

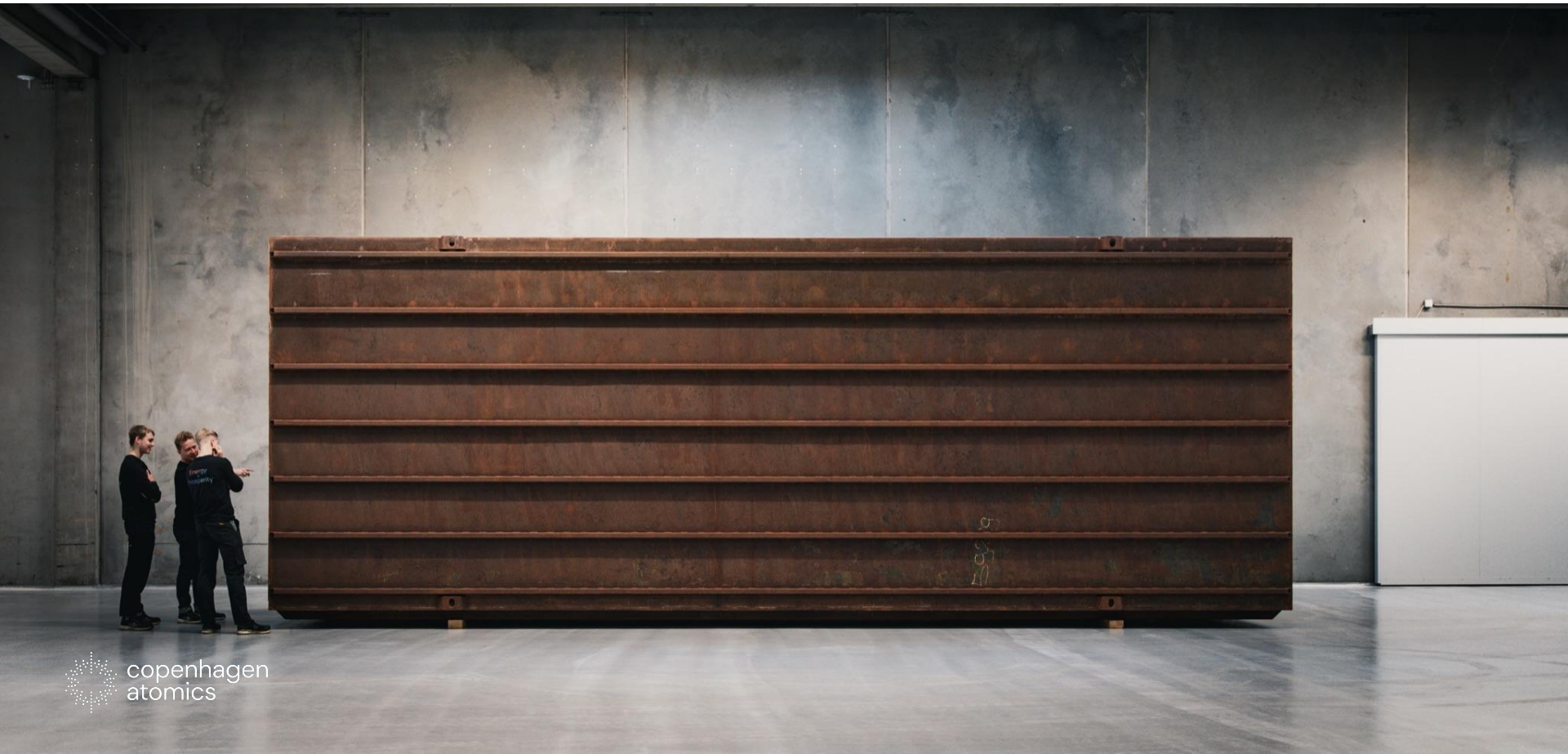


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Team Copenhagen Atomics
press@copenhagenatoms.com

Introduction to Copenhagen Atomics

Non-fission prototype

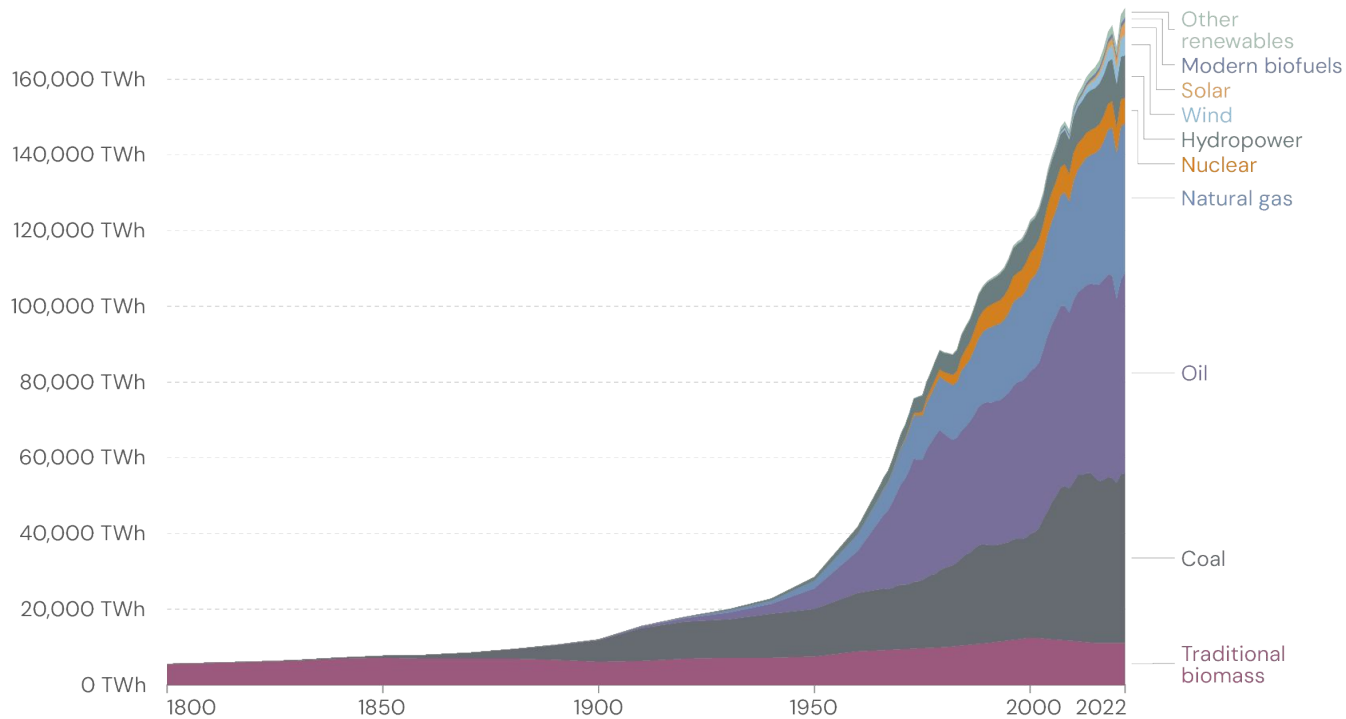


The Onion Core®



Global primary energy consumption

1800–2022



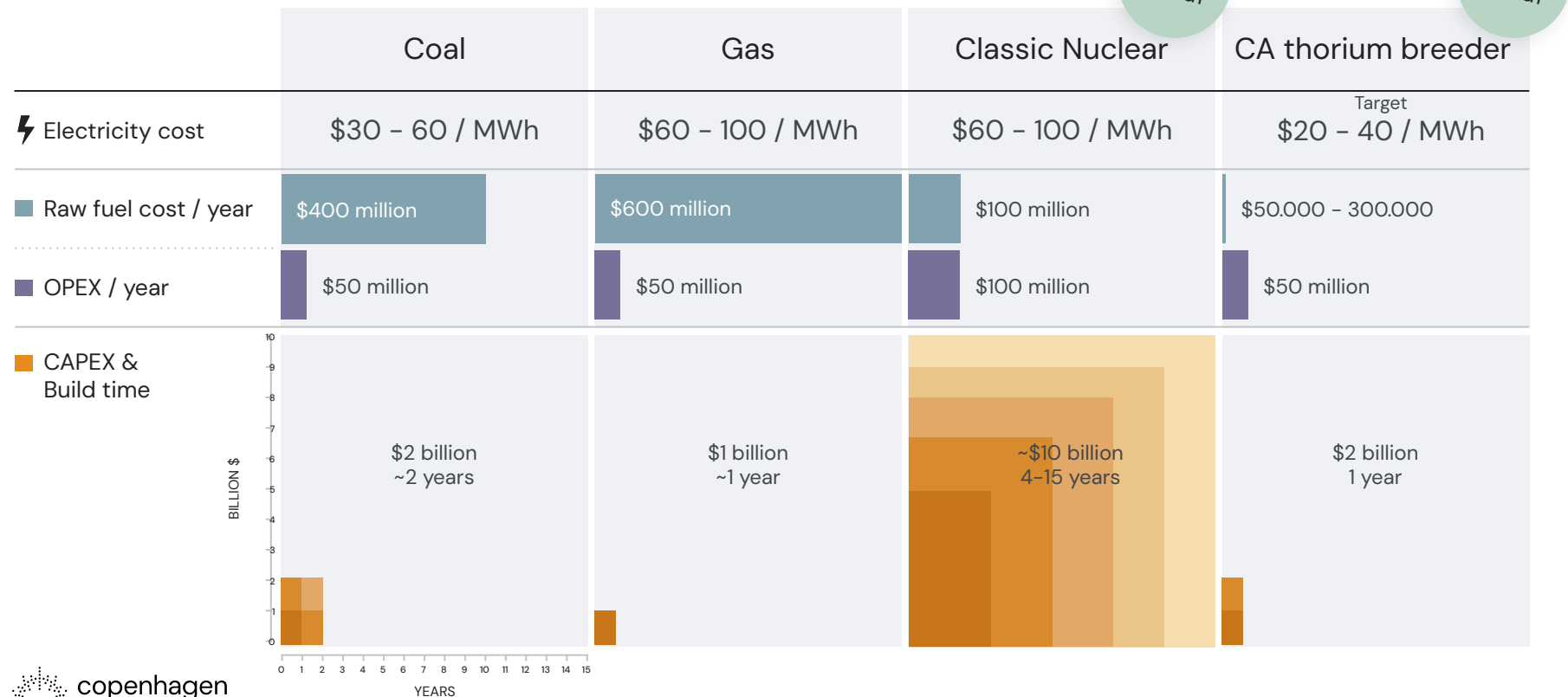
Source: Vaclav Smil (2017) and BP Statistical Review of World Energy

Nuclear energy, grouped by fuel type

Fissile fueled			Fertile fueled		
ALL NEED REPEATED REFUELING		Fuel type	ALL NEED 1 LOAD OF KICKSTARTER FUEL		Fuel type
CANDU PHWR MAGNOX		Natural Uranium	Fast + Blanket		U238
LWR, SMR HTGR, SFR, Gen 1, 2, 3, 4 ...		U235, Pu239	MSR + Blanket		Th232
HEAVY HYDROGEN FUELED					
Gen 1 Fusion		H3, H2	Fusion + Blanket		Li6, H2

Comparing base load solutions of today to CA breeder reactor

Plant size: **1 GWe** in europe or usa



Electricity production by source, World

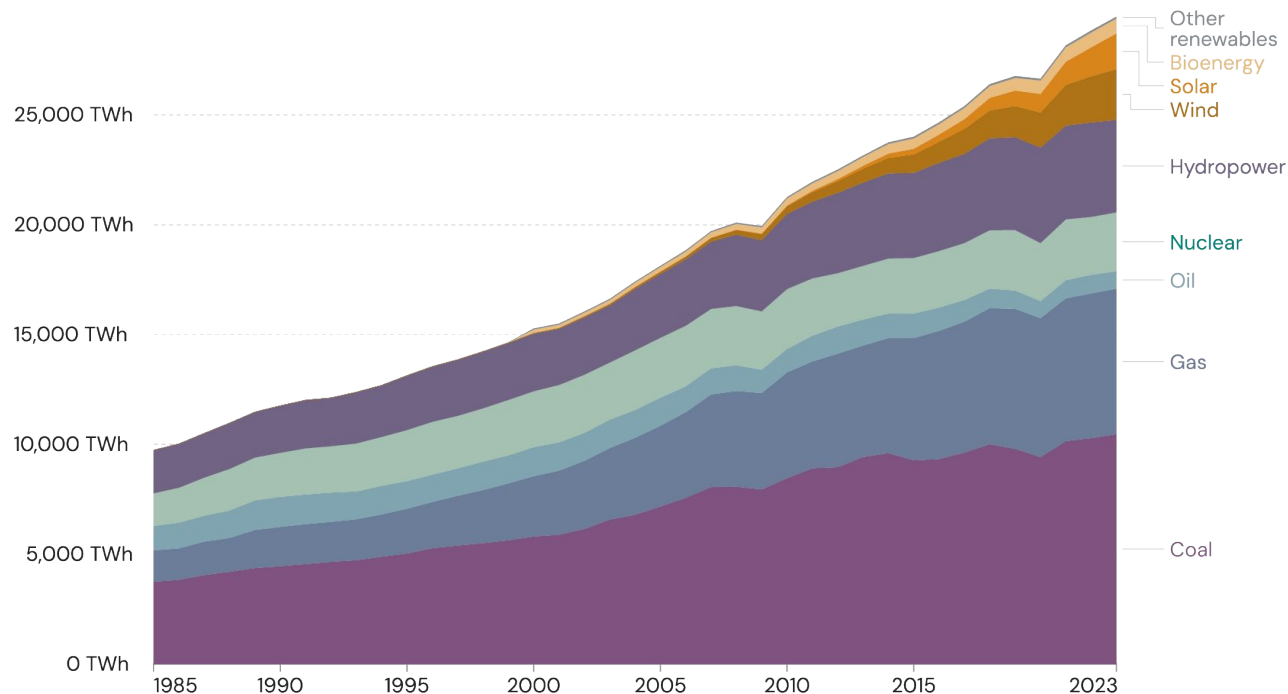
Measured in terawatt-hours

Growth is

~650 TWh/year

= 75 GW

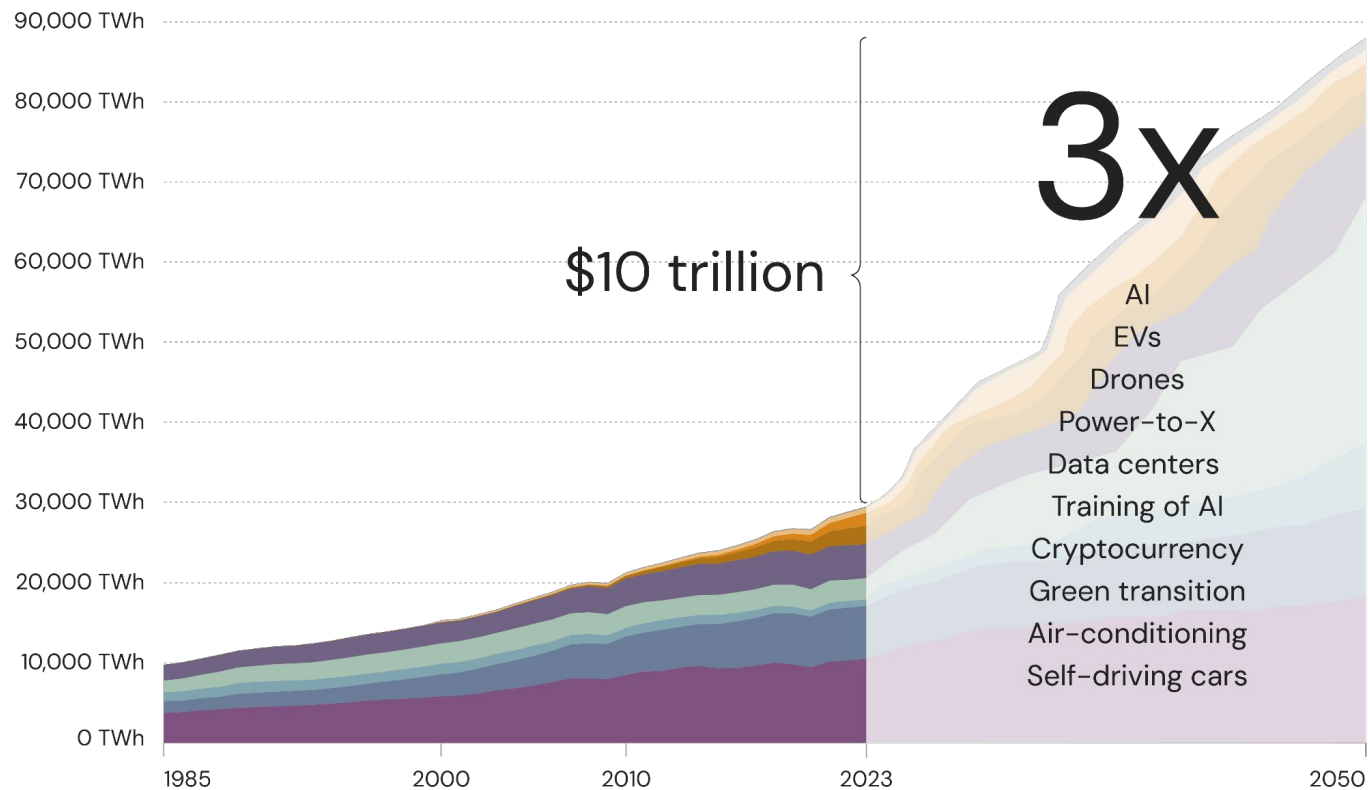
= 5 CA reactors
per day



<https://www.iea.org/reports/electricity-2024/executive-summary>

Electricity production by source, World

Measured in terawatt-hours



Technology

The energy source of the future – A metal from the Periodic Table



Thorium

A single ball of thorium metal can supply you with all the energy you need your entire life.

\$100

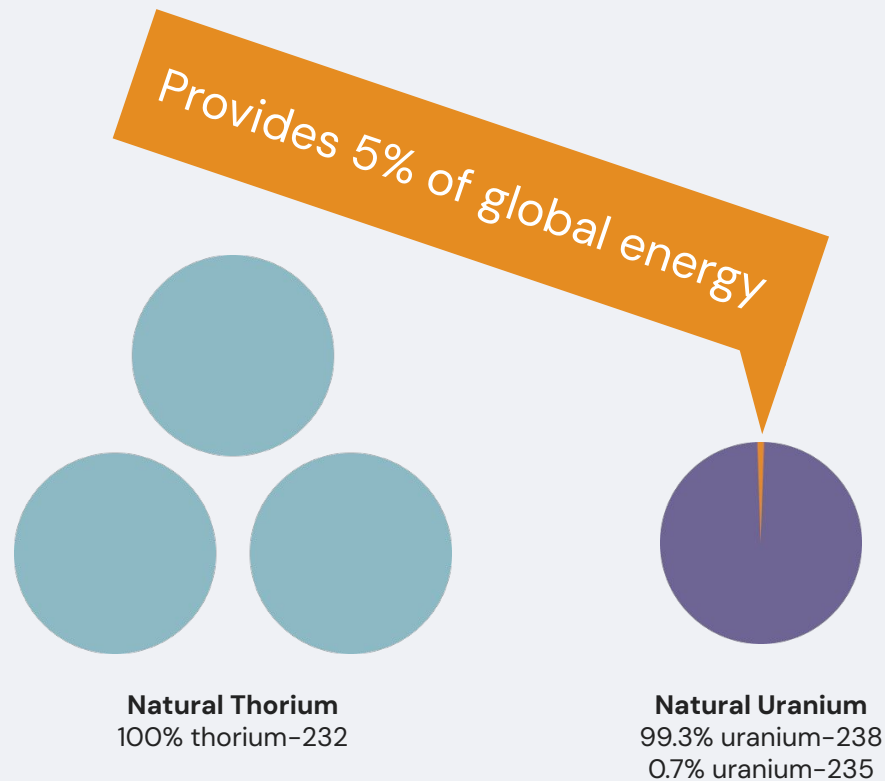


We will never run out

Thorium is more abundant than uranium

Classic nuclear uses U235 and we may run out of it in 200 years time. Therefore it is not considered a renewable energy source.

However thorium can make a breeder reactor and we will run out of materials to build wind and solar before we run out of thorium and the materials needed to build Copenhagen Atomics power plants. Therefore CA reactors are considered über-renewable energy.



100 MW heat = 42 MW electric

\$50M each

The goal

Mass
manufacturing
thorium reactors



Visualisation of a 1 GW power plant



Storage for used reactors

Remote controlled crane

Each tube holds 2x 40 foot containers

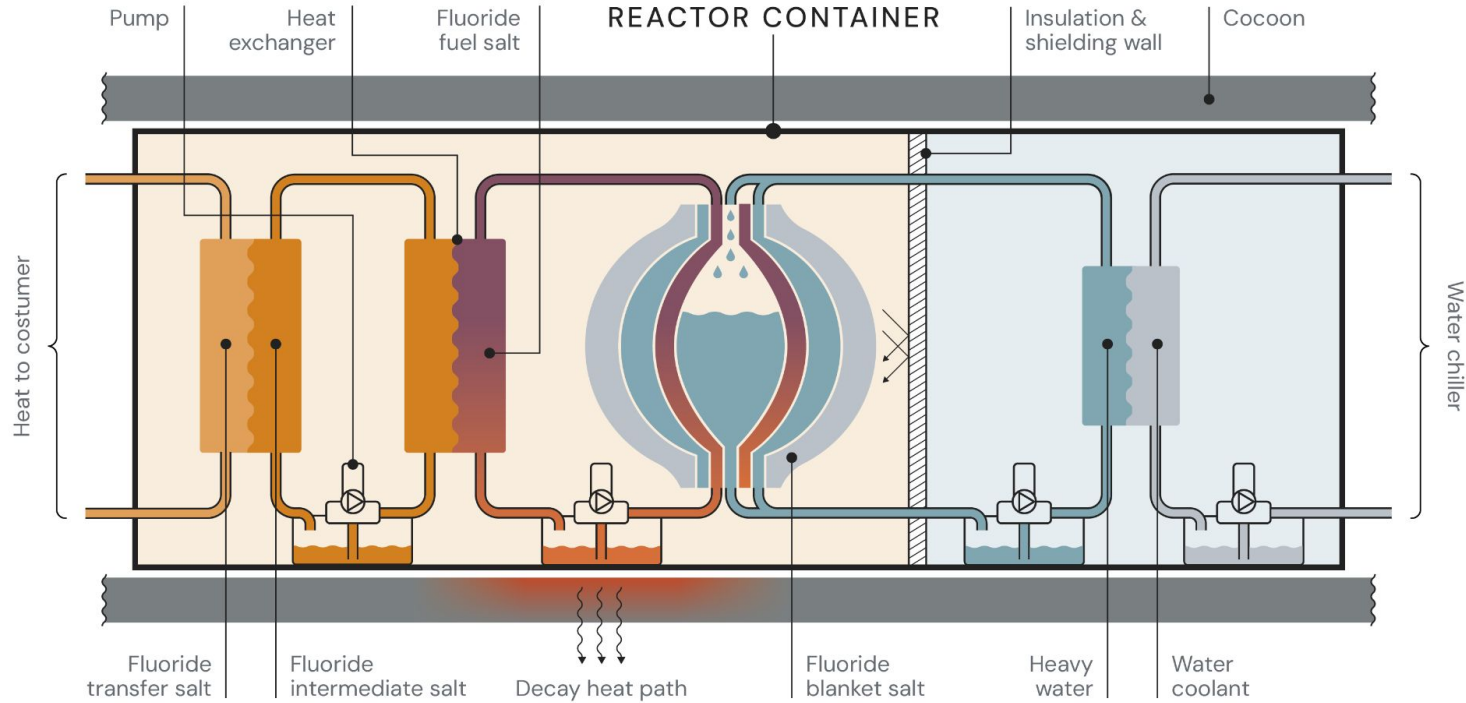
Cooling

Double lock

1x reactor being delivered by truck



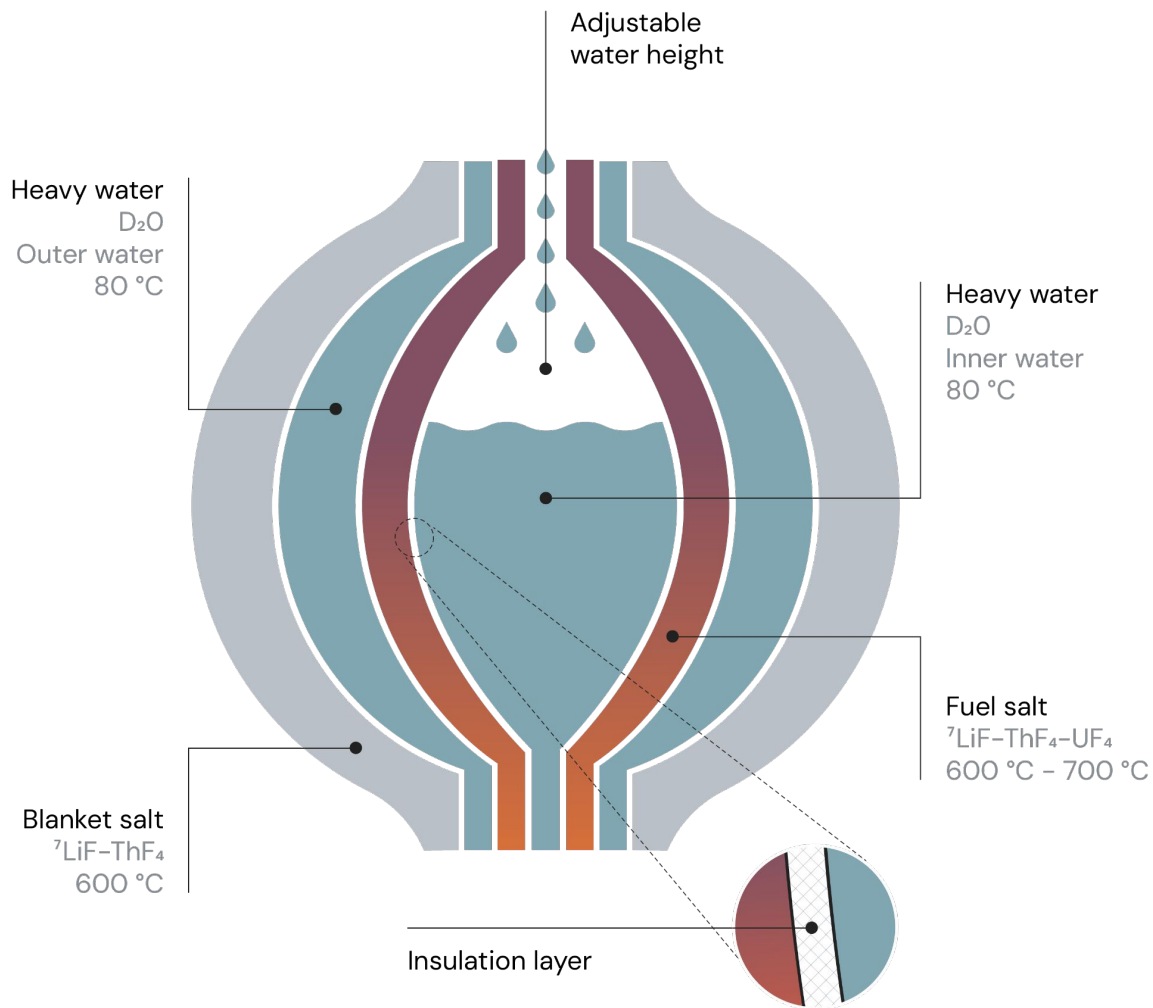
Simplified schematics of reactor container



The Onion Core®

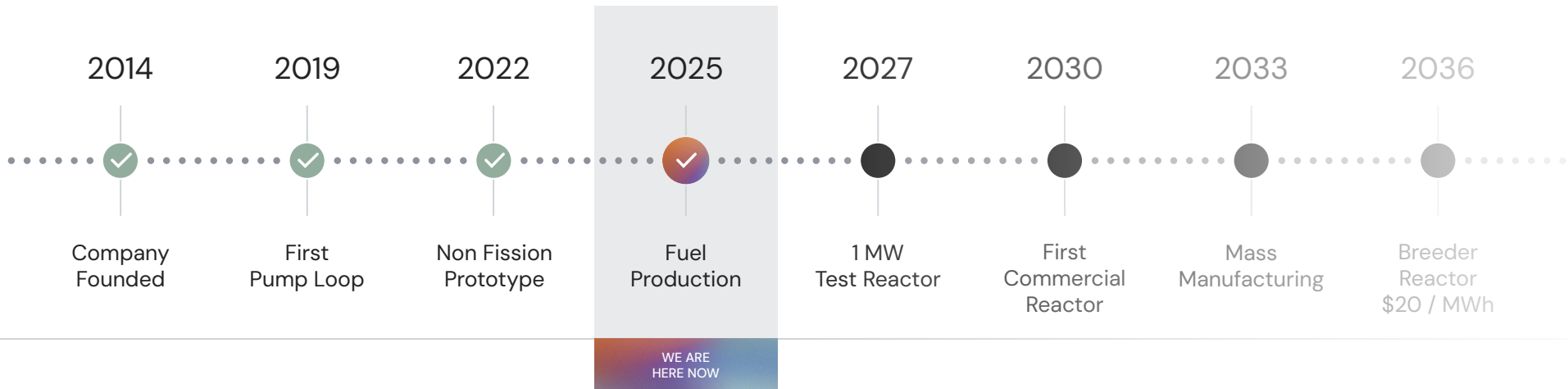
Cross-section view

- Unpressurized room temperature heavy water moderator
- Double barrier and insulation between salt and heavy water
- segments made from metal or composite material
- Below 2% neutron leakage
- Reactivity control using heavy water level adjustment

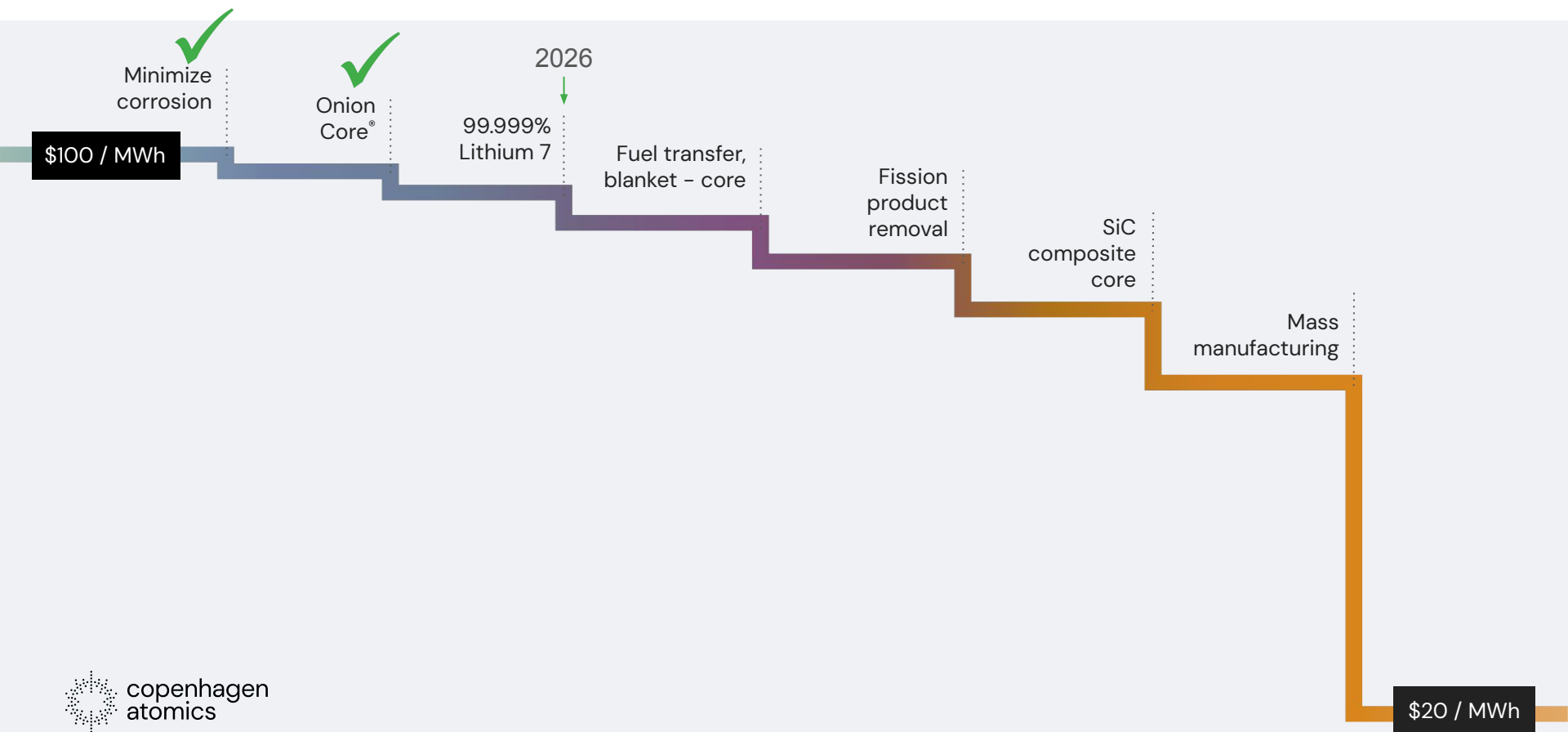


Development timeline

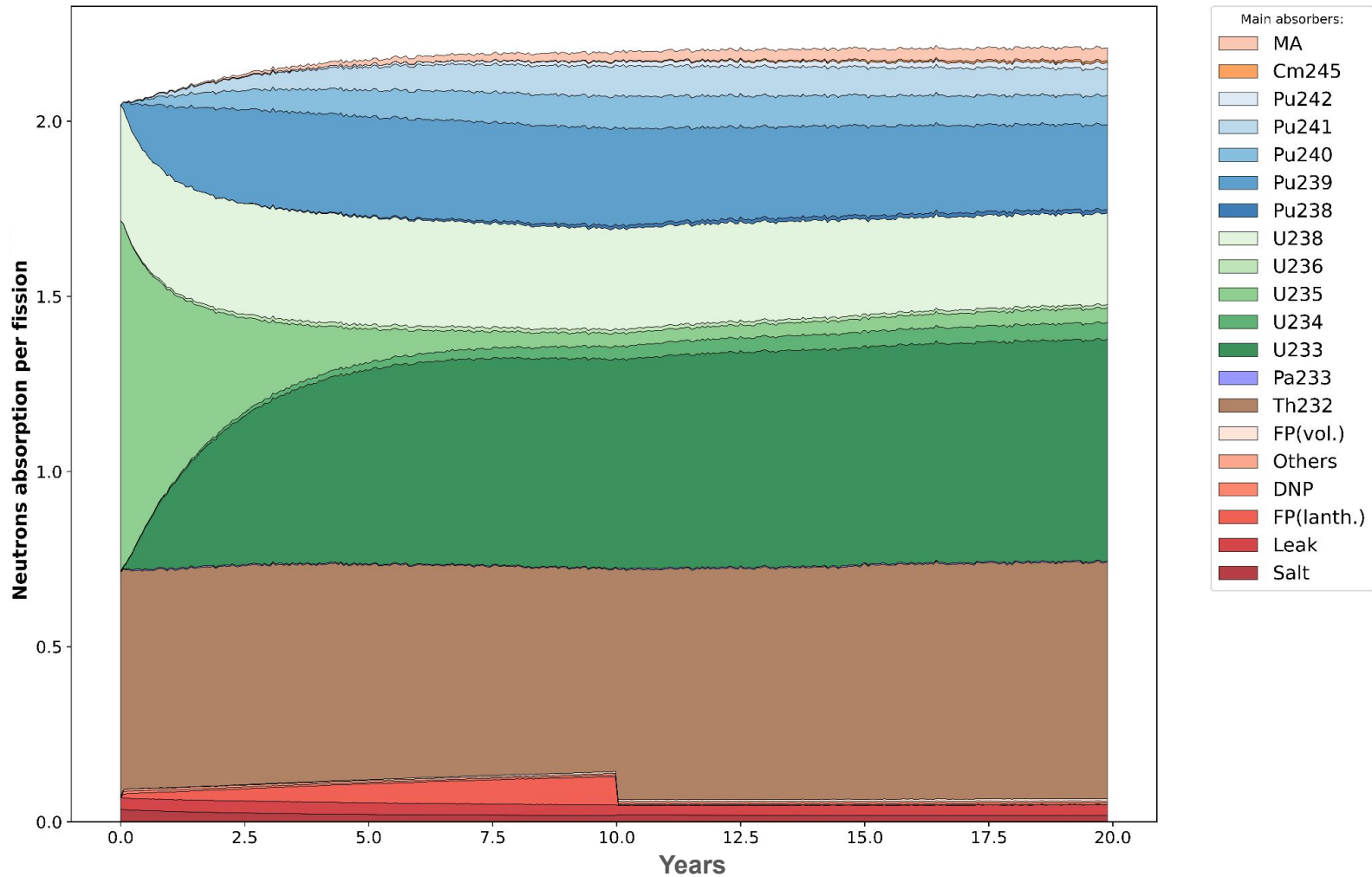
Major milestones



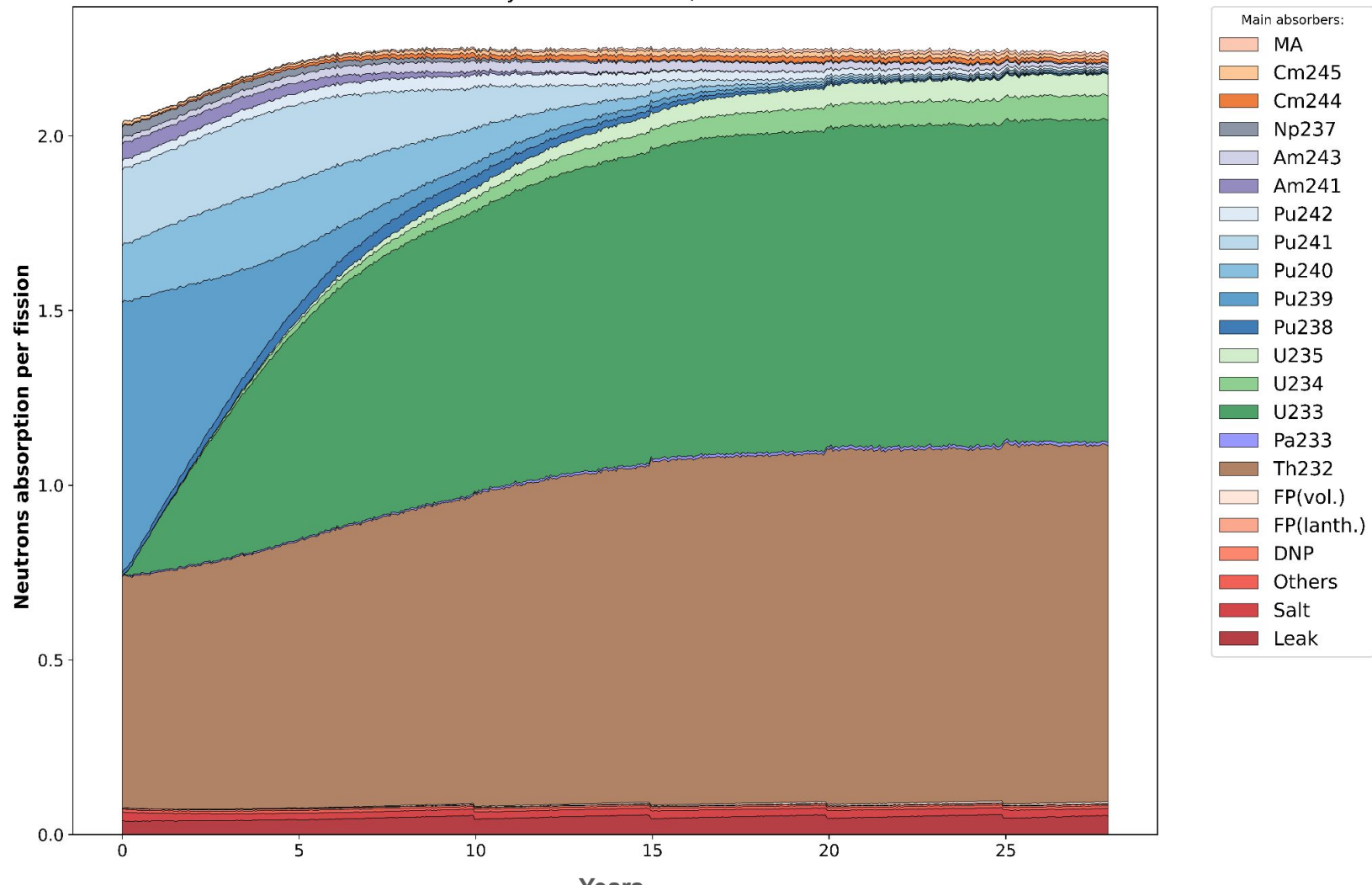
Essential steps towards \$20 / MWh



Neutron economy of CA thorium reactor (first 20 years)

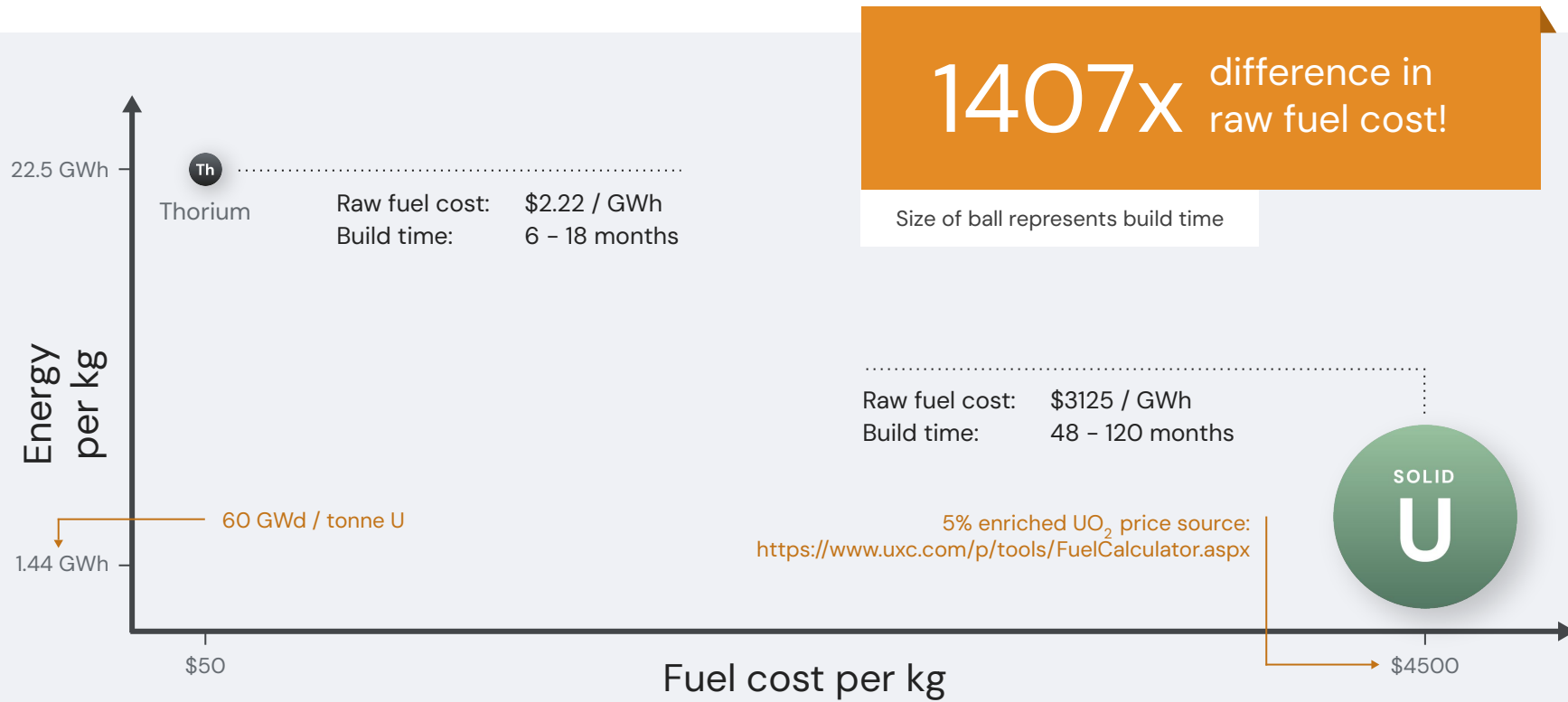


Fuel cycle: FLi-TRUF3-ThF4 / FLi-ThF4

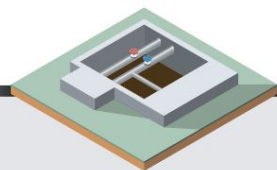
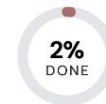
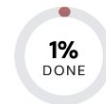
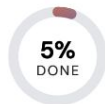
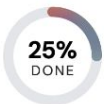


Uranium solid fuel reactors vs CA thorium breeder reactor

Fuel cost, energy per kg & build time

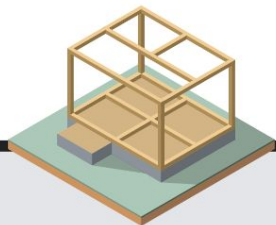


CURRENT STATUS
DECEMBER 2023



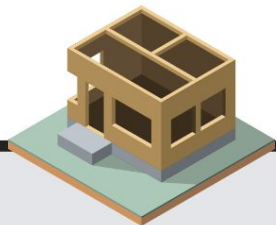
2015-2026

Technology
foundation



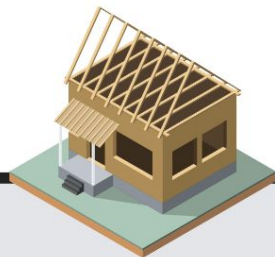
2020-2024

Non-radioactive
prototype
reactor



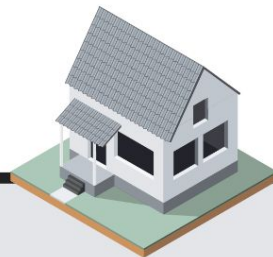
2023-2026

1 MW
Nuclear
Test Reactor



2025-2029

First
commercial
reactor



2029-2035

Assembly line
reactor
production



2032-2035

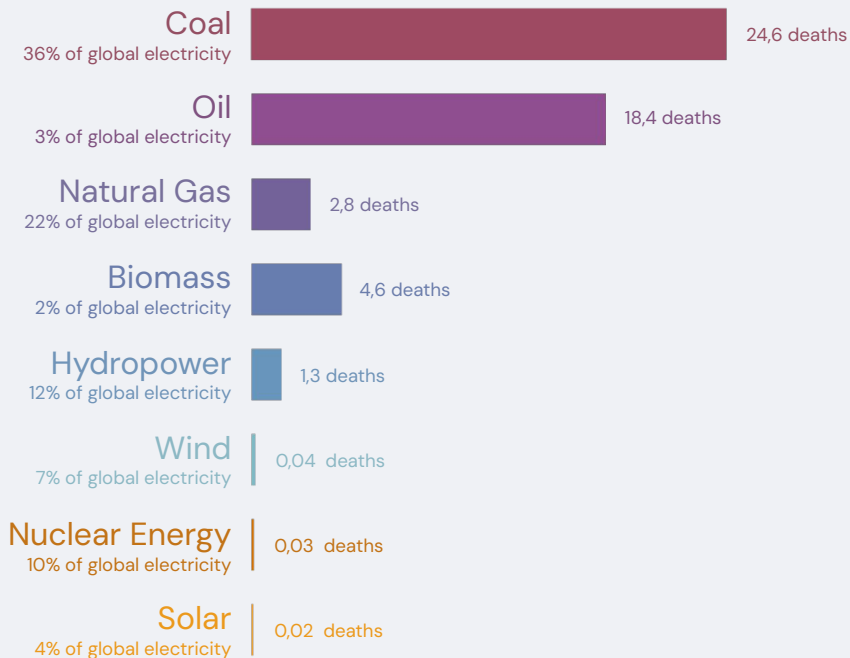
Waster Burner
Breeder Reactor

What are the safest energy sources?

Measured as deaths per terawatt-hour of electricity production.

1 terawatt-hour is the annual electricity consumption of 150.000 people in the EU.

Death rate from accidents and air pollution

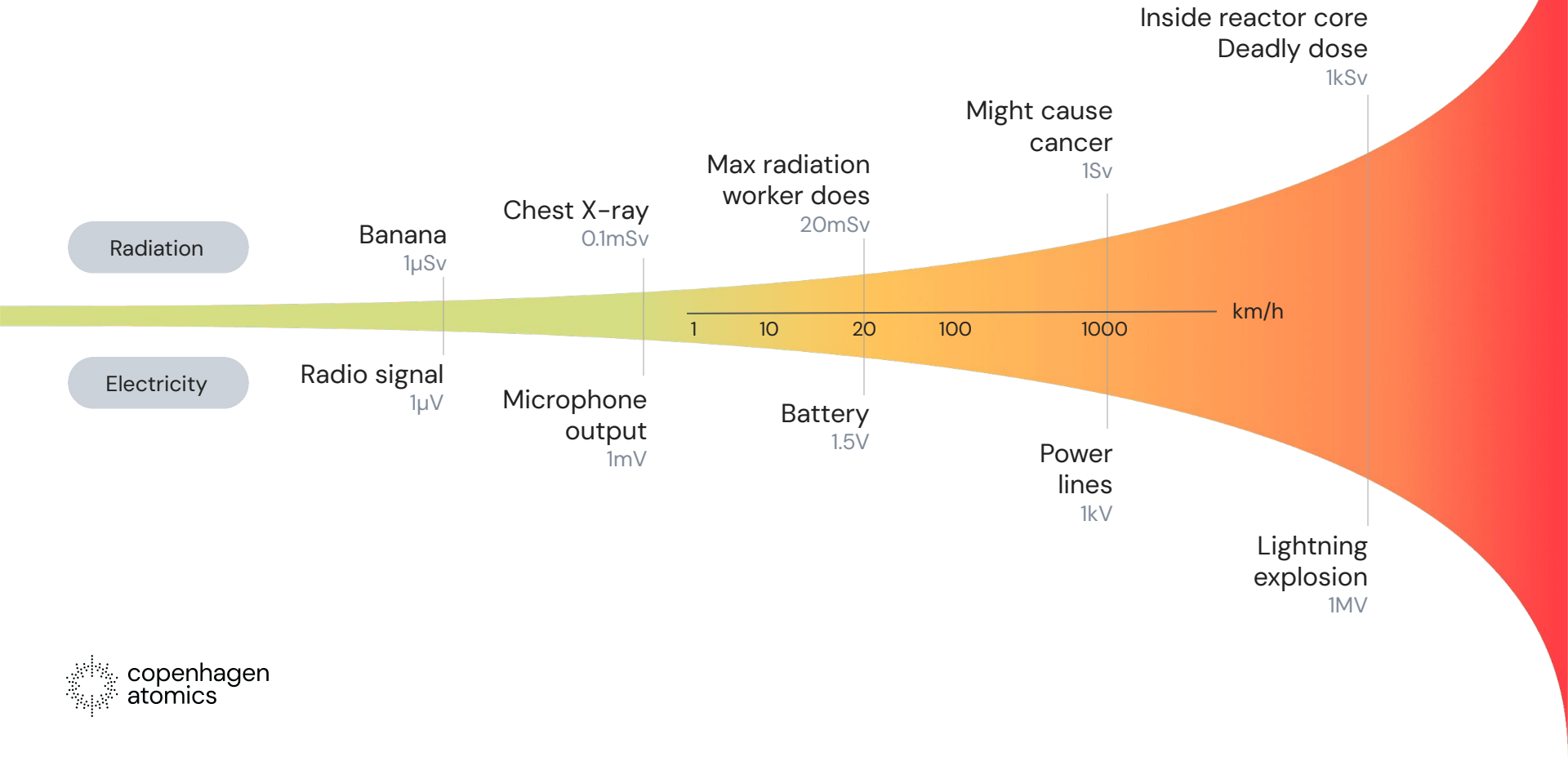


● 1230 times higher than solar.

● Incl. Deaths from Chernobyl & Fukushima.

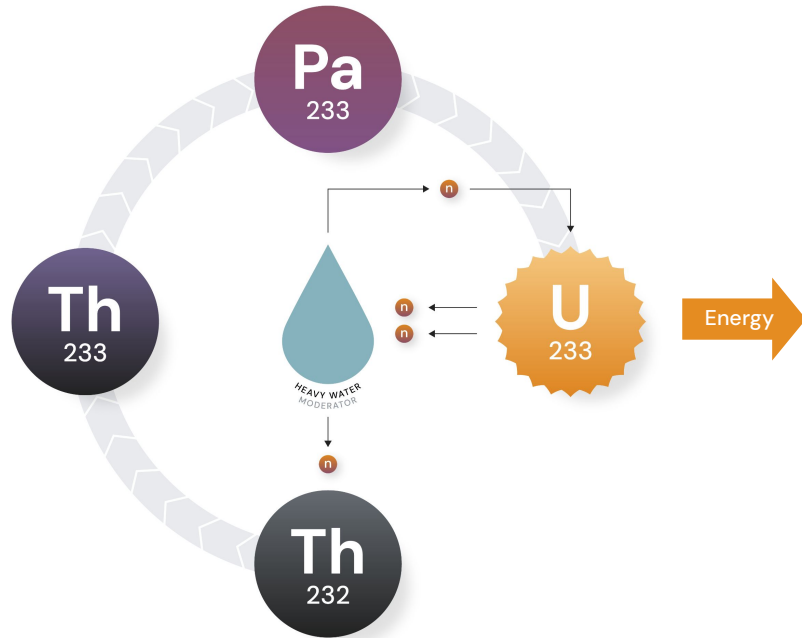
Understanding radiation

Compared to electricity



Thorium

Fuel cycle



1 kg of thorium gives you 22.5 GWh of thermal energy

6 o'clock: Natural thorium will convert to Th-233, when hit by a slow neutron, which then quickly convert, through radioactive decay to Pa-233 at 12 o'clock.

Pa-233 converts to U-233 through radioactive decay with a 30 days half life.

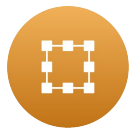
U-233 is not found in nature, but it is the best nuclear fuel you can get.

When you hit U-233 with a slow neutron it fissions with a high probability and give off 2.35 neutrons on average, which make a chain reaction possible.

Copenhagen Atomics will use heavy water as the moderator.



Reactor
Production
Facility



11.000
m²



Copenhagen,
Denmark



65+
Employees



Factory facility
9.000 m²

Office & lab space
2.000 m²

Customers
25

Team size
+65

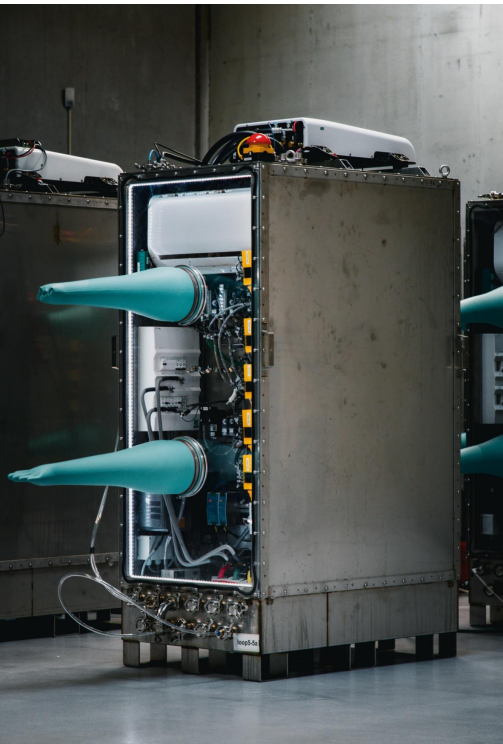
Employees from
12 countries

Sub suppliers
+200

Accumulated component testing
+100 years



Loops



Specs

Pump
Valve
Flow meter
Pressure sensor
Salt leak sensor

1000h warranty

Upcoming

Online salt chemistry
monitoring



Worlds largest molten salt test facility





Thank you

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