The ‘justification’ consultation WANA evidence

The Implications of High Burnup Spent Fuel

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March 2010

A ‘clear and robust’ plan?

Three years ago, calling for a "clear and robust" plan for radioactive waste the IAEA executive director said:

"The spent-fuel issue is the most critical one for nuclear. It will not develop if there is not a credible and satisfactory answer to the management of spent fuel and one which is convincing for the public. "

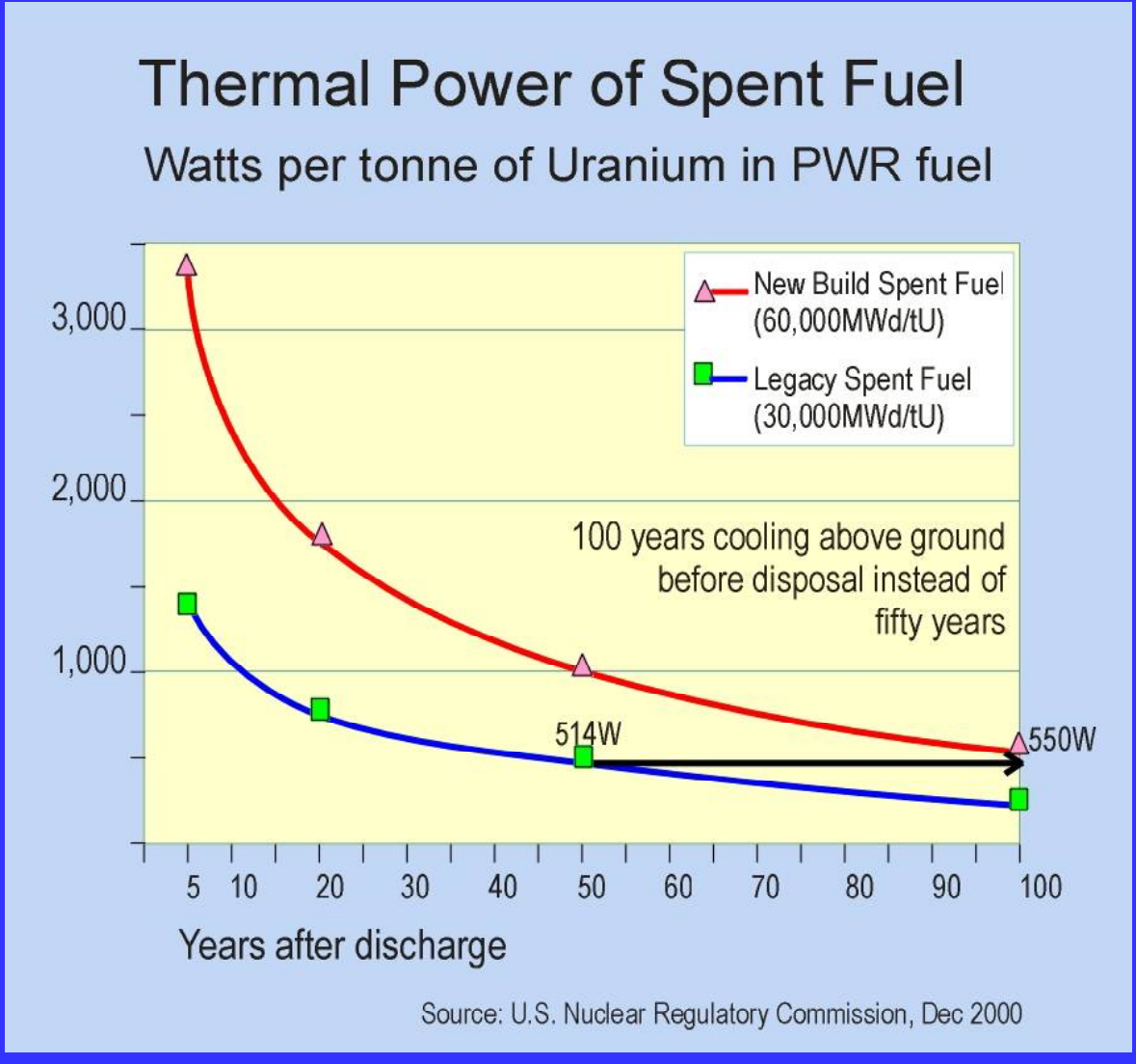
Britain gets nuclear waste warning from energy chiefs: Independent 02 March 2007

Burnup of Spent Fuel

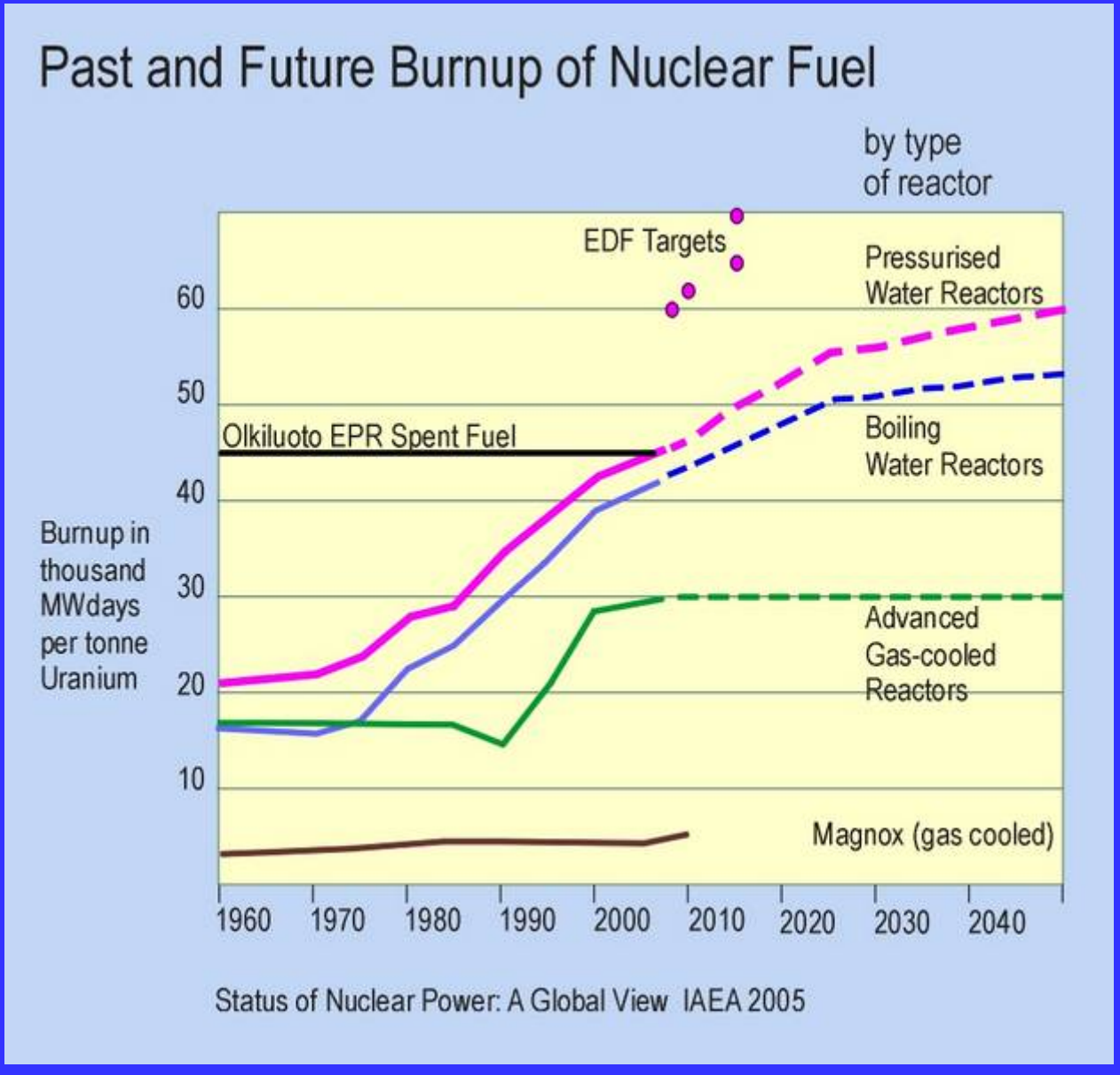
To boost the efficiency of their reactors, operators have progressively enriched the uranium they use as fuel to increase its "burn-up" rate.

This is a measure of the amount of electricity extracted from a given amount of fuel, and is expressed in thousand megawatt-days per tonne of uranium (MWd/tU).

High Burnup Spent Fuel is Twice as Hot



Creating Waste that Cannot be Disposed of?



Benefits are offset by Costs

IAEA is concerned that any benefits of lower electricity costs during the operation of reactors with high burnup fuel will be offset by an increase in the cost of managing the spent fuel.

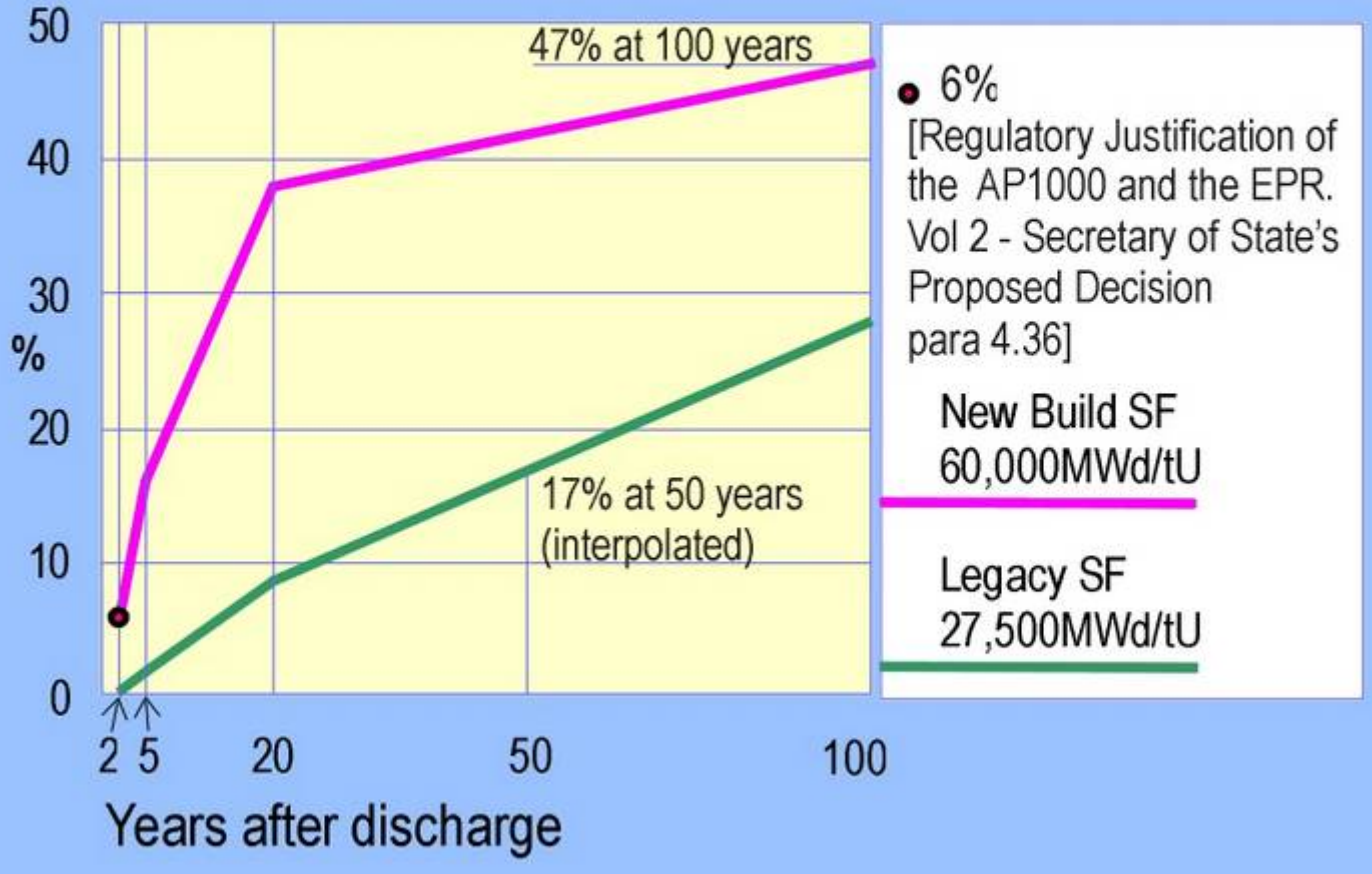
"…it has become necessary to establish …whether the benefits of lower electricity costs would not be offset by an increase in fuel management costs.

IAEA-TECDOC-1299

Technical and economic limits to fuel burnup extension. IAEA July 2002

Contribution of Neutrons to Total Dose Rate

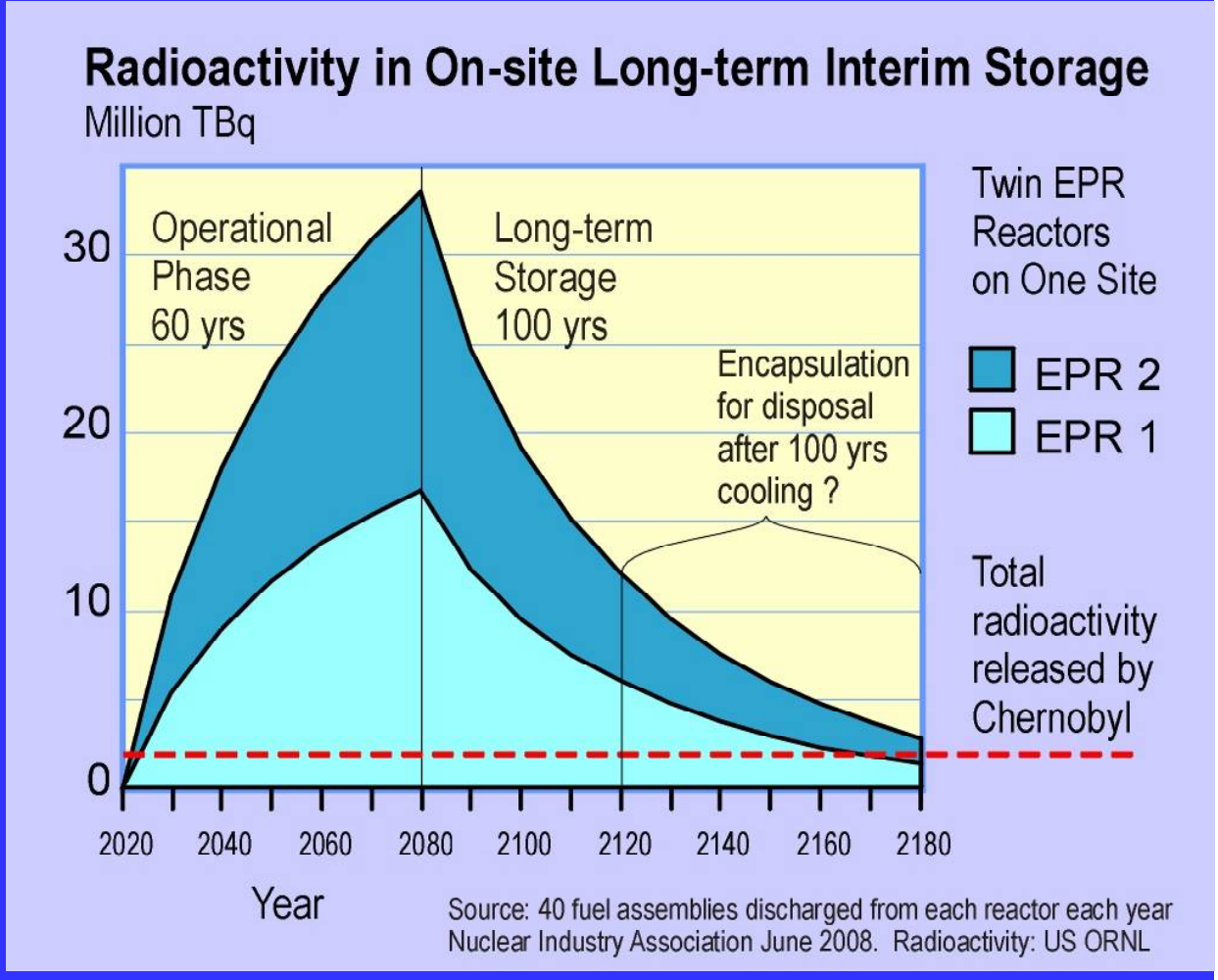
5% enriched Uranium PWR spent fuel at surface of a steel transport cask



Source: US Nuclear Regulatory Commission. Nureg 6700 Dec 2000

100 year cooling required before disposal

- No decision on Wet or Dry storage
- No designs for stores or encapsulation
- No defence against 200 year sea level rises
- No protection against terrorist attacks
- No detailed waste acceptance criteria
- No plans for reworking failed fuel



High burnup spent fuel -

- Any benefits of lower electricity costs will be offset by an increase in its management costs.
- Is more demanding at every stage of the nuclear cycle
- Will increase potential worker and public exposure to radiation.
- But most exposed to the health detriments will be the generation that has to retrieve the spent fuel from long term storage, condition it, encapsulate it and place it deep underground.

Long Term Storage is Not Responsible

AREVA

Conclusion

- Leaving the spent fuel onsite for extended periods of time was never intended and is not responsible
- ISFSIs can safely operate past 100 years by implementing an aging management program
- More responsible options exist
  - Recycling and final disposal need to be pushed forward

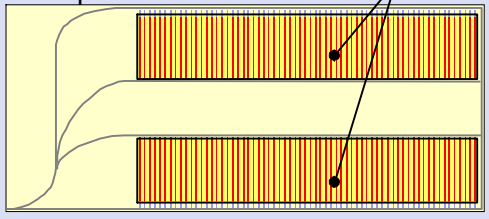
EDF explain that this 2009 statement in the US is not relevant to "our proposals or UK Government policy".

Repository Footprint for New Build Spent Fuel

to same scale

2.3 sq km overall

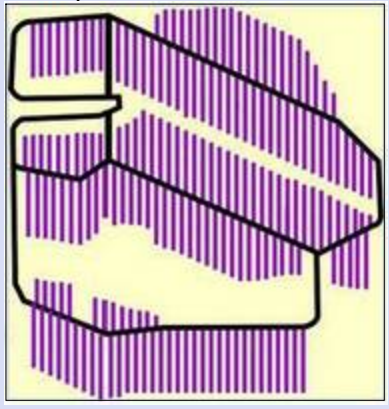
total 1 sq km



NDA Disposability Assessment for Spent Fuel from the Westinghouse AP1000

No. of canisters for 9 AP1000s = 5760
Tunnels at 25 metre centres,
holes at 6.5m centres (of which 8% unusable)

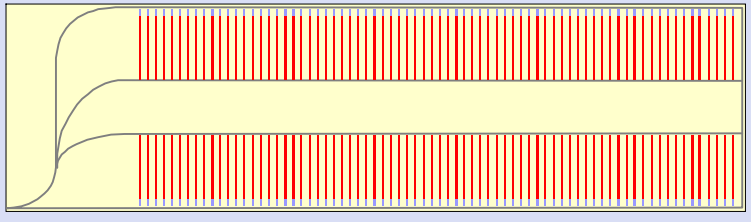
3.5 sq km



Forsmark D1

No. of canisters = 6000,
6660 deposition holes (of which 11% unusable)
Tunnels at 40 metre centres,

3.6 sq km



New Build Repository to same standards as Forsmark D2

No. of canisters = 5760,
7084 deposition holes
(of which 23% unusable)
Tunnels at 40 metre centres,

Conclusions

- Presenting Britain as the best place in the world in which to invest in nuclear power means that untried, untested ideas are being pushed harder here than elsewhere.
- There is no ‘credible and satisfactory’ answer to the management of high burnup spent fuel
- Over very long storage periods the degradation of many high burnup fuel elements is certain.
- Retrieval, encapsulation, and emplacement cannot be assumed to be possible, let alone safe.