

# Fostering nuclear safety through local monitoring: evidence from incident data in the French fleet

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## Overview

In France, in addition to the action of the nuclear safety regulator, each nuclear power station is monitored by a local commission constituted of elected officials and competent delegates from the local population. This paper presents an econometric analysis of the consequences of this local monitoring policy on nuclear safety, using a dataset of safety incidents reported by French nuclear operators between 2007 and 2015, and local data describing the intensity of the monitoring performed by the commissions. The empirical strategy proposed addresses both the adverse selection that characterizes the declaration of safety incidents, and the reverse causality link that may exist between the behaviour of nuclear operators and the intensity of the monitoring process. Early results suggest that increasing the intensity of local monitoring induces the operator to exert higher safety care, leading to fewer occurrences of safety events. The policy implications of our result are twofold. First, at the national level, this result calls for the harmonization of the financing of these commissions. More generally, given the low cost of this monitoring policy, our result suggests that public monitoring could be a cost effective improvement of nuclear safety in other fleets.

## Context, data and empirical strategy

In France, operators of nuclear power stations are regulated by an agency who sets safety standards and enforces them through periodic inspections. In addition, since 2006, a law requires the operators of each nuclear station to comply with a system of local monitoring. Twice a year, they have to disclose specific information regarding their station to a local commission constituted of local officials and other competent delegates from the local population. These commissions are intended to serve a democratic purpose: they are supposed to foster the diffusion of information from the nuclear industry to the local populations. Yet, the intensity of the monitoring is heterogeneous across stations, and may influence the decisions taken by operators, for instance through bad press, or by easing the extraction by the regulator of the operators' private information. Hence, this paper questions whether the intensity of the monitoring performed by these commissions has an impact on the behaviour of nuclear operators, and on the safety of their installations.

To carry out this analysis, I use a dataset obtained from the French nuclear safety regulator, which describes all the safety incidents reported in French reactors between 2007 and 2015, and the context in which they occurred. In addition, I collected local data on the activity exerted by each commission in charge of the local oversight of the French nuclear stations. The data collected includes the yearly budgets of the commissions, their composition and the frequency of their meetings, the number of counter-expertise missions conducted, or the frequency of publication of public reports. Our data describes an unbalanced panel of 15 commissions over the period 2007-2015.

The first issue in this analysis is the adverse selection that may bias the declaration process. The French nuclear safety regulator defines a list of situations considered as significant for safety, that ought to be reported by operators. Yet, the compliance of the operators with these guidelines is assessed through an audit mechanism, which suggests that some events could go undetected or unreported. In other words, declaring a large number of events can be a signal for both poor safety or good transparency. The empirical strategy adopted in the paper circumvents this potential bias by identifying different subsets of events, whose characteristics allow to identify a lower bound for the effect of monitoring on safety.

In addition, to determine the causal effect of local monitoring on nuclear safety and operators' behaviour, we use an instrumental variable method. As the budgets of local commissions are determined locally, we can expect them to be partially determined by past declarations of safety events as well as by the knowledge of the previous outcomes of the local monitoring. In order to circumvent this reverse causality issue, we use exogenous shocks on the budgets of the French *departments* as an instrument. These shocks will affect the endowments granted to local commissions, as they are funded by the French departments. Conversely, it is argued that the declarative behaviour of nuclear operators will have no significant impact on the occurrence of local budget shocks.

## Results

When the monitoring commissions are endowed with larger budgets, nuclear operators report a significantly smaller number of safety incidents. As this reduction may be the result of both increased transparency and increased safety efforts, the size of the effect measured can be interpreted as a lower bound on the effect of additional safety efforts. Quantitatively, over the period 2007-2015, an averaged of thirteen events were declared per reactor and per year. Increasing the endowment of a local commission by 30.000€/year could lead to an expected reduction of one event per reactor and per year.

## Conclusions and policy implications

One of the takeaways from the Fukushima-Daiichi accident was that a large potential for improvement in nuclear safety regulation could come from institutional upgrades rather than from technical ones. One such lead was for instance the prevention of regulatory capture among safety regulators around the world. This paper furthers these conclusions and suggests that promoting “soft” regulation measures, such as a compulsory monitoring by local populations, may be a cost-effective improvement of nuclear safety regulation. Indeed, even though it appears that local monitoring does not lead to a decrease of the number of “severe” incidents in nuclear power stations, it does seem to foster safety care, and to reduce the overall quantity of safety incidents, in addition to fulfilling the democratic purpose of social awareness regarding industrial activities prone to catastrophic consequences.

## Selected references

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