New ideas?

In this note I have tried to cover our discussions and the content of our recent paper. It became an exceptionally good paper in the sense that the process brought innovative ideas, where additional research could be done, and additional articles could be written. Below I have tried to summarise my impressions together with indications of what they could be. My list of ideas (not in any order of priority) is as follows:

- paradoxes and balances in the management of organisations,
- forces that influence safety activities at NPPs (nuclear power plants),
- safety culture; a concept embracing HOF activities in safety critical organisations,
- the challenge of providing quantitative estimates of safety,
- the senior management group at NPPs; composition, tasks, and roles,
- decision making regarding safety in highly uncertain situations,
- the COVID pandemic; experience obtained at NPPs in Europe,
- efficiency of safety activities; evaluating, assessing, and improving,
- applications of modern technologies for the benefit of society,
- fostering cooperation between academia and industry.

Below I give short comments on each of them that may serve as a starting point for their consideration.

Paradoxes and balances in the management of organisations

I have in my earlier papers brought forward the idea of balancing between extremes to be a vital component in the management of organisations. Later I have found similar thoughts in management journals (paradoxes, competing values). Interesting questions in this connection is whether this applies also to nuclear organisations and then what the important balances are in reality? A small activity together with selected people from NPP senior management groups may provide insights in these questions and in a later stage guidance for new managers at the NPPs.

Forces that influence safety activities at NPPs

A classic paper describes the safety activities as influenced by different forces (Rasmussen, 1990). The mechanism is explained by considering the three forces and counter forces (ergonomics, safety, economics) driving the state of systems to the border, where challenges to safety may emerge. Operators are supposed to respond to new situations are depending on their capabilities as set by knowledge and experience as well as their mental states. The tasks to be conducted depend on control room lay out and availability of instructions as well as the state of the plant and corresponding safety barriers. Situational control actions therefore depend on continuing training efforts and a functioning safety management system.

Safety culture; a concept embracing HOF activities in safety critical organisations

Our article included a piece of criticism[1] towards the use of safety culture as an all-embracing concept for everything connected to HOFs. More generally, what are the pros and cons in applying safety culture as an overriding concept of HOF activities in the nuclear industry in Europe? We know that it is not practical to believe that surveys of safety culture could give results on which one could rely. We also know that in the identification of a poor safety culture, there are cases where simple technical improvements may be more efficient than interventions aimed at changing the safety culture.

The challenge of providing quantitative estimates of safety

One main conclusion of our article was that the actual likelihood of a major accident in the accidents in TMI, Chernobyl and Fukushima were at least one order of magnitude larger then believed. This pointed especially to cases where HOF issues that had not properly been considered in estimating core damage probability. This points to the problem of including for HOF in the PSA studies. The problem with the PSA-studies is that the are scenario based, which makes it difficult to account for organisational deficiencies that may influence several safety precautions at

[1] Is “culture is meant as a pattern for behaviour or a pattern of behaviour”?

the NPPs. If it would be possible to associate a capability approach for assessing necessary and sufficient conditions for safety, it may be easier to include HOFs in quantitative assessments.

The senior management group at NPPs; composition, tasks, and roles

The senior management group has a key position when it comes to the management of safety at NPPs. Different normative documents available in the nuclear industry (IAEA, OECD/NEA, WENRA) carry one view of safety activities. Another it carried by the national regulators and international standardisation organisations (IEC, ISO, IEEE, ANS). How do these views correspond to each other and with the actual work done at the NPPs? I believe that a small explorative study of similarities and differences at NPPs in Europe can provide practical approaches to these questions.

Decision making regarding safety in highly uncertain situations

Decision making in in highly uncertain situations is a scientific discipline of its own. It may still be interesting to bring academic results to the senior management groups at the NPPs. Are there any typical situations that are difficult in strategic decisions concerning safety? What is meant with the so called “wicked problems” and are such situations likely to occur at the NPPs.

The COVID pandemic; experience obtained at NPPs in Europe

One part of our interviews with senior experts at the NPPs, were conducted during the COVID-19 pandemic. Already in the interviews we heard issues of how plants have responded to challenges in the refuelling activities. It would be interesting to enlarge this information in a follow up study.

Efficiency of safety activities; evaluating, assessing, and improving

There have been recent papers that have pointed to mechanisms (bureaucracy, clutter, probative blindness) that may undermine the efficiency of traditional safety activities at the NPPs. Is this something people feel that may be the exist also at the NPPs? If so, how could one assess possibilities to identify such mechanisms and make necessary corrections? One possibility would be to investigate possibilities to define certain norms for the safety activities that could provide guidance for the NPPs.

Applications of modern technologies for the benefit of society

The example of how nuclear power was introduced to society has illustrated severe mistakes. When new potentially dangerous technologies are on the wedge to for introduction it would be necessary to learn from these mistakes. Technology assessment was used in the late 1970ies as a method to avoid unnecessary controversies, but these methods seem to be forgotten in present narratives and practices. To enable modern technologies to come into full use providing the largest benefit for the society it would be necessary to apply a socio-technical systems approach.

Fostering cooperation between academia and the industry

One of our recommendations in our paper was an increased cooperation between academia and the nuclear industry. We have examples of national solutions at least from Germany, Finland, Spain, Sweden, and Switzerland. Can we draw conclusions on what seems to work and what not? The increased pressure for performance both within academia and the industry is one of the possible roots for the difficulties. A better understanding of the environments in which the parties are working may help in setting together fruitful cooperative projects.