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Understanding the cost structure of a Nuclear Power Project

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Understanding the Cost Structure of a Nuclear Power Project

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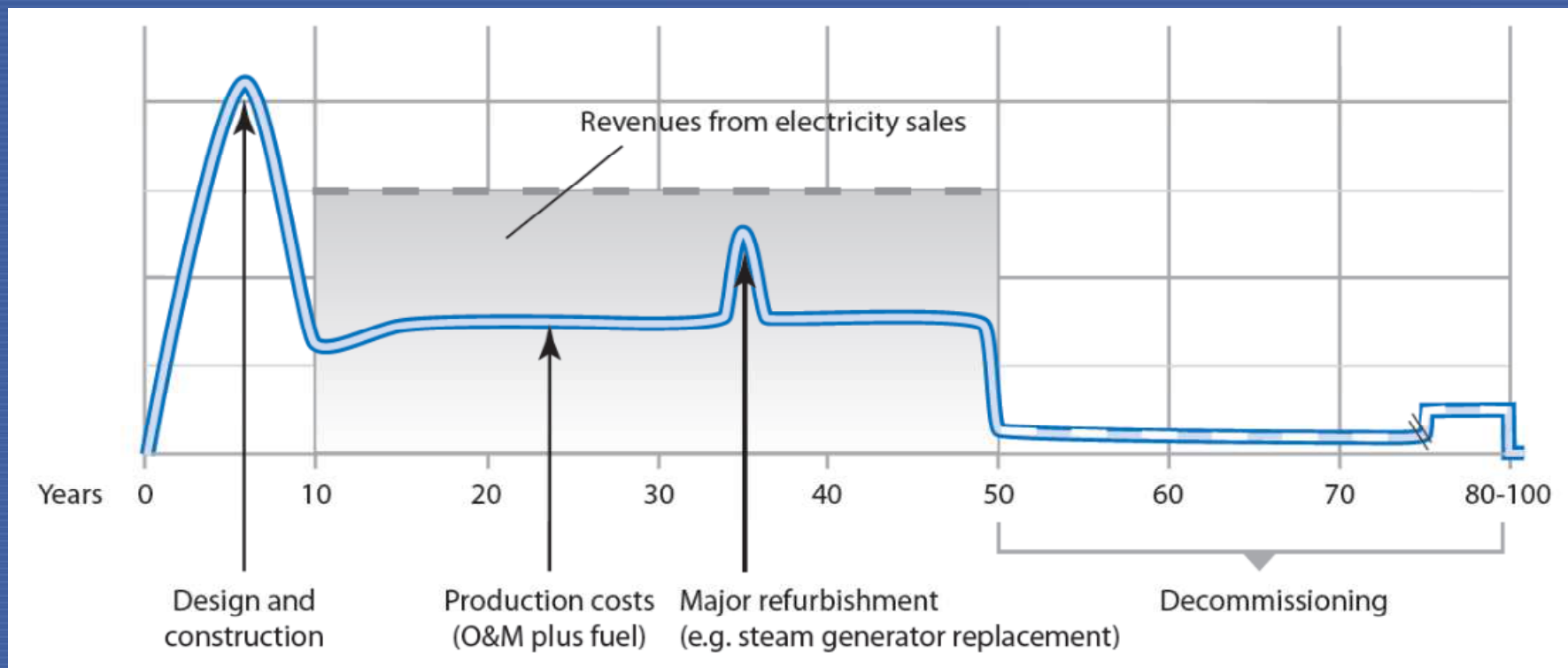
Economic Analysis (1)

- What are the objectives of the project?
- What is the outcome of the project and what are the alternative outcomes?
- Is the project the best fit solution to meet the specified objectives?
- Who will benefit and who will bear the costs of the project?
- How does the project impact the fiscal situation?

Economic Analysis (2)

- Is the project financially sustainable?
- What is the project's environmental impact?
- Is the project worthwhile?
- What are the project risks?

Illustrative life cycle cash flow of a NPP Project



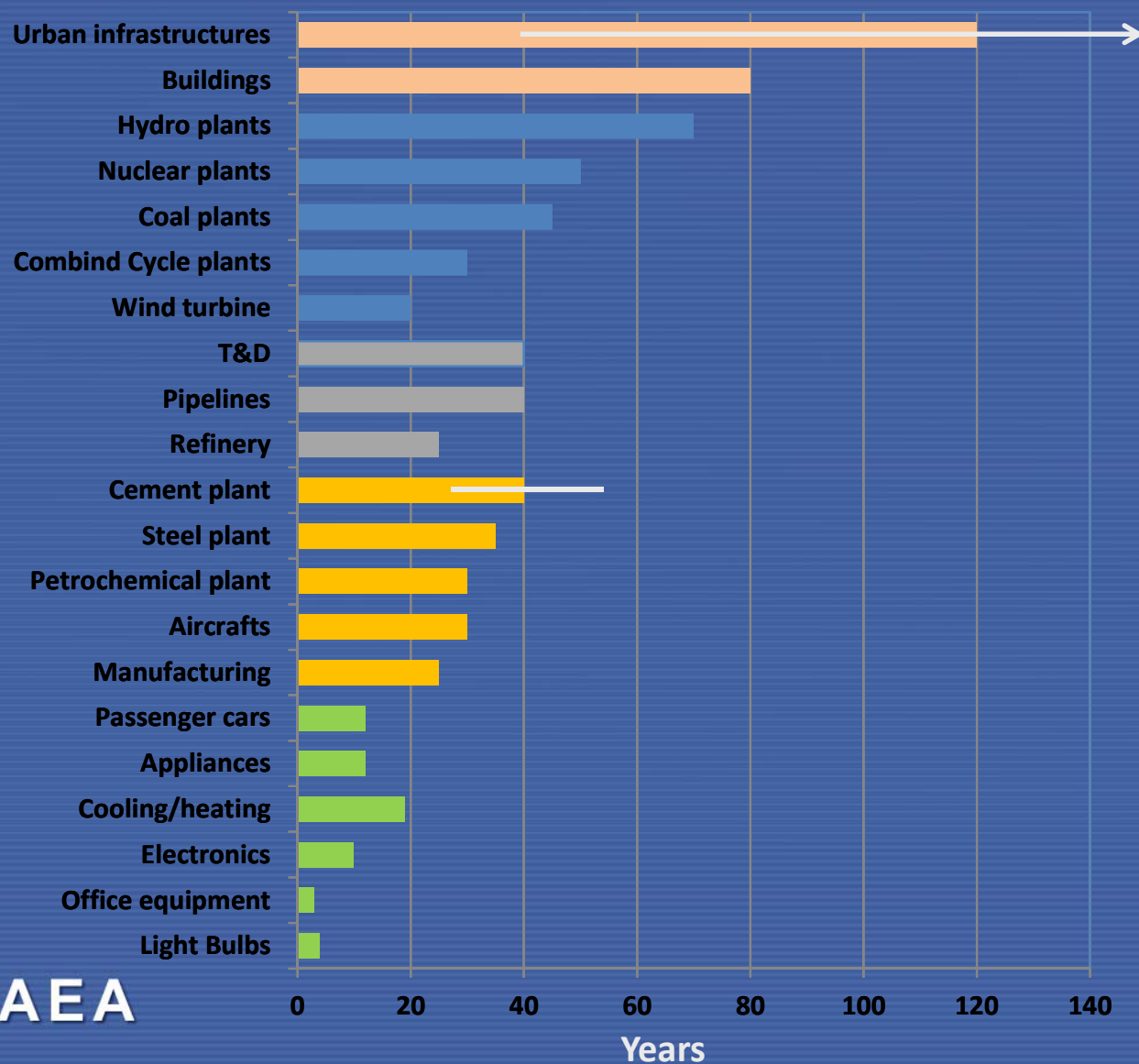
Scope of energy assessments

- Review of the current situation
- Assessment of future needs
- Assessment of resources
- Evaluation of technological options
- Development of alternative scenarios
- Assessment of economic, financial and environmental implications
- Recommendations for plans and strategies

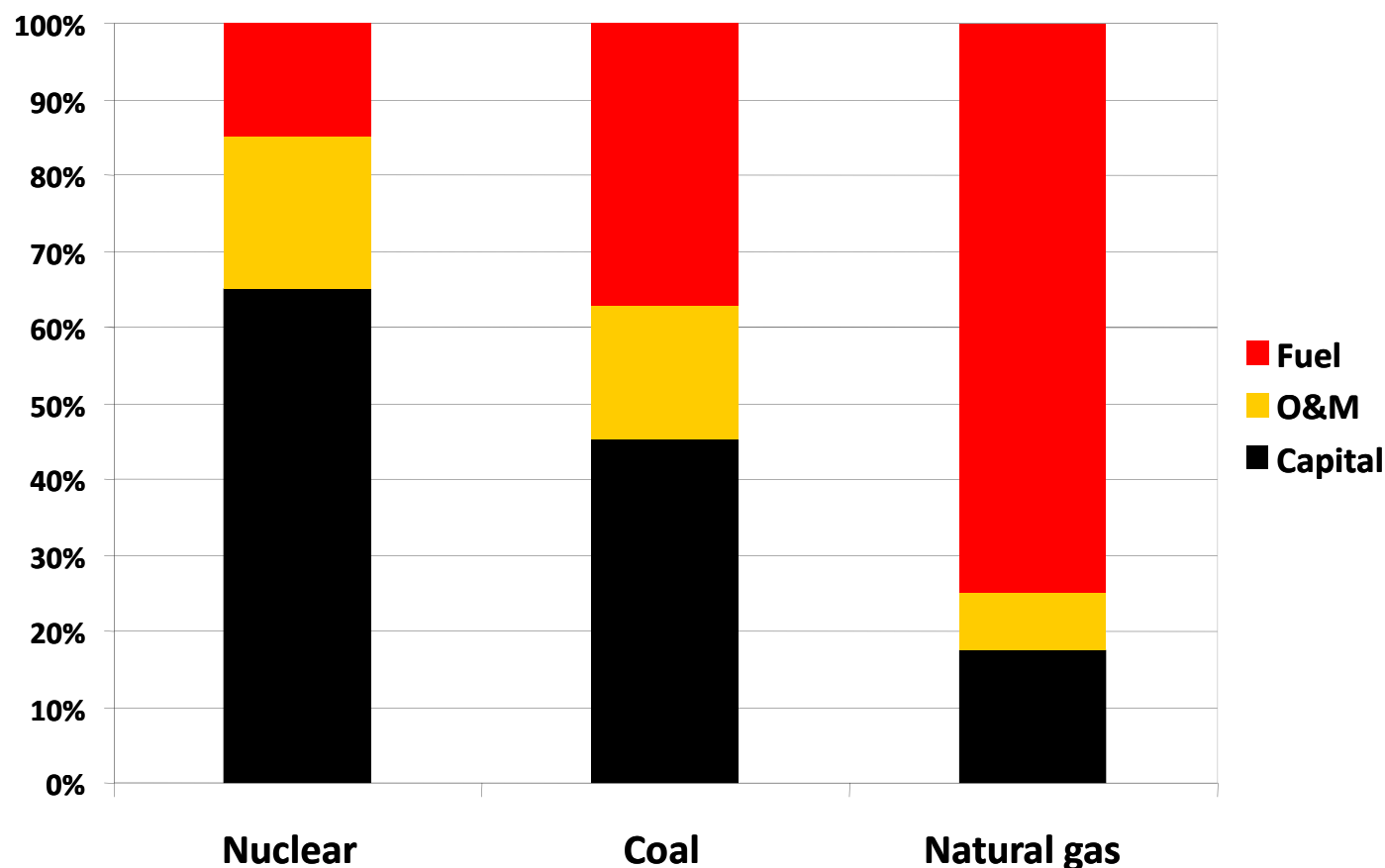
Important Issues In Economic Analysis

- Monetary value of benefits
- Discounting
- Environmental externalities

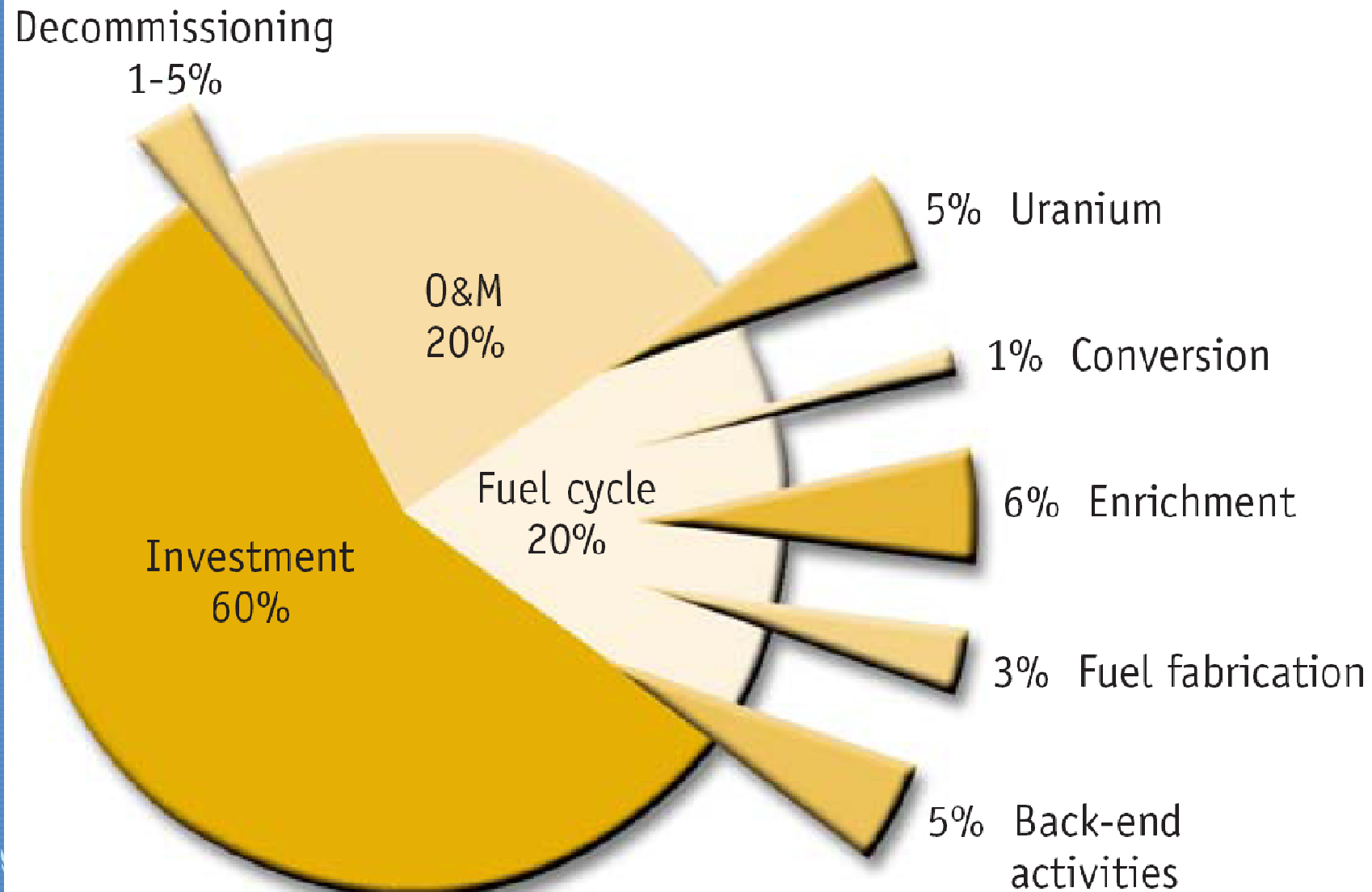
Typical lifetime of energy-related capital stock



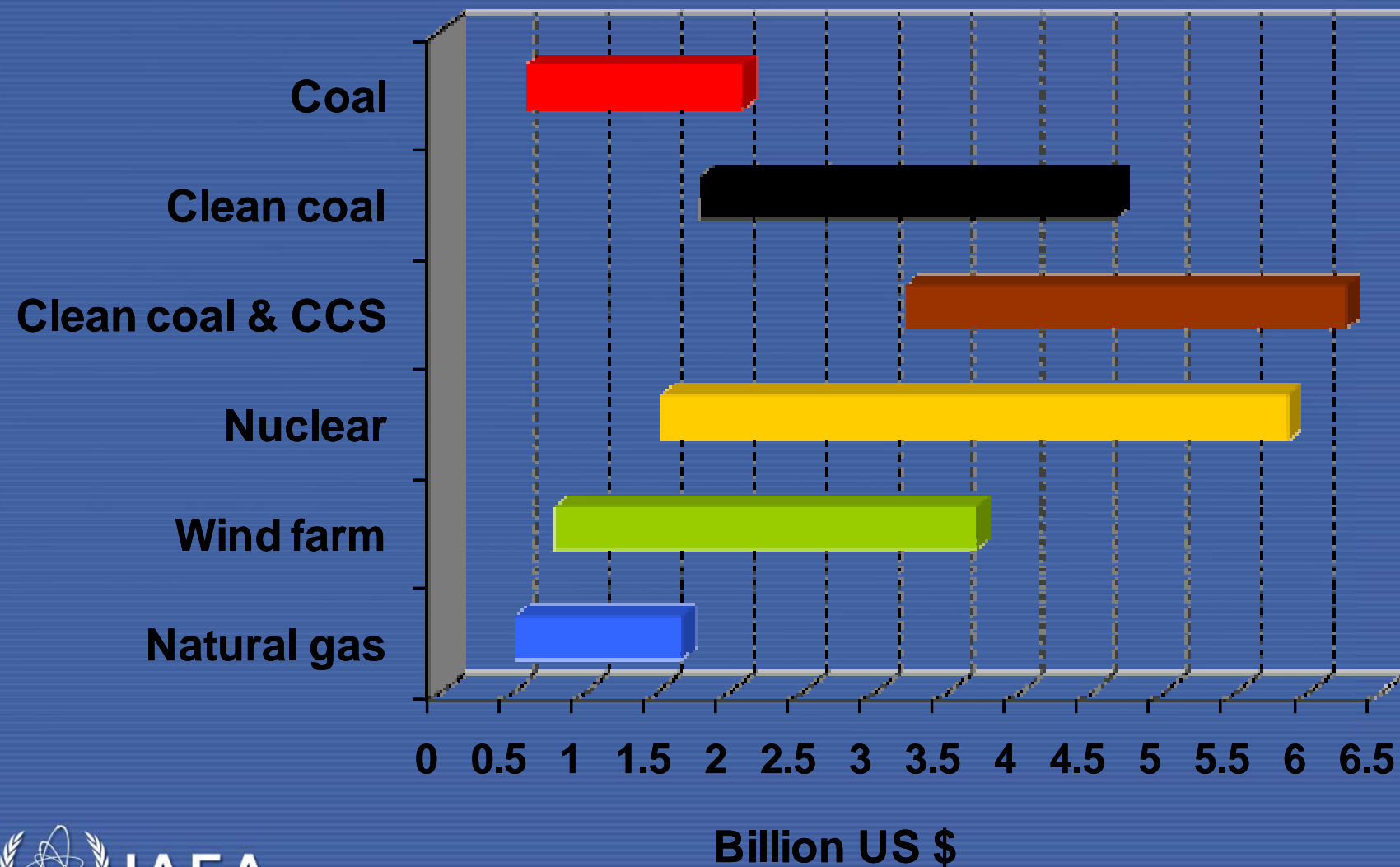
Cost structures of different options for electricity generation



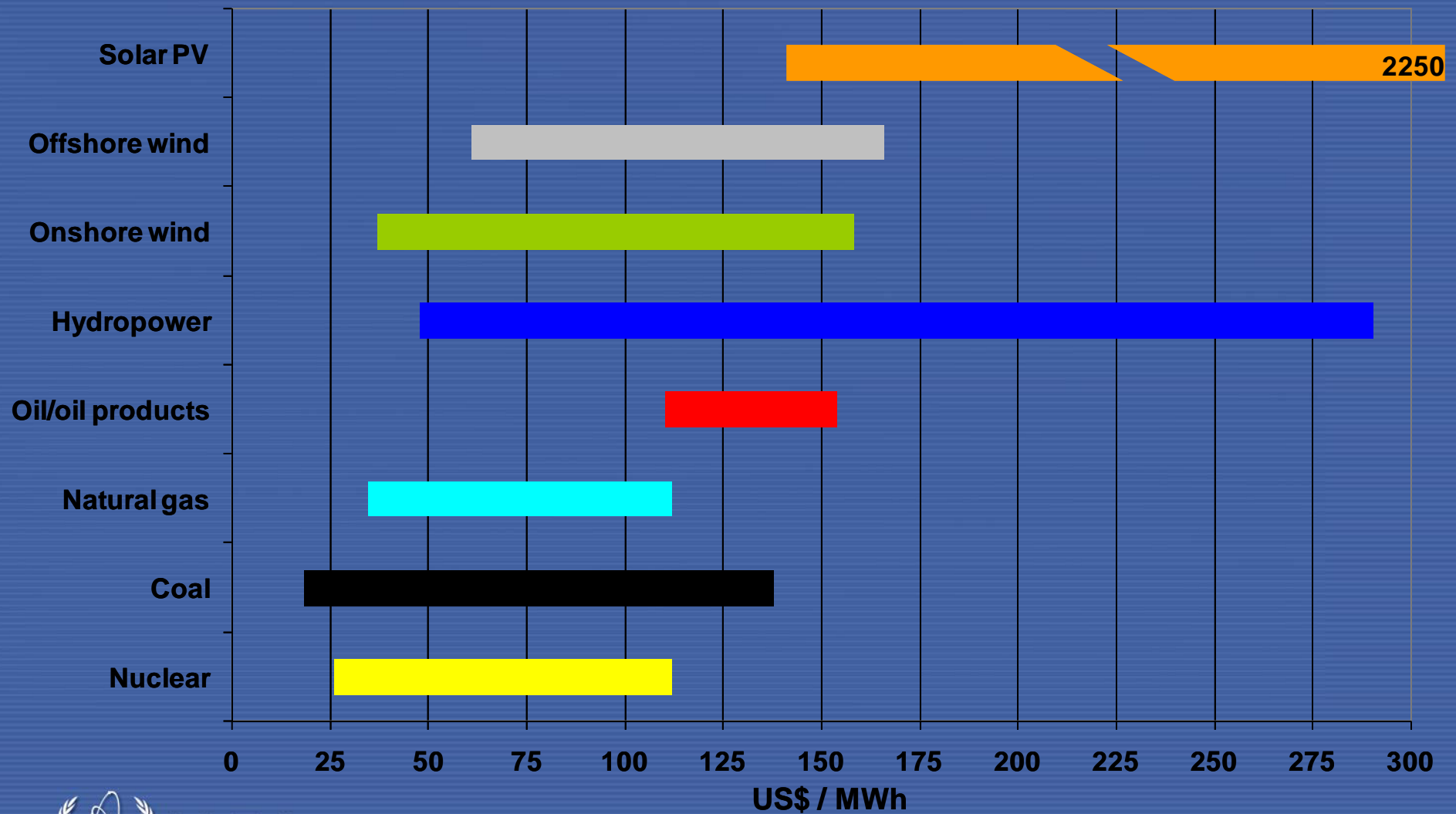
Typical nuclear electricity generation cost breakdown



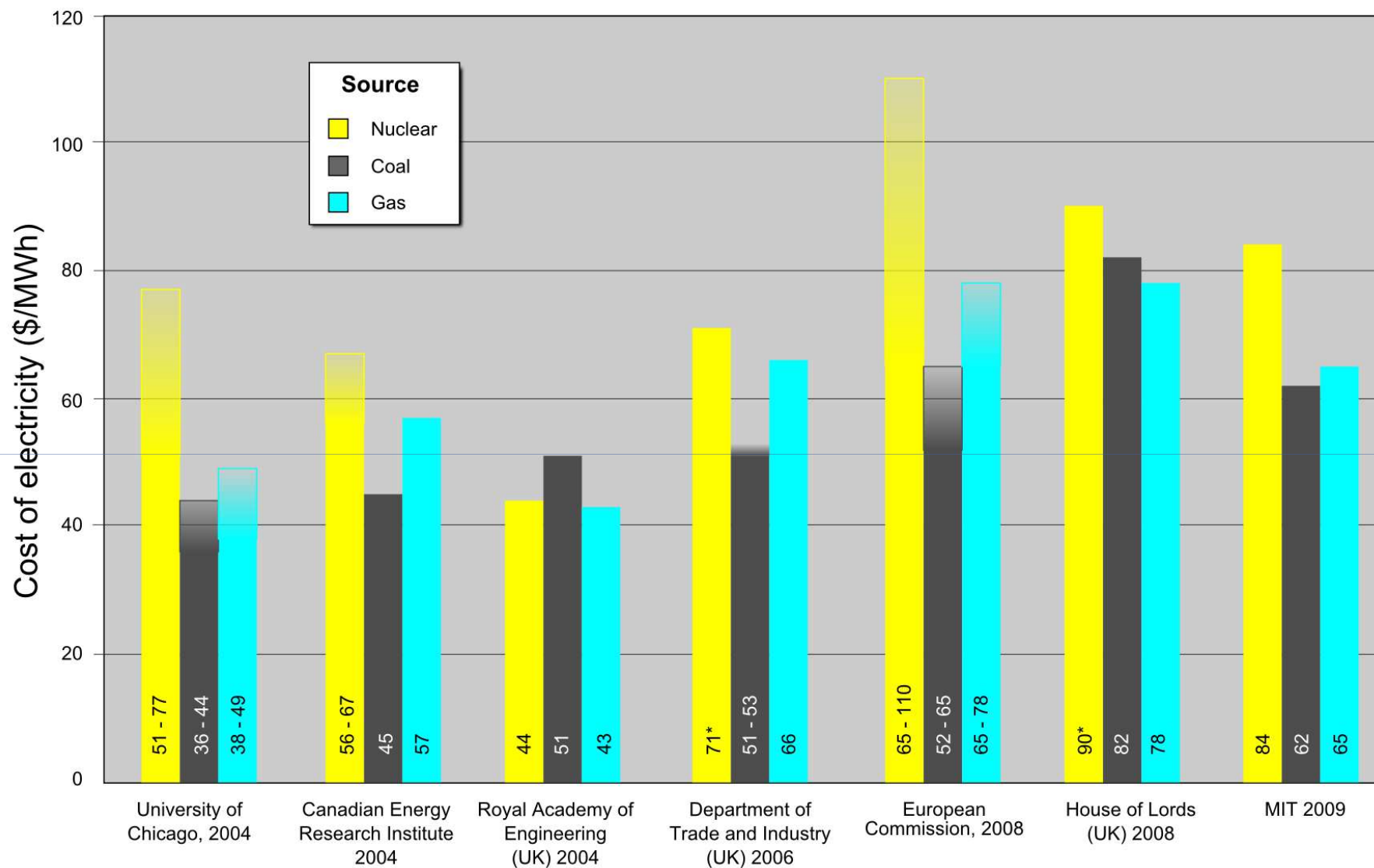
Investment costs for 1,000 MWe



Range of Levelised Generating Costs of New Electricity Generating Capacities



Levelised costs of electricity for different studies



(*) does not include waste disposal.

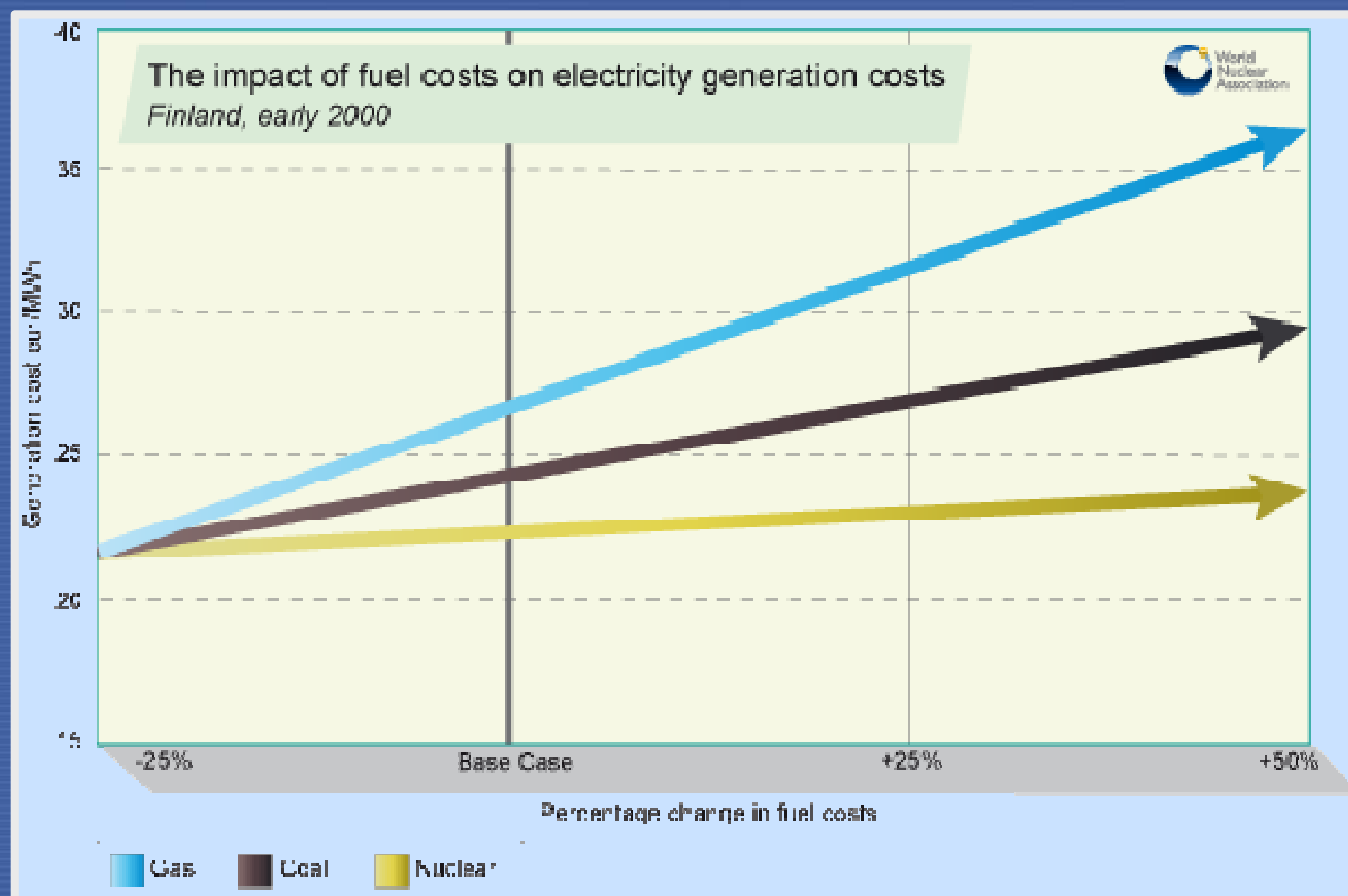
Nuclear Power vs. Fossil Fuel Based Power Plants (US \$ of 2007)

	Nuclear	Coal	Gas CC
Total Construction Cost (\$/kW)	5,071 - 6,378	2,424	1,206
Levelized Generation Cost (\$/MWh)	64.40 - 75.80	70.60	70.40 - 98.40

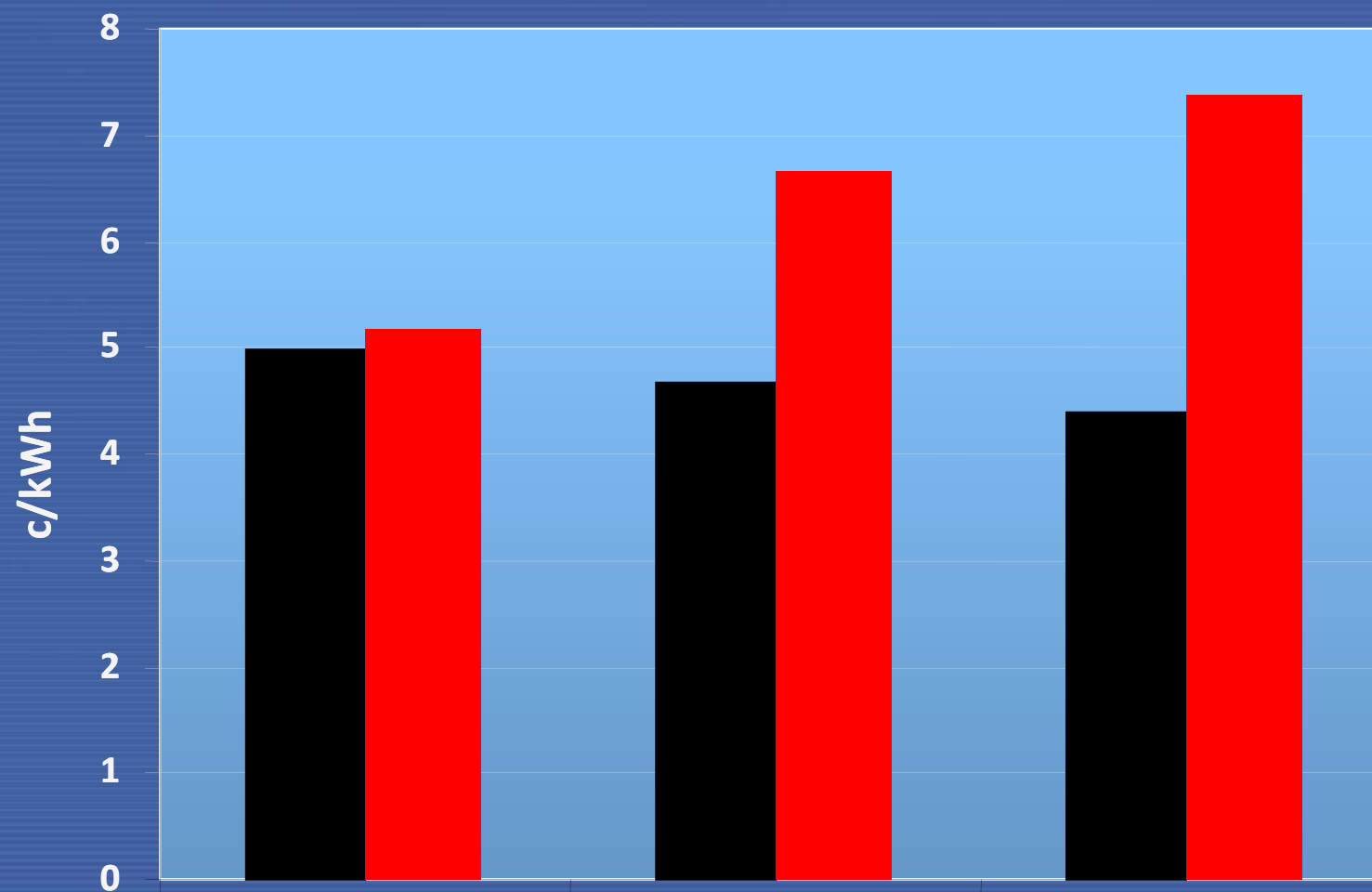
Fuel Cost: Nuclear \$ 7.50/MWh; Coal \$ 1.50/mmBtu; Gas \$ 6-10/mmBtu

Source: NEI, Feb. 2009

Impact of fuel prices increase



Impact of a doubling of resource prices



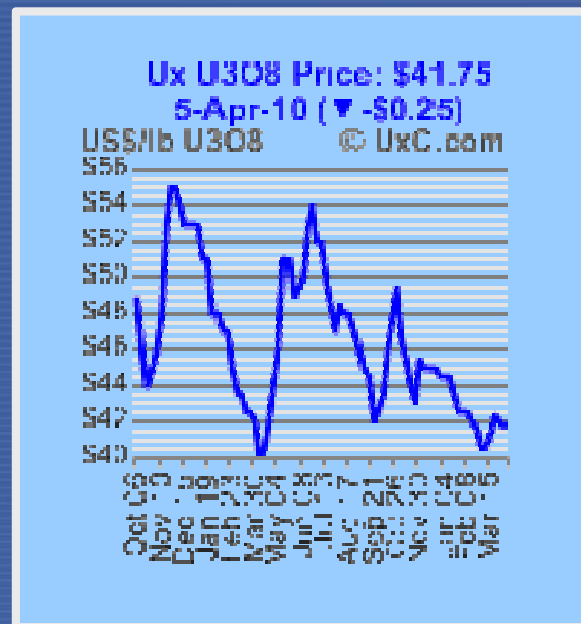
IAEA

Nuclear

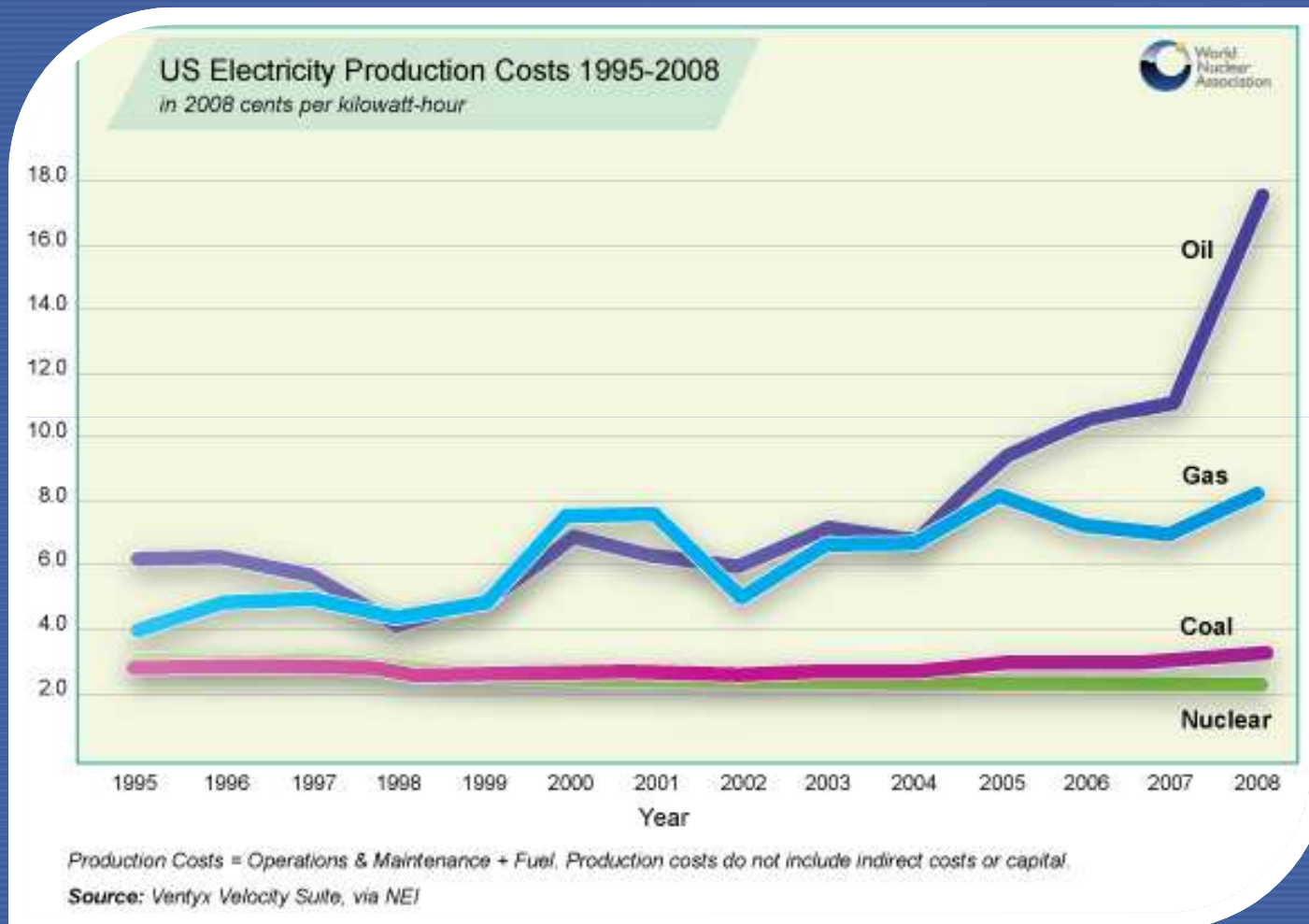
Coal

Natural gas

Uranium prices



Impact of fuel prices increase



Economics – Nuclear power

Advantages

- Nuclear power plants are cheap to operate
- Stable & predictable base load 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
- Market risks

Risk issues

- Capital exposure not unique for nuclear
- Completion risk
- Regulatory risk
- Operating risk
- Market risks – demand & revenues
- Political risk
- Technology risk
- External disasters

Risk issues

- What makes nuclear (somewhat) different
- Regulatory uncertainty
- Lack of recent experience on the part of investors and financiers
- Degree of government involvement
- Long amortization periods with long-term need
- for competitiveness
- Low probability, high impact events (and associated liability)

Environment – Nuclear power

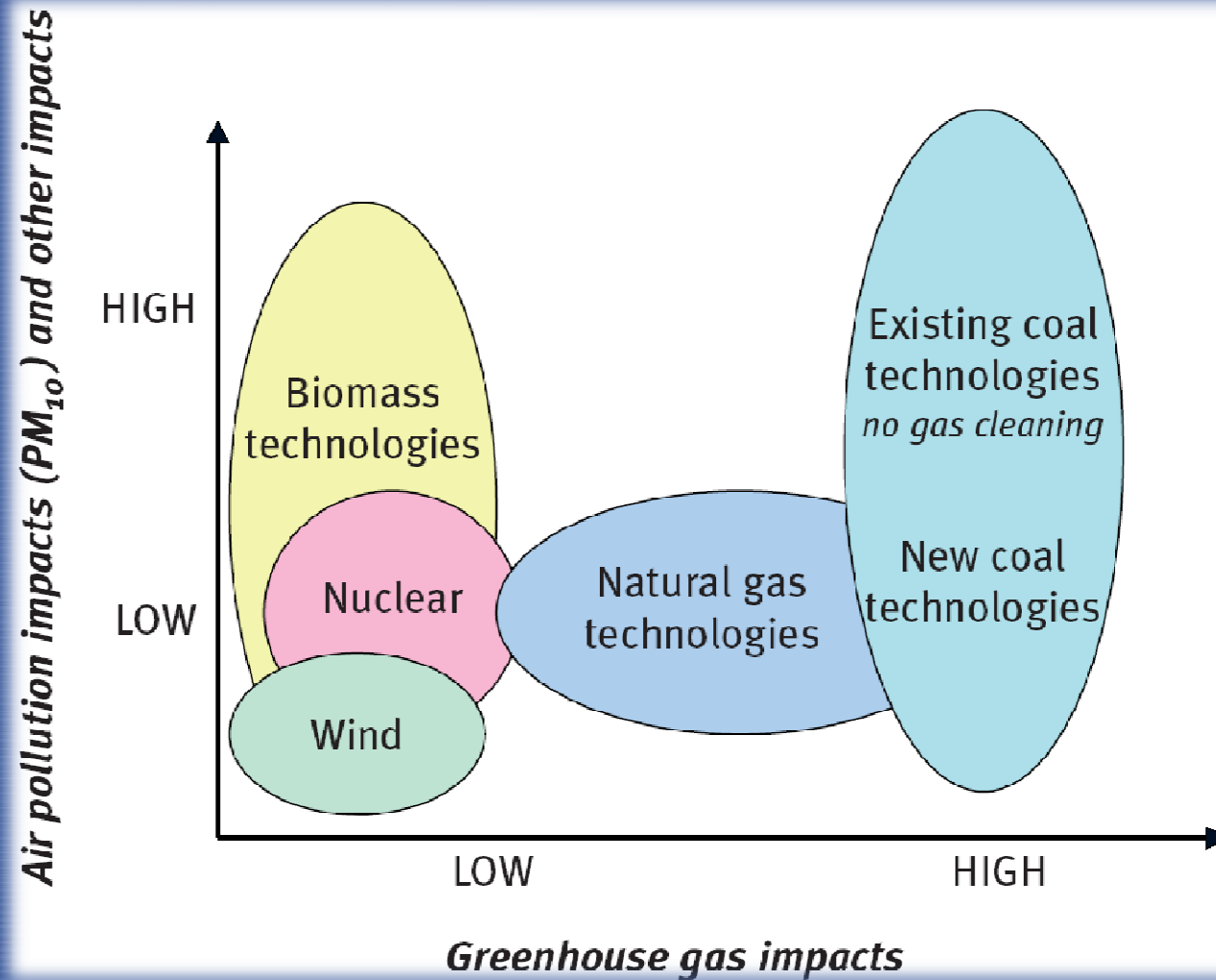
Advantages

- ✓ Low pollution emissions
- ✓ Small land requirements
- ✓ Small fuel & waste volumes
- ✓ Wastes are managed
- ✓ Proven intermediary storage

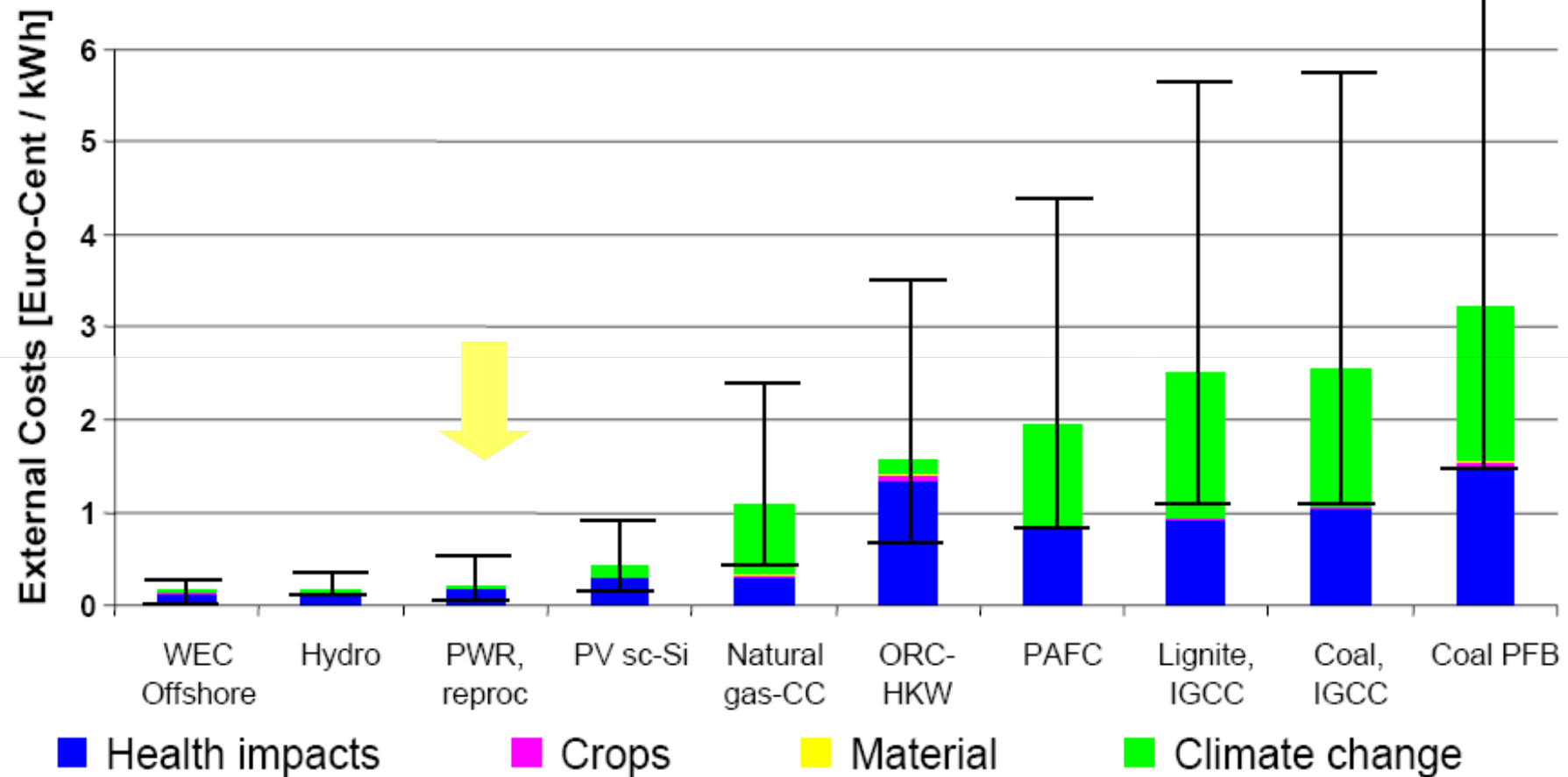
But...

- ⬇ No final waste repository in operation
- ⬇ High toxicity
- ⬇ Needs to be isolated for long time periods
- ⬇ Potential burden to future generations

Environment



Health and Environmental Damage From Electricity Generation Plants



But ...

in many cases public acceptance is low



ABGESCHALTET



Project Evaluation (1)

- Based the current and projected economic development a significant gap between supply and demand is expected.
- The need for base-load power is increasing, and nuclear generation capacity capable to feel the supply gap
- Future RES that includes nuclear option is a more viable choice for a future capacity mix than the alternative plans which exclude the nuclear option
- The proposed electric generation program is robust (considering the uncertainties related to load forecast, fuel prices, discount rate etc.)

Project Evaluation (2)

- Nuclear power will help reduce dependency on imported energy commodities
- Contribute to security of supply (fuel/services from a global market), provides greater diversity of electricity supply sources
- Sizable air quality benefits (SO₂, NO_x and particles emissions reduction)
- As a low-carbon technology can play an important role in the country's effort to comply with climate change policy and help meet CO₂ targets
- Offers a relatively stable and predictable initial cost base
- Nuclear power will/may help in stabilize the wholesale electricity prices

Criteria for a successful project

- Well – proven - designed plants (economic & safe)
- Proven track records of vendor & contractor
- Stable regulatory regime
- Risk sharing amongst all project stakeholders
- Strong project team
- Extensive Project Planning

Confidence



Thank you