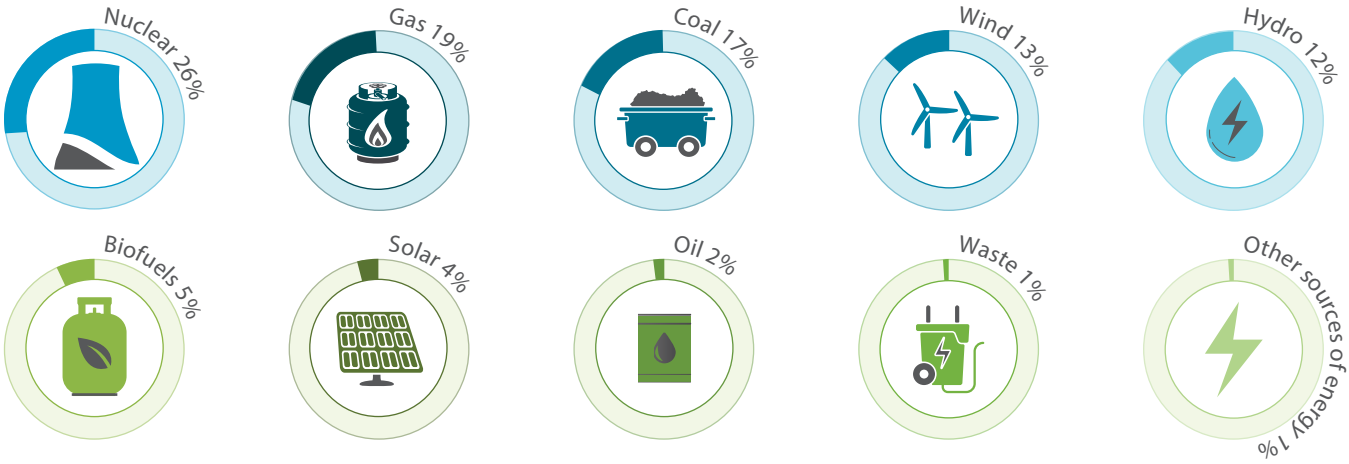
nuclearеurope

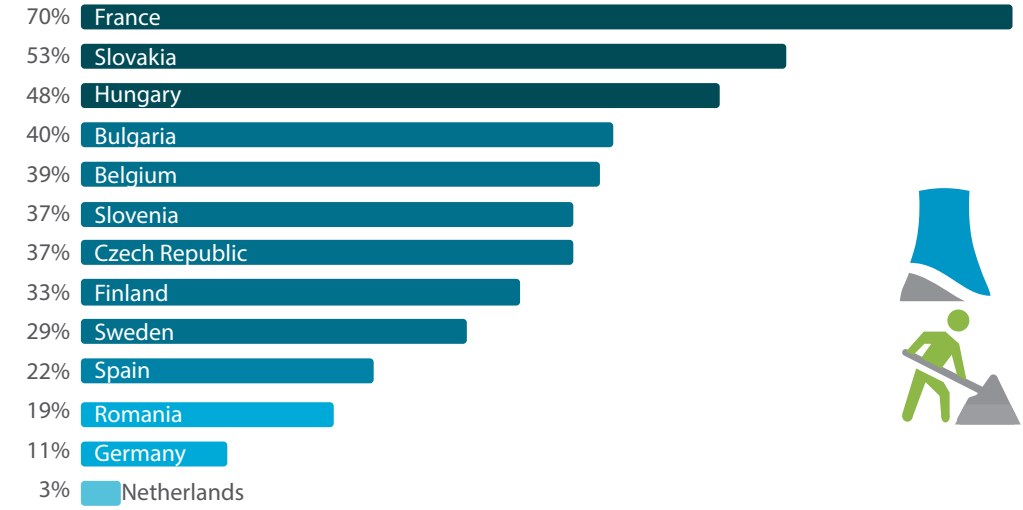
NUCLEAR INDUSTRY IN THE EU

Generates 26 % of the EU's electricity

Electricity generation by technology (% in 2019)



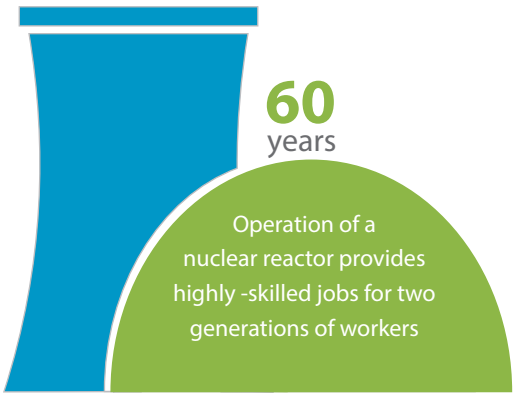
Generates electricity in 13 countries



Over **15** nuclear reactors planned

3 nuclear power plants under construction

Creating jobs that drive employment and prosperity



The European nuclear industry supports

1 million jobs

The construction of one new reactor (EPR) in the EU generates up to

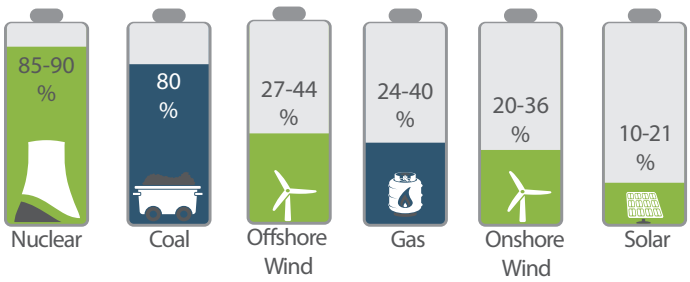
10,000

jobs in total

COMPETITIVENESS OF NUCLEAR ENERGY

Providing reliable energy...

Energy performance*



*% of rated capacity factor

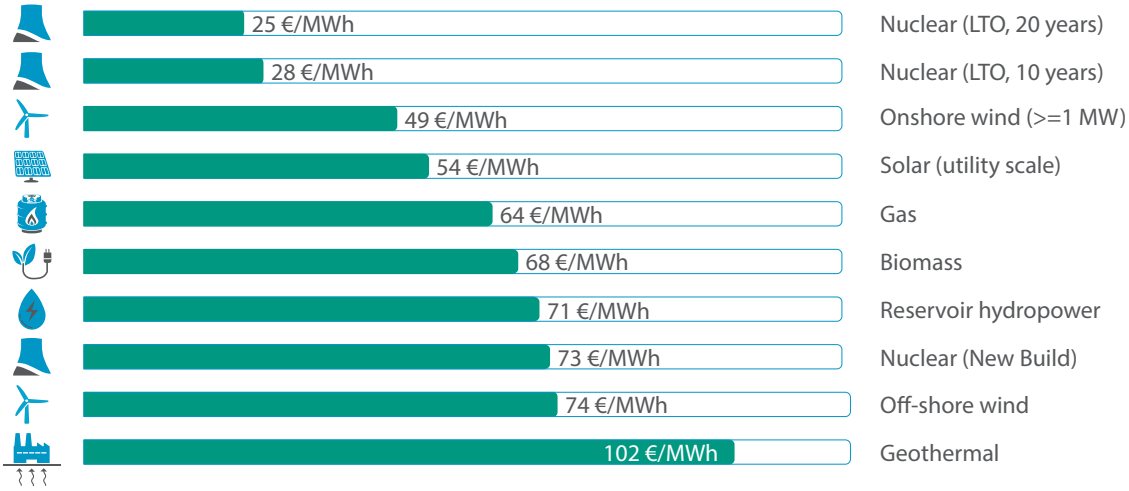
Nuclear produces electricity at full power

85 to > 90%

of the time thus enhancing security of supply

...at prices you can afford

Comparison of median LCOE (levelized cost of electricity) for different technologies in Europe (7% discount rate)*



*LCOE metrics are not sufficient to characterize the competitiveness of different power generating technologies. A comparison should include system costs, i.e. networks and flexibility costs in addition to the sole production costs.

Contributing to the EU's economy

€94 bn
Direct impact

€357.4 bn
Indirect impact

€451.4 bn
GDP generated by the nuclear sector in the EU

1 GW of installed nuclear capacity generates...

- €4 bn in EU GDP
- Nearly 10,000 jobs in the EU economy
- €3 bn annual household income in the EU
- Nearly €1 bn annual public revenues in the EU
- €9 bn annual investment throughout the EU
- €0.15 bn annual EU trade surplus

SECURITY OF ENERGY SUPPLY

Harnessing abundant natural resources

Identified resources of uranium are sufficient to support continued use and significant growth of nuclear for well over

120 years

New reactor designs and recycling fuel could increase this to

1,000s of years

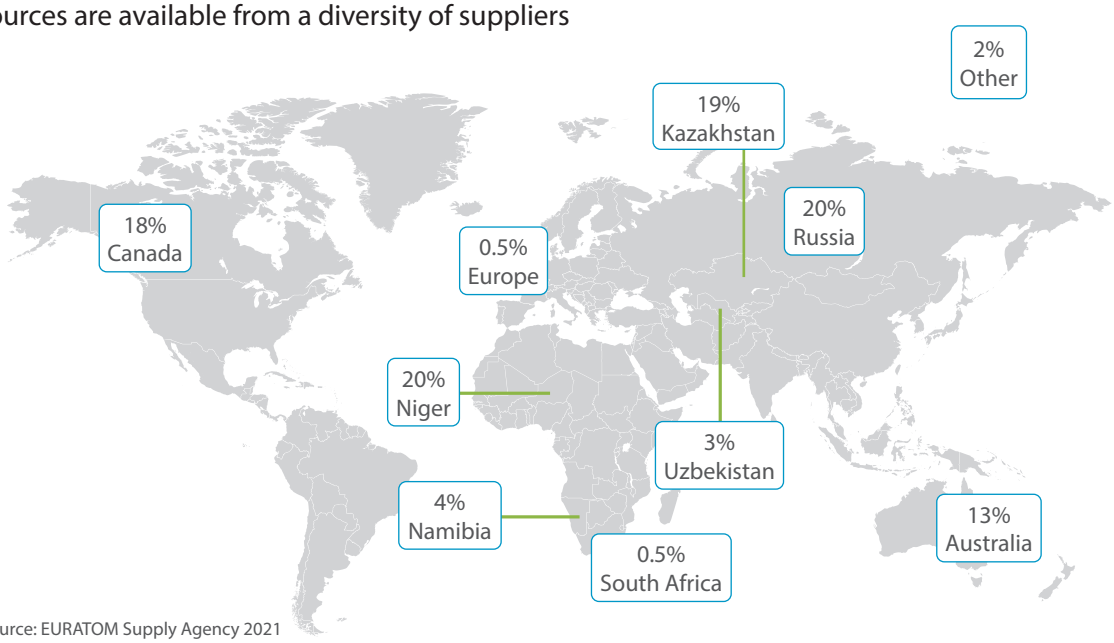
Additional exploitable resources would extend this to well over

300 years

© nucleareurope - Source: *Uranium 2014: Resources, production and demand*, IAEA 2014

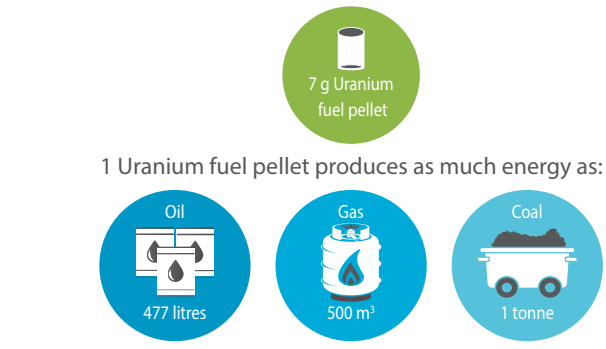
Who supplies uranium to the EU?

Uranium resources are available from a diversity of suppliers



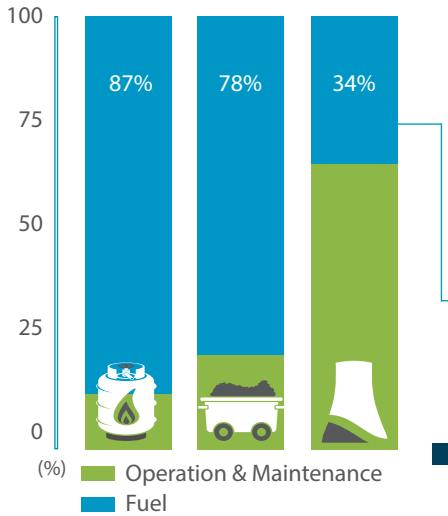
© nucleareurope - Source: EURATOM Supply Agency 2021

Providing an independent source of energy at a stable price

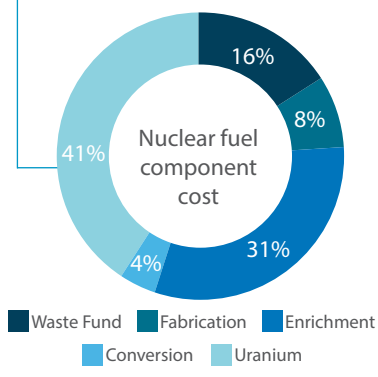


© nucleareurope - Source: American Nuclear Society 2013

Breakdown of operating costs for nuclear, coal and gas generation



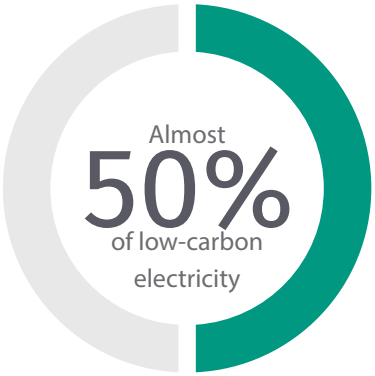
The cost of nuclear power is less vulnerable to fuel price fluctuations

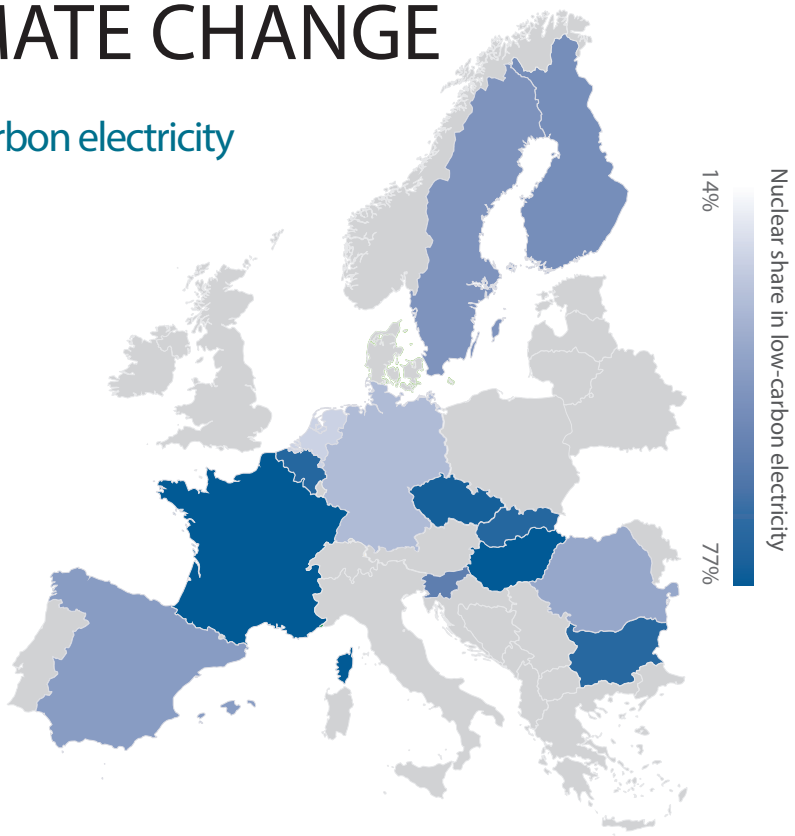


© nucleareurope - Source: World Nuclear Association 2017, Nuclear Energy Institute

NUCLEAR AND CLIMATE CHANGE

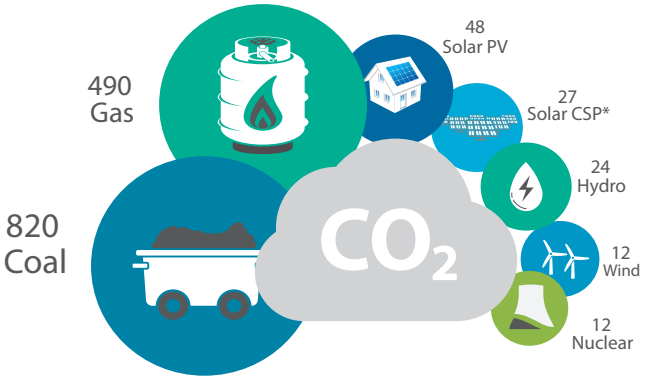
Generating almost half of the EU's low-carbon electricity





Contributing to the fight against climate change by avoiding CO_2, SO_2 and NOx emissions

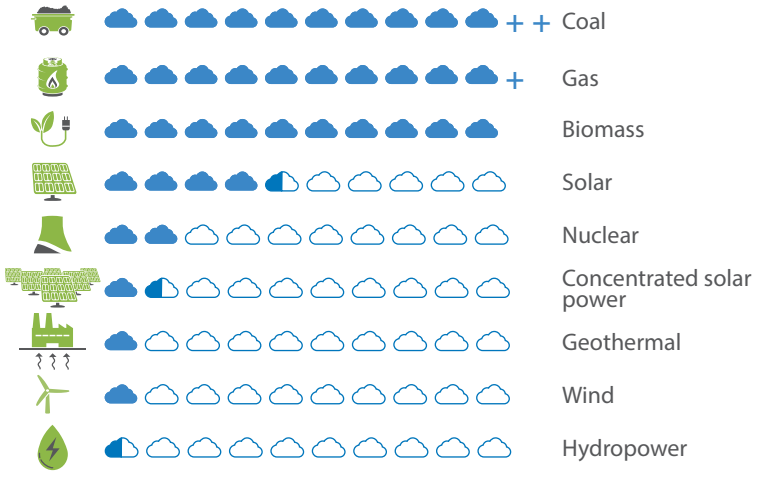
The amount of CO_2 emitted by nuclear energy is comparable to that of renewables.



Comparison of average greenhouse gas emissions (grammes CO_2 eq/kWh)

*Concentrated Solar Power

Average lifecycle SO_2 and NOx emissions of different generation technologies



Hydrogen production

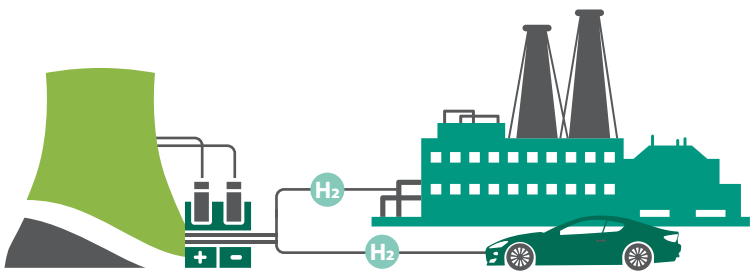
Hydrogen produced from nuclear is:

Low-carbon

Affordable as it can be produced constantly

Available 24/7 as it is not weather dependent

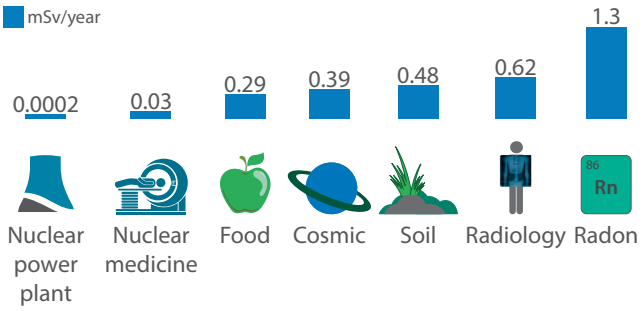
Nuclear-based hydrogen can help hard-to-decarbonise sectors reach their decarbonisation goals



NUCLEAR AND HEALTH

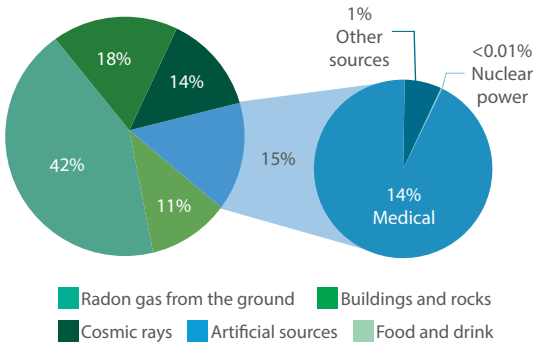
Protecting people from radiation

Average public exposure to radiation by sources*



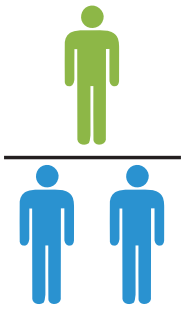
* Rounded estimations of the effective dose to a person in a year (world average)

Background Radiation



Saving people with nuclear medicine

Radiation and radioactive isotopes are used in the diagnosis and treatment of disease



1 person out of **2** will benefit from nuclear medicine during their life

Diagnosis
Chest X-ray, abdominal scan, cardiovascular imaging

Treatment
Nearly half of cancer patients receive nuclear treatment

Radioactive isotope production in the EU

Countries operating isotope production reactors in the EU

6 nuclear research reactors provide about **95%** of the world's Mo-99 or Lu-177 production. **4** of them are in the EU.

The most frequently used radioisotope is Technetium-99m for which the EU is the...

Largest producer (>60% of the global production)

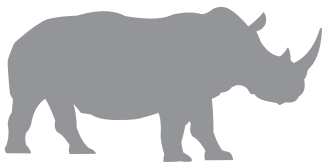
Second largest consumer (20% of global consumption)

RADIOACTIVE NUCLEAR WASTE

Sources of radioactive waste

- Nuclear Power Plants
- Industry
- Hospitals
- Research centres
- Universities etc...

On average, each year one person generates:



1.36 tonnes of total waste

270 kg
Municipal solid waste

54 kg
Hazardous waste

54 g
Radioactive waste

© nucleareurope - Source: OECD/NEA 2015 & The World Bank 'What a Waste 2.0' 2018

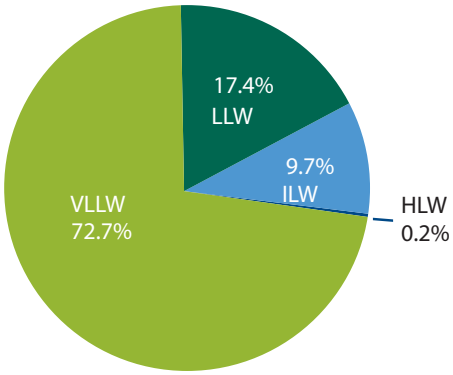
Types of radioactive waste and their distribution per category (2016)

Very low level waste (VLLW)
E.g., concrete

Low level waste (LLW)
E.g., scrap metal

Intermediate level waste (ILW)
E.g., nuclear reactor components

High level waste (HLW)
E.g., by-product of fuel reprocessing

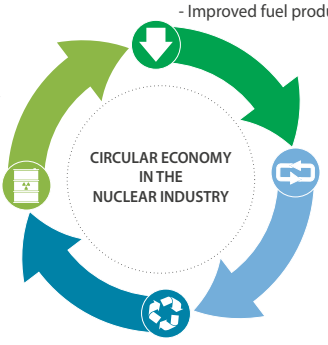


© nucleareurope - Source: 2016, *Report from the Commission to the Council and the European Parliament on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects*

Applying a circular economy approach to radioactive waste

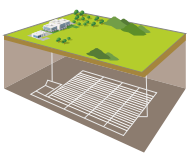
REDUCE
Reduction in the volumes of waste generated thanks to:
- Improved reactor design
- Improved reactor operation
- Improved fuel production

RESIDUAL
Temporary storage:
Some countries use temporary storage in order to enable the future retrieval and reprocessing of the spent fuel



REUSE
Several technologies exist which enable the reuse of spent fuel. This saves up to around 25% of natural uranium resources, cuts final waste volumes by a factor of 5 and its long-term radiotoxicity by a factor of 10

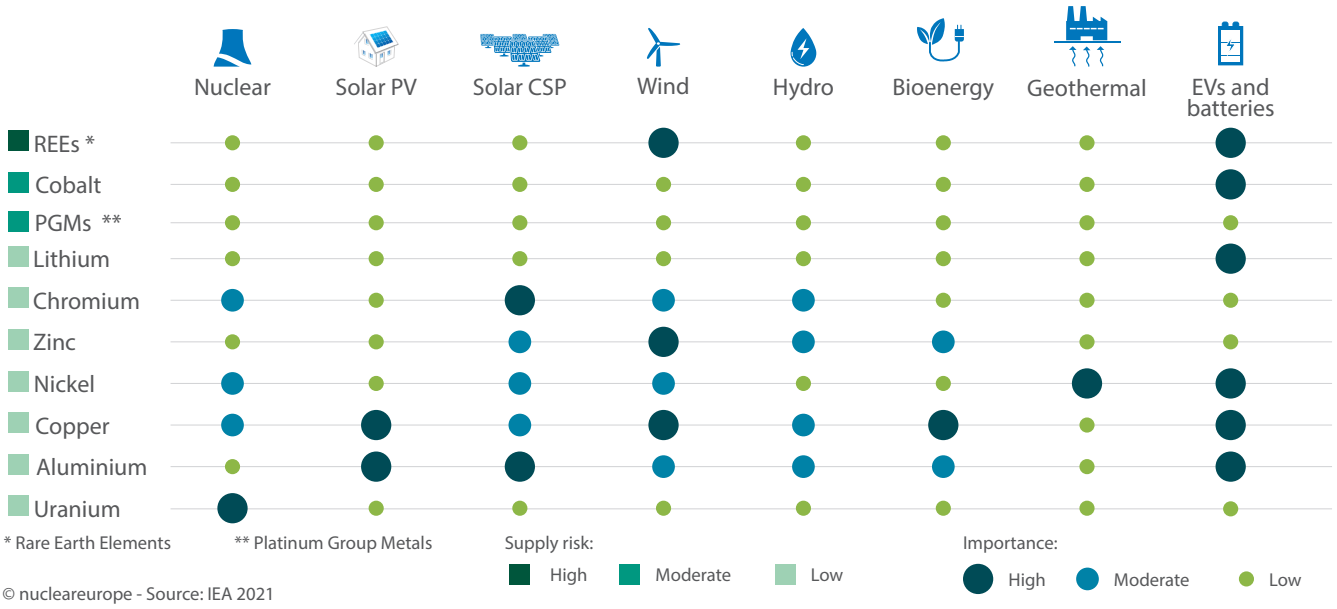
RECYCLE
Construction materials used in nuclear facilities can be fully recycled. Americium and plutonium can be recycled in space, medical and other applications



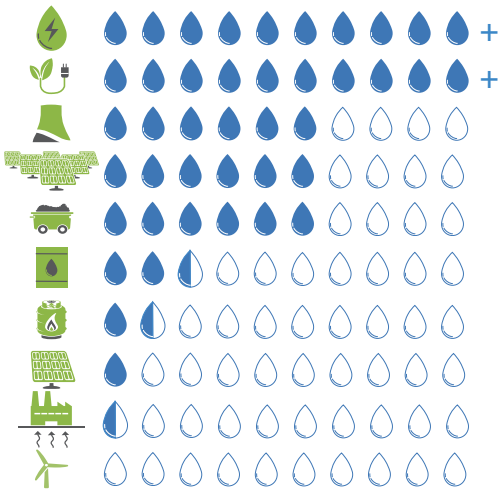
RESIDUAL
Long-term disposal:
The nuclear sector is a leading example when it comes to the long-term disposal of radioactive waste thanks to, for example, the Deep Geological Repositories currently under development.

SUSTAINABILITY OF NUCLEAR

Raw materials use

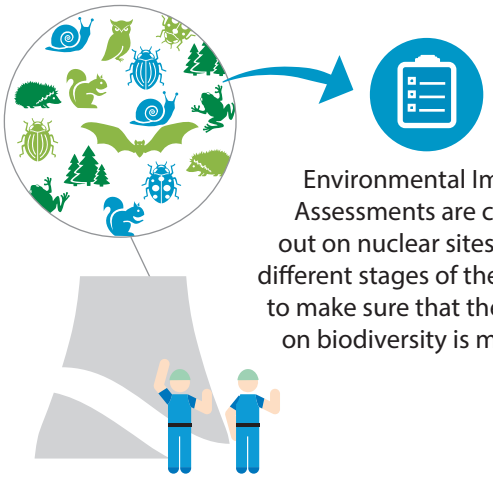


Water use



Issues related to water consumption and potential thermal pollution of nuclear energy must be appropriately handled during the site selection, facility design and plant operation phases.
Issues related to thermal pollution do not affect nuclear power plants located on coasts, that use seawater for cooling.

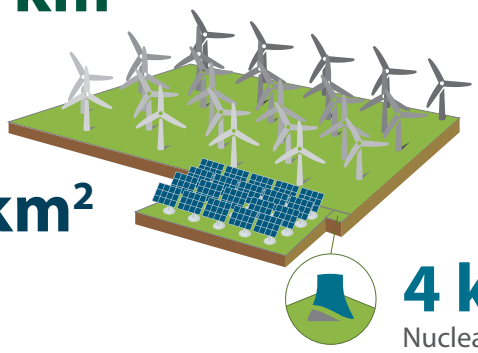
Biodiversity impact and land use



Environmental Impact Assessments are carried out on nuclear sites during different stages of the lifecycle to make sure that the impact on biodiversity is minimal.

Land required by different energy sources to match the amount of electricity produced by a 1,800 MW nuclear power plant.

437 km²
Wind



56 km²
Solar

4 km²
Nuclear

EUROPE-WIDE JOBS MAP

The civil nuclear industry supports around 1,3 million jobs in Europe (EU and FORATOM non-EU members)

17,200 31,000 48,200
BELGIUM

6,300 8,900 15,200
BULGARIA

11,200 18,400 29,600
CZECH REPUBLIC

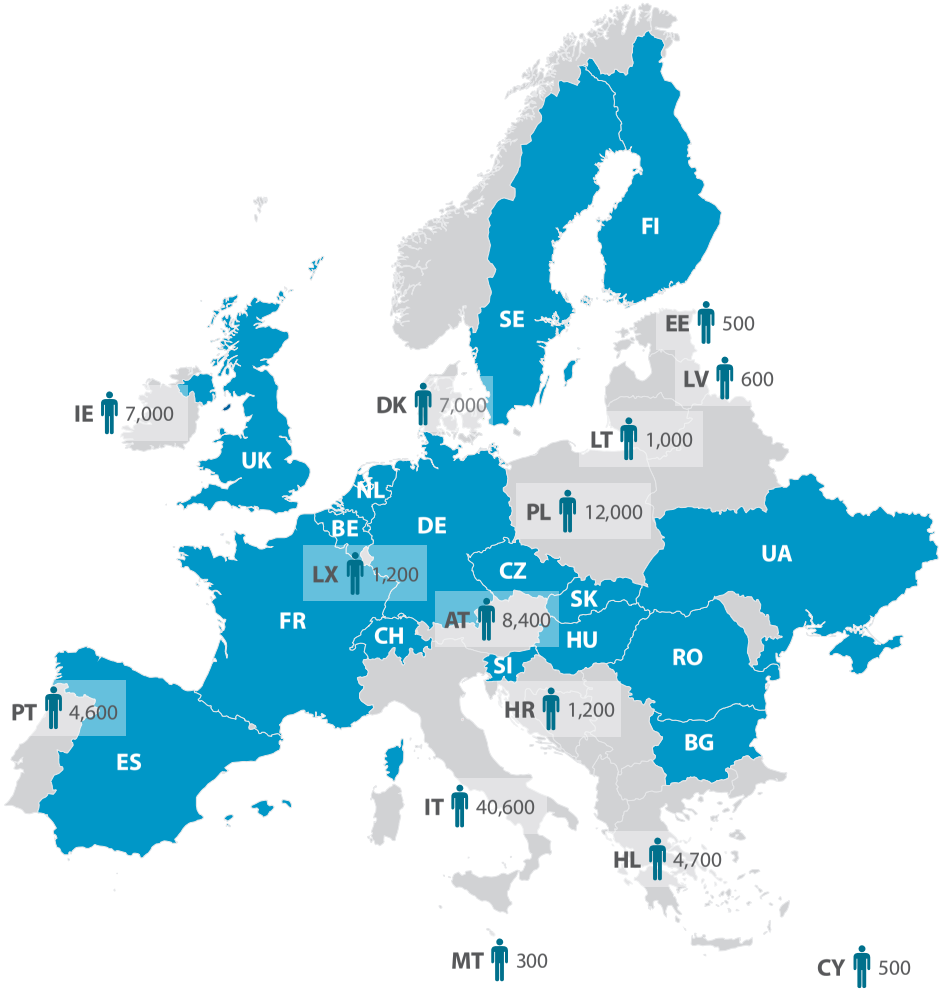
12,500 20,400 32,900
FINLAND

180,100 277,100 457,200
FRANCE

29,400 106,900 136,300
GERMANY

5,400 9,600 15,500
HUNGARY

3,800 8,800 12,600
ROMANIA



2,000 19,000 21,000
THE NETHERLANDS

6,500 10,200 16,700
SLOVAKIA

2,000 3,500 5,000
SLOVENIA

21,200 53,300 74,500
SPAIN

24,100 40,400 64,500
SWEDEN

2,000 4,000 6,500
SWITZERLAND

26,900 84,100 111,000
UNITED KINGDOM

43,700 94,900 138,600
UKRAINE

Countries that operate nuclear reactors

Countries that don't operate nuclear

Direct jobs

Indirect jobs

Total of direct and indirect jobs

Direct jobs

Direct employment in nuclear power plants and the nuclear supply chain

Indirect jobs

Employment deriving from the nuclear industry activities, including both employees in other affiliated economic sectors and additional employment in the economy,resultingfrom expenses of direct employees and employees in other economic sectors.

Source: Deloitte 2019

Countries operating nuclear

394,300 790,500 1,185,300

Europe total (EU and FORATOM non-EU members)

1,274,900

134 Operational nuclear reactors in Europe (EU and FORATOM non-EU members)

Nuclear share of electricity (% in 2020)

70% France
56 reactors - 61 370 MW

53% Slovakia
4 reactors - 1 865 MW

51%Ukraine
15 reactors - 13 107 MW

48% Hungary
4 reactors - 1 916 MW

40% Bulgaria
2 reactors - 2 006 MW

39% Belgium
7 reactors - 5 942 MW

37% Czech Republic
6 reactors - 3 934 MW

37% Slovenia
1 reactor - 688 MW

33% Finland
5 reactors - 4 394 MW

32% Switzerland
4 reactors - 2 960 MW

29% Sweden
6 reactors - 6 885 MW

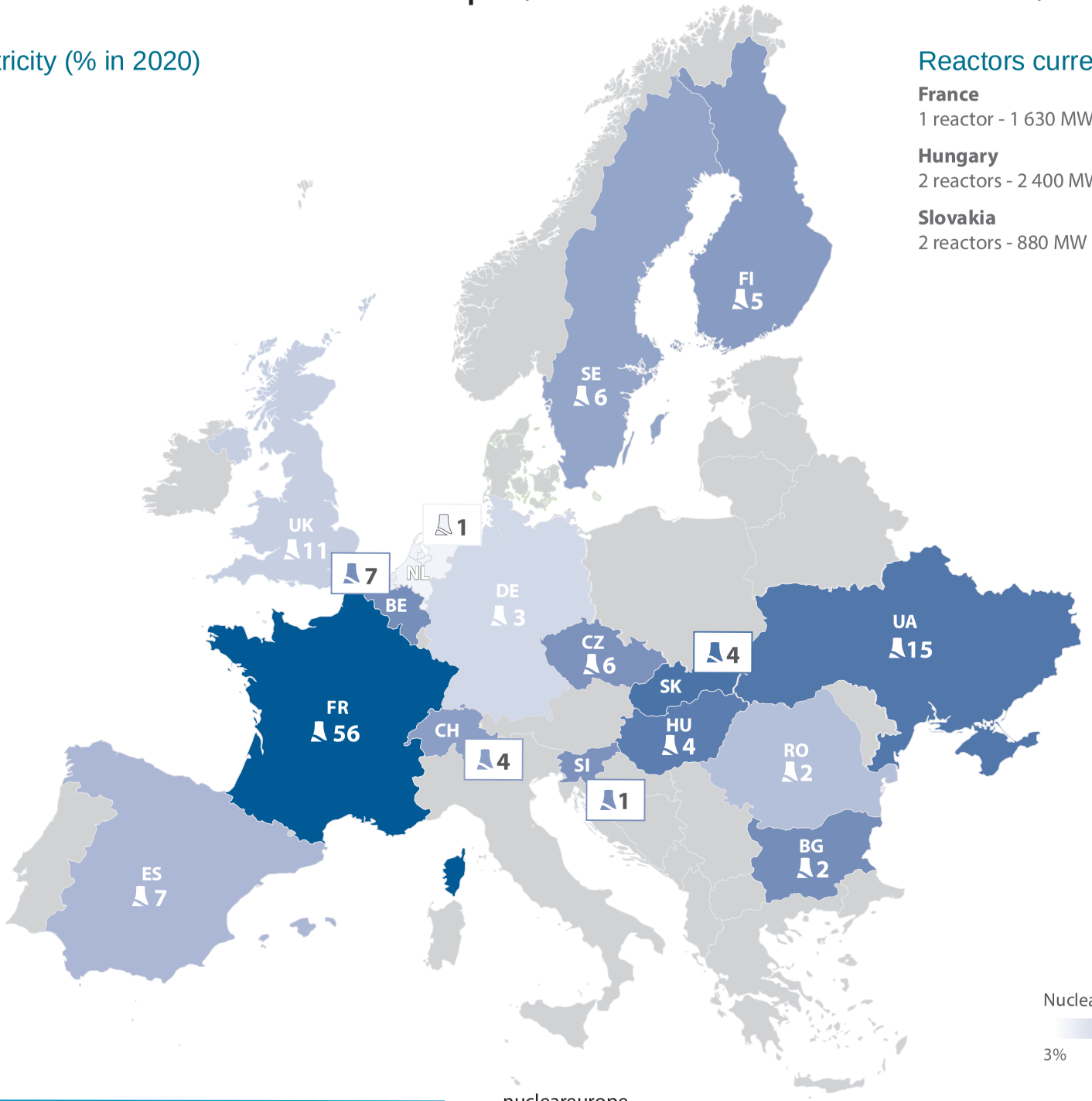
22% Spain
7 reactors - 7 121 MW

19% Romania
2 reactors - 1 300 MW

14% UK
11 reactors - 6 848 MW

11% Germany
3 reactors - 4 055 MW

3% Netherlands
1 reactor - 485 MW



Reactors currently under construction

France
1 reactor - 1 630 MW

Hungary
2 reactors - 2 400 MW

Slovakia
2 reactors - 880 MW

UK
2 reactors - 3 260 MW

Ukraine
2 reactors - 2 070 MW

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