

Ireland's Energy Policy: Reason v Emotion

Edward M Walsh, President Emeritus
University of Limerick

Energy Solutions for Sustainable Development Conference
University of Limerick
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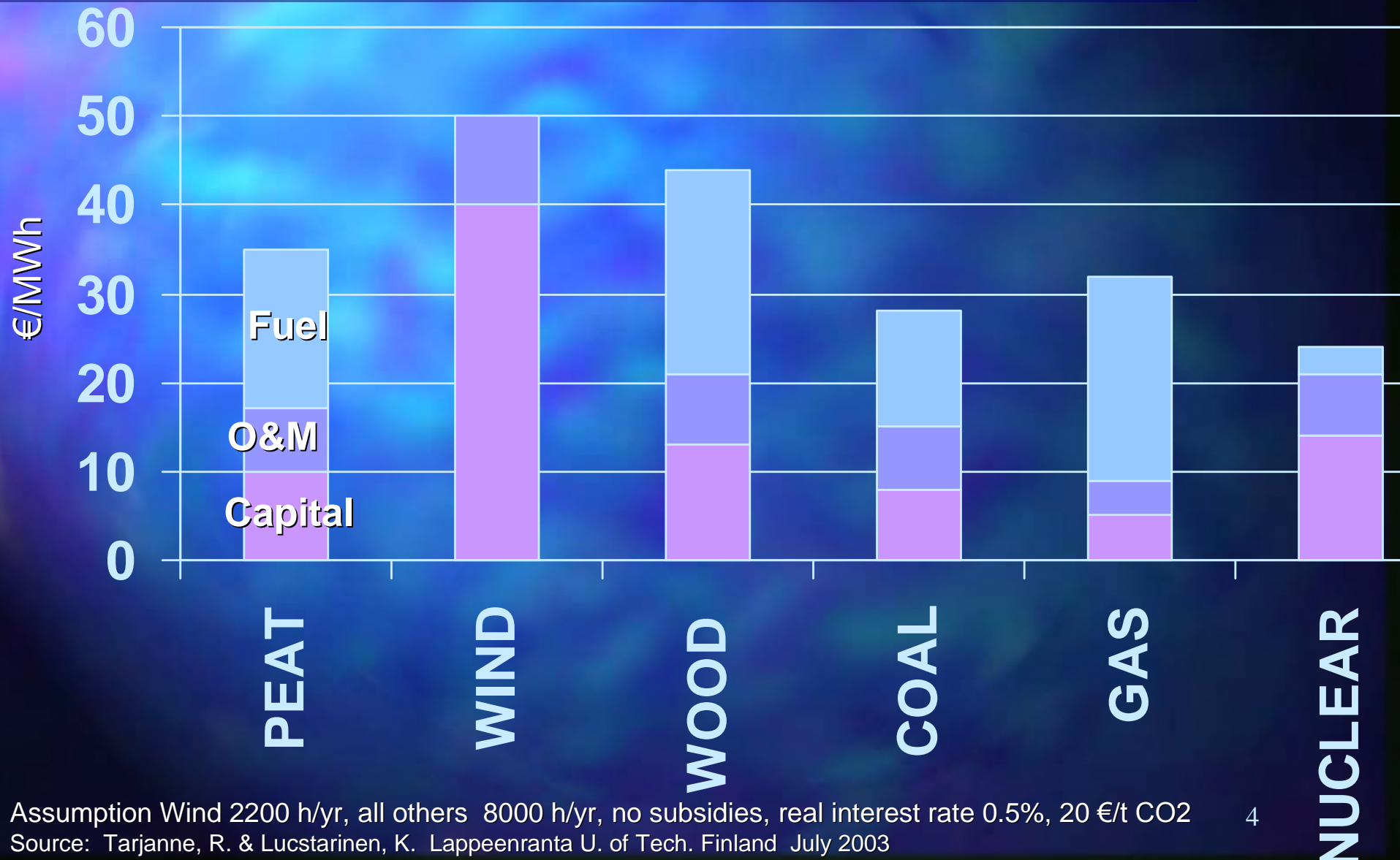
Rational Energy Policy

Factors

1. Economic....competitive advantage.
2. Carbon Emissions...global warming
3. Safety

Economic

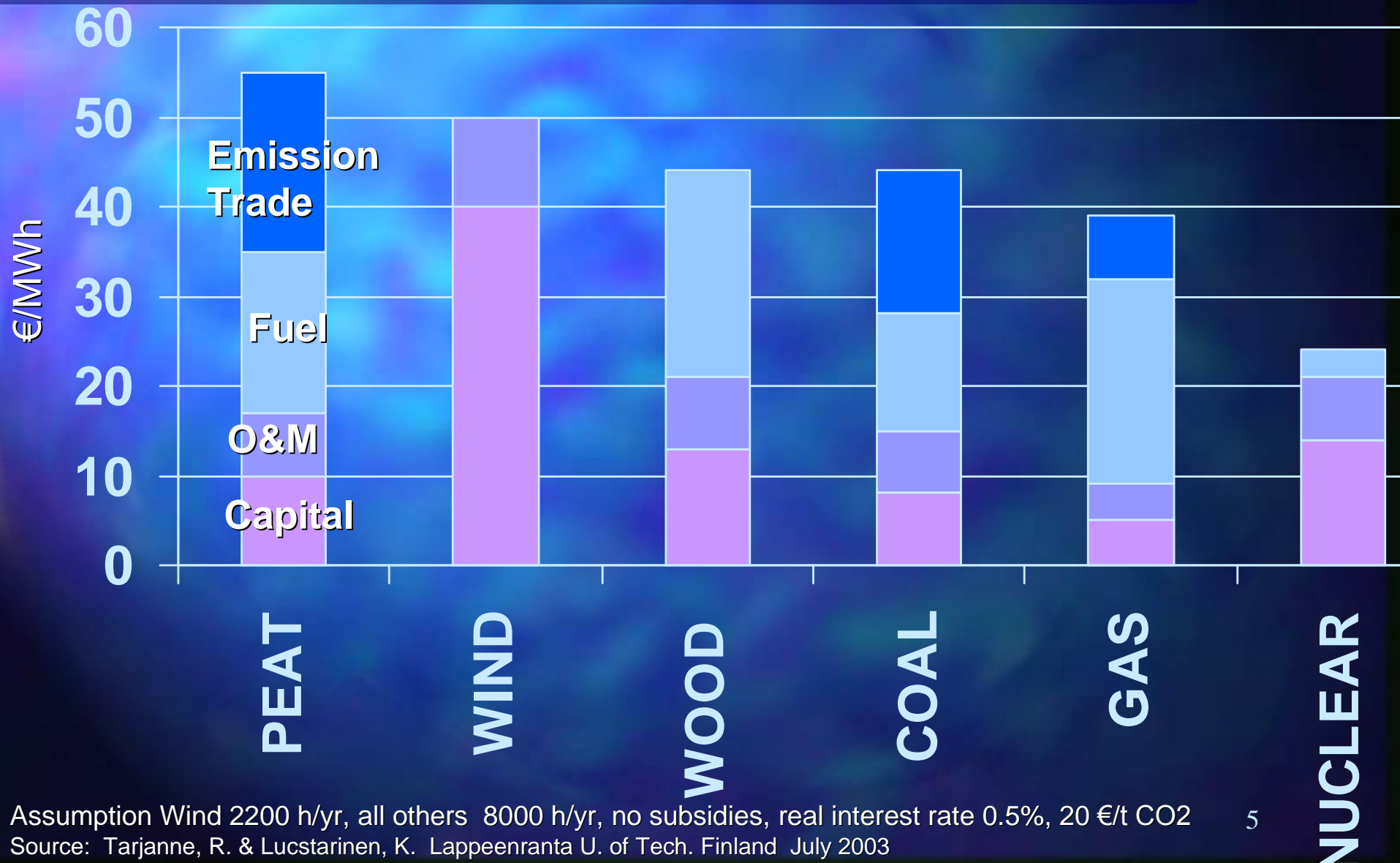
Electricity Generation Cost Study Finland



Assumption Wind 2200 h/yr, all others 8000 h/yr, no subsidies, real interest rate 0.5%, 20 €/t CO₂

Source: Tarjanne, R. & Lucstarienen, K. Lappeenranta U. of Tech. Finland July 2003

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Engineers' Journal, February 1963

ATOMIC POWER WOULD COMPETE WITH E.S.B.'s PEAT FIRED STATIONS

Says Irish engineer in report from U.S.

The author writes from the State University at Ames, Iowa: "All concerned with the development of nuclear research and power in Ireland deeply appreciate the public service provided by the Engineers' Journal in seeking and publishing the various and conflicting views on the subject.

"I have read with interest the continued lively discussion. There are a number of additional points which should be brought to mind, and in writing this article I have endeavoured to emphasise them."

Mr. Walsh, a graduate of University College, Cork, lectures in the Electrical

By EDWARD M. WALSH, B.E., M.Sc.
Iowa State University of Science and Technology.

THE first commercial power reactor commenced operation at Calder Hall in 1956. In the same year the Irish Government decided in principle on the acquisition of a research reactor, and appointed a committee to report on the type of reactor to be acquired, its location and construction.

The report of the committee recommended a one megawatt pool reactor. Several reservations were added to the report by the members of the

Engineering Department at Iowa University. Having taken his M.Sc. in Nuclear Engineering he is now working on a Ph.D. project.

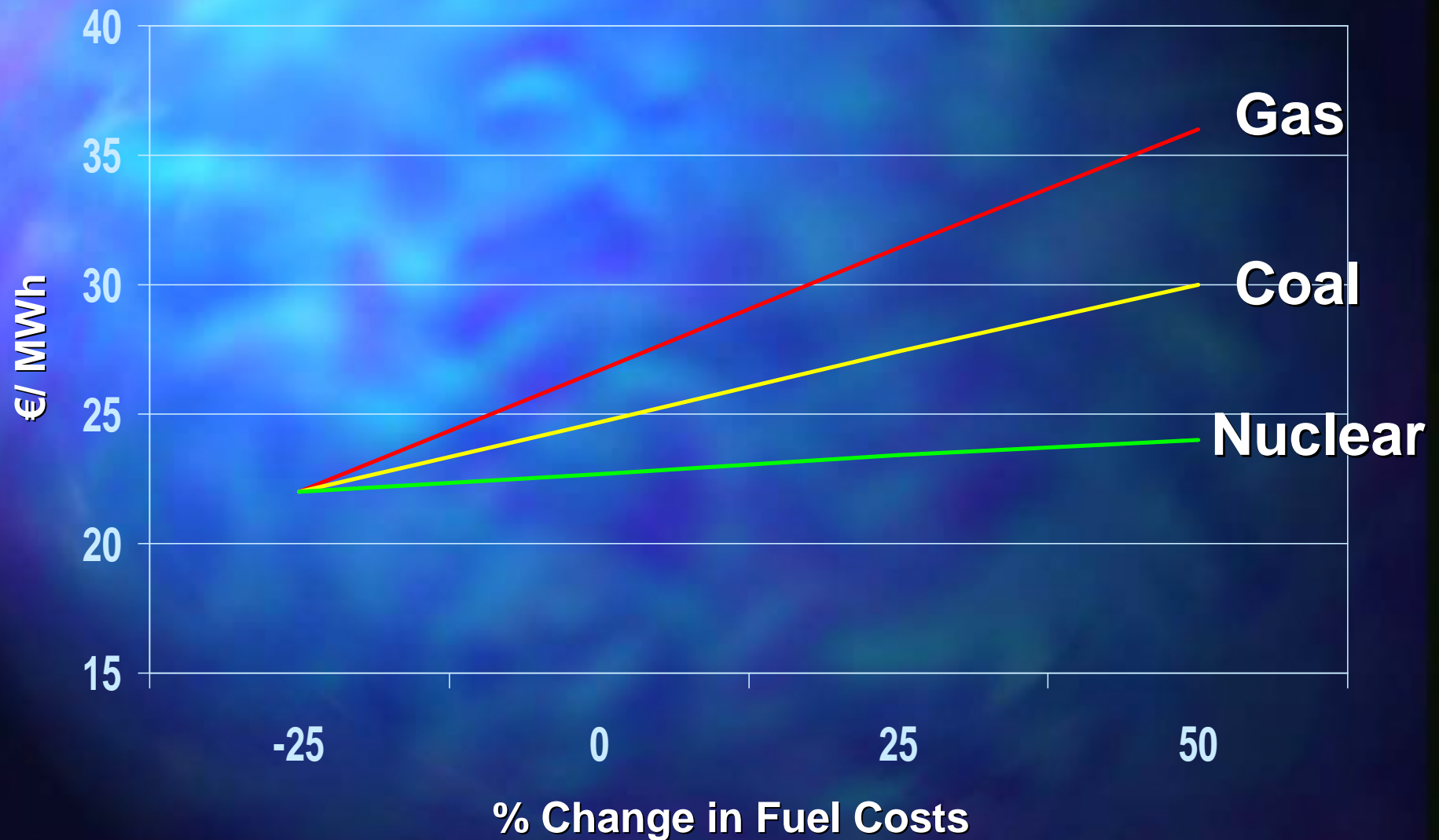


UTR-10 Nuclear Reactor

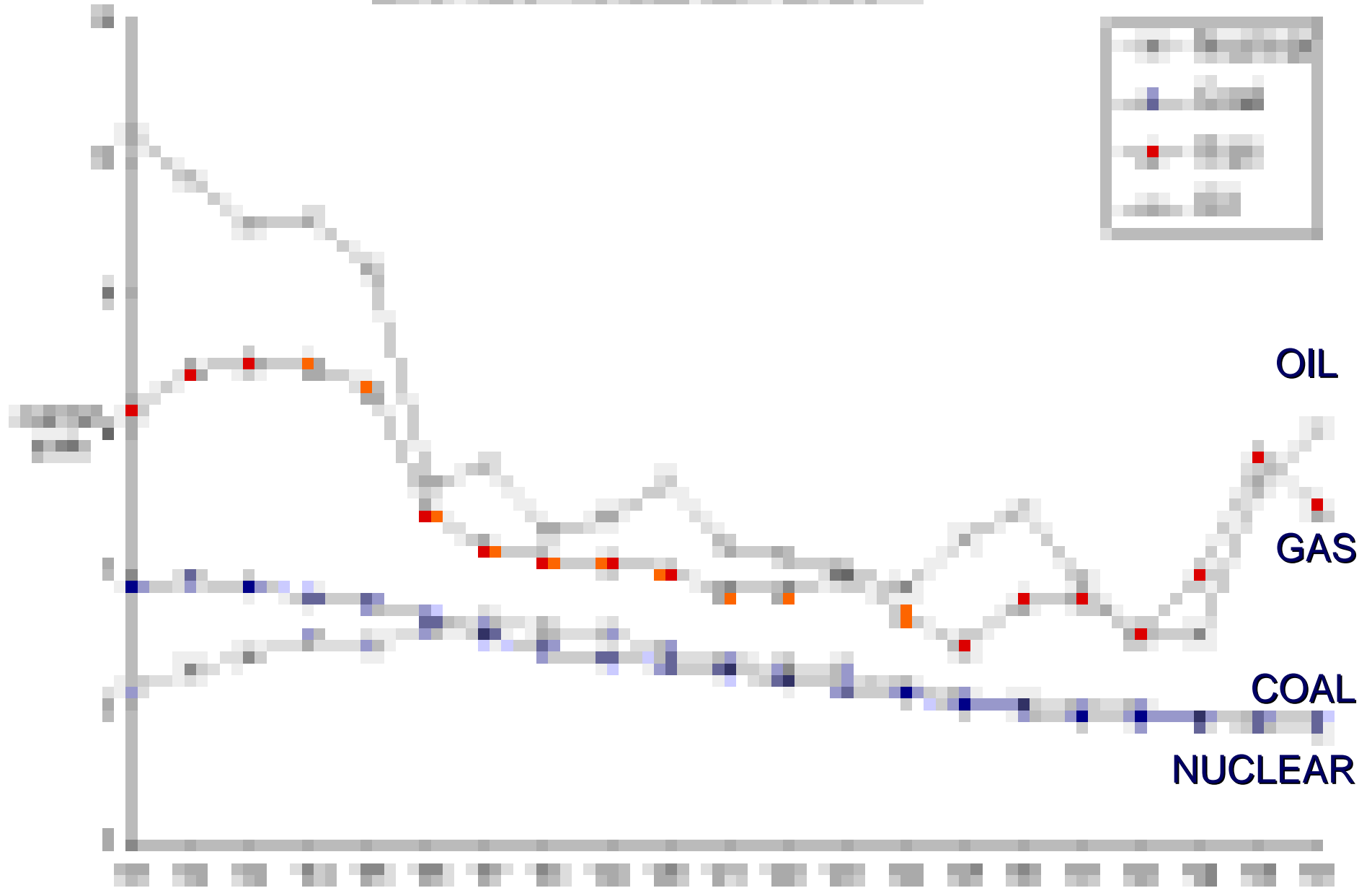
1962



Impact of Fuel Cost on Electricity Cost



Electricity Generation Fuel Costs

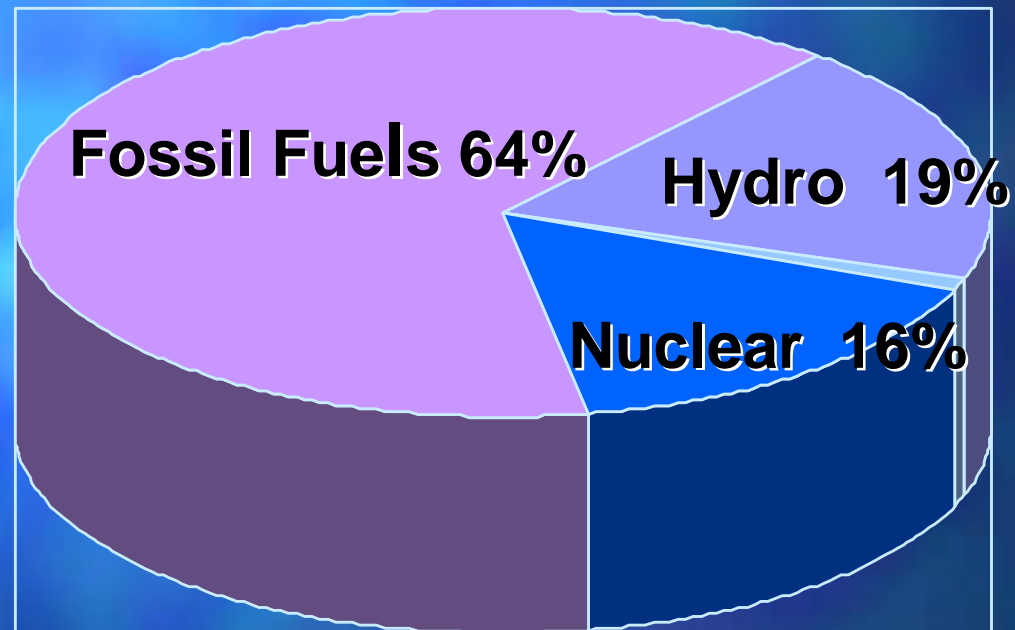


Source: US Utility Data Inst. (pre 1995), Resource Data International (1995)



Carbon Emissions

World Electricity Sources 2006



Renewables other than hydro...negligible

Founding Member of Greenpeace

Opposition to nuclear energy is based on irrational fear fed by Hollywood-style fiction, the Green lobbies and the media. These fears are unjustified, and nuclear energy from its start in 1952 has proved to be the safest of all energy sources. We must stop fretting over the minute statistical risks of cancer from chemicals or radiation. James Lovelock

Founding Member of Greenpeace

Nearly one third of us will die of cancer anyway. If we fail to concentrate our minds on the real danger, which is global warming, we may die even sooner, as did more than 20,000 unfortunates from overheating in Europe last summer

James Lovelock

Founding Member of Greenpeace

By all means, let us use the small input from renewables sensibly, but only one immediately available source does not cause global warming and that is nuclear energy.

James Lovelock

UK

New nuclear power stations required

- Sir David King, Chief Scientific Adviser to British Government
- Royal Academy of Engineers
- Institution of Civil Engineers

UK

Tony Blair...accepts expert advice

Nuclear again on the agenda

- Security of supply
- Kyoto carbon emission targets
- Cost of oil and gas

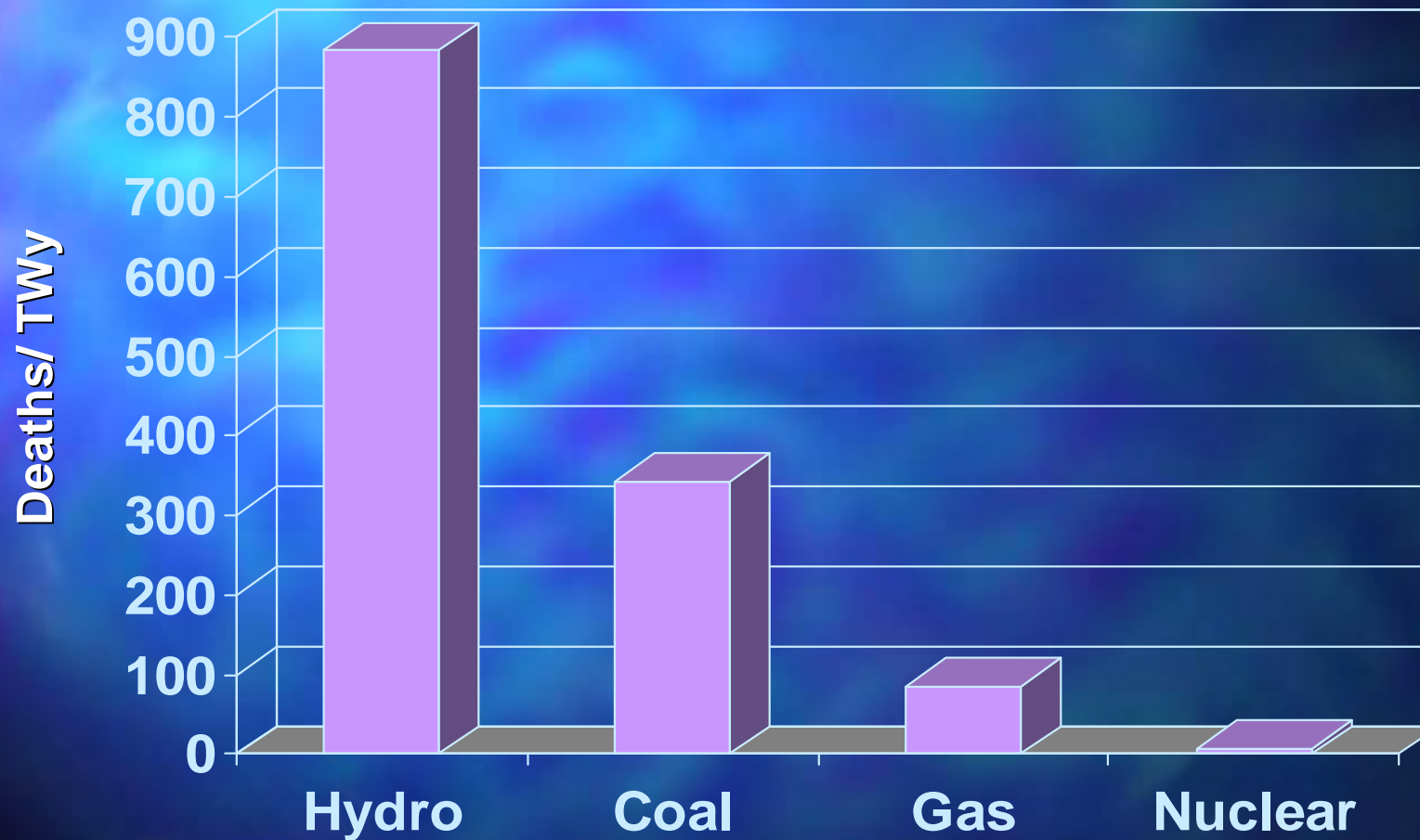
Ireland

In Aug 2005 a set of scenarios, sponsored by the Irish government, was produced entitled Energy Scenarios Ireland. Nowhere in any of these scenarios was the potential contribution of nuclear power mentioned as a possible, plausible or probable, let alone preferable factor in facing the widening energy gap that most observers predict. It was felt that this omission devalued, if not discredited, the use of scenario thinking in identifying alternative imaginable futures.

Prof John S Ratcliffe & Ruth Saurin,
The Futures Academy

SAFETY

Primary Energy Production Deaths



Source: Ball, Roberts & Simpson, Research Report #20, Centre for Environmental & Risk Management, University of East Anglia, 1994; Hirschberg et al, Paul Scherrer Institut, 1996; in: IAEA, *Sustainable Development and Nuclear Power*, 1997; Severe Accidents in the Energy Sector, Paul Scherrer Institut, 2001).

Hydroelectric Dam Failures

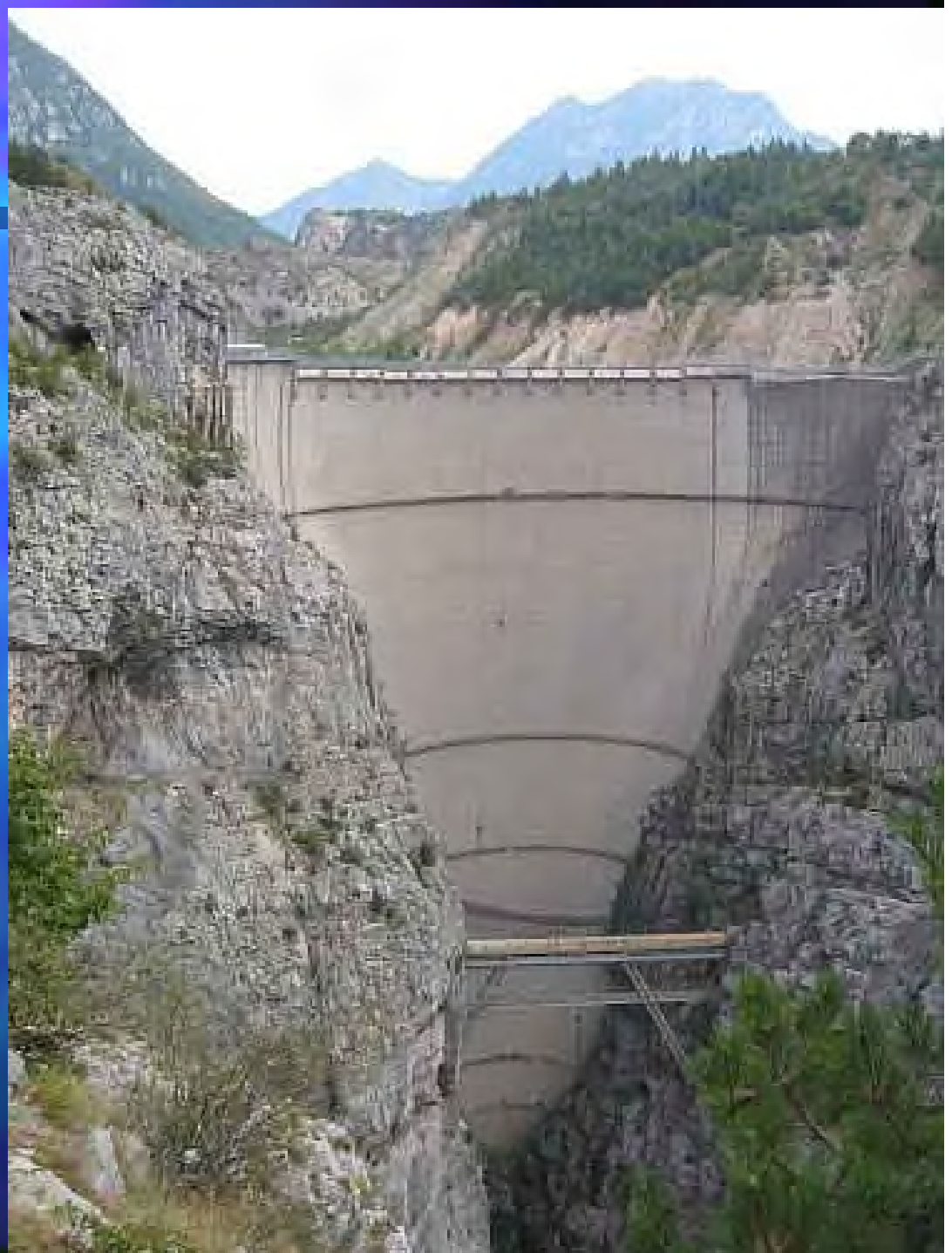
- Over 200 dam failures in past century
- 8000 deaths

Seven of the 200 Hydroelectric Dam Failures

			Deaths
Malpasset	France	1959	421
Vaiont	Italy	1963	2600
Buffalo Creek	USA	1972	125
Machhu II	India	1979	2000
Hirakud	India	1980	1000
Guavio	Columbia	1983	160
Belci	Romania	1991	116

Vaiont Dam

1963



Before destruction
of villages of

- Longarone
- Pirago
- Villanova
- Rivalta



Shannon Hydro-Electric Scheme



Coal Mining Deaths, China

	Deaths
2000	5,300
2001	5,670
2003	7,200
2004	6,027

Nuclear Reactor Incidents

		Deaths	Radiation Released
1975	Browns Ferry, USA	Nil	Nil
1979	Three-Mile Island-2 USA	Nil	Within ICRP limits
1980	St Laurent-A2, France	Nil	Within ICRP limits
1986	Chernobyl-4, Ukraine	56	Major across E. Europe & Scandinavia
1989	Vandellos-1, Spain	Nil	Nil

The Chernobyl Forum Report 2005



IAEA



WHO



FAO



UNEP



UN-OCHA



UNSCEAR



WORLD BANK GROUP

Chernobyl

- 26 April 1986 reactor crew perform test
- Disable automatic shutdown mechanisms
- Peculiarity of design produces power surge
- Water coolant vaporises
- Steam pressure bursts steel reactor vessel
- Graphite moderator goes on fire and burns for 9 days releasing 5% of reactor into atmosphere
- Radioactive smoke particles blow by wind over Ukraine, Belarus, Russia, Scandinavia and Europe

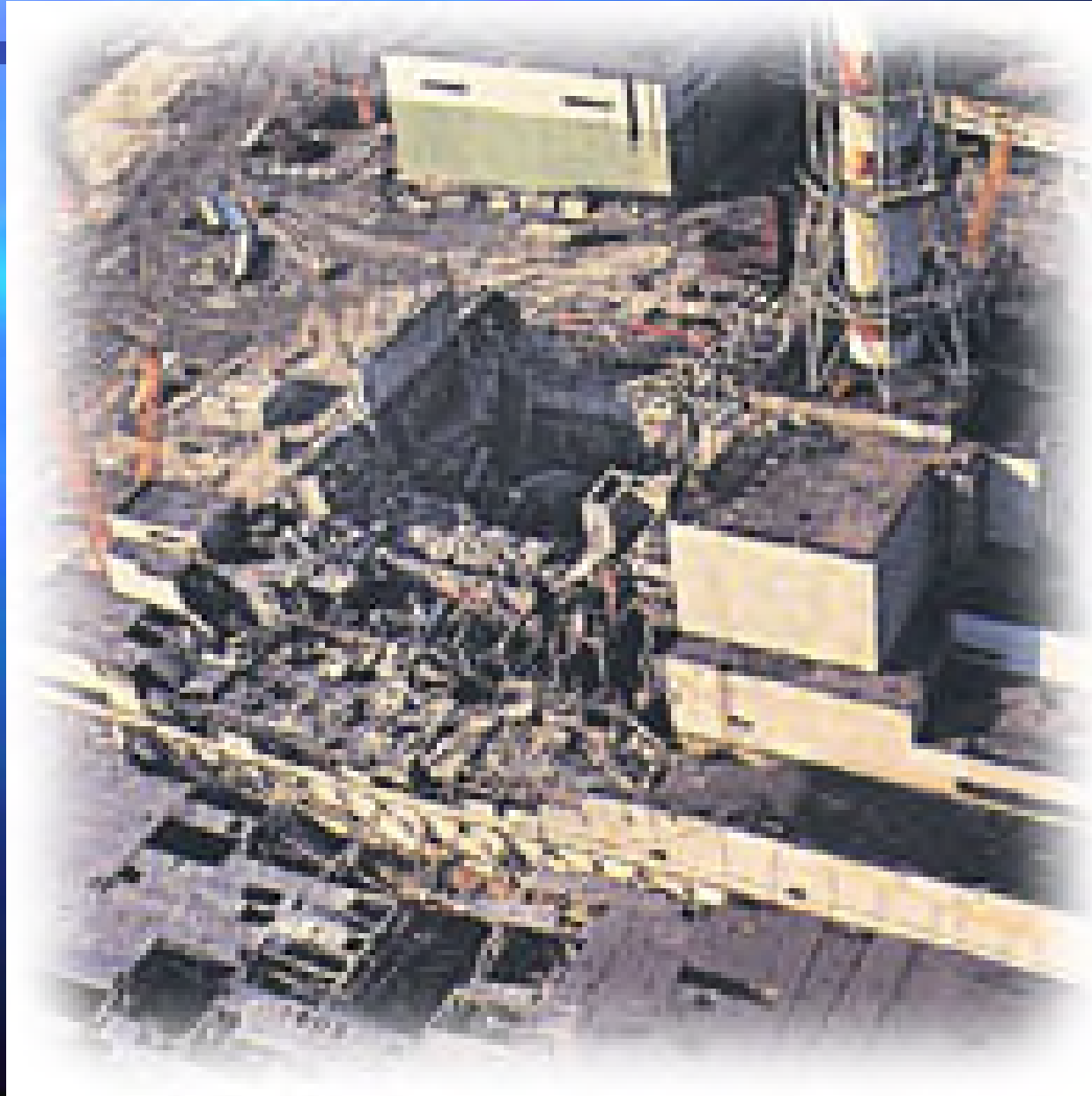
Chernobyl Radioactivity Diffusion



Source: Lawrence Livermore National Laboratory, http://digon_va.tripod.com/images/map-1.gif

Chernobyl

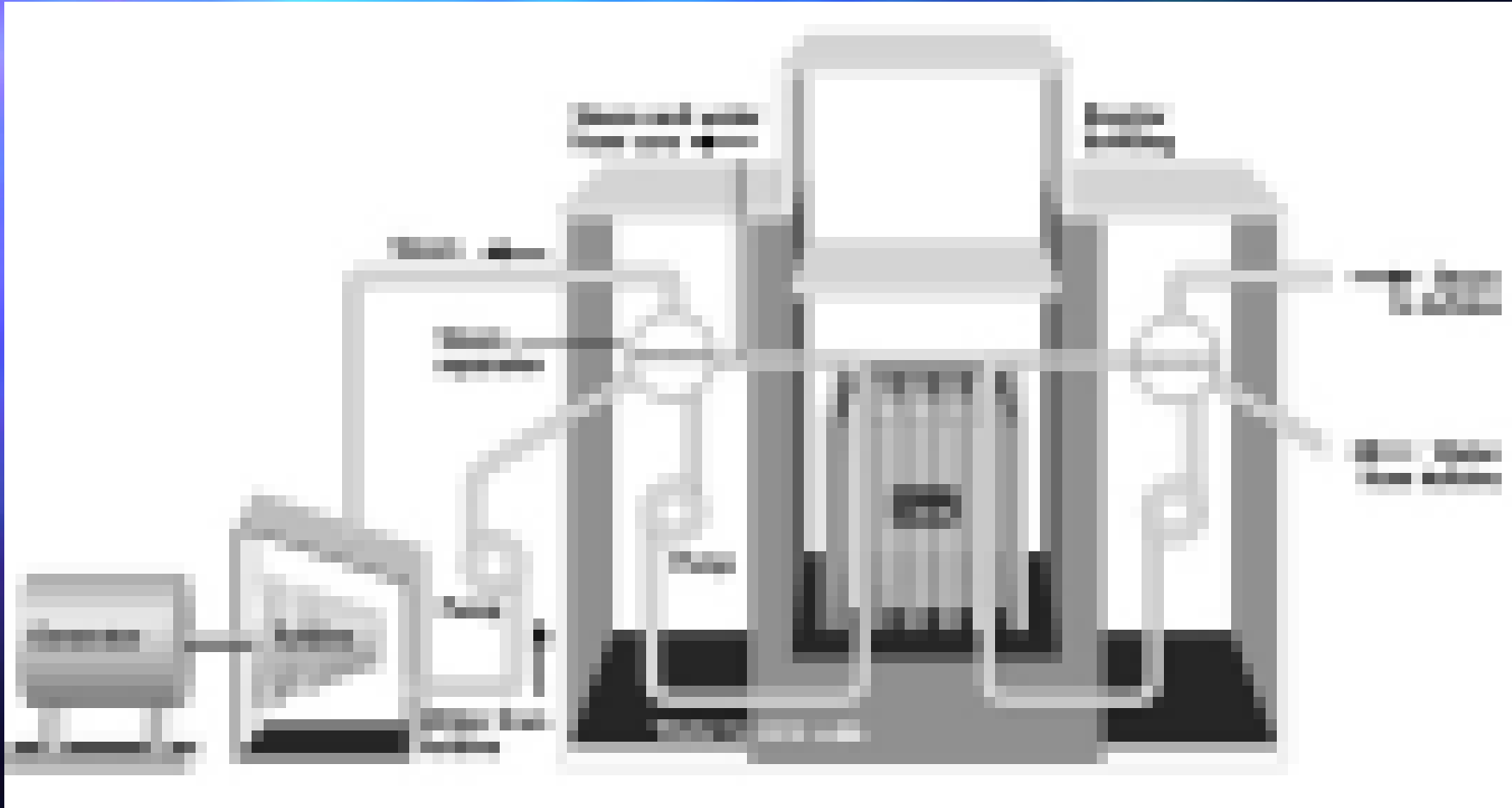
1986



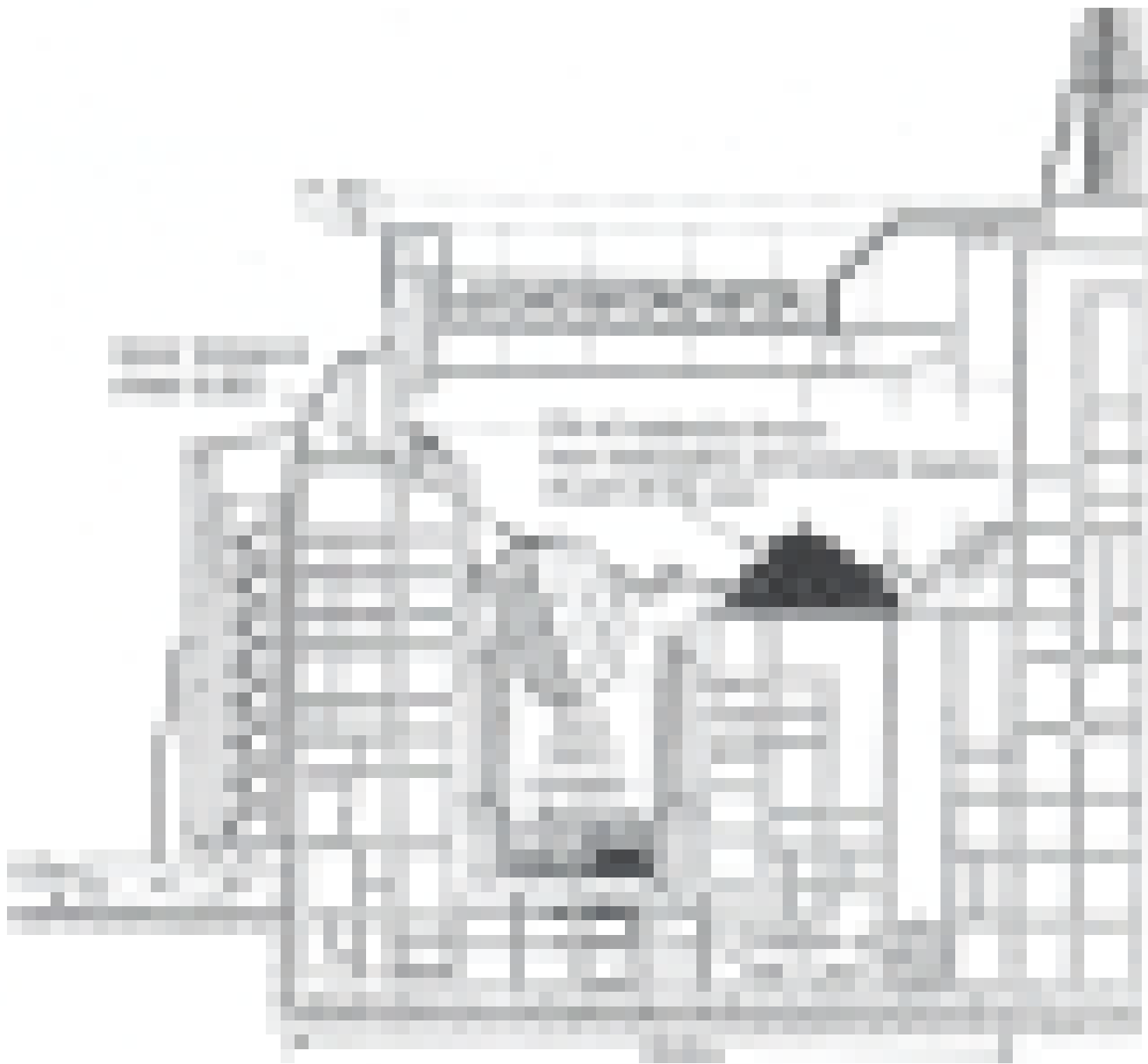
Chernobyl

- 1000 emergency workers fight fire
- Receive high radiation doses
- 28 die in next 4 months
- 19 die in subsequent 20 years
- 160,000 people evacuated from 30km radius
- 600,000 people from all over USSR involved in recovery

Chernobyl RBMK Nuclear Reactor



This severely flawed design has a "positive void coefficient", meaning the nuclear chain reaction and power output increases when cooling water is lost.





Chernobyl

1995



Three Mile Island Nuclear Reactor

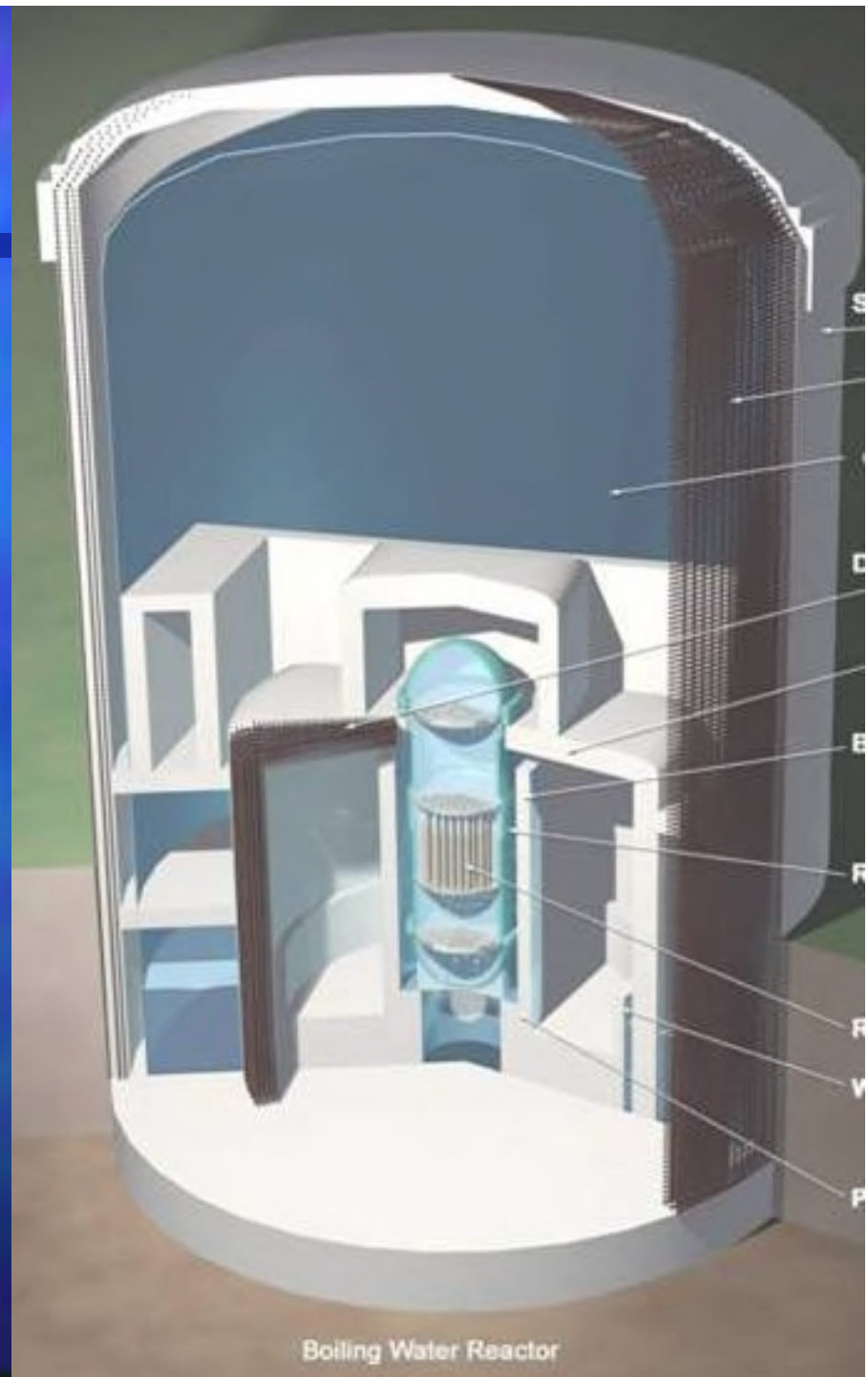


Jeffrey Muir Hamilton/Gamma Liaison

Three Mile Island

- 28 March 1979
- Main coolant pumps fail
- Reactor automatically shut down
- Pressure release valve jams
- Partial core melt-down
- Containment vessel retains reactor core
- No detectable health effects on any member of the public

US-Style Nuclear Reactor



Chernobyl Forum Report 2005

- 56 die from nuclear radiation
 - 47 emergency workers
 - 9 children from thyroid cancer
- 4000 people developed thyroid cancer, but survival above 99%
- Normal cancer fatalities could be increased by 4%

Chernobyl Forum Report 2005

No rise in incidence of leukaemia amongst population (apart from emergency workers)

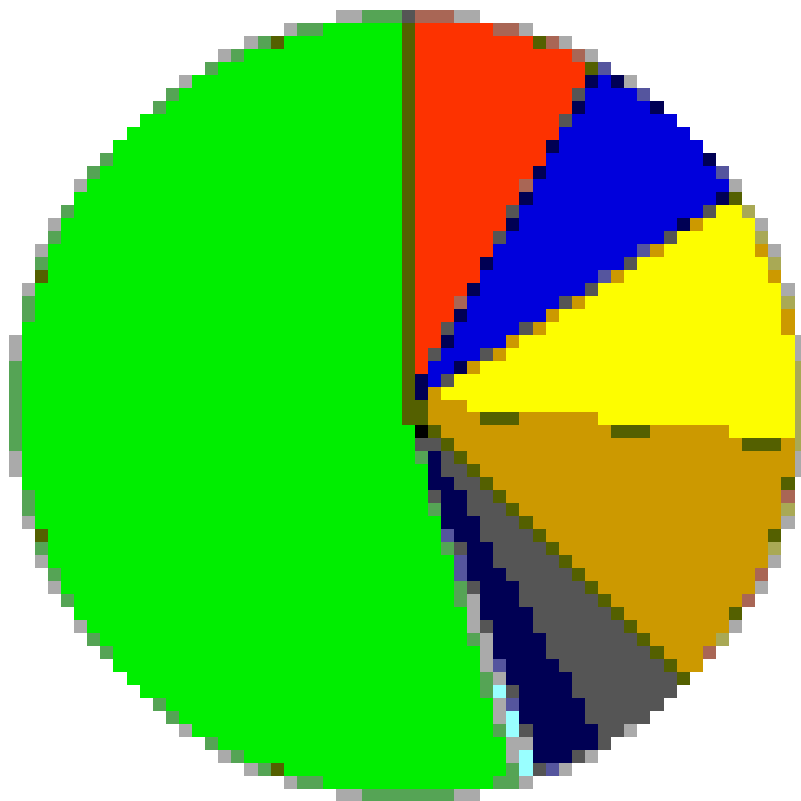
No detectable increase in birth defects

No detectable decrease in fertility

Chernobyl Forum Report 2005

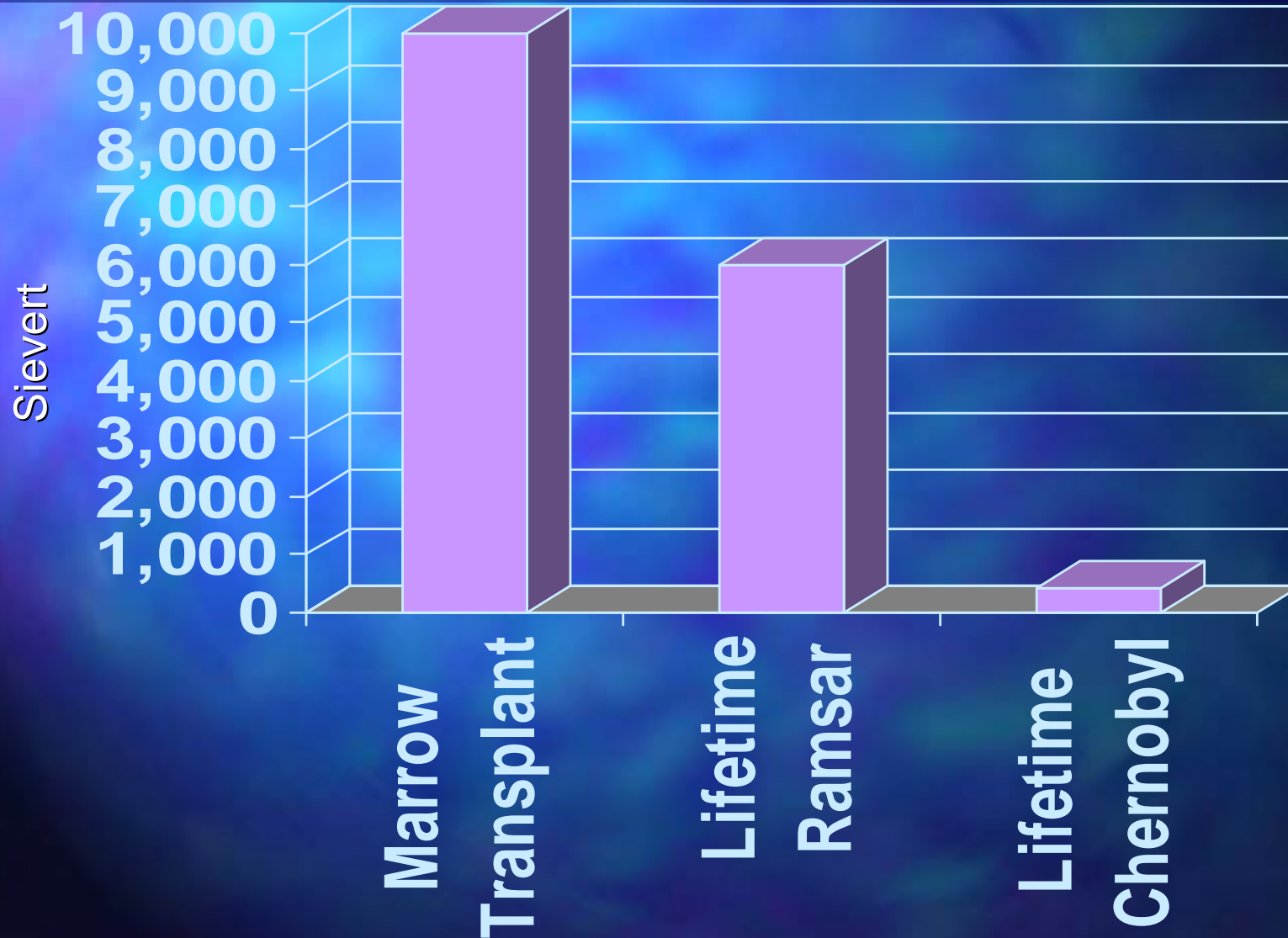
- Mental health largest public health problem
- Compensation and support programmes should be scaled back
- These foster a culture of dependency and create a major barrier to the region's recovery

Average Annual Radiation



- Background radiation (green)
- Medical procedures (yellow)
- Other sources (blue, red, brown, grey, dark blue, light blue)

Radiation doses

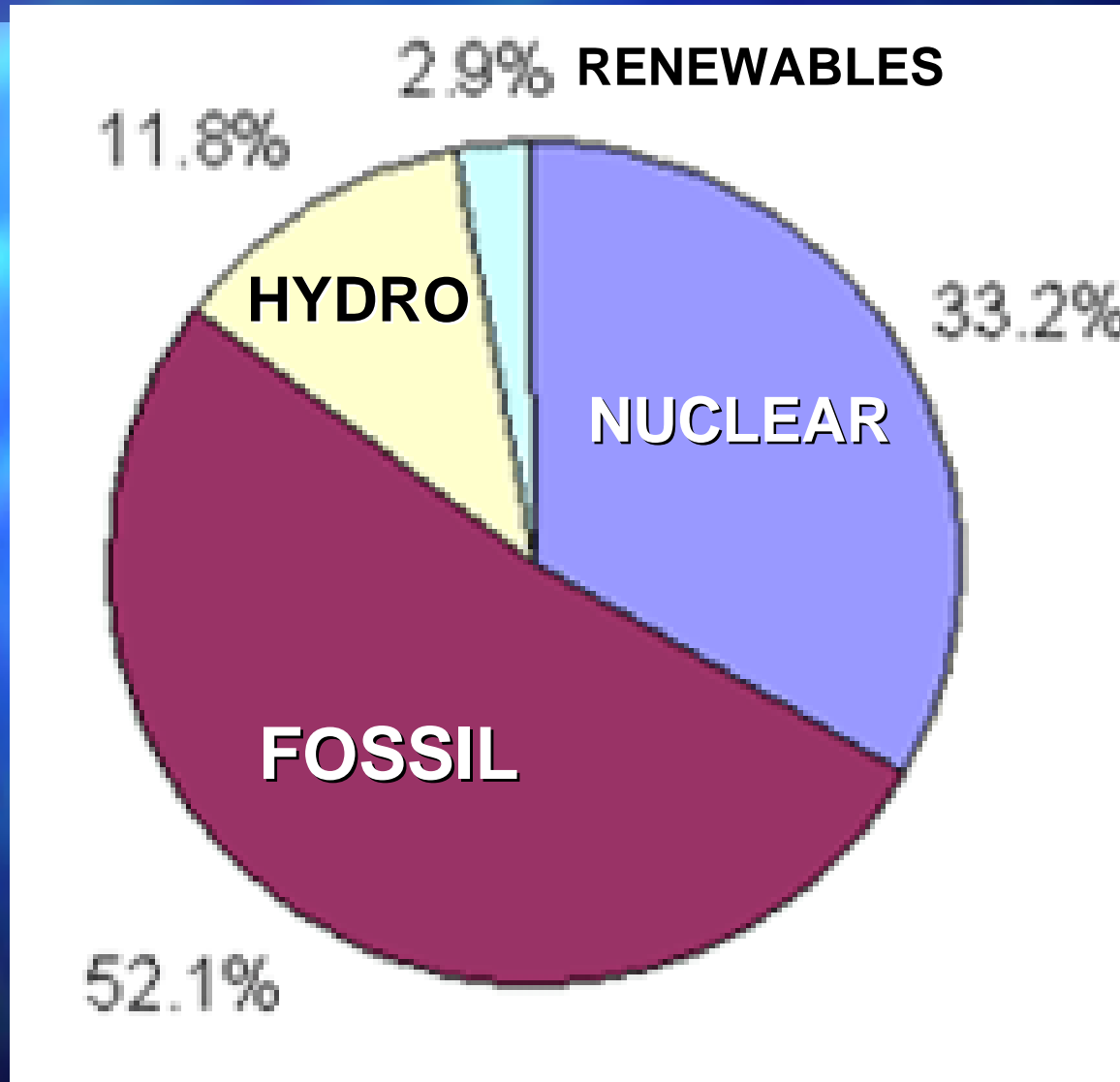


Nuclear on the Agenda Worldwide

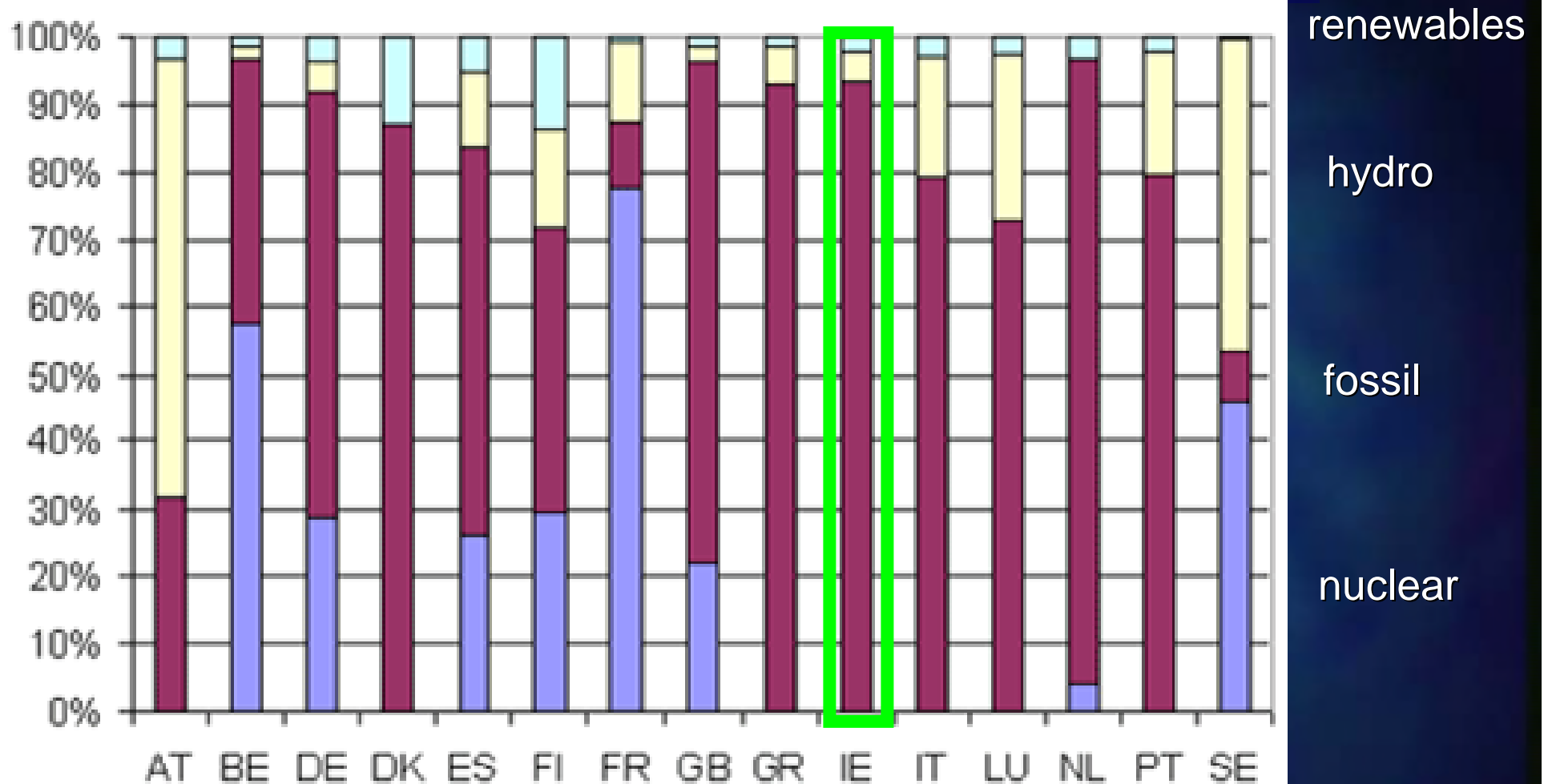
- Security of supply (Russian gas threat)
- Escalating oil and gas prices
- Need to meet Kyoto carbon emission targets
- New reactor technology and fuel handling
- View of leading 'greens' that nuclear is the only immediately available response to the threat of global warming

Electricity Sources 2002

EU15



Electricity Sources 2002



French Nuclear Power

59 reactors



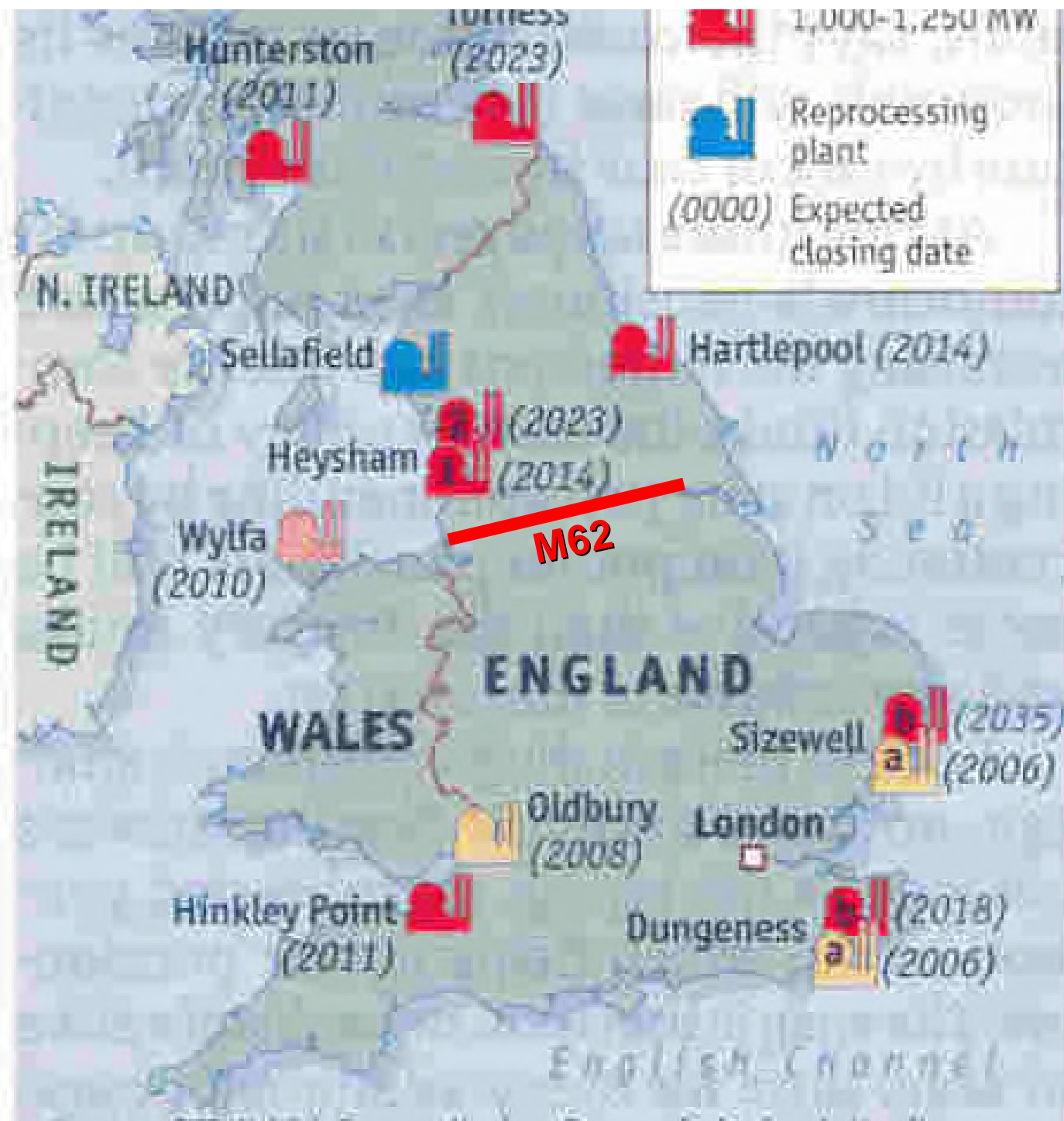
Source: <http://www.roadtechs.com/atlas/france.gii>

International Nuclear Safety Center at ANL, Mar 1993

Finland builds 5th nuclear power station



Source: <http://www.hightechfinland.com/stc/images/docs/tvo1b.jpg>



Total Nuclear Reactors

Power	440
Research	284
Ships & Submarines	220
Total	944

Nuclear Power Plants 1999



New Nuclear Reactors

- 11 countries constructing new nuclear reactors
- 24 under construction
- 113 planned

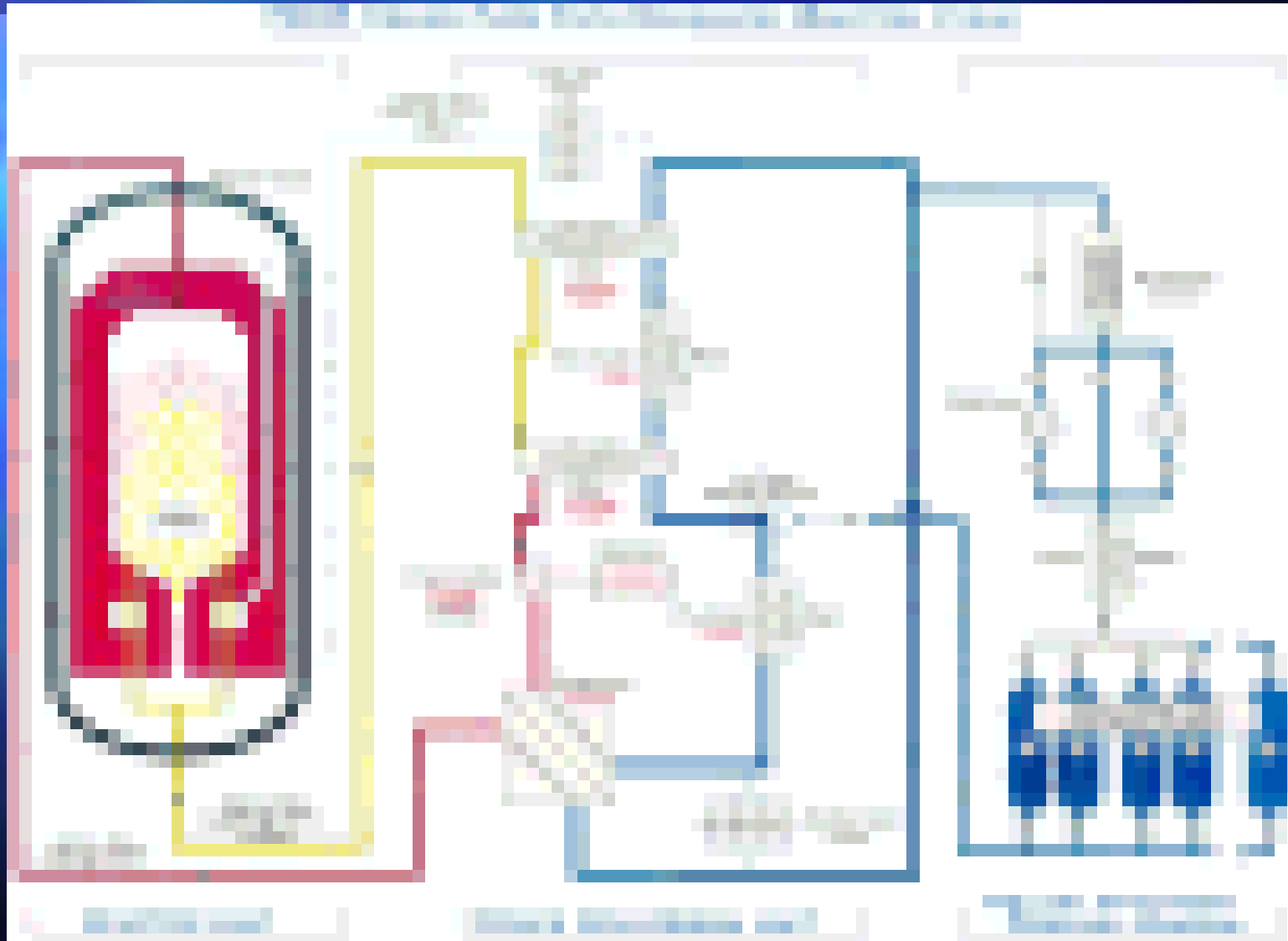
New Nuclear Power Plants Due...West

Russia	5
Ukraine	2
Romania	1
USA	1
Finland	1
France	1
Argentina	1
TOTAL	12

New Nuclear Power Plants Due ...East

China	27
Japan	15
South Korea	9
India	9
Indonesia	1
Iran	1
USA	1
Pakistan	1
TOTAL	64

Pebble Bed 110MW Modular Reactor



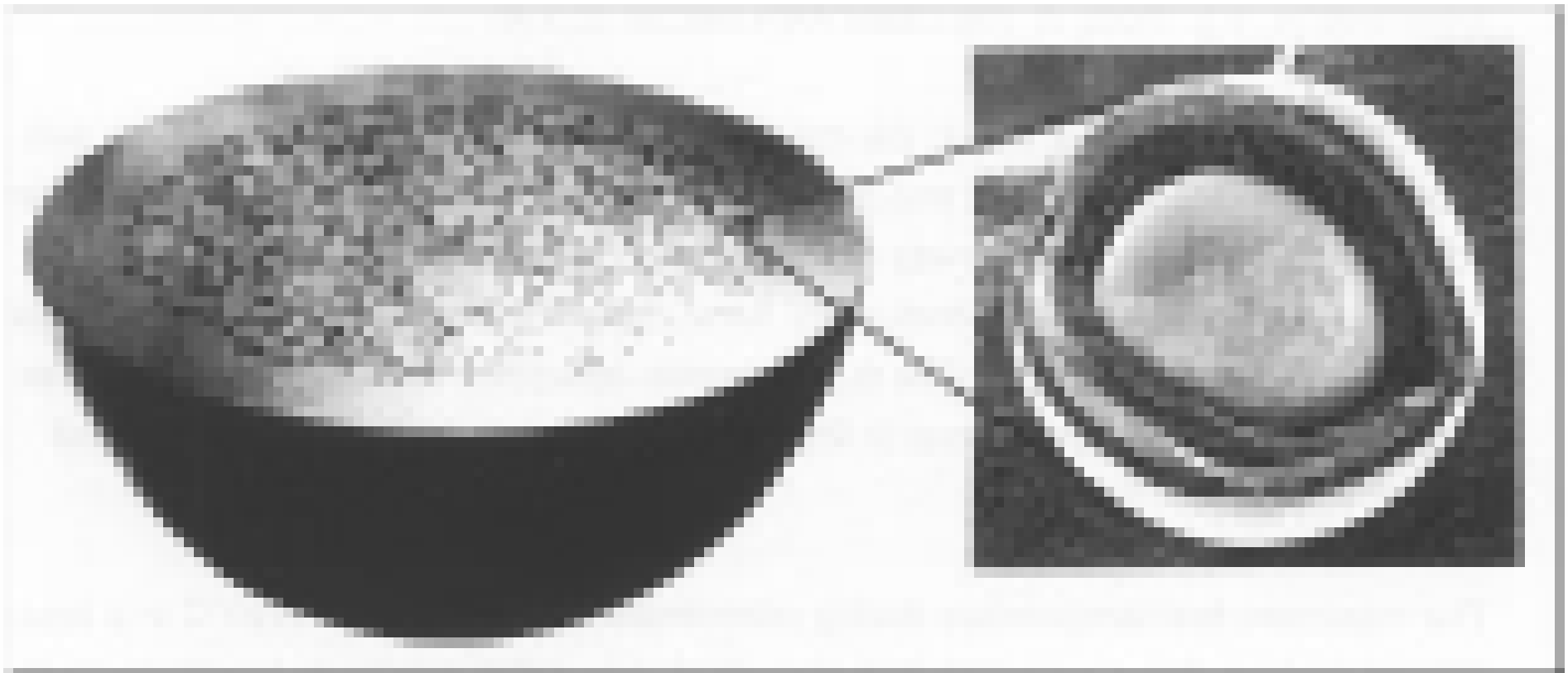
Fuel Pebbles in Ceramic Cladding



Fuel Pebble Cross Section

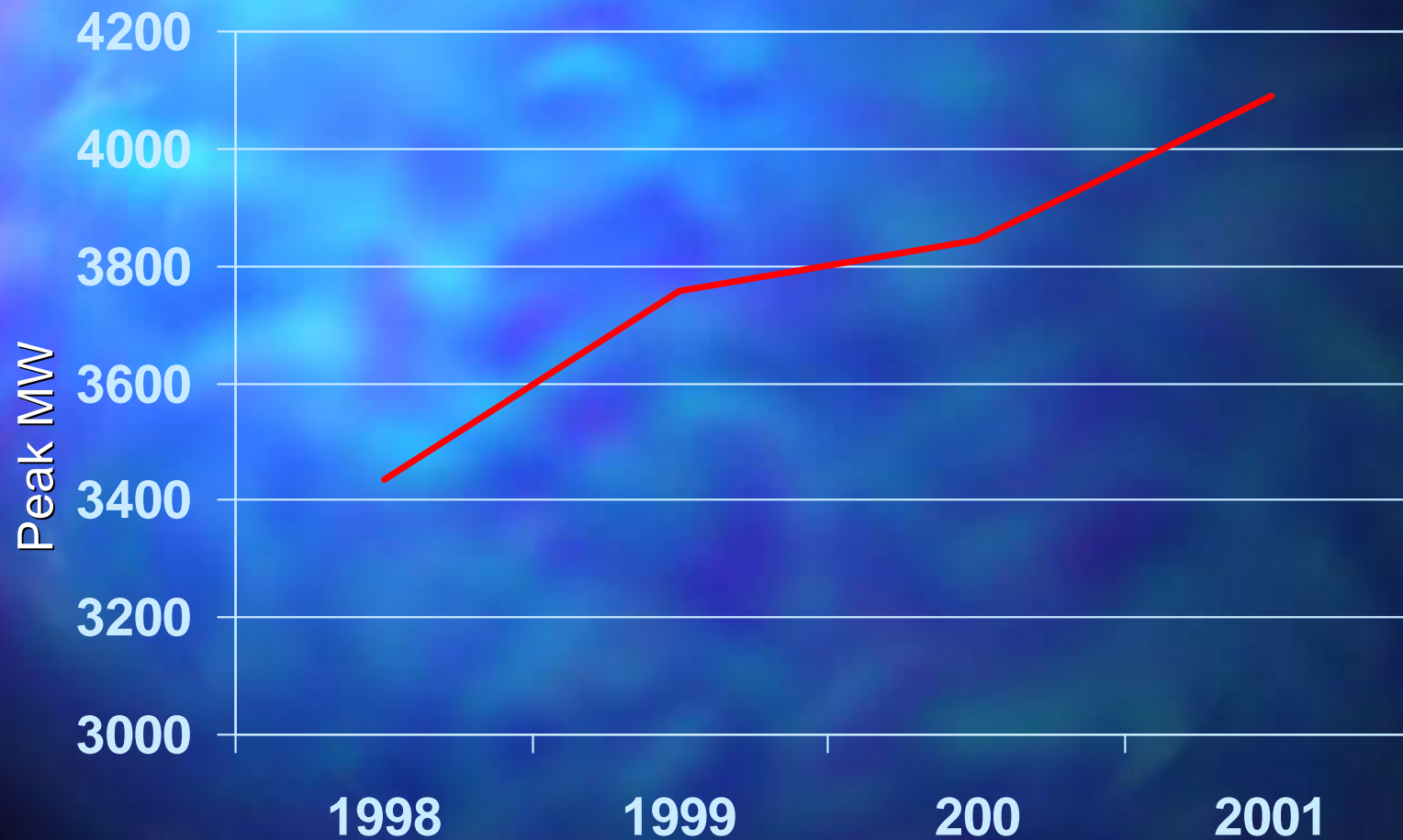
HTGR Pebble Cross-section

Cut-away Coated Particle



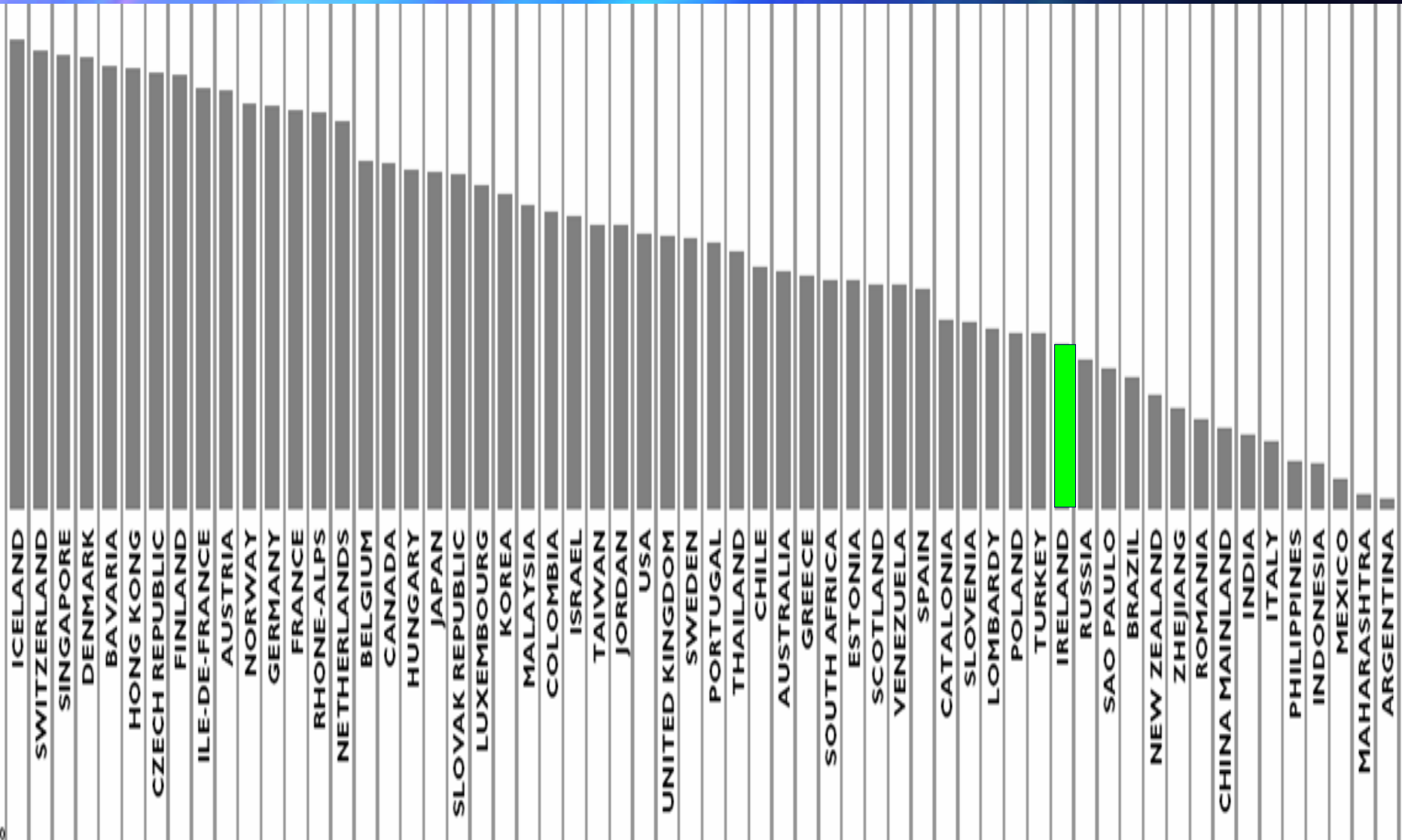
Ireland

Electricity Demand, Ireland



Source: ESB

Competitiveness: Energy Infrastructure



Nuclear Power Ireland

- 1968 ESB plan for 650MW reactor at Carnsore Point
- 1971 Nuclear Energy Act, 1971
- 1974 ESB lodges planning application for 4 reactors
 - One to be built immediately
- ESB contracts with Urenco for supply of enriched Uranium
- 1977 Minister O'Malley drives project

Uranium Deposits?

- Donegal
- Kilkenny
- Galway
- Wicklow
- Tyrone
- West Cork

Uranium Exploration

Munster Base Metals Ltd	Drilled Donegal
Maugh Ltd	Drilled Wicklow
Argosy Mining Corp	
Irish Base Metals	
Oliver Prospecting and Mining Co Ltd	
AMAX	

- 1979 Three Mile Island incident
- 1979 Minister Colley drops project
- 1986 Minister Spring protests about Sellafield leak
- 1987 Minister Burke presses for closure of Sellafield
- 1991 Nuclear Energy Board wound up

Sellafield...OECD Report 2000

- Report commissioned by Oslo-Paris Commission
- Examined radiological impact of reprocessing and storing nuclear fuel
- Well below any regulatory dose limits
- Not a public health risk

Radioactive Material in Irish Sea

- Minister Woods receives Task Force Report in 2000

- Conclusion:

Risk to human health and to marine life from dumping in past years is extremely low and does not constitute a health hazard

Ireland: Rational Energy Policy

- Diversify
- Accelerate renewables build up
- Focus on cost effective



Power Plants Around the World

Encourage renewables

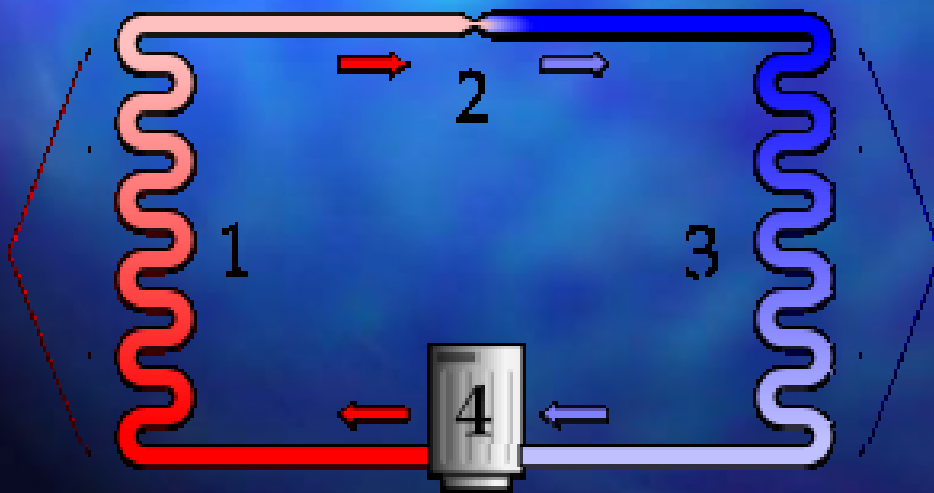
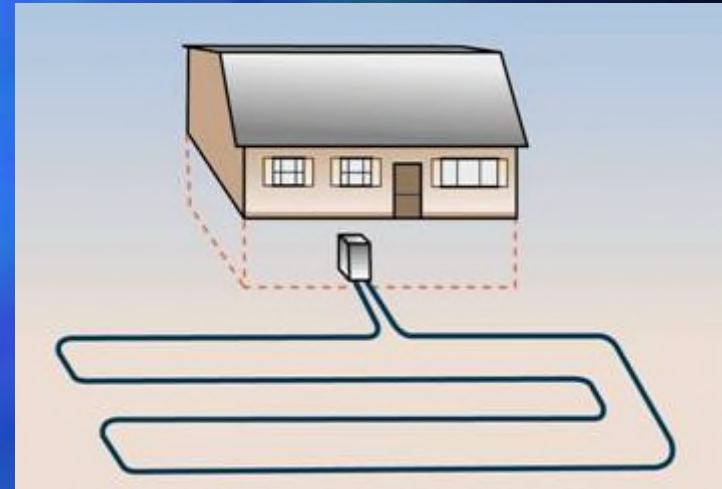
Biomass

Wood pellet heating



Use electricity more efficiently

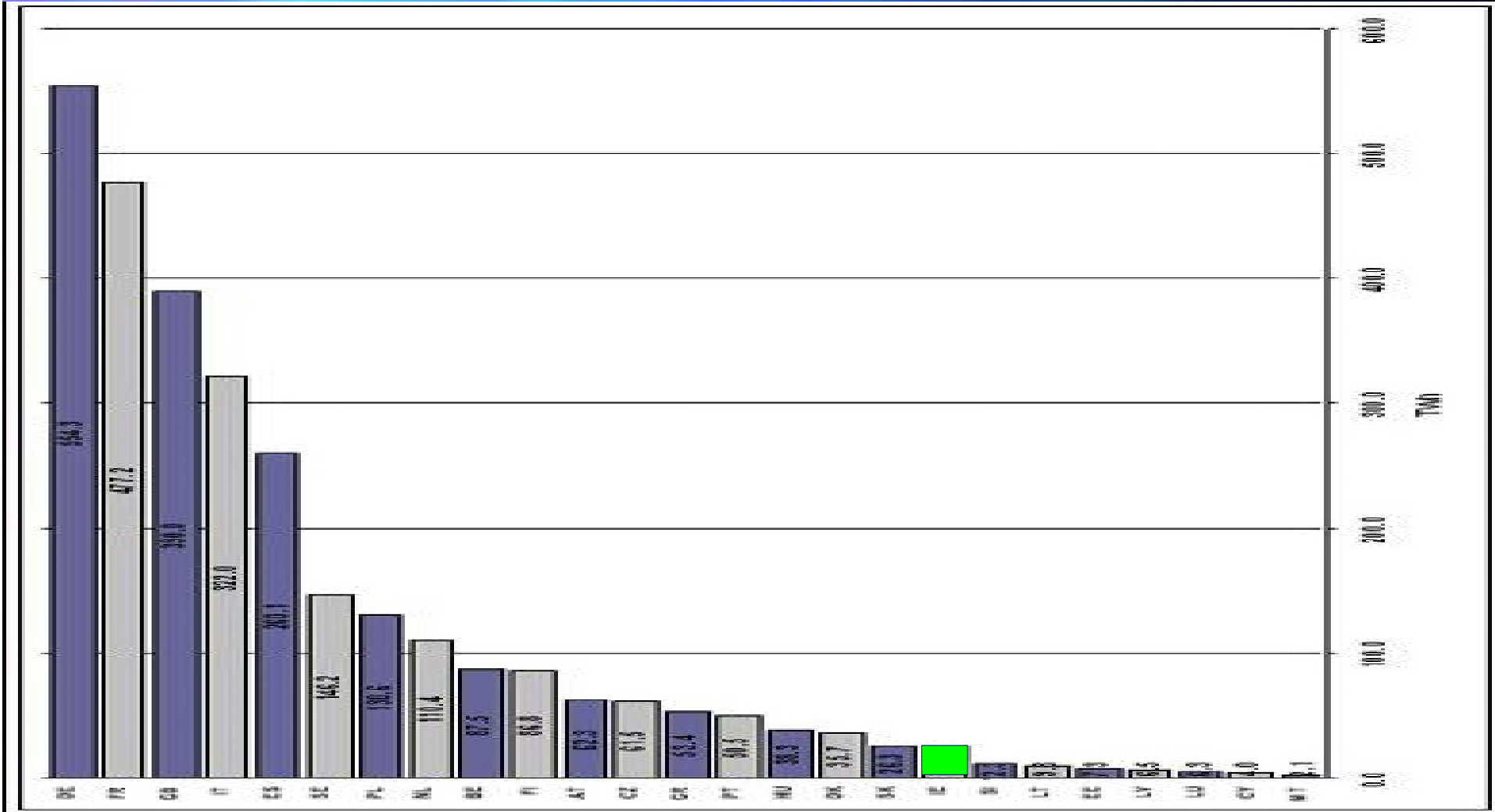
Geothermal
Heat Pump



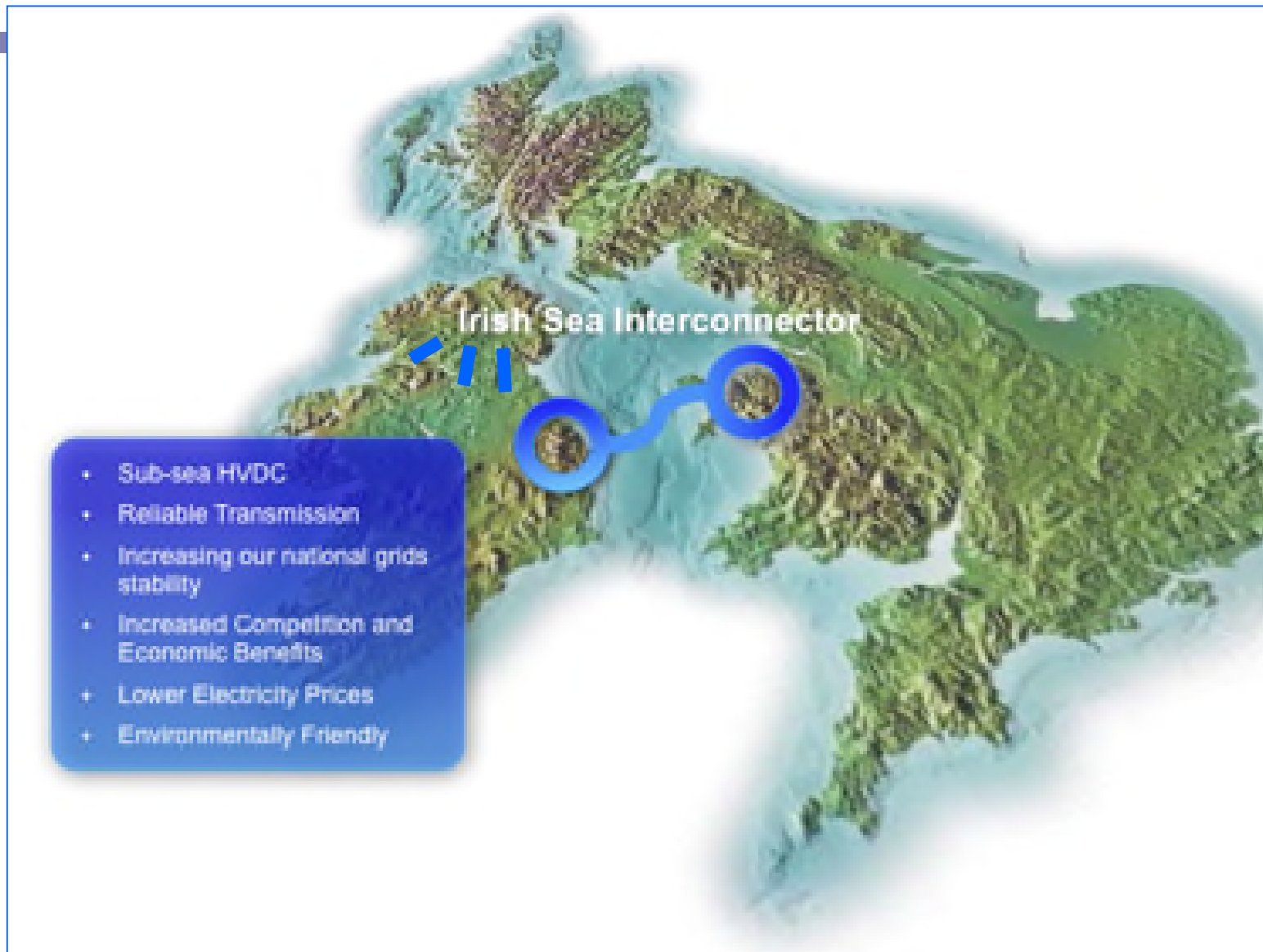
Recognise the constraints of renewables

- Wind limited to 15% of total electrical output
- Biofuels can help
- No prospect that renewables can meet Ireland's base-load growth in short to medium term

EU Electricity Generation



Build Interconnectors



High Voltage DC Submarine Cable



Behave rationally about Sellafield

- Recognise that Ireland will be dependent on the UK for energy on the interconnector when the wind is not blowing
- Gather the facts and have a rational discussion

Keep an eye on the rest of the world

Most countries revisiting the nuclear option

- Oil and gas costs
- Global warming
- Security of supply
- Countries with major nuclear installations such as France have increasing competitive advantage...

Nuclear for Ireland is not a short-term option

- But...we should have a rational discussion
- Mission impossible at present because of scaremongering over Sellafield and Chernobyl
- Ireland must first learn to behave rationally with incinerators
- Then the nuclear option can be introduced
- In the interim Ireland is going to have a competitive disadvantage because of high energy costs
- Public attitudes commence to alter
 - as energy bills spiral
 - as jobs are lost
 - as 'greens' internationally endorse nuclear

Keep the windmills turning
at Carnsore Point...for the present



- Until Carnsore is needed... and the time is right
- It remains a choice location for a cluster of nuclear reactors.....

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