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Nuclear cemetery designation mired with controversy, but radioactive waste management unavoidable

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Barcelona (CNA).- There has been discussion among the Nuclear Safety Council (CSN) to approve construction of Spain's Temporary Centralised Storage Facility, more commonly referred to as the ATC (Almacén Temporal Centralizado), and a decision is expected in the coming days. The Spanish Government designated Villar de Cañas in Castilla-La Mancha's Cuenca Province as the location for the ATC at the end of 2011 to temporarily store 6,700 tU of radioactive waste accumulated in the country, including high-activity radioactive materials that could not previously be stored in any facility within Spain's borders. The need for a central storage facility has arisen from the expiry of Spain's nuclear waste storage contracts with France and the U.K., and as the Spanish Government must pay a fee of €60,000 for every day nuclear waste is held abroad. At present, nuclear reactors – including three active in Catalonia – must manage high-level waste on-site, either in light water pools or in dry storage casks until it can be shipped to a completed ATC. Catalans have already voiced their aversion to hosting a waste storage facility within their territory, and while Catalonia's nuclear power plants are licensed far into the 2020s, environmental concerns over the safety of nuclear waste persist, especially in regards to the as-of-yet inconclusive fate of the nuclear waste that has been accumulating for decades and will remain radioactive for thousands of years.

Nuclear waste in Catalonia, and in Spain in general, is a problem to be handled in the present, although the future of the nuclear industry is not as clear. On the one hand, in a time where global climate change and the spewing of CO₂ into the atmosphere are chief concerns, a carbon emissions-free energy source like nuclear can be quite lucrative. But on the other side of the fence, anti-nuclear protesters are a reminder that the problem of managing already-existing waste has yet to be solved, and continuing production could add to a problem that could impact the environment for hundreds, even thousands of years; not to mention the horrifying consequences of a hypothetical serious accident in a nuclear plant.

Spain has been operating nuclear power plants for commercial use since 1968 with the opening of the José Cabrera plant 70 km east of Madrid. At peak levels, Spain has had 10 nuclear power plants running at once, although now there are only seven in operation. Currently Spain gets 20% of its electricity from nuclear sources, and for Catalonia that number shoots up to more than 50% in recent years.

As it stands, Spain has no means for storing the most dangerous radioactive materials produced by nuclear power plants. The existence of these waste products without proper long-term storage means there is a possibility for radioactive emissions to reach the air and soil, Greenpeace Catalonia volunteers Jesús Navarro and Nick Thorp said. And furthermore, even if a nuclear reactor has been decommissioned, it is still possible for it to leach radioactivity into the surrounding soil and groundwater.



hosting two nuclear reactors (by ACN)

The issue of a nuclear waste storage facility is a pressing one for Catalonia in particular. Out of the seven nuclear energy reactors operating in Spain, three of them are located in the Catalan Province of Tarragona – Ascó-I, Ascó-II and Vandellós-II. What this means is that Catalonia has a very high capacity to produce nuclear waste compared to other Autonomous Communities.

Even so, the nuclear power sector is an important one for the local energy model and cannot be dispensed of so easily. The nuclear plants currently in operation in Catalonia have a gross energy capacity of 3,146.85 megawatts of power. That number translates to enough electricity to power more than 3.14 million homes, and nuclear energy accounts for roughly half of Catalonia's gross energy production.

Despite this large proportion, Greenpeace volunteers said it "it is necessary to define a plan to close down all these power plants as quickly as possible." They also noted that most of Spain and Catalonia's gas-run power plants "are not in service due to the surplus and the recovering demand due to the economic crisis." They believe that if Catalonia's nuclear power plants were shut down, "There would be no problem covering the gap, neither in the short term, nor in the long term."

Spain's current management strategy

Nuclear waste cannot be stored just anywhere, of course. It needs to be stored in a facility impervious to any radiation that is released. Spain has been operating a nuclear waste cemetery at El Cabril (in the Andalusian Province of Córdoba) since 1992 to deal with its stores of nuclear waste, but El Cabril only has so much space. According to 2004 estimates, the facility will be filled to the brim around 2030; it was 61.6% full in 2009. In addition, El Cabril is not qualified to hold the most radioactive components of nuclear waste.

The type of waste being stored at El Cabril is only hazardous for tens of years: low- and medium-level waste. The majority of the nuclear waste produced in the European Union every year, by a proportion of 84%, is either low-level waste – meaning it does not generate heat, it has a half-life of fewer than 30 years and its level of radioactivity will be reduced to a thousandth of its original level after 300 years – or waste with a short radioactive lifespan, according to the civil non-profit organisation Foro Nuclear. The final 16% comes directly from spent fuel rods, and the high-level waste found in this proportion can remain hazardedly radioactive for up to 10,000 years.

El Cabril cemetery was not suitable to host highly-radioactive waste, meanwhile most of the high-level waste Spain has ever produced has been kept by the UK and France. However those waste storage contracts expired in 2010 and 2011, respectively, and therefore they should be renewed or an alternative solution should be found. In addition, following those contracts' expiries, it has cost the Spanish Government €60,000 a day – now totalling €78 million – to keep nuclear waste in these countries.

Catalonia, along with the rest of Spain, has been unable to export high-level waste since 2010 due to the Spanish Government's expired contracts abroad. So instead of securing the most dangerous waste in an off-site designated facility, Catalan and Spanish plants have been storing spent fuel rods in pools for cooling down or in above-ground storage, according to Pere Palacín, General Director of the Catalan Government's Department of Energy, Mines and Industrial Safety. However, the Vandellós-I reactor's dismantlement represents an exceptional case, he said, because that waste is being taken care of through a contract with French facilities.

A temporary solution

In order to deal with this situation, a Centralised Temporary Storage Facility, most commonly referred to as the ATC ('Almacén Temporal Centralizado'), was decided to be built for the containment of nuclear waste, including waste coming from spent fuel. The Spanish Government designated Villar de Cañas, near Cuenca (Castilla-La Mancha), to house the facility and its construction has been repeatedly delayed. Enresa (Empresa Nacional de Residuos Radiactivos), the company in charge of building and maintaining the ATC, has yet to receive approval to start building from the Nuclear Security Council (CSN), Spain's supervision authority for nuclear power, and the Spanish Ministry of Industry, Energy and Tourism (MINETUR).

Once built, the ATC will be able to hold all of the spent fuel produced by Spain (6,700 tonnes), in accordance with the Sixth General Radioactive Waste Plan, including some 68 capsules of high-level waste (12 m³) and intermediate level, vitrified long-life or compact metal waste from reprocessing of spent fuel from the Vandellós-I Nuclear Power Plant that will return from France, Enresa said. The ATC will hold these wastes for 60 years, after which the waste will be transferred elsewhere and the facility should be shut down.

The decision on whether to give Enresa the green light to build the ATC should be made either this week or next week while the CSN plenary reviews the suitability of the Cuenca site. Ultimately the prior authorisation to construct the ATC can be granted by MINETUR as long as the CSN gives a favourable report. But if the CSN says "no," it is unclear what the solution will be for managing the swelling volume of waste being produced until the ATC can be approved.

Doubts about the adequacy of the ATC's location

According to Enresa, the documentation for this authorisation was submitted to MINETUR in January 2014, and a review of this documentation containing comments and requests for information required by the CSN was submitted on 12 May, 2015. Between these two submissions, in a report done at the end of 2014, URS, the engineering company subcontracted to build the ATC, alerted the CSN that the site was inadequate. Furthermore, the Spanish Professional Association of Geologists (ICOG) said the preliminary geological studies for the site have been "very insufficient and inadequate."

Another concern that has been raised is that Villar de Cañas is not connected to the Spanish railway system, which is one of the safest ways to transport nuclear waste. Instead, all of the containers of radioactive waste transported to the facility will come by highway, Enresa said. This transport aspect made Greenpeace volunteers uncertain, as they said there is a possibility of an accident transporting waste from power plants to the facility.

Enresa is confident in the proposed system, despite naysayers. "The safety of transport is guaranteed," Enresa said, citing the slow speed of transport and the experience of the drivers. Internationally speaking, the company said in recent decades nuclear waste containers have been transported over 30 million kilometres without accident. Enresa alone has safely transported waste 3 million kilometres over the last two decades.

And "in the unlikely event that the truck has an accident," Enresa noted, "special containers in which the waste is shipped ensure that there will be no dispersion of material and the shielding of said containers limit the dose to the exterior to values compatible with the roads." The steel containers used for shipping are subject to international regulations to ensure they are airtight, watertight, can withstand a drop from 9 metres, can endure temperatures of 800°C for 30 minutes and can be immersed in water at depths of 200 metres for an hour.

If all goes according to plan and Enresa gets the permits it has been waiting on, construction on the first two phases of the ATC will commence in early 2016, and standby facilities will be available to receive shipments in summer 2017. The first phase of storage vaults would be commissioned in 2018 and construction on the second phase would be complete in 2019. The third phase would be constructed separately, from 2022-2027. In any case, the funding for the facility is already guaranteed – some €2.5 billion have been accumulated from consumers' electricity bills over the last two decades for the facility, which, according to Enresa, has a construction budget of €927 million.

Costs and processes that will endure for decades

The aforementioned budgeting for the ATC done by Enresa will cover only a fraction of the total cost nuclear power plants will have during the next century. According to the Sixth General Radioactive Waste Plan, the cost of dismantling all of the nuclear reactors in Spain and storing the waste produced by them will have an estimated cost of €13.4 billion in today's currency. This exorbitant cost comes from the long-term management of nuclear plants required post-closure and the eventual final storage of waste products.

Even though the ideal for an organisation like Greenpeace would be to shut down nuclear power and for renewable energy to seamlessly spring up right behind it, the closure of one nuclear plant can take 30-40 years because it is necessary to cool down, decontaminate and dismantle the nuclear reactors once they are finished with their service. Behind managing high-level nuclear waste, the closure of Spain's remaining nuclear plants will comprise the second-most costly proportion of the Radioactive Waste Plan.

Catalonia is in the midst of dismantling one of its reactors right now. Vandellós-I was closed down in 1989 after there was a fire in the turbine area of the plant. Although no radiation leaked from the plant as a result of the incident, the cost of repairing the damage and continuing to operate the plant were too high and it was closed. The process of closing the plant down commenced in 1991 and all but the nuclear reactor were removed and disposed of by 2003, when the reactor was sealed for a dormancy period of 25 years.

Come 2028, when the dormancy period is over, the entire process of shutting down the site will have taken 37 years. In all, the dismantlement process cost Enresa €94.6 million, not including the more than €150 million they will pay to the French company Areva to hold waste coming from Vandellós-I and to alleviate the amount of waste from the project that must be repatriated.

At minimum, Catalonia will be producing nuclear power until 2027 taking into account the life the current contracts of the plants. However, there is a chance these operating permits could be extended further, but that is at the discretion of the CSN. At maximum, nuclear energy will be shut down for good in Catalonia by 2050, the year it aims to obtain all of its energy from renewable sources, Palacín said. As it stands, though, Catalonia has more than enough electricity production within its borders and actually has a surplus it could utilize while seeking other power sources, he said.

In Catalonia, the fate of nuclear power should be taken seriously because with the debate over self-determination, an independent Catalan State would have to draft its own, new, nuclear waste disposal plan. The particulars of how that plan would be carried out would depend on how much longer nuclear plants are in operation. However, Palacín said that if that scenario occurred, "the end result would be a negotiation with Spain, so it is premature to anticipate events, as in many other issues, these will be results of negotiations and agreements."

Greenpeace volunteers said the costs of dismantling a nuclear plant can cost anywhere between 9% and 200% of the construction costs, but the most important cost is storing the waste for thousands of years. Right now, Catalonia's waste would be taken care of by Enresa, but it would have to raise its own funds to manage radioactive waste. Those costs, Greenpeace mentioned, come out of taxpayers' pockets and from energy bills, which is why they said, "it is important to remember this point when somebody claims that nuclear energy is cheap."

Not in my backyard

Cuenca was considered a dark horse to host the ATC among the 13 provinces that submitted bids. The Catalan town of Ascó, which is already home to the twin nuclear reactors by the same name, was a finalist for receiving the ATC and achieved the second-highest composite rating out of the 13 proposed sites. In the qualification of the sites, Ascó scored 300 points, only four behind the top location, Zarra, in Valencia. In contrast, Villar de Cañas received 272 points and came in fourth place.

The decision to locate the ATC in Villar de Cañas has actually proved to be rather controversial, as critics have said the site's selection was a result of political factors above all. Zarra was for a long time considered the front-runner in the selection process, although strong local opposition led to an appeal from Valencian authorities and leading civil society organisations against having the ATC there.

As for the Catalan location, Palacín said, "Ascó met some of the main requirements to accommodate the warehouse, but the commitment of the Government of Catalonia was directly linked to gathering social acceptance that did not occur. This resulted in the opposition of the Parliament of Catalonia to the construction of this facility in our territory." It is possible, too, that the Spanish Government did not want to place the warehouse in Catalonia due to the issue of Catalan independence.

So after the top two choices for the ATC were ruled out, Castilla-La Mancha held the highest remaining candidates: Yebra, in the Guadalajara Province, and Villar de Cañas, in Cuenca. Originally, María Dolores de Cospedal, the Secretary General of the People's Party (PP) – which has been running the Spanish Government since late 2011 – and President of the Castilla-La Mancha Government at that time was vehemently opposed to the idea of hosting the ATC in her region at all. "The PP in Castilla-La Mancha believes that there should be no nuclear waste storage plant, temporary or otherwise, in Castilla-La Mancha, in none of its provinces, and in none of its municipalities," she said, as reported by 'El País' newspaper.

But because the PP's party stance is pro-nuclear, de Cospedal had to revise her statements, saying instead that only Guadalajara (near Madrid) would rescind its candidacy because it is already home to two nuclear power plants (José Cabrera and Trillo-I) and two temporary waste storage facilities.

Why temporary?

The choice to make a transitory facility, according to the ATC environmental impact report, was to keep Spain's options open for its nuclear waste's final destination. "The 60 years of operation of the ATC under the Sixth General Radioactive Waste Plan allows for 60 more years of research and development in technologies for radioactive waste, which will allow that the ATC be dismantled and its spent fuel and high-level waste pass to the next stage of management," Enresa said.

There are two basic routes Spain could choose in regards to spent fuel management: open cycle or closed cycle. In both cases, once the fuel has been used in the nuclear reactors to generate electricity, it is stored in light water pools to cool down, put into metal containers and kept in a temporary storage facility. From there, there is a divergence in the method of disposal, and depending on

the public's attitude toward continuing with nuclear power, the fuel can either be directly put away in deep geological storage (open cycle), or reprocessed and purified for reuse until the fuel is completely used up (closed cycle).

In a closed cycle scenario, the spent fuel is dissolved and chemically separated into uranium depleted to less than 1% U-235 (a more fissile and unstable isotope) and some plutonium. That plutonium, specifically the isotope Pu-239, can then be reformulated into a mixed-oxide fuel for reuse in a reactor. In all, after reprocessing, 97% of the products can be reused as fuel while approximately 3% is discarded as high-level waste. In addition to reducing the need to mine more uranium ore, this process also creates less waste in the end, and can be repeated several times.

Some countries in Europe and Japan use this plutonium cycle, although to be able to utilize reprocessed fuel, a certain type of reactor is necessary. That so-called "third generation" of nuclear reactors does not exist among Catalonia's nuclear plants, said Palacín. "We should see how technology evolves and what happens with the useful life of the Catalan reactors to be able to begin to study the possibility of recycling the fuel used in plants located in Catalonia," he added. The time necessary for spent fuel to stay in temporary storage before reprocessing is an advantage because it allows for the deliberation and development of these technologies.

There are concerns surrounding reprocessing plutonium fission products linked to the possibility of promoting the proliferation of nuclear weapons, although in reality, the bigger threat lies within leaving such products as is. If spent nuclear fuel is left untouched after use, the stocks of plutonium – which, along with U-235, can be used to make nuclear weapons – will rise. In a nuclear reactor, U-238 (the isotope found in uranium fuel in the highest abundance) absorbs neutrons from the fission of U-235 to form neptunium-239, which then decays into Pu-239, which is therefore being stored in the ATC. However, if Pu-239 is used as fuel in a nuclear reactor after reprocessing, this threat is mitigated and more plutonium can be destroyed than created.

As for the open fuel cycle, the one currently favoured by Spain, once spent fuel has been cooled down and its radiation level has decreased, it undergoes no further processing and is sent away for permanent storage. If the public decides to renew nuclear power plants' contracts, then it is possible the ATC will contribute to a closed-cycle model and current reactors will be updated. In either case, the Spanish Government needs to formulate a long-term plan for the fate of Spain's nuclear waste, since even in an efficient reprocessing circuit, there is still waste leftover to vitrify and dispose of.

More on

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