

Women in Nuclear Global Conference

14-18 JULY 2025, LONDON

Dr Jo Lackenby

Former President of the Australian Nuclear Association & WiN Australia

Positively Nuclear



IN ASSOCIATION WITH



Positively Nuclear

Dr Jo Lackenby

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Question 1

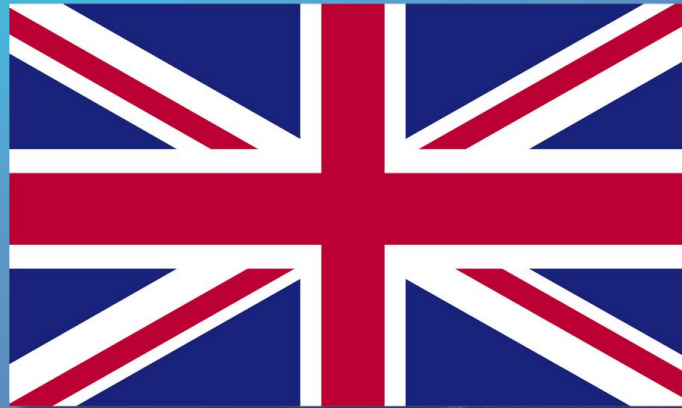
Which country in the world has the longest name?



Question 1

Which country in the world has the longest name?

Answer: The United Kingdom of Great Britain and Northern Ireland



Question 2

In 2000, 85.5% of the world's primary energy (TWh) came from fossil fuels (gas, oil, coal).

In 2023, what percentage of the world's primary energy came from fossil fuels?

- a) 91.5%
- b) 81.5%
- c) 71.5%
- d) 61.5%

Question 2

In 2000, 85.5% of the world's primary energy (TWh) came from fossil fuels (gas, oil, coal).

In 2023, what percentage of the world's primary energy came from fossil fuels?

Answer



a) 91.5%

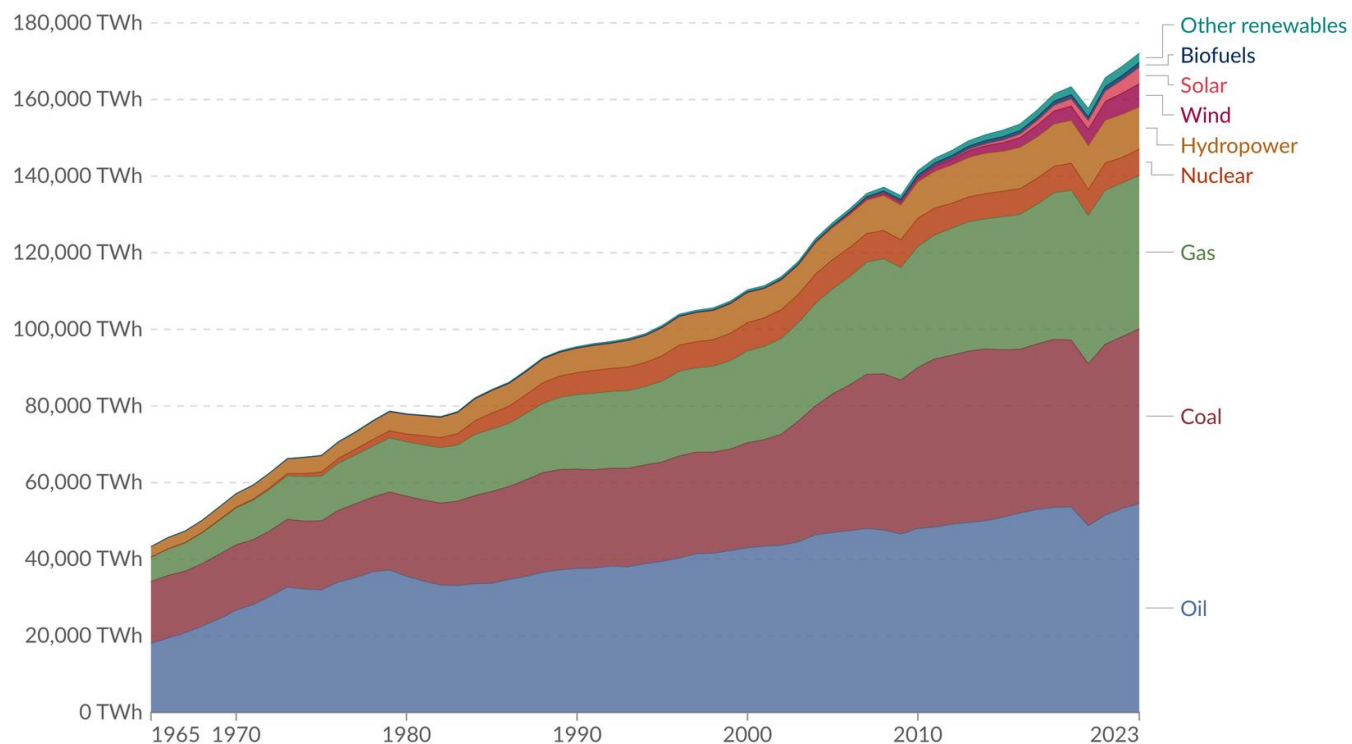
b) 81.5%

c) 71.5%

d) 61.5%

Energy consumption by source, World

Measured in terms of primary energy¹ using the substitution method².



Data source: Energy Institute - Statistical Review of World Energy (2024)

Note: "Other renewables" include geothermal, biomass, and waste energy.

OurWorldinData.org/energy | CC BY

Energy use is growing

Fossil fuel use is growing.

We need all low-carbon sources to displace fossil fuels.

Source: Our World in Data

Choose your own nuclear adventure

General

Science

Waste

Value

Safety

Health

Social

Environment

Security



Question 3

Which topics do you most want to hear about? Choose 3

General

Science

Waste

Value

Safety

Health

Social

Environment

Security



General



Packs a punch



**Swiss army
knife**



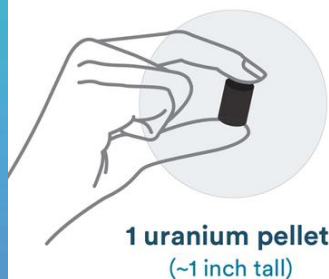
Shiny and new



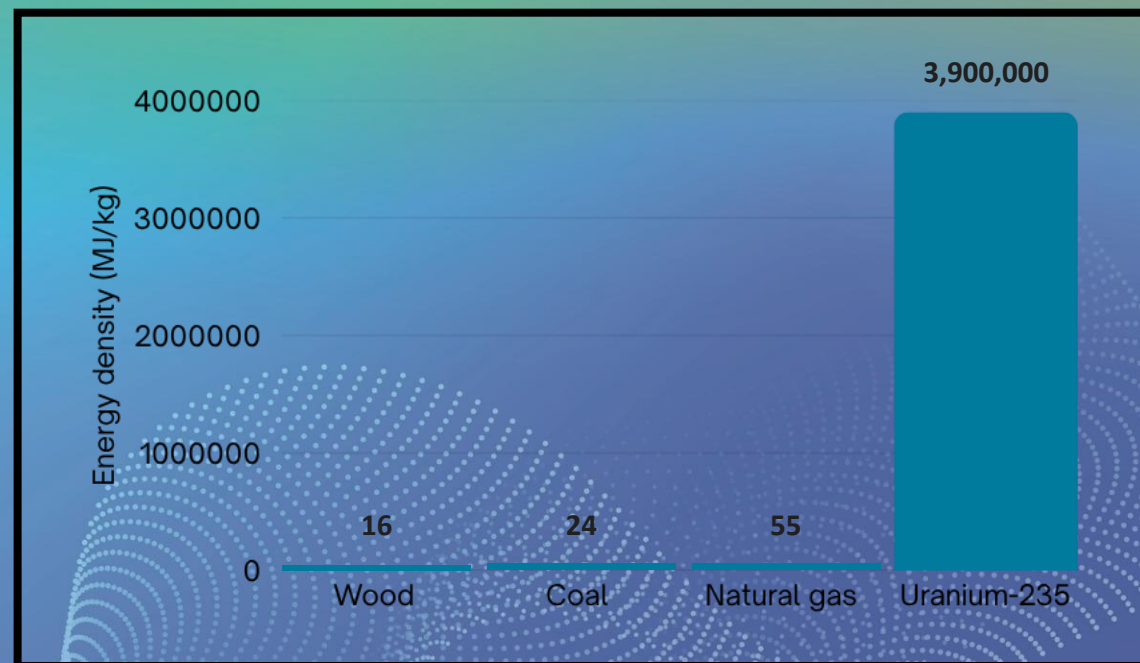
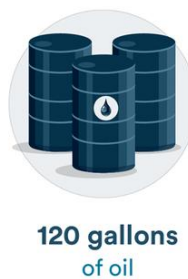
Packs a punch

Fast Facts on NUCLEAR ENERGY

Nuclear fuel is **extremely energy dense**.



=



Source: US Department of Energy, Office of Nuclear Energy

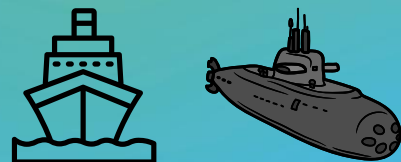
Data source: I. Hore-Lacy, "Future Energy Demand and Supply," in Nuclear Energy in the 21st Century, 2nd ed., London, UK: WNUP, 2011, ch.1, sec.6, pp.9

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Swiss army knife



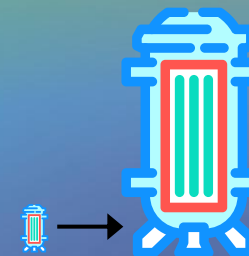
Electricity and/or heat



Propulsion

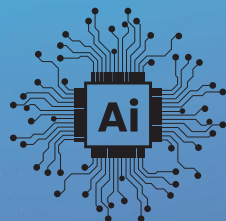


Future mobile
power plants?



Microreactor 100 kWt to McMassive
1750 MWe

Grids, remote locations, hydrogen
production, desalination, other
specific industrial uses



Shiny and new

Nuclear - is it old and outdated technology?



1878

Hydropower first generated
electricity



1883

Wind first
generated electricity



1951

Nuclear energy first
generated electricity



1954

Solar first
generated electricity



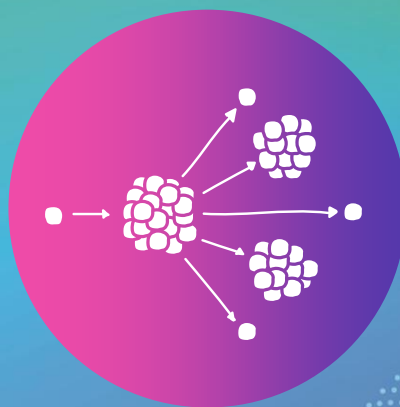
Science



**To infinity &
beyond**



Super-heroes



**For you,
no charge**



Bye bye bugs

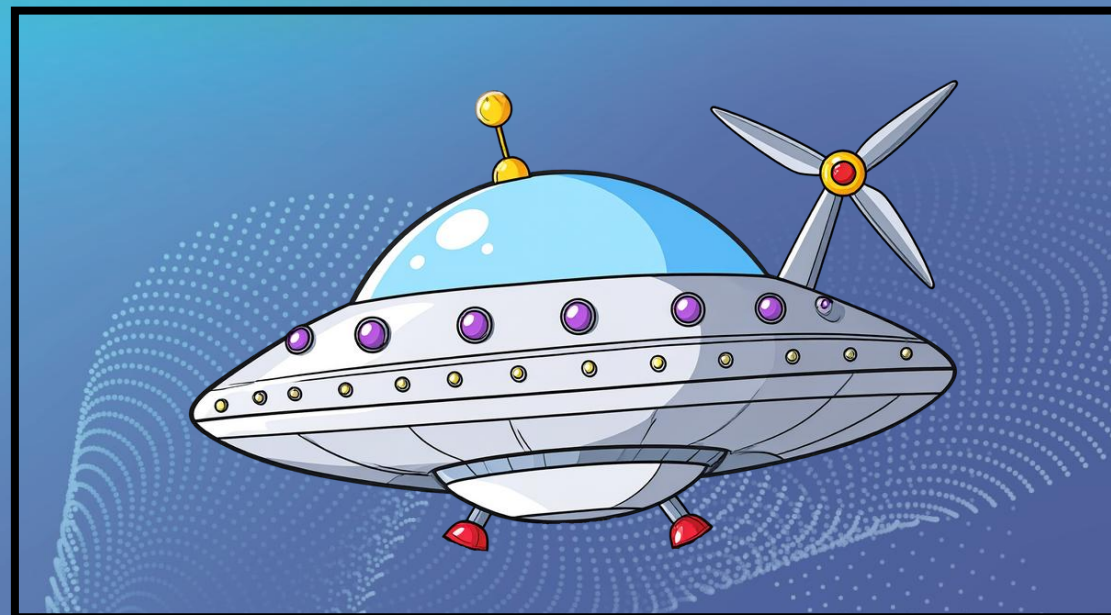


**Precision
+**



To infinity & beyond

Space propulsion, heat, reactors for electricity



Superheroes



Source: Marvel



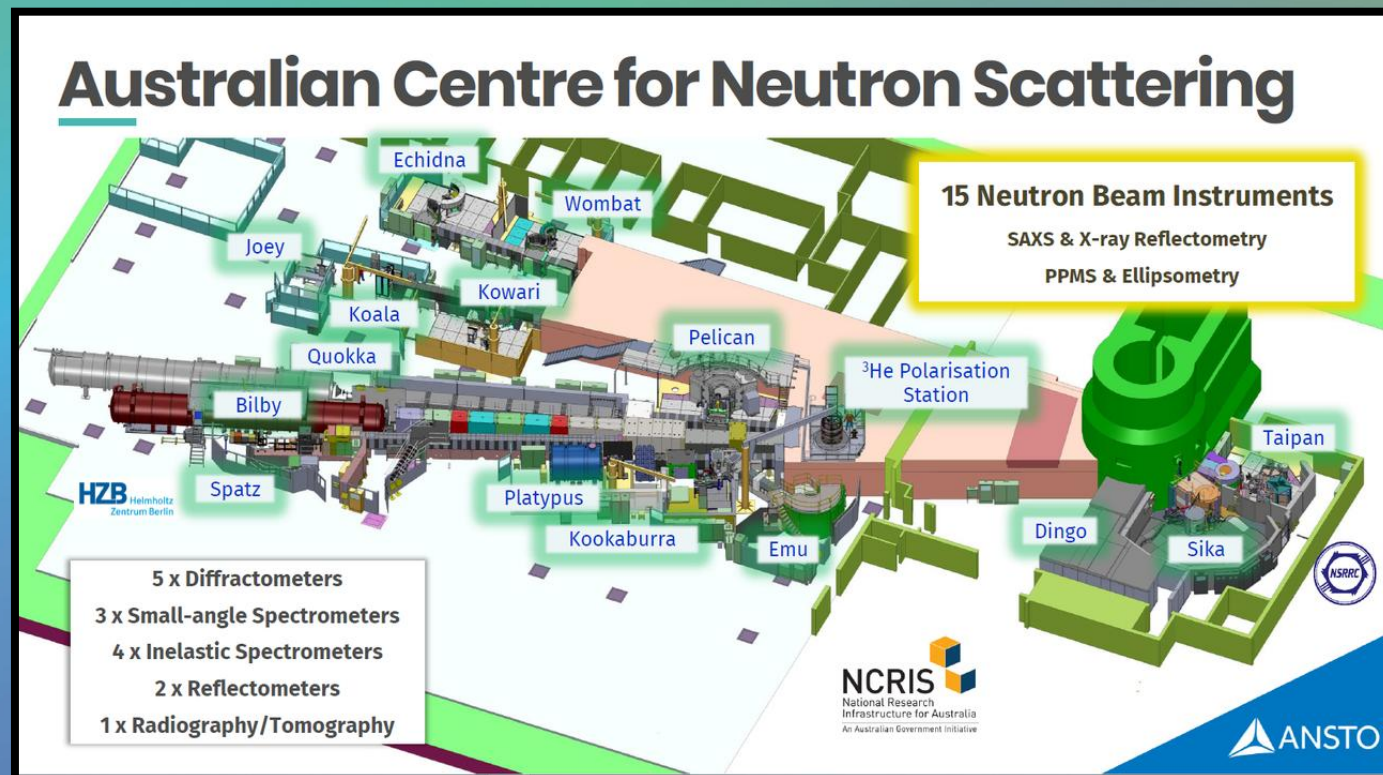
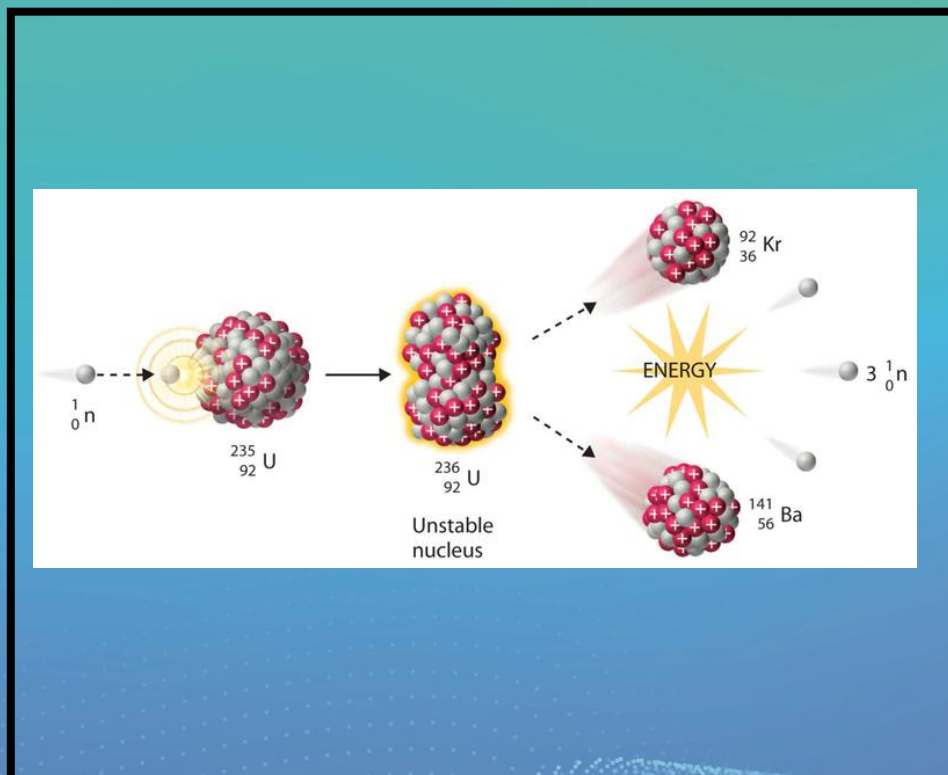
Source: Marvel



Source: OpenAI



For you, no charge



Bye bye bugs



Sterile insect technique



Medical sterilisation



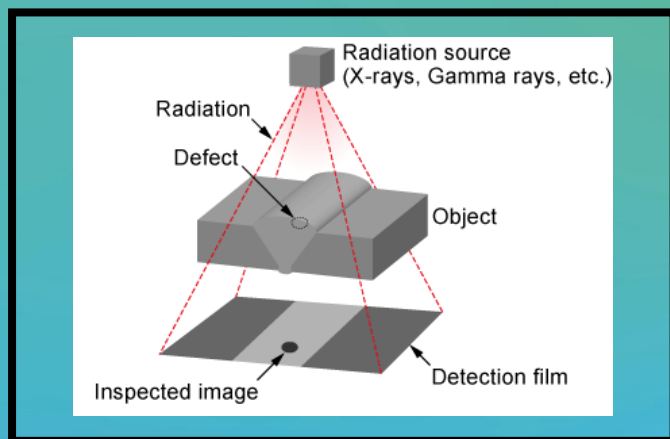
Food irradiation

Source: IAEA

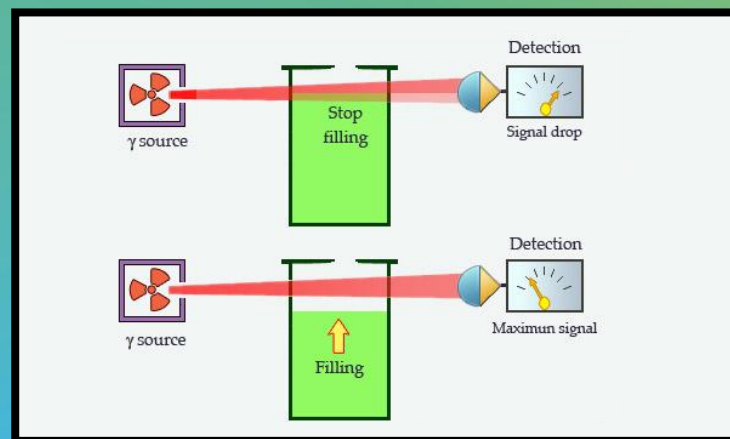
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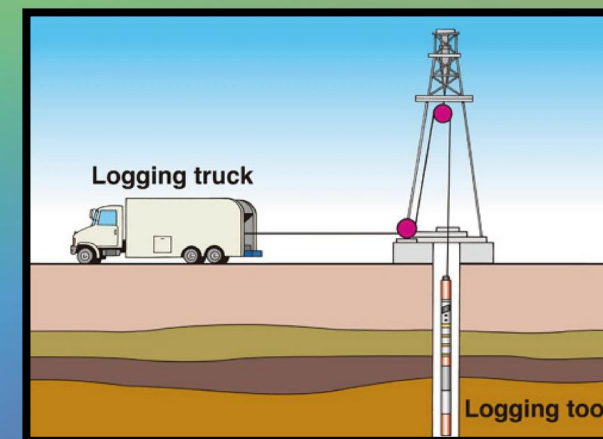
Precision +



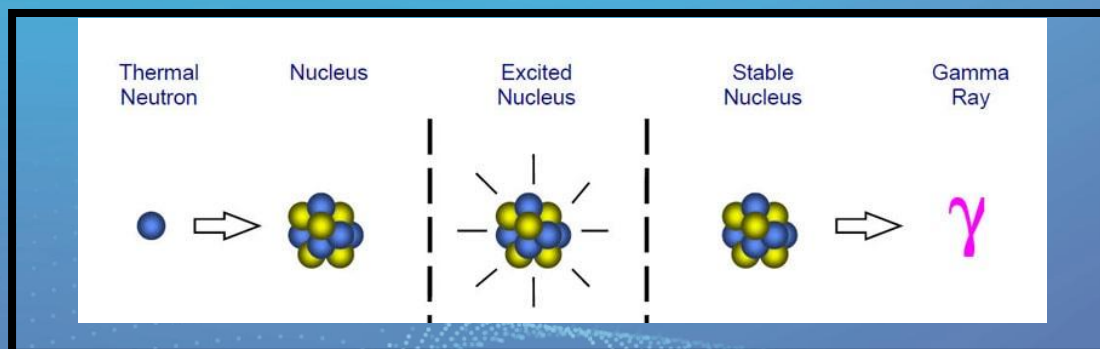
Source: www.matsusada.com



Source: radioactivity.eu.com



Source: Salt Work Consultants Pty Ltd



Source: Frontier Technology Corp



Source: ANSTO

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Waste



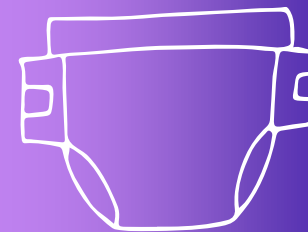
Hold this



Is it really
waste?



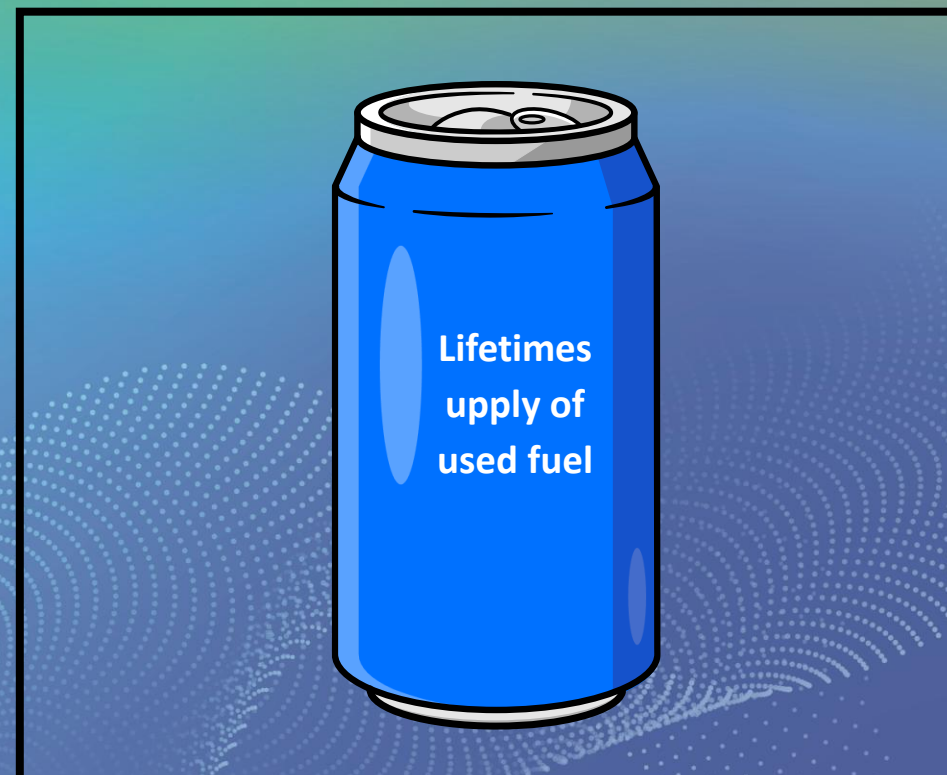
Cool, calm and
collected



Nappy

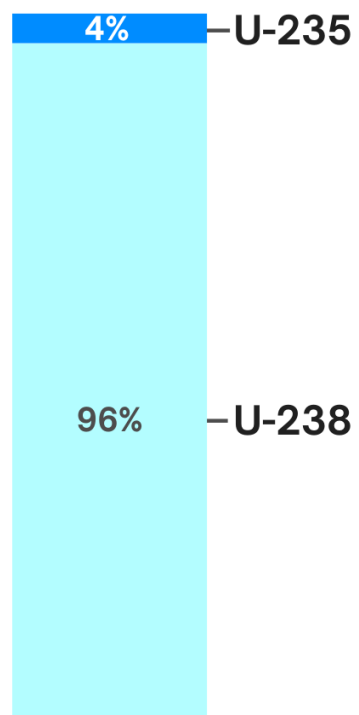


Hold this

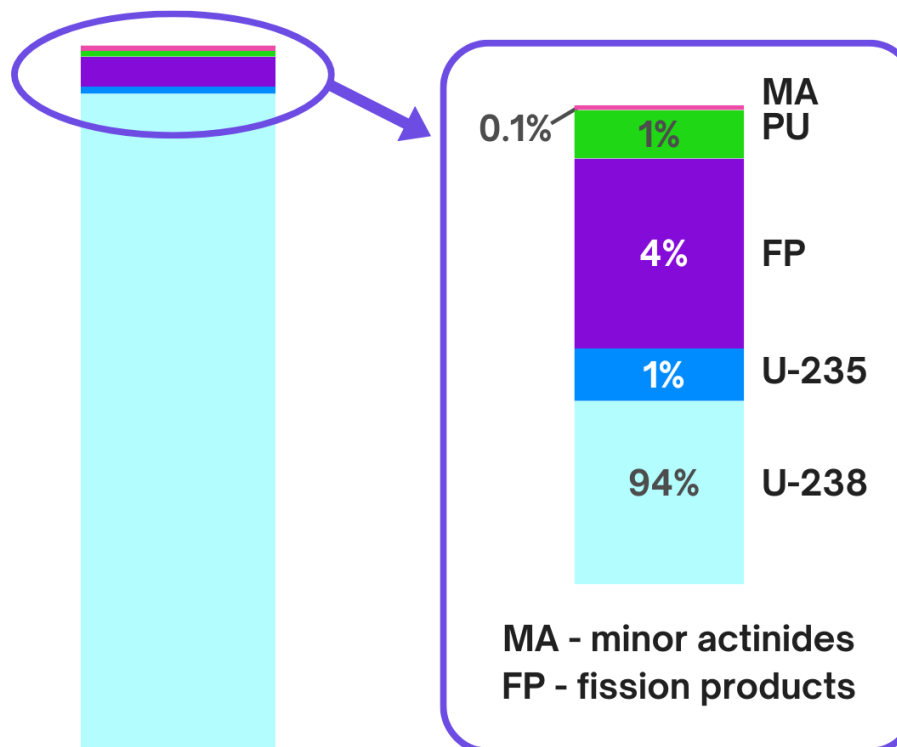


Is it really waste?

Fresh fuel



Used fuel = is it really waste?



Cool, calm and collected



Source: Posiva

Waste is:

- Highly regulated
- Easy to monitor
- Well understood (especially nuclear power plant waste)
- Accounted for in its entirety, i.e. it isn't pumped into the atmosphere or disposed of into landfill

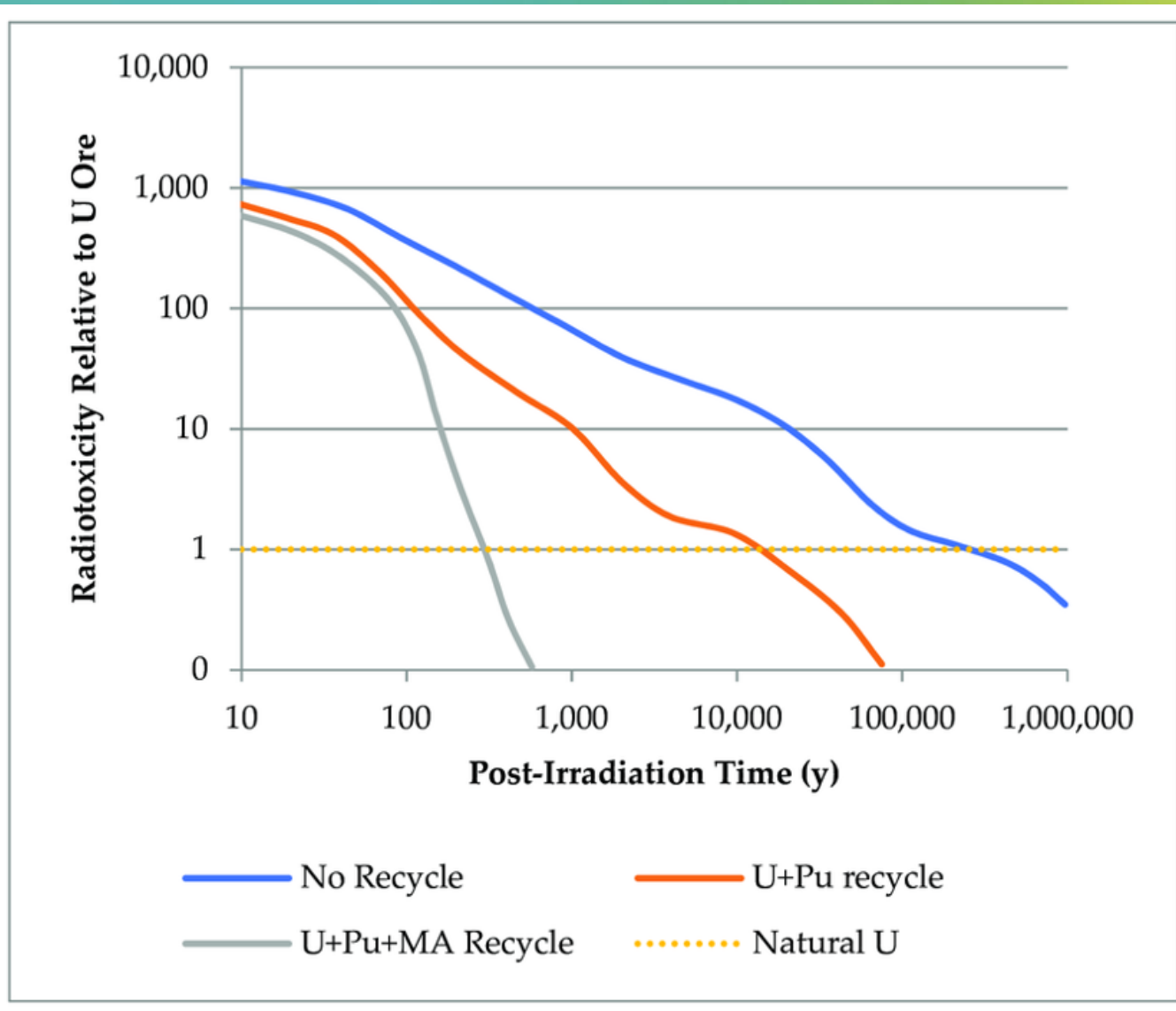


Nappy

What lasts longer – nuclear waste or a disposable nappy?

It depends!

Source: Holdsworth et al. 2023. Spent Nuclear Fuel—Waste or Resource? The Potential of Strategic Materials Recovery during Recycle for Sustainability and Advanced Waste Management. Waste. 1. 249-263.



Value



PVC



Worth its weight
in gold



U-turn



PVC

Price

Amount charged to the customer

Value

Use or perceived benefit to the customer

Cost

Amount paid by the provider

High upfront capital costs, low operating costs



To bring down capital costs:

- Standardisation
- Suitable financing arrangements

To minimize consumer price, the entire system cost needs to be taken into account



Worth its weight in gold



What *value* does nuclear bring?

- Dispatchable generation
- Less equipment needed for the grid
- Synchronous generation
- Very low carbon emissions



U-turn



Recent financing shifts

- Inclusion of nuclear in green funding models
- Interest from the banking sector to fund new NPP, including the World Bank
- US Inflationary Reduction Act
- Consideration of state loans for new builds

More work needs to be done, e.g., ESG funds



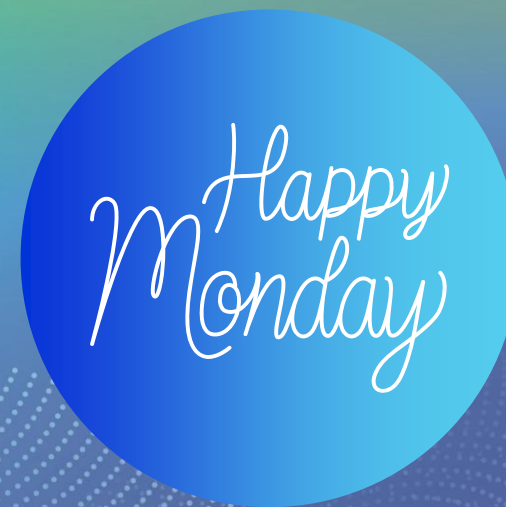
Safety



Not sure how to make this
one positive



改善



Thank goodness it's
Monday!

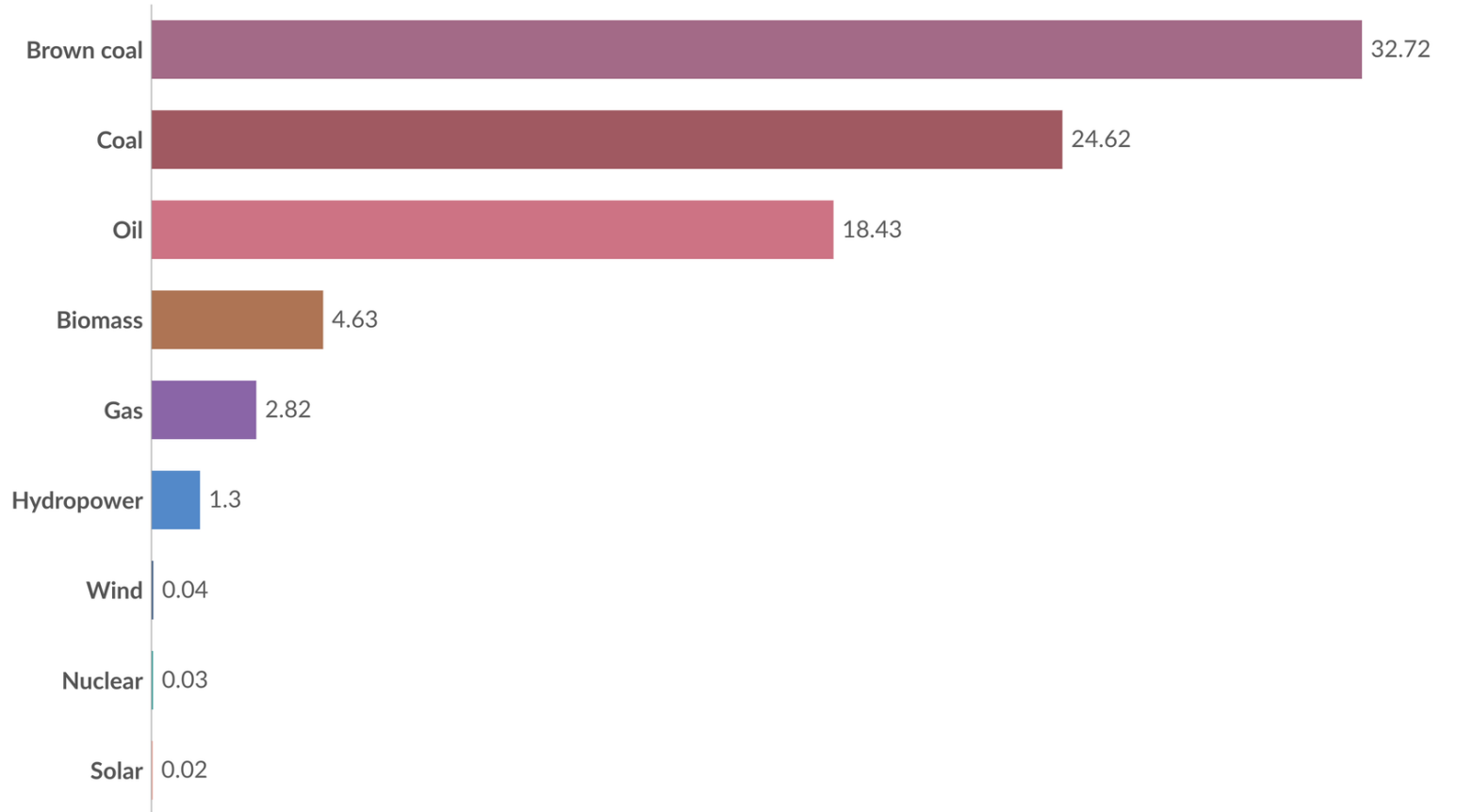


Not sure
how to
make
this one
positive

Death rates per unit of electricity production

Our World
in Data

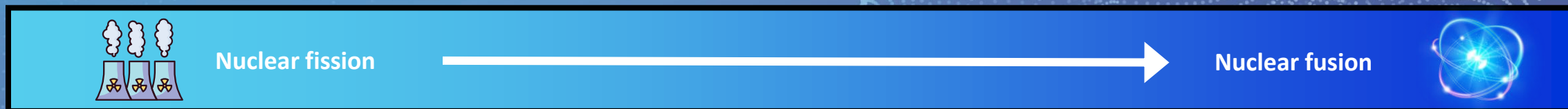
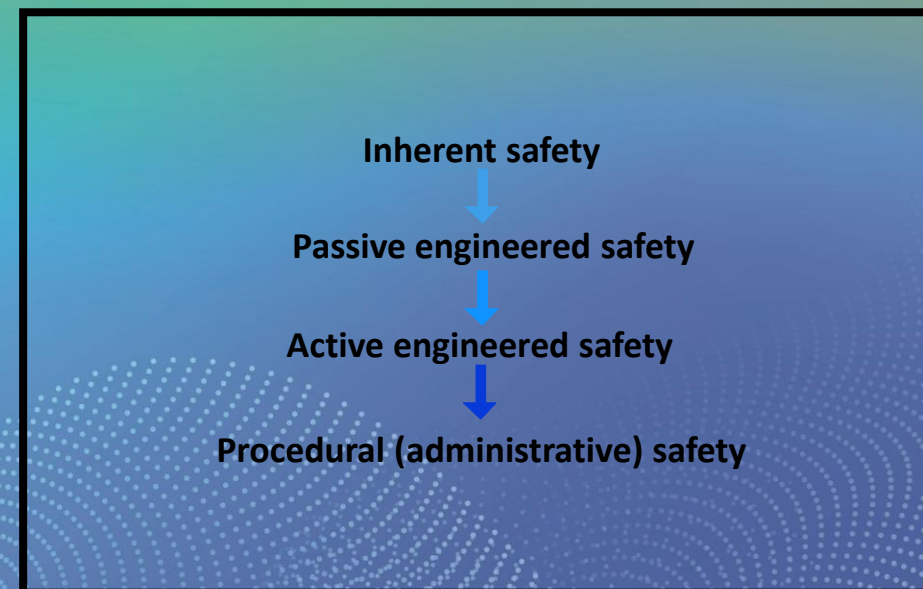
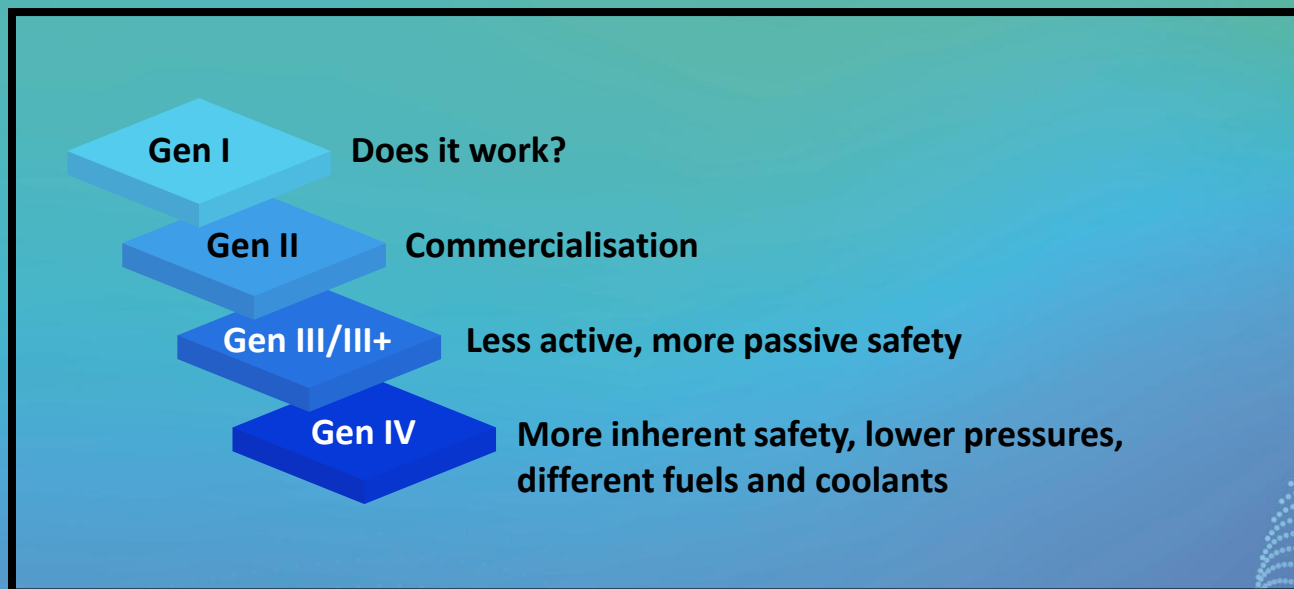
Death rates are measured based on deaths from accidents and air pollution per terawatt-hour¹ of electricity.



Data source: Markandya & Wilkinson (2007); Sovacool et al. (2016); UNSCEAR (2008; & 2018)

OurWorldinData.org/energy | CC BY

改善



Thank goodness it's Monday!

Which Industry Offers The Safest Jobs In America: Nuclear Or Logging?

Much safer to be at work at a nuclear power plant than at home!



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Health



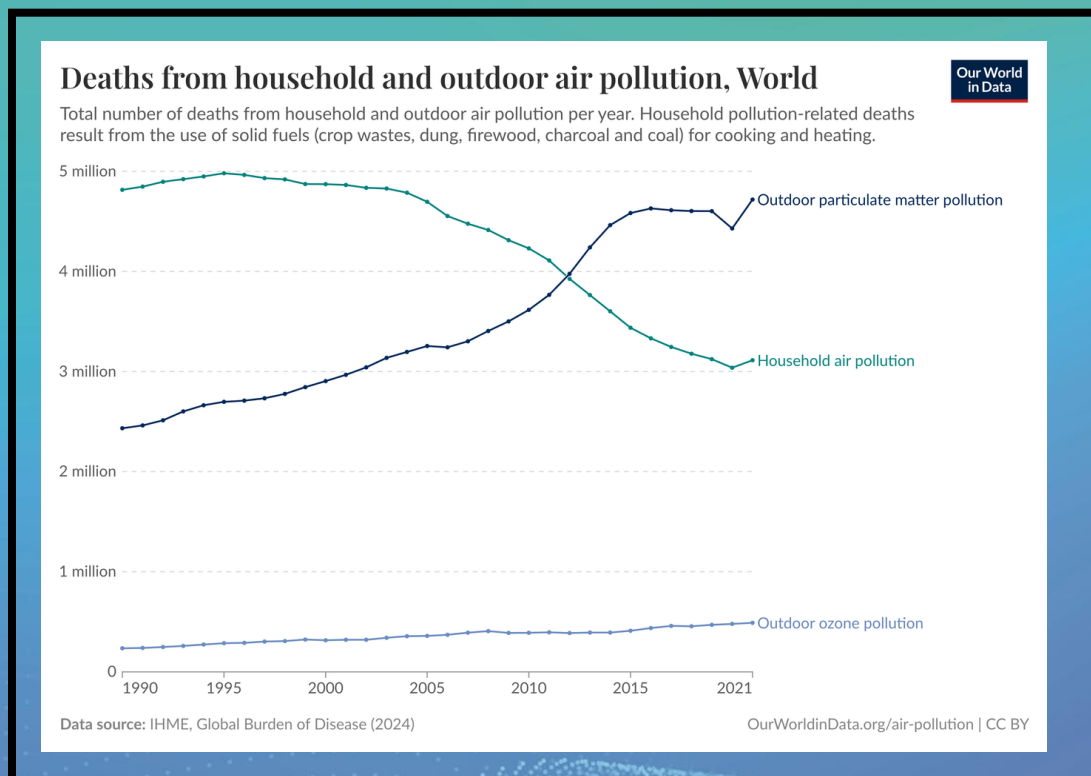
Don't breathe



**You can run, but you
can't hide**



Don't breathe



Environmental Science & Technology

Article

pubs.acs.org/est

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Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power

Pushker A. Kharecha* and James E. Hansen

NASA Goddard Institute for Space Studies and Columbia University Earth Institute, 2880 Broadway, New York, New York 10025, United States

Source: Our World in Data

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You can run, but you can't hide



Source: GE Healthcare

Nuclear medicine saves
millions of lives each
year

Social



Narrrr... yeah



Reverse NIMBY



Not bad as far as
work goes



Narrrrr...yeah

Shifts in sentiment towards nuclear power have been immense over the past 5 or so years

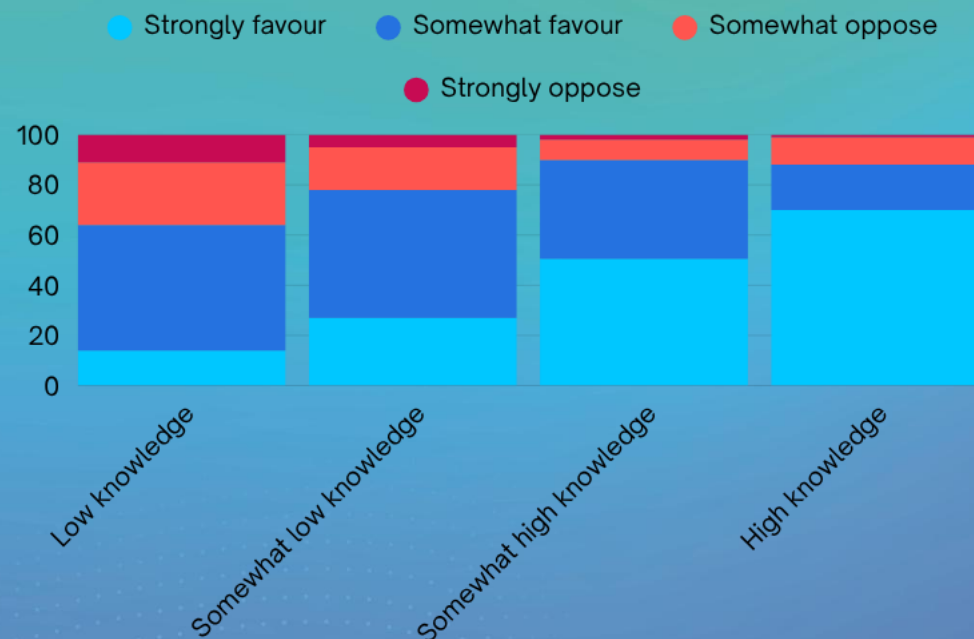


- COP agreement recognition
- Shifts in country policies
- Inclusion in green funding models
- Banking sector shifts
- Interest from tech companies



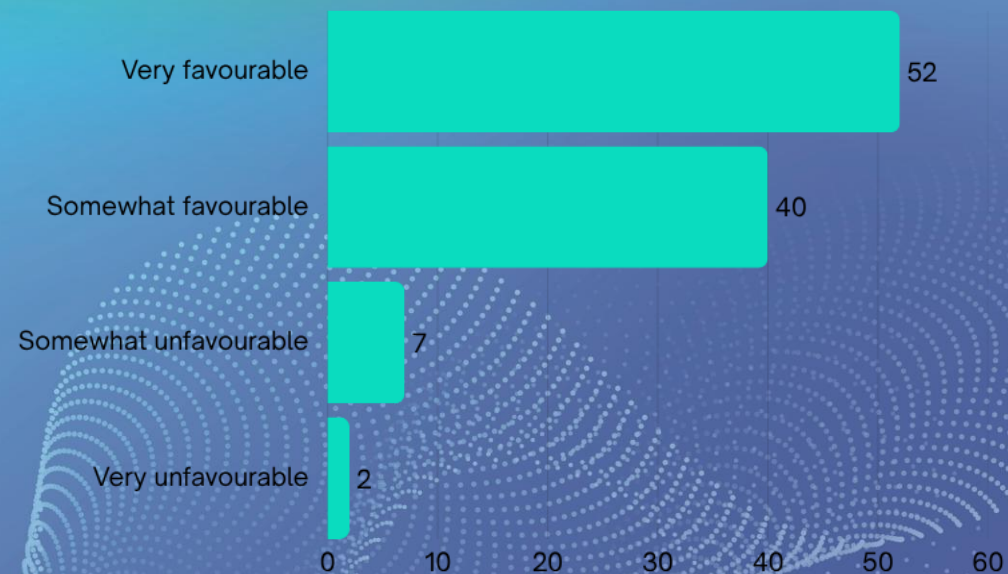
Reverse NIMBY

Overall, do you favor or oppose the use of nuclear energy as one of the ways to provide electricity in the United States?



Source: www.bisconti.com

Thinking of the nuclear power plant closest to where you live, would you describe your general impression of this plant and the way it has operated recently as favourable or unfavourable?



Source: www.bisconti.com

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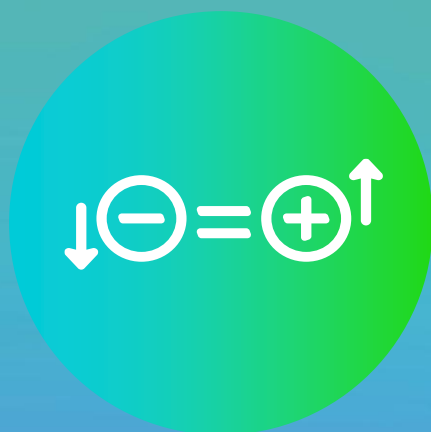
Not bad as far as work goes



- Well paid, highly trained, highly skilled, stable, local workforces
- Not jobs for life, but jobs for generations



Environment



Less is more



Digging holes



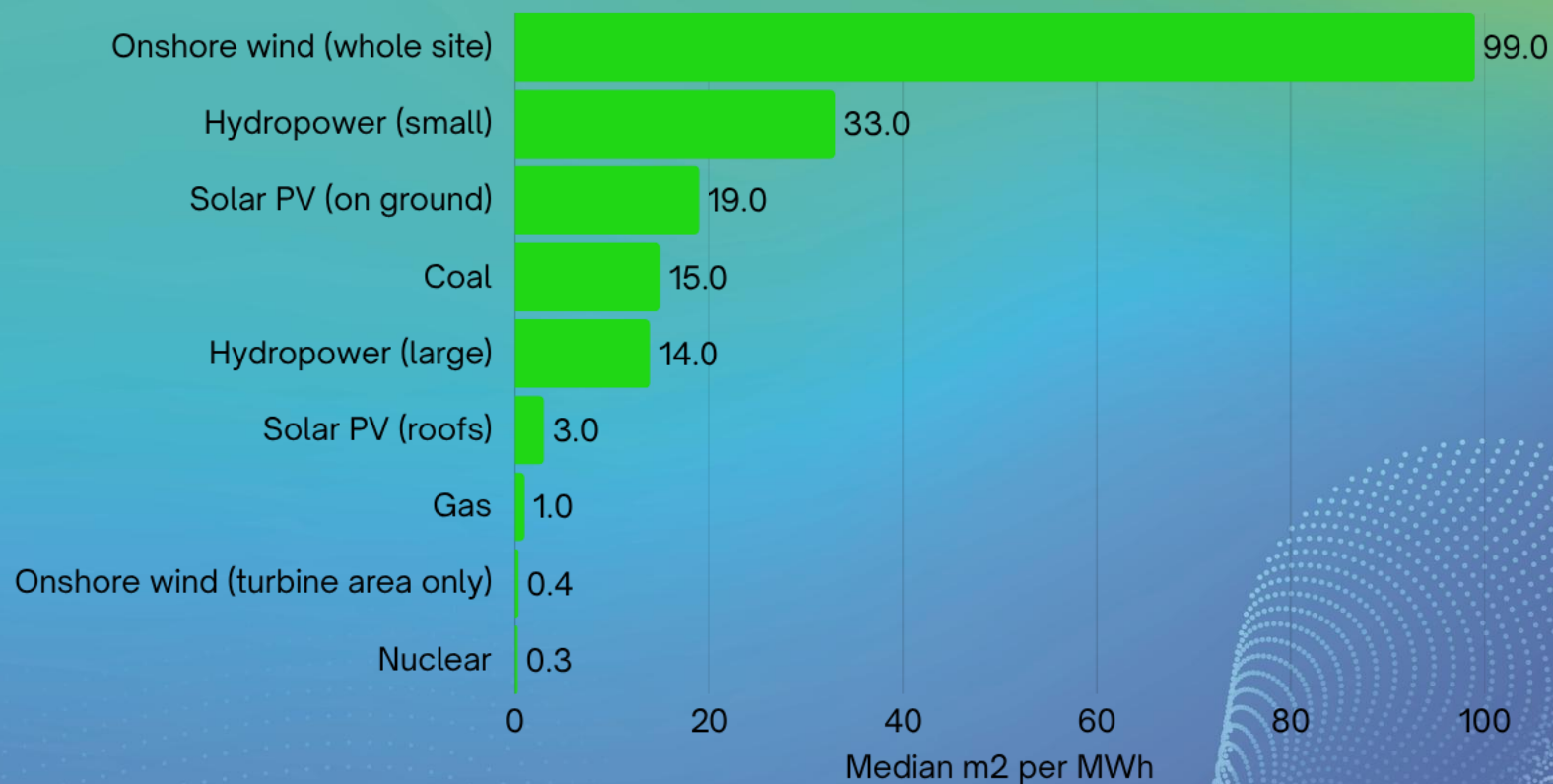
CO2



Plants and
animals



Land use for different energy sources (median)

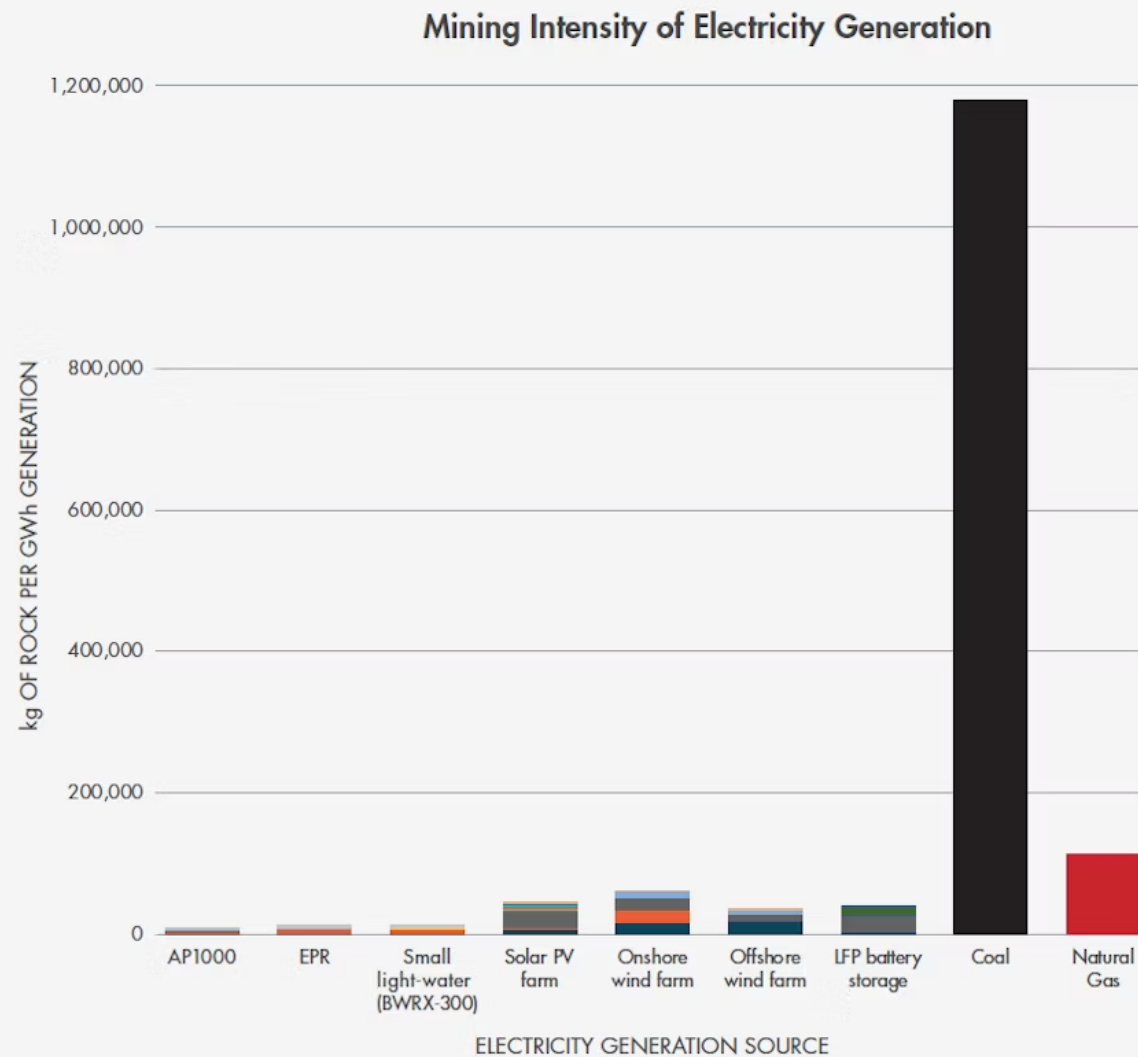


Source: Reproduced from Our World in Data

**Less
is more**

Digging holes

Source: The Breakthrough Institute



Greenhouse gas emissions

Measured in emissions of CO₂-equivalents per gigawatt-hour of electricity over the lifecycle of the power plant. 1 gigawatt-hour is the annual electricity consumption of 150 people in the EU.

Coal

36% of global electricity



160-times higher than nuclear energy

Oil

3% of global electricity



65-times higher than wind

Natural Gas

22% of global electricity



Biomass

2% of global electricity



Hydropower

12% of global electricity



Wind

7% of global electricity



Nuclear energy

10% of global electricity



Solar

4% of global electricity



CO₂

Source: Our World in Data

Plants and animals



Biggest ecosystem impacts:

- Climate change
- Land use

Security



(Usually)
always on



Buy now, use
later



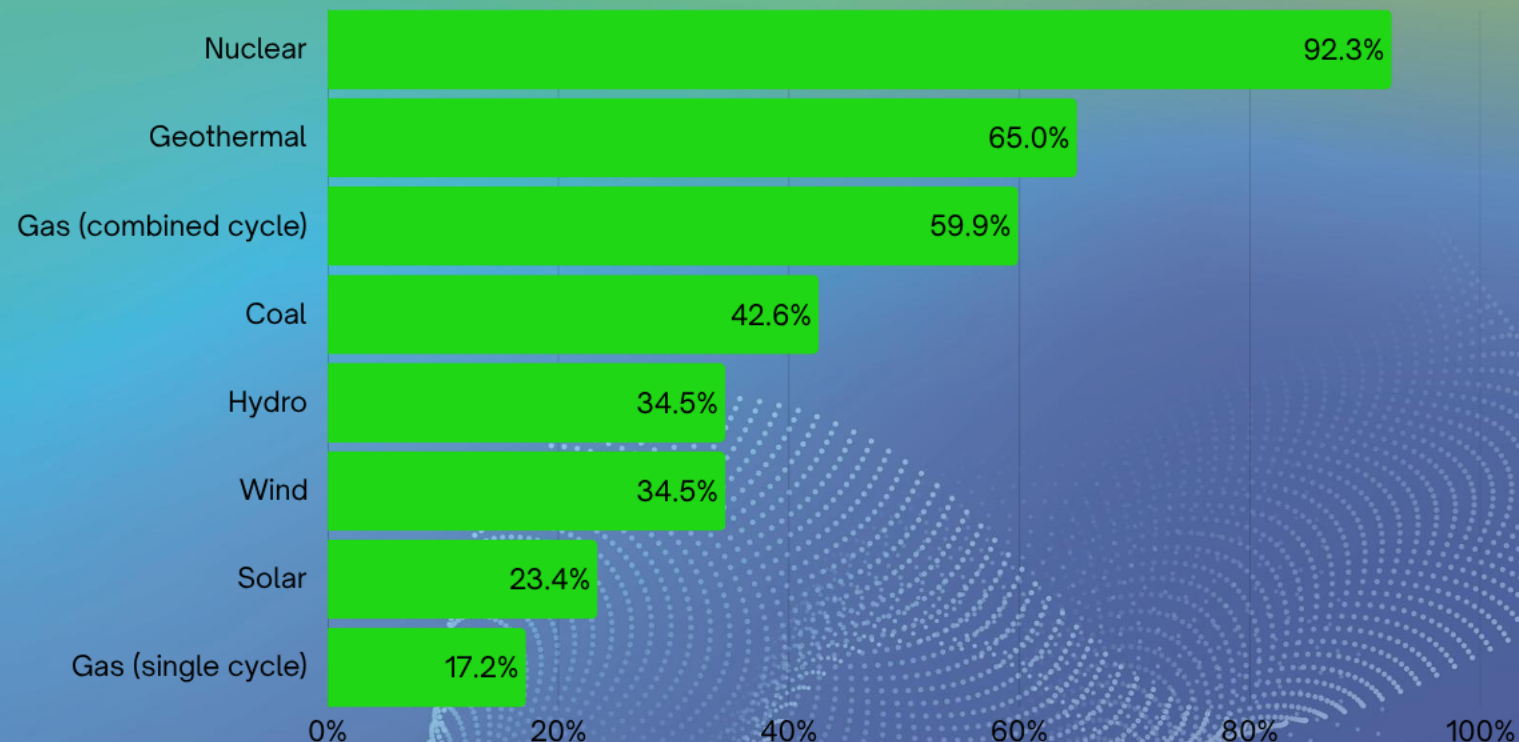
80s
club



(Usually)
always on

Capacity Factor by Energy Source

USA 2024



Source: US DOE Office of Nuclear Energy



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Buy now, use later



Source: China National Nuclear Corporation

- Stockpile fuel
- Weather independent

80s club



Source: US Department of Energy

- Turkey Point Units 3 and 4 - the first units to be licenced to 80 years
- Licence extensions and refurbishments are occurring in many countries throughout the world



Question 4

What excites you most about nuclear?

Question 4

What excites you most about nuclear?

My Top 2:



The relatively low environmental impacts, including very low carbon emissions



Nuclear hasn't come anywhere near meeting its full potential

Conclusion

There is much to be excited about. Let's be Positively Nuclear and be part of the nuclear adventure!

A summary of all slides can be found on the conference app.



Jo Lackenby

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Connect on LinkedIn → “Joanne Lackenby”



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