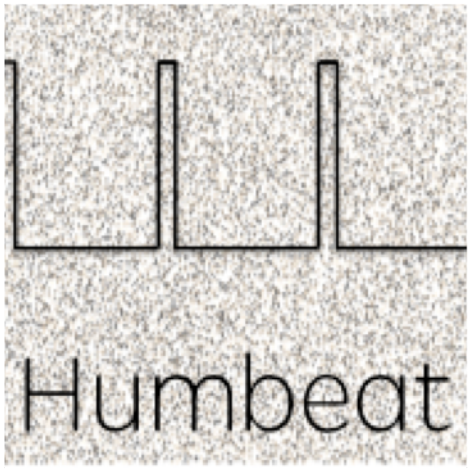
Integrated risk management for new nuclear power plants

Humbeat discusses risk management for new nuclear power plants, and proposes that managing risks for a lifetime of success requires expertise from many different non-engineering disciplines to complement traditional engineering risk management methods.



Fast-paced modern life extends to all disciplines. **Humbeat** seeks out recent developments and regularly comments on those that are most important to you. What do you think?

Si.Gillett@humbeat.co.uk
March 2017

Introduction

Close to the core of the nuclear power industry, is the skill of risk management. But risk management means different things to different people. The "so what" of this series of articles therefore is this: that organisations already skilled in design, engineering and operations risk management, who are embarking on a relationship with nuclear power, will benefit significantly from the addition of many non-engineering risk management skills, knowledge and experience, in order to ensure that overall business performance remains at front-and-centre of mind of their organisation.

An important bit of supporting background, is the external context against which new reactors will be designed, constructed and commissioned. It has changed in the past, is changing now and likely will continue to change in the future. (Inter)national political landscapes; public perception and public permission; ownership and funding; advanced reactors; power systems and markets; digitization; climate and weather; labour markets and laws; supply chain partners and contracts … the list goes on and its pretty easy to feel daunted by its breadth and depth.

In this article we will use four risk groups to describe how a broad and integrated risk management approach contributes to ensuring enduring business success for reactor operators. In subsequent articles, we will discuss some of these groups and their interactions in more detail, and will go on to propose how the enduring management of risk could shape the operating model of an organization which is about to embark on a lifetime relationship with nuclear risk management.

Risk manage what?

Risk management is a vitally important discipline, which should support enduring business performance. Although many aspects of risk management are complex within the long-dwell nuclear context, a proactive risk management framework will guide decisions over near, medium and distant horizons. Common threads within the framework will ensure that overall business performance remains at front-and-centre of mind.

Engineering, technical and human performance risk management underpins nuclear safety. These core disciplines are already long established within nuclear organisations and remain vitally important for any new reactor operator to incorporate. As such, they are not the topic of this set of articles. Instead, we use four separate but inter-related risk groups to shape our view of other important risks which also require specialised management. These are:

- Regulatory risk, relating to securing, or sustaining, a formal operating licence;
- Reputational risk, relating to securing, or sustaining, public acceptance, or support, for a plant to operate;

- Operational risk, relating to the plant being capable of generating power not just today, but throughout its expected lifetime; and
- Commercial risk, relating to both revenue and cost lines through the lifetime of the plant, from design through construction, commissioning and operation to decommissioning and waste mangement.

Regulatory Risk

The principle relevant regulations for nuclear operators, are nuclear-specific safety management and local planning issues, nuclear security and environmental performance. Maintaining a licence to operate by having safety, security and environmental protection measures in place to manage risk, is a non-negotiable for continued operation, and therefore for business success.

Future nuclear power plant operators, however, will need to consider an even wider spectrum of regulation in their operating arrangements from the outset.

For example, in many liberalised electricity markets, regulations require key operational and commercial information on generators and their performance to be made public through "Market Information Platforms". These are updated in near-to-real time, and many provide historical searches to anyone willing to devote some time to their search. Actions required to meet one regulatory aspect (e.g. safety) therefore immediately become transparent under a different one (e.g. market transparency) … An operating company, following a safety-driven course of action, may soon find itself justifying its market-facing actions in a public forum to non-nuclear experts.

Operators who have a full understanding of all relevant regulations will provide, if required, the clearest explanations of their well-judged, compliant actions. They will know how regulations are best complied with, and why, and will not allow the requirements of different regulations to create contradictory messages, or tensions, either within or out-with their operating organisation.

Reputational Risk

Similarly, reputational risk has expanded from its core of delivering safe, reliable power generation and ensuring ongoing governmental support.

Firstly, local community opinions are more and more taken into account with regard to nuclear development. Think of reactor restarts in Japan; waste repository location debates in UK, USA, Germany and others; and community engagement on new build proposals in very many countries worldwide. The industry's local reputation is increasingly important to getting new projects underway.

Secondly, new nuclear power plants will operate in more open electricity markets, where consumers pay for their power. The "affordability" conversations which took place decades ago, when government-backed national electricity authorities sponsored nuclear projects, have been replaced by "value for money" conversations, often in newspapers, between consumers, politicians, developers and other commentators.

Regulatory risk and reputational risk have always been (and remain) related. In recent years however, the regulatory rulebook has become thicker. The topics covered by it have also become broader; and public visibility of operator performance has become significantly more detailed.

It is difficult to pull together a coherent argument as to why each of these developments independently are not "good things", however together they have some significant implications for nuclear operators, and an integrated approach to managing such issues is a key enabler of business success.

Operational Risk

Managing operational risk is fundamental for a facility which has been designed and contracted to operate with a lifetime of 40+ years, but where the bulk of the investment has been made before the first power has even been produced. The proper management of operational risk through the life of a power station will ensure that it is able to operate throughout its scheduled life, or longer, without being closed early.

Within a nuclear context, operational risk is managed through written instructions. These are robustly structured, ensuring they are both restrictive (follow pre-defined actions) and protective (stay safe). Their role is to protect people and the environment by avoiding accidents or incidents, and to protect the facility from damage-in-the-course-of-duty. They are also in some sense an interface between the outside world and the power plant. Operating rules are established to guide operators through real-life situations, to safe and secure outcomes, while taking into account all relevant and important information on the way.

To develop operating rules that always achieve the best outcome for the plant and those who depend on it requires strong understanding of operational, reputational and regulatory risks. In the increasingly volatile world of power generation, we suggest that new or novel scenarios requiring operating rule enhancement will be more frequently *externally driven* than *internally sourced*. A broader outward-facing risk management capability will be essential for this purpose.

Commercial risk

Other risks (safety being the best example) are generally managed with much more priority than commercial risk, however the importance of managing commercial risk is growing in the nuclear sector. Three examples:

1. Many US operators are canvassing (with varied success but hitherto much debate) for commercial support measures for their existing plants. Their argument is that nuclear's contribution to clean electricity is not recognised in existing US market mechanisms, therefore mid-life reactors are commercially uncompetitive and are being forced prematurely to close. Some currently under construction have uncertain futures due to the precarious commercial position of their prime contractors.
2. In Belgium, commercial mechanisms are being used to mitigate risks around political intervention during what could be their last decade of nuclear power generation. Their idea is to provide confidence that returns on necessary investments will be gained either through market revenue or compensation.
3. In the UK, a new market mechanism hade been designed for new low-carbon generators with high capital costs (the "CfD"). This is designed to provide revenue certainty for the operator, increasing confidence in attaining a return on significant capital employed.

Nuclear gross margins are also at risk of reducing, as fossil fuel share of generation reduces more quickly than do nuclear operating costs. Nuclear operators should consider carefully how to streamline costs without eroding safety margins; how and when to sell output to manage market price risk; and understand how near-term energy market risks interact with operational plans, risks and capabilities, so they can protect their hard-earned gross margins at delivery.

The fact is that in liberalised electricity markets, the rise of new generating technologies has increased market price volatility. The addition of more market mechanisms will likely further increase the complexity and volatility of those markets.

Effective commercial risk management requires all regulatory, reputational and operational requirements and risks to be taken into account alongside commercial matters. An effective risk management strategy will take contributions from teams with very different skills, experience, knowledge and understanding. How they work to understand and communicate with each other will be vital to their success.

So what next?

The scene is set for this series of articles. Integrated risk management across regulatory, reputational, operational and commercial disciplines is a prerequisite for enduring business success for new nuclear operators.

In the next articles we'll go on to discuss some of these themes in more detail, and in doing so, will highlight what we believe are important pre-requisites for the enduring business success of new nuclear power plants.