DECOMMISSIONING

Three EU countries push forward with nuclear phaseout

Some European governments have been sceptical, or outright hostile, towards nuclear energy for decades. Now the countries which are doing away with their fission power plants are reckoning with the tricky issue of decommissioning, write *Liz Newmark*, in Brussels; *Jens Kastner*, in Hamburg; and *Brenda Dionisi* in Milan.

Belgium's Doel nuclear power plant near Antwerp is slated for closure – with nuclear going the way of old-style windmills as an energy source in this low country kingdom

Photo: Trougnouf

Though investment into nuclear energy continues – especially in emerging markets such as China – the sector is shrinking in Europe, with some key countries pursuing plans to phase out atomic power altogether. In January 2003, Belgium's lawmakers agreed to stop any nuclear energy production within the country by 2025. Its seven existing reactors, all of which were opened between 1974 and 1985, are scheduled for decommissioning in the coming years as the country moves ahead with a '100% renewable' energy strategy.

The federal government of Prime Minister Alexander De Croo, (a broad coalition of greens, liberals, Christian Democrats and socialists), has said it will stick to the 2025 phaseout deadline. However, De Croo himself has told journalists he is still 'open to the idea' of longer-term operations, should security of supply be a problem post-2025. A government report on the issue is scheduled for publication this November.

Any delay would, unsurprisingly, be of concern to the two green parties in the coalition – the Ecolo and Groen parties. Samuel Cogolati, an Ecolo Parliamentary Deputy, tells *Energy World*: 'Five out of the seven reactors will have to close by 2025 in any case because they are too old and no longer safe.'

Belgium decommissioning

Jean-Pierre Clamadieu, President of French utility Engie, parent company of Belgium's electricity provider Electrabel, said last November that prolonging the lives of the plants for 10 or even 20 years would cost up to €1bn given the equipment investment and regulatory compliance requirements. Moreover, he said the firm had not received government guidance on whether to start financing a potential extension of operations.

Hostility from some politicians and environmentalists means that utilities are reluctant to even plan for a possible extension of nuclear operations, according to Paul Bossens, the President of pro-nuclear group 100TWh. Paris-based nuclear energy consultant Mycle Schneider, who opposes nuclear power, argues: 'Engie/Electrabel made it very clear that they are not interested in further lifetime extensions. Also, it is now technically too late to do upgrading work necessary for operation beyond 2025.'

In Schneider's view, a change of government, even if the greens left the ruling coalition, would not make much difference: 'Any new government would have to pass a law in parliament to change [the 2025 phaseout]. However, if the operator does not wish any lifetime extensions, it is unrealistic to imagine any government forcing an operator into it.'

According to an Engie Belgium spokesperson, Electrabel is already preparing for the decommissioning of all its nuclear power plants, starting with Doel 3 and Tihange 2, in October 2022 and February 2023, respectively. The funds earmarked by the company for work amount to €13.8bn as of the end of last year. Of this total sum, €6.1bn has been reserved for the decommissioning and dismantling of the power plants themselves, and €7.7bn will go toward the final disposal of spent nuclear fuel.

For the current government, the nuclear exit is not an end in itself, but a way of reaching its goal of developing more renewables and delivering a flexible, controllable energy supply. 'Electricity prices will not rise as a result of plant closures – for consumers, families or businesses,' Cogolati says. 'This is a solemn engagement of the federal government.'

Cogolati tells *Energy World* that around €200mn per year from 2025 will be invested in developing 3.6 GW in additional generating capacity from all energy sources, compared with the €1.6bn needed 'for just extending the plants for 10 years for 2 GW of nuclear.'

Replacing lost capacity

Indeed, Belgium is already investing in alternative power production to replace the 6 GW of energy capacity represented by the country's nuclear plants. For the time being, this replacement capacity will have to include fossil fuels, with national grid operator Elia saying the nuclear phaseout from 2022 to 2025 will require new gas-powered plants, as well as a significant growth in renewables and imported electricity.

'The precise volume of replacement capacity has not yet been decided,' says an Engie Belgium spokesperson. 'But a

The Swiss government is executing a slow phaseout of its nuclear power stations, including the Leibstadt plant on the River Rhine, at Aargau
Photo: Verpacker

previous Elia study concluded 3.9 GW of new capacity would be needed.'

Belgium also plans to introduce a capacity remuneration mechanism (CRM). A first auction of energy projects is scheduled for November to ensure replacement capacity will be available by 2025. The government says the CRM is technology-neutral, so it can involve projects delivering gas or biomass-fired power plants, battery storage or any type of renewable energy.

However, Matthias Meersschaert, spokesperson for the Belgian Nuclear Forum, says the CRM is only officially technology neutral, as Belgian nuclear capacity is excluded: 'In practice it is expected that fossil-fuelled capacity will replace the current nuclear fleet,' he says, warning of the expected increase in greenhouse gas emissions.

Meersschaert said the decision to close nuclear operations after 40 years was a political not a technical one. The greens were needed to form a coalition government in 1999, and their condition for doing so was a commitment to end nuclear. He says the government could technically prolong nuclear plants' lifetimes if it wanted to.

'Extending operations is common worldwide – with extensions of 40 to 60 years in the Netherlands and Switzerland, and the US even considering 80,' Meersschaert says. Based on research from UK think-tank Ember, he believes that the scheduled nuclear phaseout would make Belgium the only EU country where carbon dioxide emissions from electricity production will increase – and dramatically – after 2025.

Public opinion towards nuclear has also shifted, Bossens maintains. A January 2021 poll for Belgian TV and radio network RTL revealed roughly half the population opposes a nuclear phaseout, with only 25% in favour. 'It's a complete turnaround. Nuclear is no longer seen as dirty and dangerous,' Bossens says. 'The population now says we need nuclear to meet our climate goals.'

By 2030, half of Belgium's electricity will be generated by renewables under any energy scenario, Meersschaert says: 'Keeping nuclear open after 2025 is no barrier to the deployment of renewable energy in Belgium'.

The end of German nuclear

Germany's nuclear phaseout, however, remains solidly on track, with no one doubting that the country's last nuclear power plant will be shut down by the end of 2022. The federal elections in September are expected to see a strong showing by the greens, making any u-turn on nuclear policy highly unlikely.

The unprecedented effort of decommissioning the 17 reactors that once contributed 22% of Germany's electricity mix began in 2011 after the political leadership in Berlin reacted to Japan's Fukushima disaster that year by ordering a nuclear phaseout.

Energy World spoke with PreussenElektra, a utility that is currently dismantling five reactors (Isar 1, Grafenrheinfeld, Stade, Unterweser and Würgassen), with three others (Grohnde, Brokdorf and Isar 2) still running. Production at Grohnde and Brokdorf will end by this December, whereas Isar 2 will be shut at the end of 2022.

There's little doubt that this phaseout process will reduce German electricity production in the short term. On 7 February, Grohnde broke the world record by passing the mark of 400 TWh of electricity generated by one plant in its lifespan, claims PreussenElektra.

'From the experiences we gained through the dismantling of Stade, Unterweser and Würgassen, we are very confident that the remaining work will go ahead smoothly,' says Almut Zyweck, a PreussenElektra spokesperson. 'One key takeaway is that it is best to begin with tackling the difficult steps by first dismantling the pressure containers and the equipment in the cooling pools.'

Zyweck added that the increasingly tense discussions around climate change leave no mark on PreussenElektra's phaseout plans, with the company remaining totally focused on the dismantling effort. Led by chancellor Angela Merkel's Christian Democratic Union (CDU), Germany's coalition government is committed to making renewables account for 60% of the mix by 2030. It plans to achieve this by doubling photovoltaic capacity and making land-based wind turbines increase output by one-third. The country's last coal power plants are scheduled to be taken offline by 2038.

In 2019 and 2020, Germany's nuclear plant operators transferred their responsibilities for interim and end-storage to the state-owned Gesellschaft für Zwischenlagerung (BGZ) and Bundesgesellschaft für Endlagerung (BGE) respectively. BGE is tasked with finding an end storage location for the country's nuclear waste by 2031.

'This regulatory change means we are responsible for the

packaging of radioactive waste, and we have not yet recorded any bottlenecks in passing on the waste to BGZ,' Zyweck said.

Slower Swiss approach

Nuclear phaseout is also on track, albeit along a less-stringent timeline, in Switzerland, where four nuclear power plants currently generate up to 36% of the country's electricity. The government decided in 2011 – following the Fukushima accident – not to replace any reactors, saying all plants would be closed by 2050. However, there is no final formal deadline. At that time, Bern halted the permit process for the planned construction of three new nuclear power plants.

The decommissioning timetable is progressing in a typically pragmatic Swiss fashion. In December 2019, the Mühleberg plant, located 15 km from the Swiss capital, was closed after 47 years in operation by energy company BKW Group. The date of the shutdown reflected commercial considerations: the necessary safety measures and upgrades would have been too expensive and BKW opted to decommission. The dismantling will cost €865mn and waste disposal will cost $1.4bn. Decommissioning began in January 2020 and will take 15 years to complete.

The country's remaining atomic power plants include its largest, Beznau, which has two reactors that generate some 6,000 GWh of electricity per year. While there are reports that the reactors could close by 2029, the operator insists that it has the right to continue generating energy as long as it is safe and economically possible to do so.

The same applies to Switzerland's third and fourth operating nuclear power plants – the 9,600 GWh Leibstadt, and the 8,000 GWh Gösgen – which have been projected to remain in operation until 2045 and 2040, respectively. However, no firm closure dates have been set.

Under an Energy Strategy 2050 endorsed by Swiss voters in a 2016 referendum, these plants' output will be replaced by more hydro power, which currently supplies about 60% of the country's electricity, and renewables from solar, wind, biomass and geothermal sources, which are planned to increase from 5 TWh in 2017 to at least 11.4 TWh by 2035.

However, another 2016 referendum vote blocked efforts by the Swiss Green Party to close all the plants by 2029. This was not welcomed by environmentalists. Matthias Lüthard, a spokesperson for another group, Switzerland's Green Liberal Party, claims the government has made insufficient plans for phasing out its nuclear sector.

'There is no sufficient insurance in case of an accident and the financial reserves are insufficient for the dismantling and disposal of nuclear power plants after decommissioning,' he tells *Energy World*. 'Even today, we are technically far from an ecologically and economically sustainable solution that could make nuclear waste significantly less harmful in the future.'

The problem of secure nuclear waste disposal has yet to be decisively solved by any country with a nuclear power sector. But the problem of climate change requires all of the low-carbon energy sources available. Though some European countries appear happy to dispose of fission power, others are dragging their feet, or pursuing expansion – and it's not difficult to understand why. ●

The scheduled nuclear phaseout would make Belgium the only EU country where carbon dioxide emissions from electricity production will increase – and dramatically – after 2025