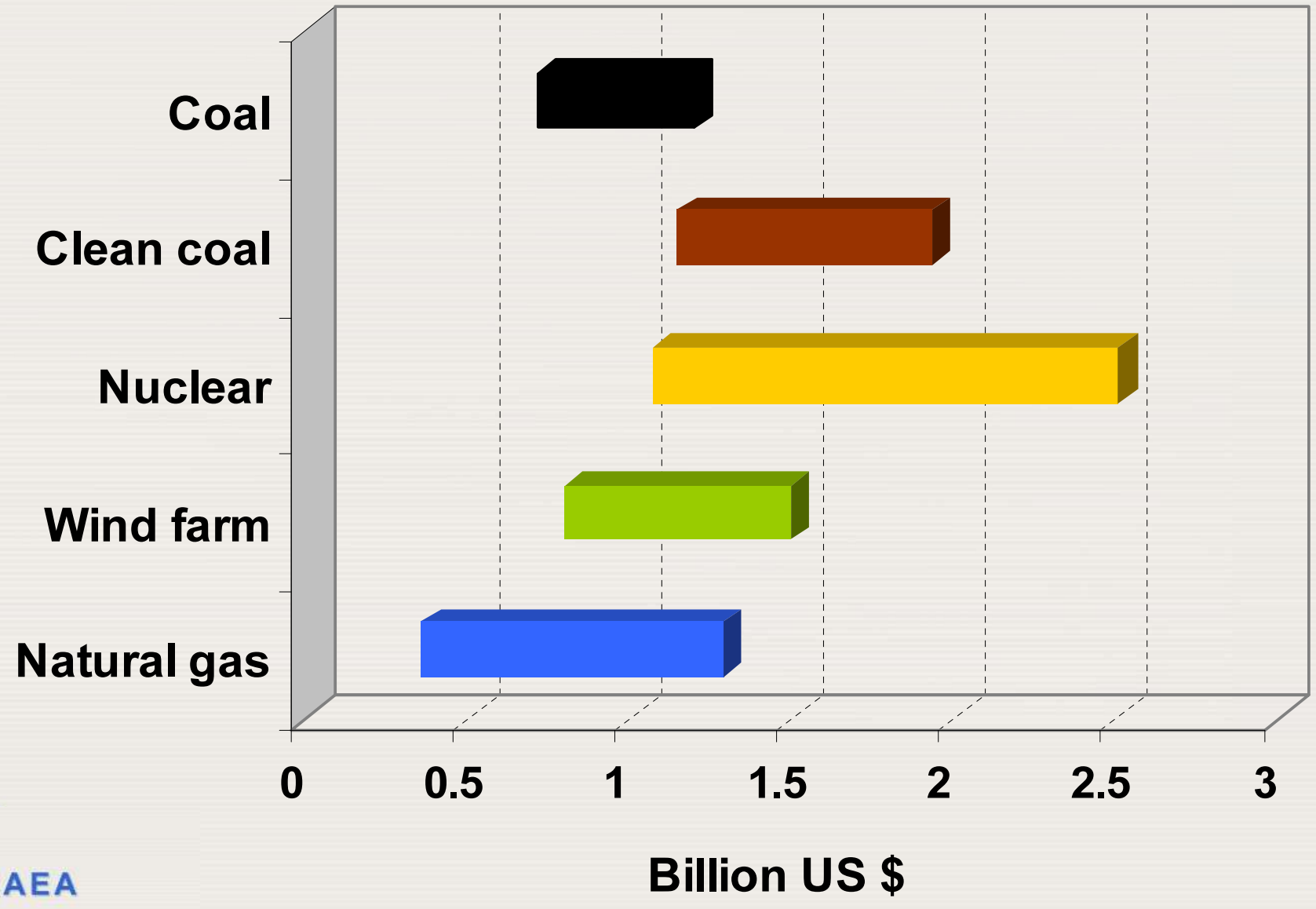
## Advantages

- Nuclear power plants are cheap to operate
- Stable & predictable generating costs
- Long life time
- Supply security (insurance premium)
- Low external costs (so far no credit applied)

## But…

- High upfront capital costs can be difficult to finance
- Sensitive to interest rates
- Long lead times (planning, construction, etc)
- Long payback periods
- Regulatory/policy risks

# Investment Costs for 1,000 MWe

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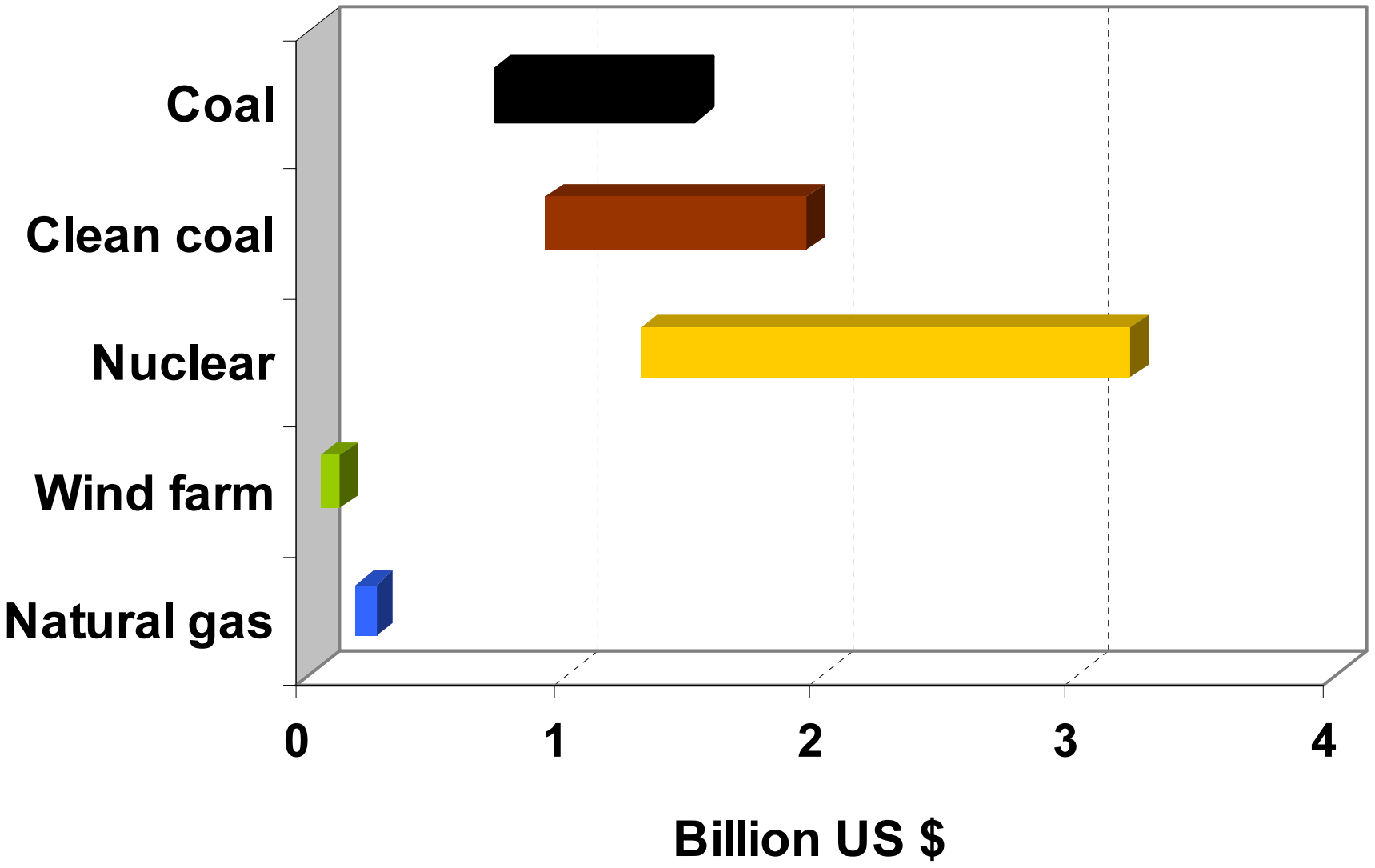
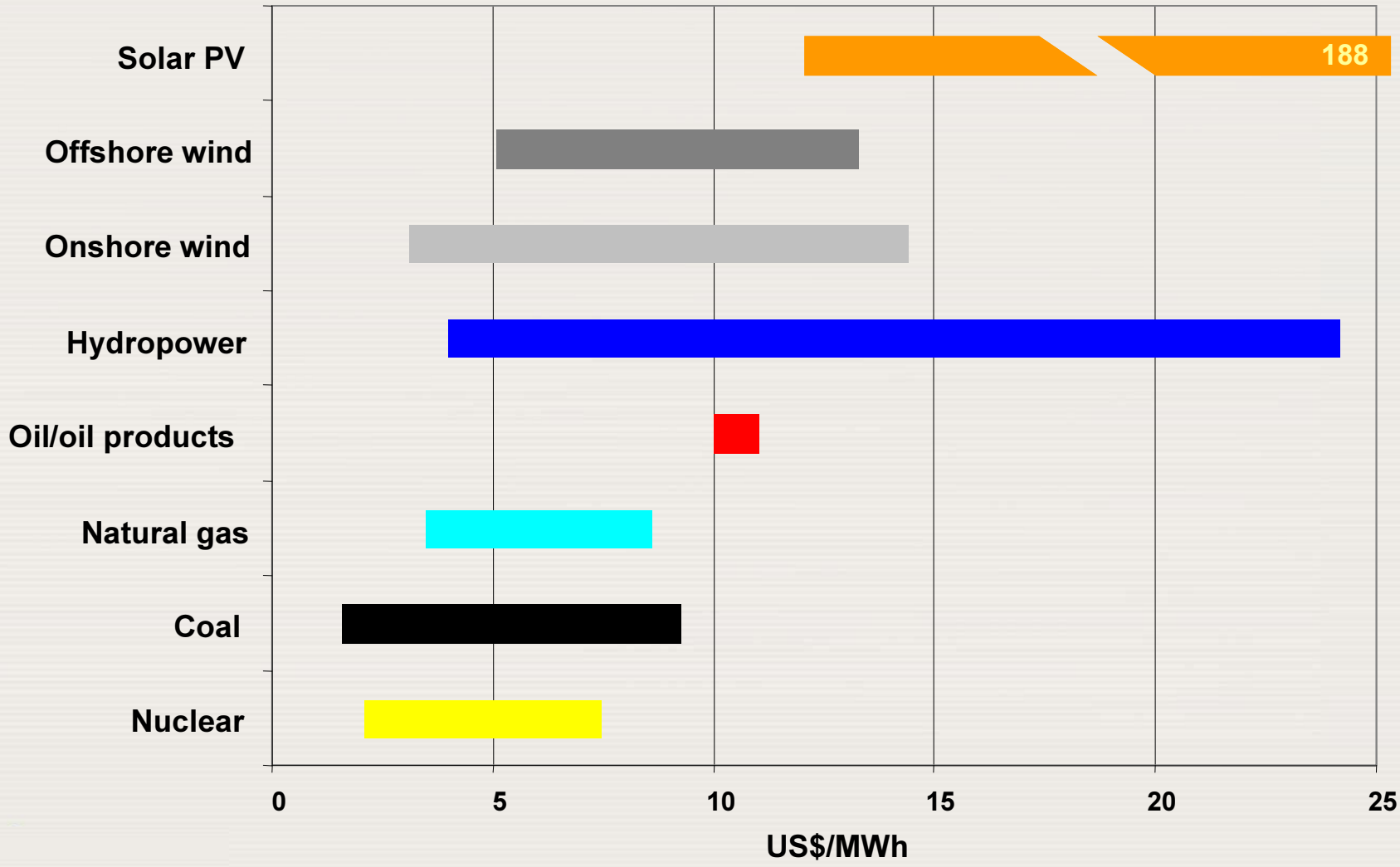
# Typical Turn-key Costs

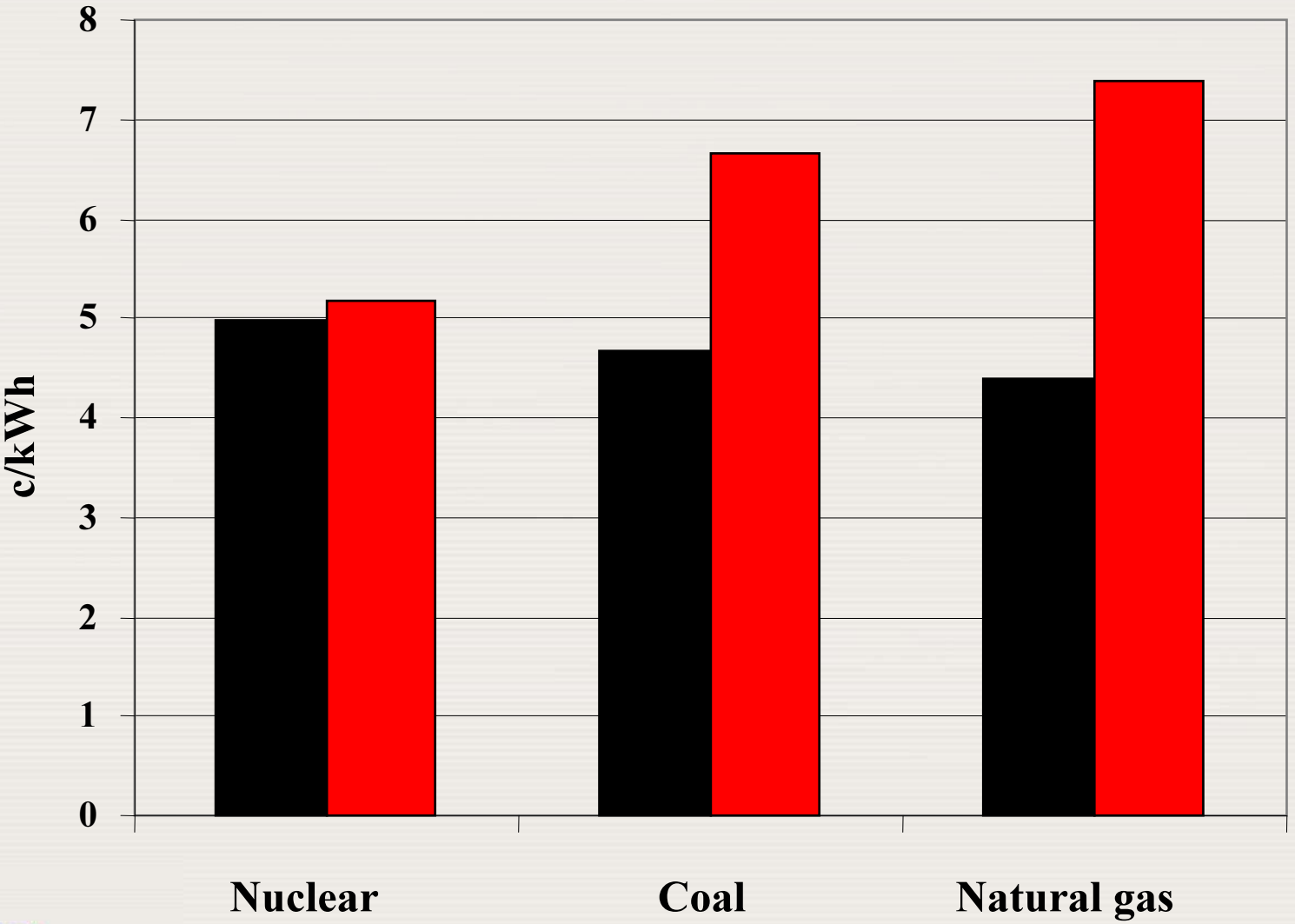


# Range of Levelized Generating Costs of New Electricity Generating Capacities




IAEA Source: Adapted from eight recent studies

# Impact of a doubling of resource prices

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# Nuclear Power and Climate Change

- All credible scenarios of future energy demand and supply show that the more nuclear is used, the more GHG emissions are avoided
- Still, there continue to be proposals to further exclude it from the menu of GHG mitigation options
- Countries with high nuclear shares have the lowest per capita GHG emissions

# Conclusion

- Exclusion from climate change agreements of any technology with clear climate benefits limits options, flexibility and competitiveness
- Life cycle economics and environmental characteristics of nuclear power compare well with alternatives
- Climate change and sustainable development are best served by allowing all options to compete on a level playing field on the basis of cost-effectiveness, GHG reductions, environmental & health protection, security, and safety