# French Nuclear Safety Authority (ASN) is developing a new approach to more effectively regulate shut-down nuclear facilities

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## INTRODUCTION

According to French policy, shut-down nuclear facilities must be decommissioned as soon as possible at an acceptable cost. Before this principle became a statutory requirement in France, several facilities had been shut down for an extended period of time. Knowledge of their operating histories has been partially lost and, in some cases, large quantities of radioactive waste are still present in ageing structures and buildings. As more nuclear fuel cycle facilities and nuclear power plants are being shut down, the decommissioning projects are becoming more complex and more numerous. The correct progress of decommissioning projects and legacy waste retrieval and conditioning projects is thus a major safety issue. Over the last few years, ASN has set a number of project milestones, as a way of enforcing this principle of “immediate dismantling”. It should nevertheless be noted that the majority of the decommissioning projects are experiencing significant technical difficulties, and thus falling behind schedule. ASN, cognizant of the complexity of these projects, identified and learned lessons from this highly prescriptive approach to evolve into a new one (named “dynamic approach”) to enable effective delivery against clear and prioritized safety outcomes. This new approach relies on a redesigned regulatory framework, the use of visual tools, the delivery of regulatory project inspections and lastly the promotion of positive mindset and behaviors. Since 2019 ASN has developed this dynamic approach with Orano La Hague for their legacy waste retrieval and conditioning complex projects.

## Redesign of the regulatory framework to support complex projects delivery (or why this is a dynamic approach?)

Decommissioning projects are generally complex and uncertain due to their long time frame, their technical uncertainties or their high interdependencies with other projects like for example the definition of the waste conditioning strategy. ASN used to set typically milestones over decades with the aim to freeze the completion deadlines of the projects main steps. Such milestones were far away in time thus uncertain and as a result subject to successive change requests by the licensee whenever a strategy change was necessary, resulting, in some cases, in administrative difficulties. As a lesson taken from this approach, ASN finds it decisive to set the focus in the short term to oversight the implementation of the on-going key actions and decisions. This resulted in the enhancement of the regulatory framework to make it tailored to key intermediate milestones over the next five years, like for example the achievement of engineering design for the development of a new process, the start of construction of a new key building or the active start-up of a new facility. Practically the nuclear licensee commits yearly to ASN to a 5-year rolling detailed schedule and highlights the binding key intermediate milestones. Then ASN acknowledge them and can moreover set some of them which become enforceable regulatory requirements. Once these prioritized outcomes are delivered, the regulatory framework is renewed accordingly on rolling basis until the project is completed: this is why the approach is said to be dynamic. To be noted that ASN allow nuclear licensees to secure their milestones with a float which is derived from their project risk assessment. Beyond a predefine threshold float consumption trigs recovery actions to ensure the schedule is kept on track (see part III below). This float, if properly managed by the licensee, reduces the risk of non-compliance and thus provides consistency in this new regulatory framework. Therefore the licensee is also required to report periodically their main project risks and to implement the mitigations measures that secure the key intermediate milestones. This contributes to hold the licensee accountable to deliver their project on time.

The new regulatory framework is far less prescriptive than the previous one therefore ASN needs to be reassured at any time that the project progress adequately. For this purpose, ASN relies on visual tools, developed by the licensee and also on specific inspections.

## Visual tools to better oversight delivery of complex projects (examples provided by Orano Recyclage La Hague)

A project is complex when the project involves a lot different contributors with a lot of interaction points. With complex projects, risks effects are exponential. This should drive the focus on the critical convergence points, the identification of what deliverables are required at these points and the review of the respective plans to deliver them on time. ASN invited Orano to build a tool picturing a global view across the different work packages, highlighting the key intermediate milestones, deliverables and interfaces on the same time line. This resulted in the production of the “driver schedule” tool.

This tool is supported with two other documents also shared with ASN:

- a basis of schedule (BoS) providing the key assumptions and risks that need to be addressed to implement the key intermediate milestones,

- the fever chart which is a schedule float consumption indicator that pictures the current schedule adherence (see figure 1).

The BoS, which describes comprehensively the strategy of the project, can usefully inform ASN interventions to make them relevant and proportionate to the main risks.

The float indicator is used by the project leader when he reports periodically to his own governance: any deviation should be investigated and beyond a defined threshold, mitigation measures have to be defined and implemented to protect the schedule. ASN can oversight that this arrangement is adequately implemented in particular during periodic stakeholders programme meetings or inspections at site. This tool provides at any time evidence whether the project is adequately driven or, in case of a repetitive slippage, can trigger an inspection by ASN to identify the underlying causes.

These different tools support the focus on the prioritized outcomes to be delivered, and reinforce alignment between stakeholders: for example, the project leader can involve more easily contributors outside his team within his organization; he can appeal to his governance for additional ressources; ASN is committed to grant a permission on time, etc.

Fig.1 : *Fever chart*

## Innovative project inspections to support the dynamic regulatory approach

Over the last years, ASN has delivered new kind of inspections to support this new regulatory approach. There are mainly two kind of inspections developed by ASN for this purpose:

1. Tactical inspection plan, during routine inspections (one day), to test the project delivery capability and identify immediate emerging deviations,
2. Project based inspections (two days), to deliver a comprehensive performance or readiness review.

Tactical inspection plan are typically informed by questions like:

* What arrangements and procedures have been utilized?
* How the integrated programme has been built?
* How all the activities have been captured and sequenced?
* How the critical path/critical chain have been identified?
* The calculated schedule contingency (float – what is acceptable?)
* The Programme Management Plan
* Risk management and assumptions
* Resource management
* Supporting the above items; what are the associated governance arrangements?
* Are current works on time or delayed?
* In case of delay, what is the impact on the critical path?
* Has the delay been clearly investigated and related underlying causes addressed with an action plan?
* Any other consequences for the project?

This inspection requires some good understanding in the project technical features and also the licensee project delivery arrangements. Several benefits have been achieved thanks to these inspections in particular:

* licensee has become more transparent over years as it was worth sharing difficulties and priorities with the regulator to align respective efforts on the same priorities,
* ASN additional role, to intervene early in the project lifecycle to oversight licensee project delivery arrangements and review whether the project progress against its baseline, is now fully accepted by dutyholders,
* ASN ability to identify repetitive shortfalls in project delivery which result in priority regulatory requests to address them timely (like for example the need to staff fully the project team)
* ASN ability to identify generic issues across projects (like for example interface issues between licensee offices or competition between projects for the same common resources),
* ASN annual assessment delivered to licensee senior board has become more consistent as all project interventions findings of the past year are integrated into discrete strategic regulatory messages (typically key progress achieved or priority actions to be undertaken).

Despite these tangible benefits, ASN witnessed in 2016-2018 major shortfalls from the different licensees, like for example the full cancelation of decommissioning project scenarios with the implementation of fully new ones, major decommissioning program changes or repetitive slippage for top priority projects. Therefore ASN decided in 2019 to test the opportunity and feasibility of an in-depth review (the project health review) which was already undertaken by some project-driven organizations. The aim of this review was to gain an independent assessment, at any point during the project life cycle, of how well the project is performing in accordance with its objectives and how well it adheres to the methodologies best practices. Such review was expected to be suitable to identify root-causes failures and relevant leverage actions.

An health review must be supported by an holistic picture of the project which requires a several days systemic review of the different project disciplines (typically project scheduling, engineering, project control, cost control, construction, commissioning, procurement, etc.) and the related human performance. ASN requested a support from a consulting agency which was expert in complex projects reviews to define a relevant method for this review, after having invested time to understand firmly licensee project delivery arrangements.

From 2019 to 2022 such reviews have been successfully undertaken with Orano, EDF and the CEA and required a full week intervention. The health review findings have offered to the regulator an invaluable learning of how well the licensee project delivery organisation was performing and identified leverage improvements to be conducted. This resulted in a dynamic series of major improvements mainly decided by the licensees on their own. For example Orano decided to develop a front-end loading process to assess the maturity of their projects at the end of each project stage and once implemented ASN stated the related projects were found to be more robust. This process, initiated during the ASN 2019 health review, is now being extended to the whole Orano organisation. In 2022 ASN listened to the licensees about their view of such reviews and considered it was important to reduce the time spent in review to ensure a sustainable approach of inspection. ASN is now testing besides the tactical inspection plan an optimised approach of systemic review delivered against a few typical project delivery fundamentals on a two days duration (project based inspections). Such reviews can be triggered in particular when a project:

* is falling continuously behind schedule to check whether the causes analysis and related action plan defined by the licensee is adequate (performance review),
* is said to be mature and ready to change stage (readiness review).

Furthermore, ASN is now developing their regulatory capability to increase the number of project inspections, by training inspectors and building technical inspection guidance and policy.

1. Enabling mindset and behaviors

Stakeholders need to be cognizant of the complexity of decommissioning projects and promote an enabling culture supporting their delivery. Over the past years ASN and Orano have consistently employed practices and behaviors that have been proven to deliver successful safety outcomes, promoting in particular:

* an open engagement and transparency focusing on priorities and identifying the related challenges to be addressed,
* encouraging pragmatic solutions, consistently over time, to sustain a dynamic of progress,
* a support to regulatory oversight whilst preventing intrusive queries or co-engineering,
* a trusty relationship, with an expectation that the regulator uses wisely the higher level of information retrieved from the licensee,
* fit-for-purpose solutions accelerating safety case assessment and safety improvements,
* several good practices between the regulator, the technical support organization and the licensee enabling regulatory permissions to be granted more quickly.

## Conclusions and next steps

ASN experience is that regulating shut down facilities can be challenging when it comes to complex projects and timely decommissioning. ASN initiative was to engage openly with Orano Recyclage La Hague to test and implement progressively different initiatives to enhance regulations in a more dynamic and effective way. Four years of trials have resulted in successful good practices including a redesigned regulatory framework, visual tools, new kind of inspections and enabling mindset. ASN intention now is to build on these benefits by widening these enabling regulations from La Hague to the other shut-down facilities. ASN is also considering the potential benefit to test some of these good practices for other complex projects related to safety like for example the geological disposal facility or other new nuclear facilities (for example spent fuel pond). This development is driving different challenges for ASN like training suitably their inspectors to get the right skills in project review, building related tools and policy, carrying on to listening to licensees to address their comments in order to support more widely the extension of these enabling regulations.