

A day in the life of a safeguards inspector

By Sasha Henriques

Walking several miles through the winding, narrow corridors of a nuclear facility in protective gear while carrying heavy equipment, often escorted by facility operator personnel: welcome to the life of an IAEA safeguards inspector.

Safeguards inspectors are an essential part of the global non-proliferation regime, carrying out verification activities, so the IAEA can provide assurances to States worldwide that other countries are not diverting nuclear material from peaceful to military purposes or

misusing nuclear technology. One important activity is the inspection of declared stocks of nuclear material: the IAEA is the only organization in the world with the mandate to verify the use of nuclear material and technology globally.

In 2015, 709 facilities and 577 locations outside facilities in 181 States were under IAEA safeguards, making them subject to verification by IAEA inspectors. IAEA inspectors performed 2118 inspections,

spending a total of 13 248 calendar days in the field.

On average, safeguards inspectors are on the road around 100 days a year, but where they are going are not exactly coveted tourist locations. Power plants, uranium mines, nuclear fuel fabrication plants, enrichment facilities, research reactors and waste facilities are typically located in remote areas that are sometimes hard to access. Inspectors need to be mindful of security considerations in some locations.

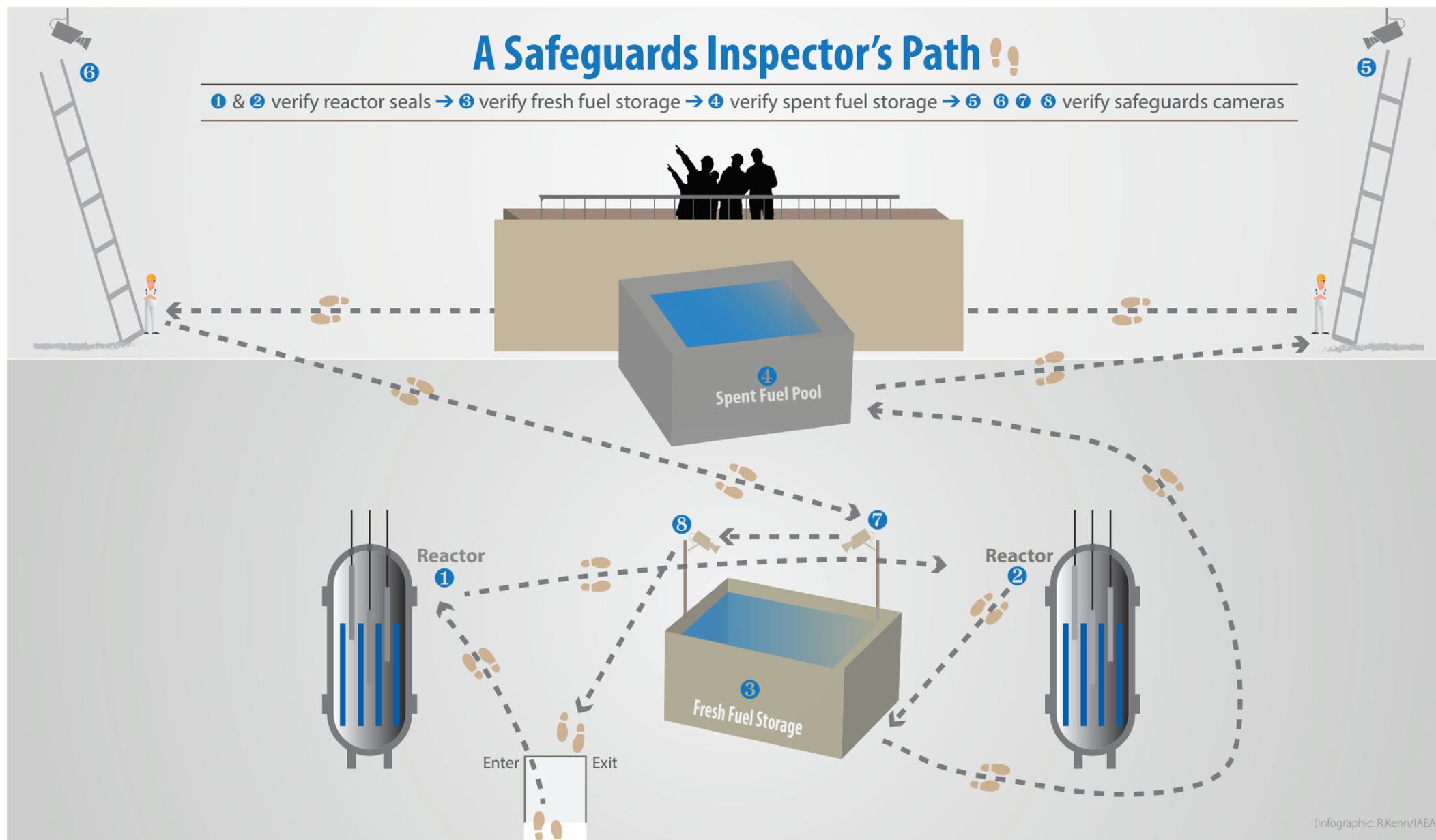
Up and down

An inspector does about 5 kilometres of continuous walking and climbing during an inspection of the average nuclear power

plant, dressed in steel-capped safety boots, safety helmets and coveralls. “It’s a very physical job,” said Abdellah Chahid, who has been an inspector for 16 years. “You really need to be fit and you need to have stamina.”

To add to the physical demands of the job, there are times when the weather refuses to cooperate. Chahid recalls protecting a gamma measurement device inside his jacket during a particularly brutal winter inspection in Kazakhstan where the temperature was -30 degrees Celsius. If the device had been out in the open, the liquid crystal display would have cracked and the entire instrument would have become useless.

An inspection of a nuclear power plant can last anywhere from four hours (if things





Safeguards inspectors at work.
(Photo: D. Calma/IAEA)

go smoothly) to ten hours (if there are problems). The inspection of other types of facilities, such as those dealing with fuel fabrication, may require about a week to complete.

Precarious perch

Inside the reactor hall of a power plant, one of the key activities safeguards inspectors need to undertake is the verification of the spent fuel pond's contents. Inspectors

use improved Cerenkov viewing devices (ICVDs) to determine the presence of the spent nuclear fuel assemblies stored inside the pool and to make sure that the plant operator has as much fuel as was reported. Depending on the size and age of the reactor, the total number of spent fuel assemblies can number in the thousands. Inspectors verify these by looking for the collimated Cerenkov radiation, the telltale blue glow, which emanates from a spent fuel assembly (see article, page 18). Most facilities provide

the necessary equipment for inspectors to work in a safe environment. When this is not the case, inspectors take along and use IAEA equipment to ensure their safety. The job requires fitness, patience and adaptability.

Becoming an inspector

Of the around 250 applications received each year, only 15 to 25 inspectors are hired. New inspectors are trained and tested for five or six months before they are sent to facilities. Typically, their first assignments are supervised by a more experienced inspector, after which the new inspectors are finally ready to work on their own. All new inspectors also have a mentor for the first year. The IAEA employs around 385 designated inspectors from around 80 countries.

Because of the specialized skills required to do the job, mostly physicists, chemists and engineers (ideally with a background in nuclear physics or a related field) have been recruited as inspectors. "Safeguards inspectors need adaptability and good judgement. They need to learn quickly and pay attention to details," says Hilario Munyaradzi, who worked as an in-field inspector for eight and a half years and has spent the past five years training new inspectors. They also need to show discretion, as much of the work they do and the samples they carry are highly confidential.

There are different kinds of verification activities — planned/routine inspections, unannounced inspections, complementary access, design information verification (to ensure that no modifications have been made to the facility and that it is being used as declared) and physical inventory verification (to verify the presence of the declared inventory of nuclear material — such as fuel — in the facility).

A physical inventory verification at a large facility can be so complex and time-consuming that it might take up to 10 inspectors 7 to 14 days to complete. During a design information verification, the inspector compares information about the facility's design that the State has submitted to the IAEA with in-field observations to confirm that the information provided is correct and complete, and the facility has not been misused.

Both design information verifications and physical inventory verifications are conducted once a year in most of the 700 facilities that are under IAEA safeguards worldwide. Inspections are also carried out in a selected number of the almost 600 locations outside facilities under IAEA safeguards every year. Inspectors may also need to be present during major activities such as reactor refuelling at nuclear power plants and to work with a wide variety of complex equipment (see article, page 18).

Walk a mile in the 'overshoes' of a safeguards inspector

The timeline of a routine inspection of an average nuclear power plant goes something like this:



Fly into the country the night before, arriving around **7 p.m.**



8 a.m.

the next day — leave hotel. Drive one hour to reach the power plant, which is often located in a remote, sparsely populated area.

9 a.m.

arrive at the power plant. Wait for the escort provided by the plant.

30 minutes to 1 hour

for nuclear material accountancy: the inspector looks at the amount of nuclear fuel the facility has purchased, stored and used, as well as the capacity at which the facility is running to see if all this information adds up.



15 minutes

to meet with the representative of the national safeguards authority and plant operator to discuss the inspection and to agree on an 'activity plan' detailing the operator's plans for the facility's future.

1 hour

to undergo a whole body radiation scan, receive a dosimeter to track radiation dose received while on the premises, and put on special clothing and protective gear before entering the reactor hall.

2 to 4 hours

in the reactor hall for verification activities.

1 hour

for lunch
Discussion with national safeguards authority and plant operator about follow-up actions.

2 to 4 hours

Return to reactor hall or move elsewhere in the plant for other verification activities or continue with audits of the nuclear material accountancy records.

4 p.m.

leave the plant and drive for one hour back to the hotel.

5 p.m.

arrive back at hotel.

