



CAMBRIDGE
Judge Business School



**DEPARTMENT OF
ENGINEERING**

***Nuclear Renaissance Requires
Nuclear Enlightenment?
Some lessons from across Europe***

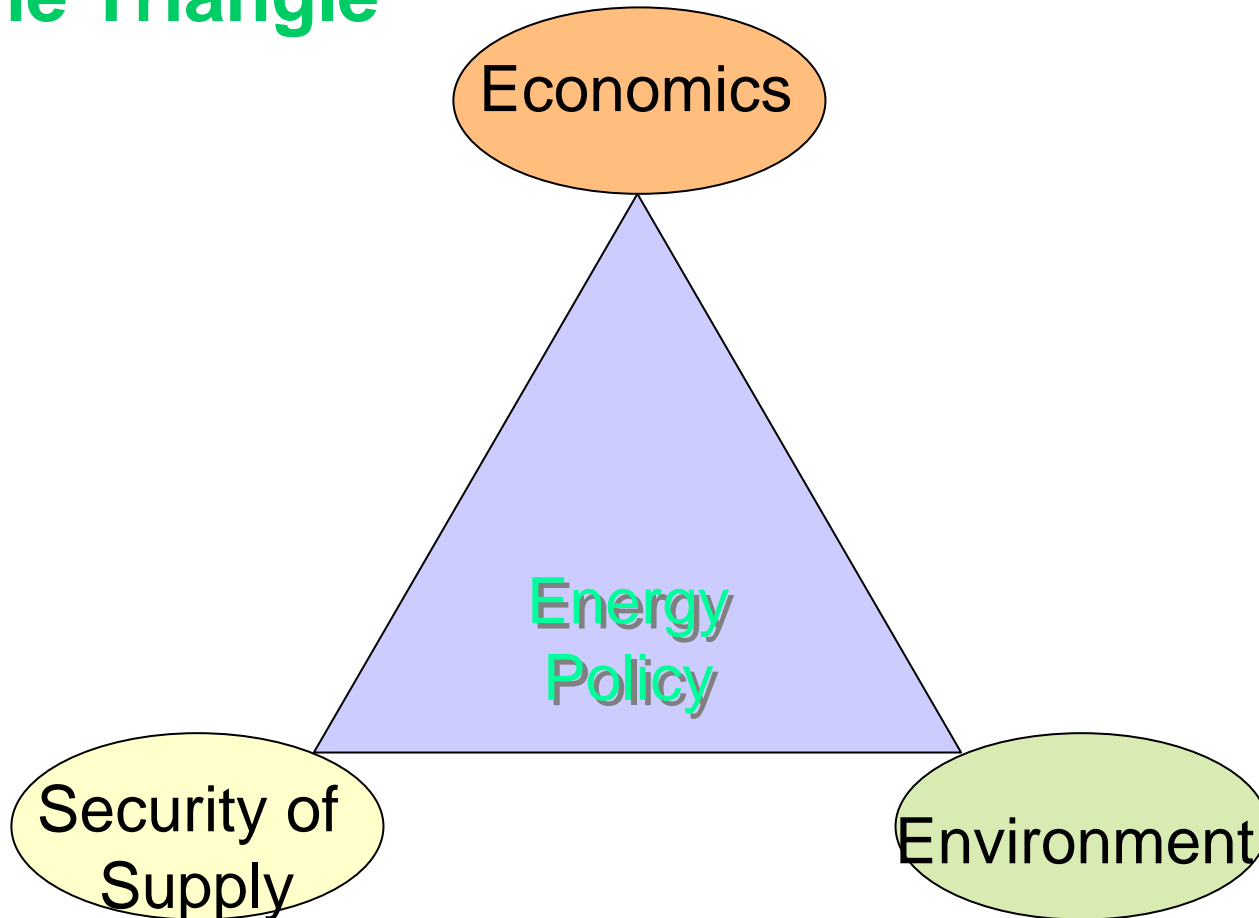
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Assistant Director ESRC Electricity Policy Research Group

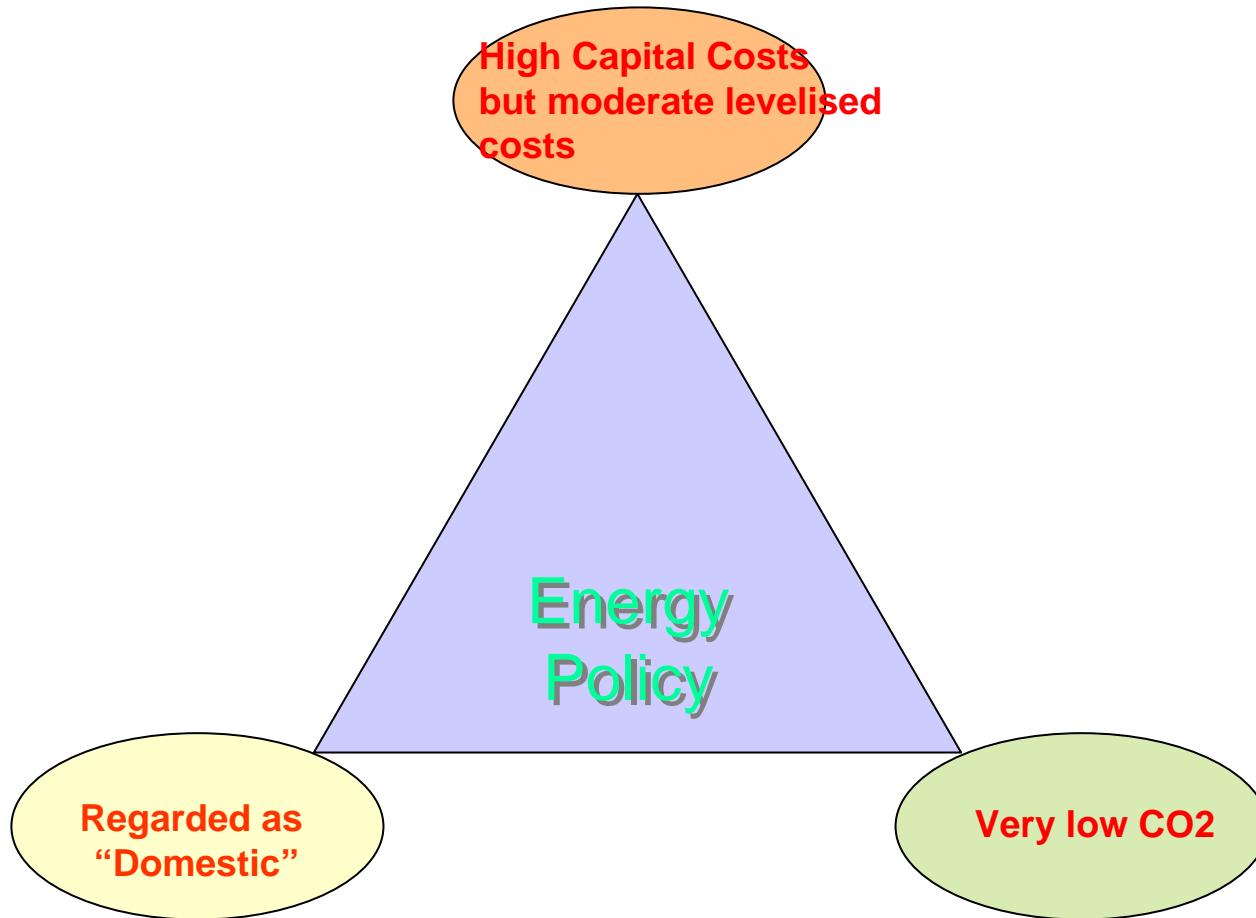
UK Director Cambridge-MIT Energy Security Initiative

The Major Drivers of UK Energy Policy: The Triangle



I was first introduced to this way of viewing energy policy by Gordon MacKerron (SPRU)

The Triangle and Nuclear power



Security of Supply

Yellowcake has an energy density [GJ/tonne] 16,200 times greater than export coking coal

[see <http://www.ior.com.au/ecflist.html>]

It is easily transported and stored – for energy policy it is regarded as ‘domestic’.

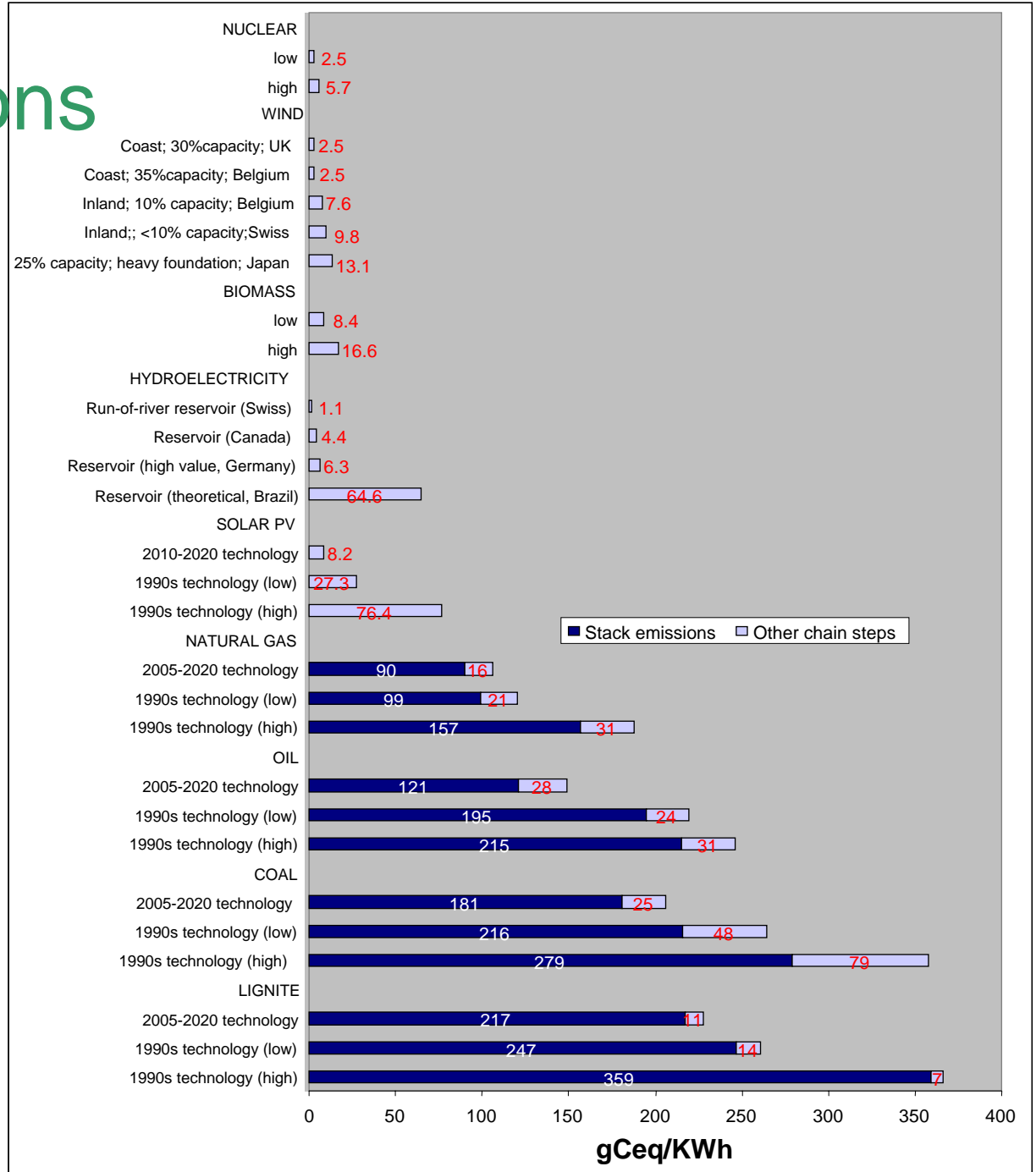
Pro-nuclear advocates frequently point to the risk of of gas supply interruption and price volatility in 2020

They also point to the impact of future primary fuel imports on a country’s balance of payments [Nuclear Task Force 2003].

GHG Emissions

Source:

Spadaro et al. (2000),
 "Greenhouse Gas
 Emissions of
 Electricity Generation
 Chains," *IAEA
 bulletin*, vol. 42, No. 2,
 Vienna, Austria.

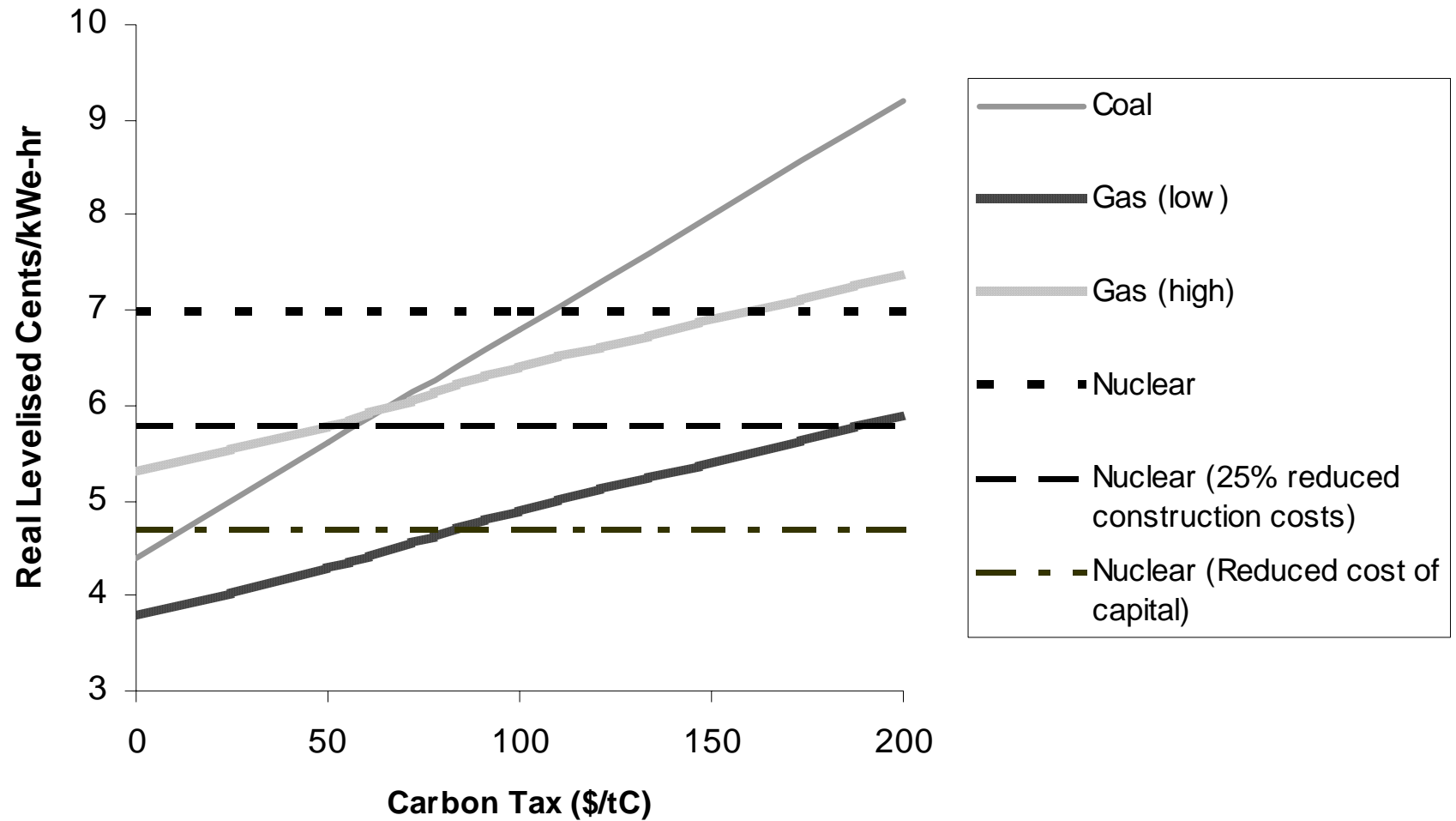


Nuclear power and the environment

Achieving the UK Royal Commission on Environmental Pollution's (22nd Report 2000) recommendation of 60% CO₂ emissions reductions by 2050 to stabilise the climate without nuclear power and carbon capture and storage will be both expensive and *possibly a greater threat to our liberal, modern and comfortable way of life?*

Is the prospect of green authoritarianism greater than that of a nuclear technocracy?

Nuclear power economics



In EU states government is not above the law

Justice Sullivan, Greenpeace and the UK DTI's *New Build* plans – lessons learned:

- Consultations that are merely pro-forma or which are *procedurally unfair* do not lead to quick and efficient policy-making – instead they lead to judicial review
- Government may not be able to promise a stable regulatory environment for the duration of a new build project
- NGO scrutiny changes government behaviour
- Government is a major stakeholder, but still just a stakeholder

***So is triangle enough to
understand how nuclear power
relates to energy policy?...***

No, Because Nuclear Power Is “Special”

Radioactive Wastes?

Public Attitudes?

Nuclear Fears?

Proliferation?

Terrorism?

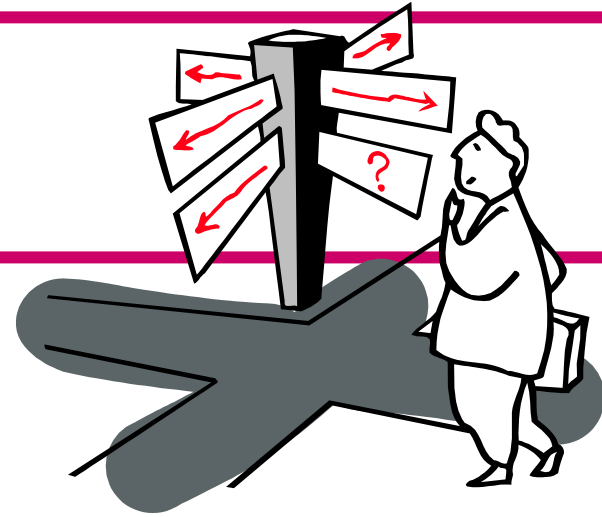
Nuclear Waste - the orthodox approach

Historically the expert consensus has been to 'dispose' of intermediate and high level radioactive wastes deep underground in a repository.

Safety would be assured via multiple barriers – containers, immediate cement or bentonite clay back fill and the bedrock.

Nuclear power was the first energy source to manage its wastes

Discussion point



But, ... what is nuclear waste?

It is largely a question of terminology - in the UK spent fuel is not a waste, plutonium is not a waste and depleted uranium is not a waste

The Nuclear Fuel Cycle

Reprocessing is the recycling of spent fuel into concentrated waste streams, and reusable uranium and plutonium

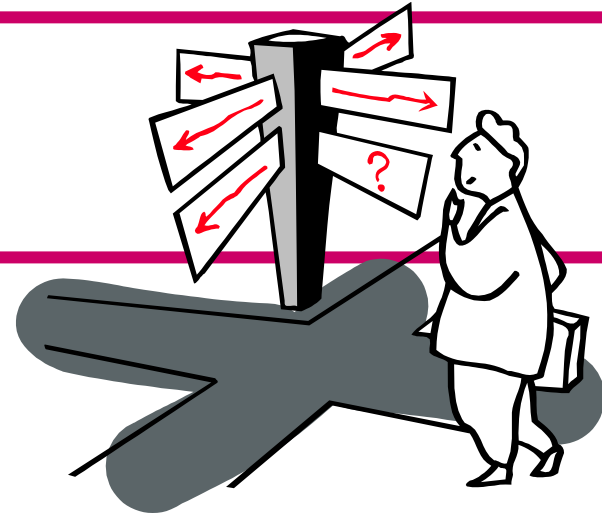
British policy has long advocated a 'closed fuel cycle' based upon reprocessing of spent fuel, but note Energy White Paper May 2007

The Nuclear Fuel Cycle

The simplest and cheapest approach is the direct disposal of spent fuel – the once-through fuel cycle.

Nuclear power has been reported worthy of future consideration by a recent MIT study – providing that the fuel cycle is ‘once through’.

Discussion point



In the UK should we follow the example of the USA in the 1970s by ending our current practice of separating plutonium from spent nuclear fuel? Would that usefully set a good example to others?

But how powerful is leadership by example?

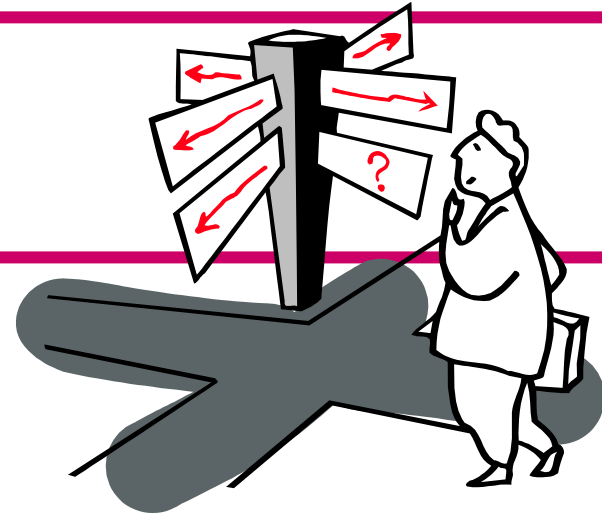
Nirex UK – lessons of experience

- 1. Nirex was badly set-back by its failure in 1997 to win approval for its planned underground Rock Characterisation Facility – they had adopted ‘Decide-Announce-Defend’*
- 2. In 1976 the UK Royal Commission on Environmental Pollution chaired by Sir Brian Flowers advised against expanding nuclear power until a safe method had been found to contain radioactive waste – hence waste became Nuclear Power’s Achilles’ Heel*
- 3. Polluter Pays philosophy – but this made Nirex a “creature of the nuclear industry”*

A Case Study – Nirex UK

- 4. Nirex worried about property blight – but this led to secret site lists*
- 5. Too many of the experts were on the Nirex payroll. Who could provide independent peer review?*
- 6. Arguably Nirex was too technocratic (cf RaWMAC to CoRWM)*
- 7. Nirex worried too much about public safety and not enough about public fears?*
- 8. But Nirex learns ... e.g. transparency and monitored retrievability, ...but too late?*
- 9. Today Nirex UK has been merged into a new public body the Nuclear Decommissioning Authority*

Discussion point



This year is the 50th anniversary of the Windscale Fire. An accident with important lessons...

The public often worry that the scientists have forgotten something important. Wigner energy was something important

Risk

Risk and Risk Perception:

True risk: a quantitative probabilistic concept with roots in science, mathematics and engineering – an objective scientific reality

Perceived risk: a social construct but nevertheless a measurable reality

Some would argue that my term “True Risk” is merely one example of a perceived risk.

‘Your science is no more valid than my science....’

‘Your science is as socially constructed as mine’ etc.

I disagree: astronomy is science, astrology is not – my preference is to defend the separation above.

- That said I respect perceived risk

“Risk = Hazard + Outrage”

Peter M Sandman, *Strategies for Effective Risk Communication*, AIHA (1993)

Sandman reserves the term “hazard” for my “true risk” and uses the label “outrage” to describe the role of perception.

Outrage is driven by fear factors

Nuclear Fear and Nuclear Danger

Risks are less acceptable and more feared if they are perceived as

- Involuntary
- Inequitably distributed in society
- Inescapable
- Coming from an unfamiliar or novel source
- Causing hidden or irreversible damage particularly dangerous to children or future generations
- Causing dreaded illness (e.g. cancer)
- Poorly understood by science
- The subject of contradictory statements from scientists in authority

(Jill Mehta, J. Radiol. Pro **22** 79-85 (2002))

Werner von Lensa has described nuclear power policy in Germany as a 'quasi-religious war'

Fear vs. Danger

For fifty years the nuclear energy industry has heard that the public is scared of the dangers of nuclear power and for fifty years the industry has worked to reduce the danger. They should have worked harder to reduce the fear

[Nuttall, Nuclear Renaissance]

Reducing fear: transparency and inclusion

The Example of Finland:

Construction of underground repository in Olkiluoto

A twenty year process characterised by community engagement (with powers of veto) and consistent forward policy momentum

High levels of mutual trust between the community and the nuclear agencies

Compare with the US Napoleonic approach (Yucca Mountain) and Britain's old '*DAD*' approach.

More recently the Committee on Radioactive Waste Management (CoRWM) has pioneered a new more inclusive approach in the UK

The Swedish Experience

1970s Swedish Social Democratic party divided over prompt nuclear shutdown.

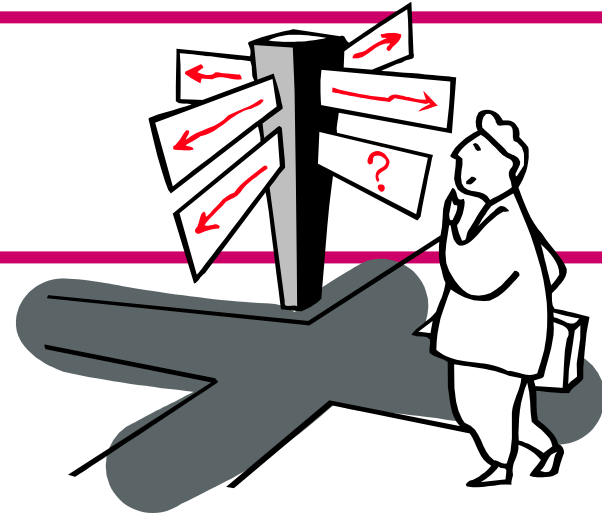
High level decision not to separate plutonium,

Decision to build an underground spent fuel store – the CLAB

Aspo underground rock laboratory – unthreatening architecture on the surface

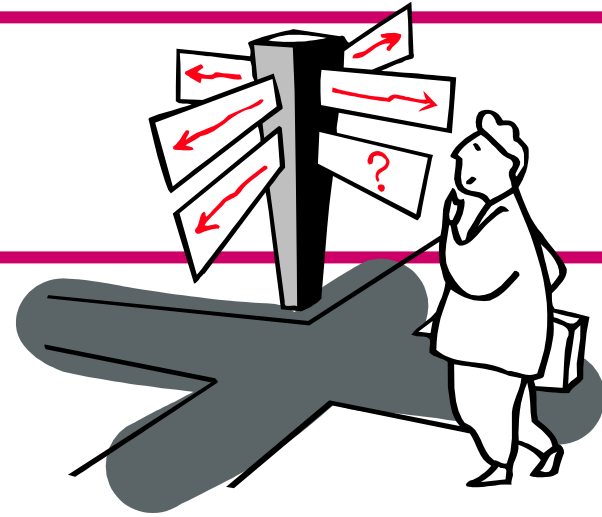
Discussion point

Is it dishonest to design nuclear waste labs to look like this?



Source: SKB

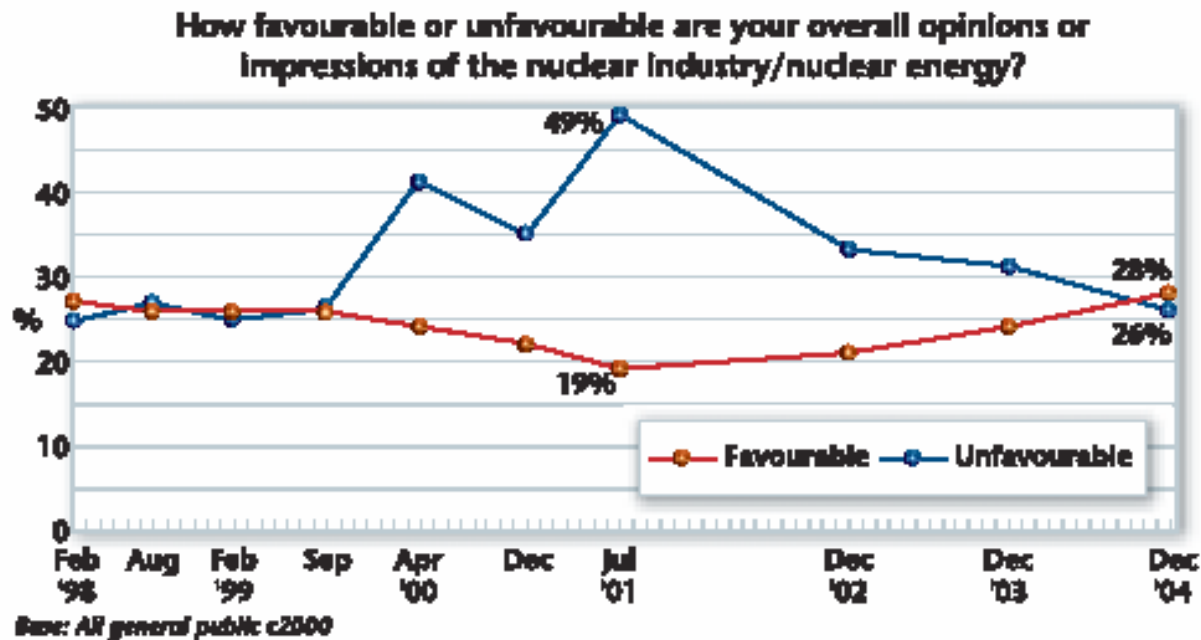
Discussion point



**Thomas Sebeok's gave us
the phrase: "The Atomic Priesthood"**

Three Nuclear Thoughts – number 1

The British public attitude to nuclear power



To what extent would you support or oppose the building of new nuclear power stations in Britain to replace those being phased out over the next few years?
This would ensure the same proportion of nuclear energy is retained.

MORI All Great Britain general public polling of public attitudes to the nuclear industry (MORI Omnibus polling is conducted every week with approximately 2000 face-to-face interviews of the general public aged 15 and over at 210 sampling points) (Knight, 2005)

Three Nuclear Thoughts – number 2

Perceptions of perceptions are key:

	Favorable to Nuclear industry (%)	Unfavorable to nuclear industry (%)	Don't know or don't care
UK Public opinion	28	25	47
UK MP's Opinion	43	44	13
UK MP's Perception of public opinion	2	84	14

From:
Double or Quits

Grimston and Beck
RIIA

Three Nuclear Thoughts – number 3

The greatest problem facing nuclear power is that it is, and is perceived to be, a centralising technology when the fashion is for decentralised technologies. This matters far more than economics, safety, and environmental issues, it's simply what people want.

Another thought inspired by Malcolm Grimston

Conclusions

All stakeholders have a voice, but none (including government) is all powerful.

Regulators, however, are not merely stakeholders and their political independence is therefore vital

Moves towards nuclear new build should rest upon a foundation of democracy and consent

Nuclear power need not be technocratic

Public opinion is not simply “anti nuclear”