

Improving Management of Potentially Catastrophic Risks

in the Oil & Gas Industry



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Executive Summary

Recent catastrophic events show that, despite carefully planned and implemented risk management, the impact of residual risks can present significant damage to an Oil & Gas company's balance sheet. Amongst other initiatives, this has turned industry attention to the assessment of Exposure to Risk (EtR) – the concept of the maximum potential economic loss associated with catastrophic risk. Such focus provides a basis for strengthening of arrangements – from Strategy through Process and Organization to Methodologies and Tools, providing benefit to long-term stability of the balance sheet.

During recent project experience, Arthur D. Little has developed a roadmap to establish the optimal EtR Evaluation Model. It is suited to the management and organisational arrangements of individual Oil & Gas companies (e.g. Governance Model, Field Portfolio Differentiation, Size etc.), and applicable to International Oil Companies (IOCs), National Oil Companies (NOCs) and Oil Field Service Companies (OFSCs). The framework focuses on defining the optimal EtR Evaluation Strategy, deploying selected strategy that is fit-for-purpose (Process and Organization frameworks, Methodologies and Tools) and implementing it across the international business to establish an effective baseline for future assessments to exposure.

The Challenges for Oil & Gas Companies: Managing Their Potential Hazard Exposures

Background: industry trends and recent episodes

The future outlook for the energy industry is increasingly influenced by the growing technological complexity of Oil & Gas operations. This is a trend which is particularly pronounced in the Exploration & Production sector of the Oil & Gas industry, for instance, in relation to the demands of harsh deep water environments or unconventional oil extraction and processing plant.

Over the past decade, a number of catastrophic events affecting the entire Oil & Gas industry's value chain have undermined the stability of companies' balance sheets:

- Refineries: Texas City refinery fire and explosion in 2005.
- Transportation: oil spill from South Korea's MT Hebei Spirit tanker after collision with crane barge in 2007.
- Production Operations: well blow-out and sinking of Tamsah platform in Egypt 2006; Petrobras-36 floating platform sinking and oil spill in 2001.
- Development: rig sinking and oil spill from Timor East's Mortara oil field in 2009.
- Exploration: well blow-out with consequent rig sinking and oil spill from Macondo well in Gulf of Mexico in 2010.

Increasing complexity of technology affects event frequencies and economic impacts.

In addition, the destructive power of natural hazards such as hurricanes increasingly threatens offshore and onshore Oil & Gas operations in particular geographies:

- Gulf of Mexico: in 2004 and 2005, the impact of hurricanes such as Ivan, Katrina and Rita was unprecedented, resulting in a significant change in the traditional definitions of risk and asset management for the Oil & Gas industry.
- China: the strength of storms during the first half of 2010 has heavily impacted even large-sized Oil & Gas floating structures (e.g. FPSO).

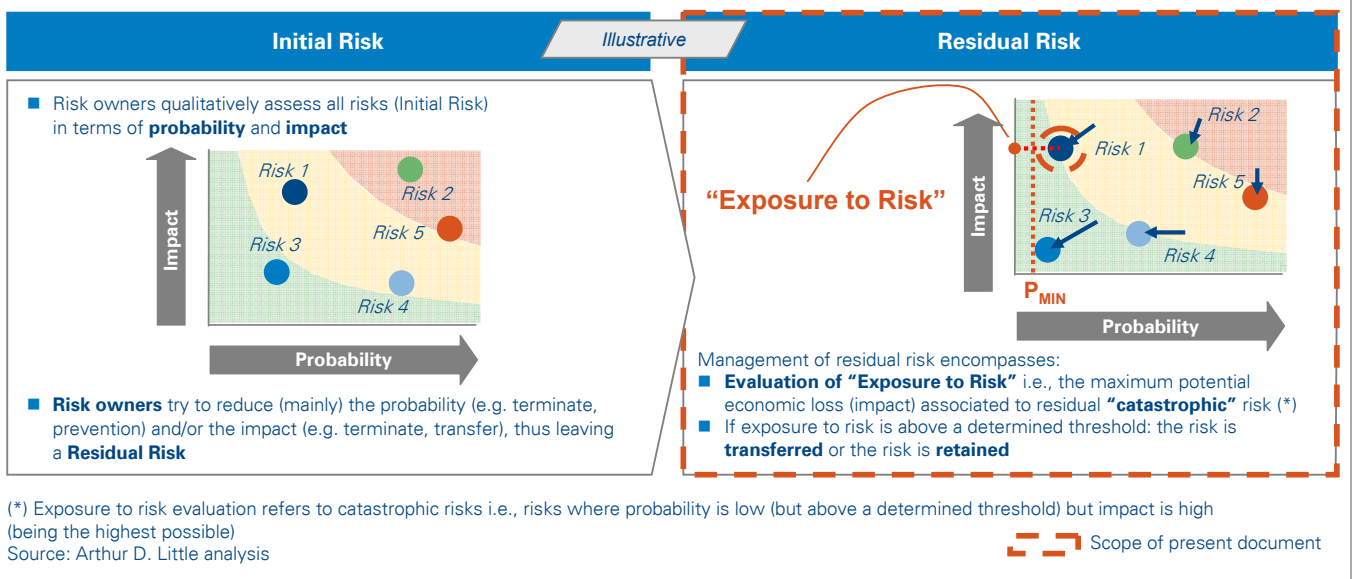
Scope: Residual "Catastrophic" Risk

Oil & Gas companies – being capital intensive businesses operating with assets in complex and potentially risky environments – need to optimize management of their portfolio of potentially catastrophic risks. All key industry players need to continuously strengthen their Industrial Risk Management Models.

A very simple representation of the typical Industrial Risk Management Model suggests two primary phases of risk management:

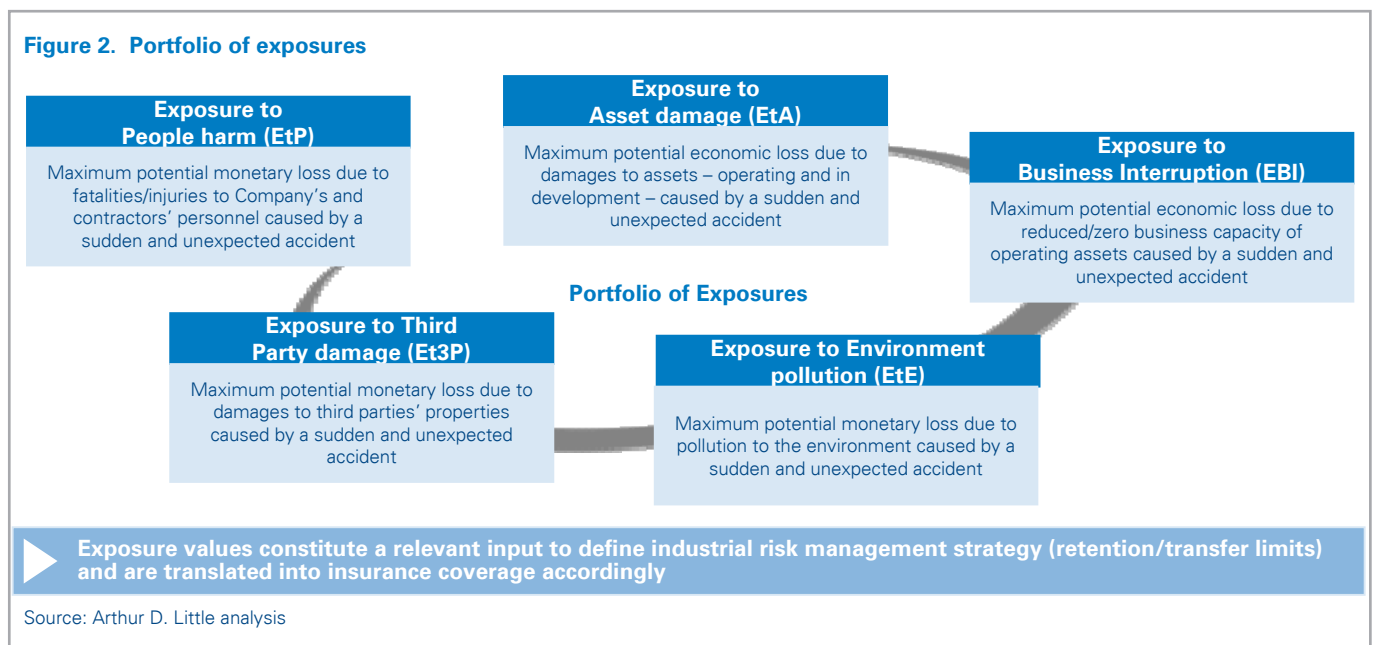
- **Initial Risk Management**, where companies carry out a comprehensive identification and qualitative evaluation of all risks associated with their Oil & Gas operations (Initial Risk), both in terms of probability and impact, in order to define and implement risk control arrangements (typically provision of risk control measures to optimise accident prevention and risk mitigation, and/or transfer to local insurance markets). The risks remaining after applying initial control arrangements constitute Residual Risk.
- **Residual Risk Management**, including those which have the potential to generate the greatest economic loss ("Exposure to Risk"). The risk in question is, by definition, a catastrophic risk and typically a threshold of impact (defined within the Industrial Risk Management function) dictates whether to transfer the potential impacts of such a risk to the external insurance market or to retain it (e.g. by resorting to an equity-owned captive insurance company) (see figure 1).

Figure 1. Managing Residual “Catastrophic” Risk



Typically, Oil & Gas companies deal with five types of Exposure to Risk, according to the type of potential risk impact areas:

- Exposure to Asset damage (EtA): losses associated with damages to assets (operating and in development).
- Exposure to Business Interruption (EBI): losses associated with a partial or total reduction in the business capacity of assets (operating and in development).
- Exposure to Environmental pollution (EtE): losses associated with pollution to the environment.
- Exposure to Third Party damage (Et3P): losses associated with damages to the properties and assets of third parties.
- Exposure to People harm (EtP): losses associated with fatalities/injuries to Company and contractor personnel (see figure 2 overleaf).



In our view, much is being done by Oil & Gas companies to develop and implement control measures in what we broadly term Initial Risk Management above, with key processes and best practices comprehensively described and successfully deployed throughout Asset Lifecycle Management Systems (as mentioned in our previous paper 'Time for Change: Oil Companies Asset Management'). Indeed, as a firm, we have supported the industry worldwide in the development of best practice in this area for over 40 years.

A key challenge now for Oil & Gas players is to further develop the management of the Residual Risks – those which are potentially “catastrophic” risks – to minimise the likelihood of major damage to the balance sheet. For further strengthening of industrial risk retention/transfer policies, Arthur D. Little has developed a new approach to EtR Evaluation.



Establishing a New Approach to Exposure to Risk Evaluation

Why? What benefits?

Establishing a robust EtR Evaluation Model provides benefits to the performance of a company’s overall Industrial Risk Management Model and generates enhanced awareness of the Exposure to Risk portfolio (effectiveness). The approach can also support reducing insurance and EtR evaluation process costs (efficiency).

While benefits to effectiveness typically result from good practice (such as robust evaluation criteria, fit-for-purpose cost estimate tools and competence-based allocation of responsibilities), benefits to efficiency can be delivered in two ways:

- More accurate measure of Exposure to Risk values to enable better sizing of specific insurance coverage and strengthened definition of risk transfer/retention limits based on an informed perspective, both leading to reduced insurance costs.
- A more streamlined evaluation process – where allocation of effort is guided by effective definition of responsibilities, adequate gauging of evaluation requirements and availability of standard practices – saves time and thus cost of internal human resources (see figure 3).

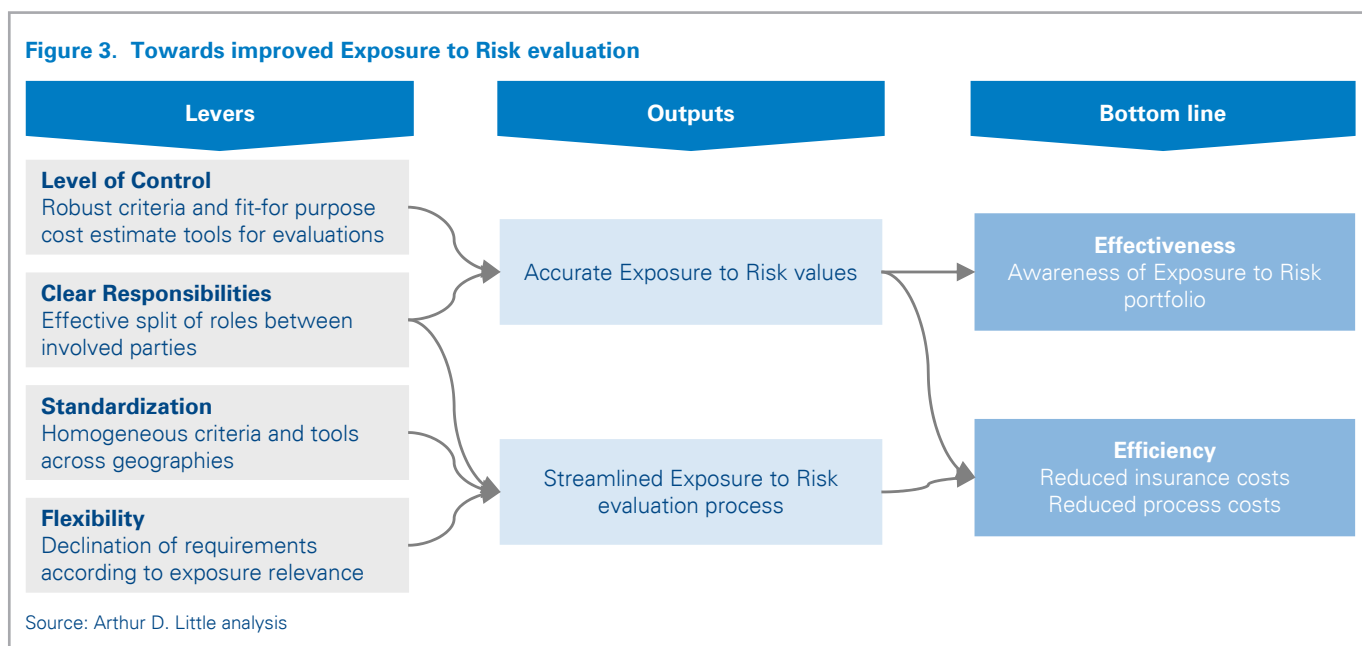
How?

A new approach to EtR evaluations can be derived from Arthur D. Little’s High Performance Business Model, which:

- Establishes the right Strategy to satisfy primary stakeholders
- ... develops Process to deliver the objectives defined by the Strategy
- ... aligns and sizes the Organization to support the processes
- ... and ultimately, endows the organization with fit-for-purpose supporting Methodologies and Tools

Thus, four key questions must be asked:

- Strategy: which are the key drivers to guide the definition of the EtR Evaluation Model?
- Process: what are the key activities, core and support, which need to be included?
- Organization: which functions should be charged to administer the identified core and support activities? What are the most appropriate collaboration models between the different characters?



- Methodologies and Tools: which are the most suitable operative criteria for the organizational functions to actually deploy the core and support activities?

Additional insight to each of these questions is now provided.

Strategy

Defining the Exposure to Risk Evaluation Strategy consists in taking a set of high-level decisions and accepting specific trade-offs, including:

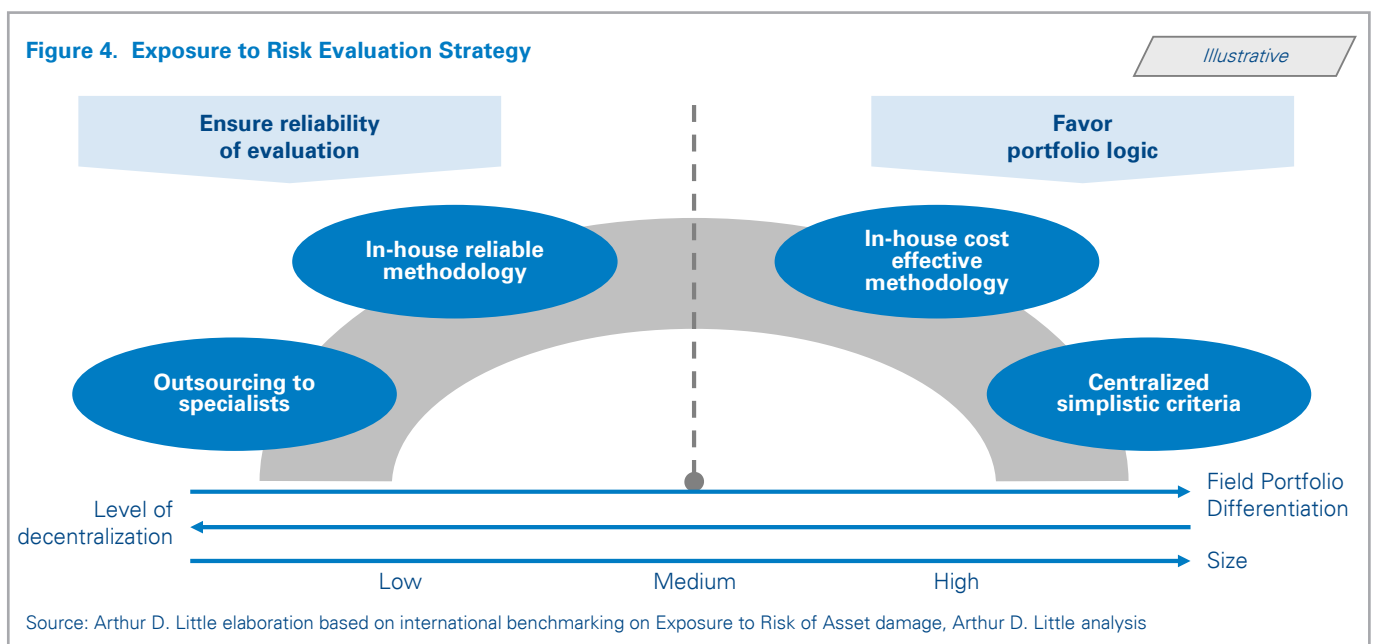
- “Make” (in-house evaluations) or “Buy” (using an external specialist)?
- Effectiveness (reliability of methodology) or Efficiency (simplistic and heavily standardized criteria)?
- Focused (gauging evaluation requirements according to prioritization model) or universal (blanket application of all evaluation requirements across all five types of exposure, regardless of their relevance)?

- Centralization (by involving central corporate departments) or decentralization (limiting requirements from central HQ and letting local business units execute EtR evaluation based on their own models)?

The underlying assumption is that there is no perfect off-the-shelf Exposure to Risk Evaluation Model: specific solutions have to be designed to fit both governance models (e.g. Control-Oriented, Consistent Supervisors, Delegators) and asset/project portfolios (e.g. geographies, technological challenges, on/offshore).

Based on international benchmarking that Arthur D. Little carried out in 2008 around Evaluation of Exposure to Asset Damage on operating assets, a few key drivers emerged as being paramount in defining the overall EtR Evaluation Strategy, including:

- Governance Model: e.g. level of decentralization (delegation of authority to Subsidiaries/Operating Companies)
- Field Portfolio Differentiation: e.g. number of host countries
- Size: e.g. annual revenues (see figure 4)



Process and Organization

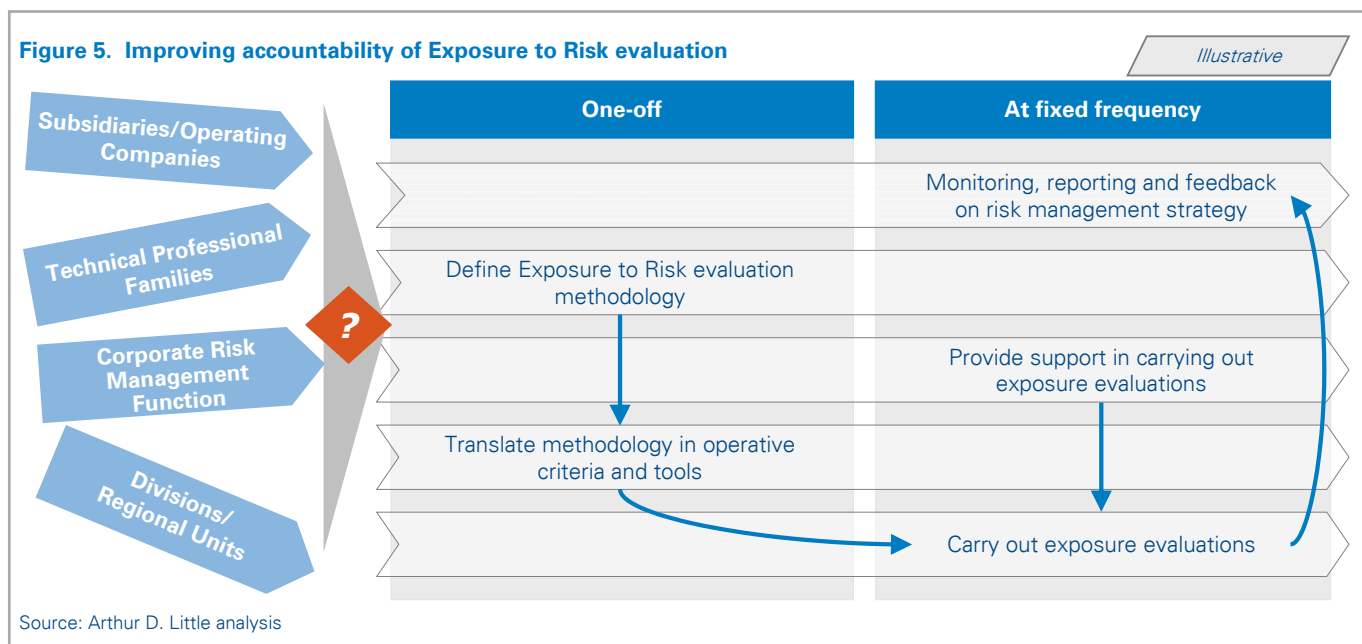
Process and Organization used to go hand in hand, a tendency which is confirmed in Exposure to Risk evaluations: a robust process calls for a competence-based allocation of responsibilities, while relevant individuals' key drivers guide the definition of the process itself.

The Exposure to Risk Evaluation process should be shaped around the Plan-Do-Check-Act wheel to guarantee overall quality. Two streams of activities – where the central hub is, of course, the actual execution of the exposure evaluation – need to be considered:

- **One-off:** definition and deployment of the methodology in operative criteria – later referred to as the Calculation Model – (the “Plan” node).
- **At fixed frequency:** execution of evaluations (the “Do” node), including provision of support, as necessary; monitoring and reporting (the “Check” node), and feedback on risk management strategy (the “Act” node) (see figure 5).

The definition of the EtR evaluation organization framework should follow:

- Firstly, the corporate governance model, whether it favours decentralization or strong control from central headquarters.
- Secondly, the competence map: provided that accountability of final exposure values follows the risk ownership, activities belonging to Plan, Check and Act nodes are to be addressed to the relevant holder of financial and technical (cost estimate and risk management) know-how.
- Thirdly, implications relating to the five types of exposures, for example:
 - EtE, Et3P, EtP: HSE professional family is likely to be involved, at least in the one-off activities.
 - EBI: the production budget holder has to maintain a key role along the “Plan” and “Do” nodes of the wheel.
 - Different Divisions/Functions (Refining & Marketing, Exploration, Development, Production) may have supporting roles according to the lifecycle stage of the exposure in question.



The key drivers of the parties involved are important in shaping the processes, in particular:

- Whoever carries out exposure evaluations (“Risk Owners”) should ensure compliance to the operative criteria defined by whoever is responsible for the Calculation Model.
- Whoever is responsible for deploying the methodology into operative criteria and tools (“Calculation Model Custodian”) should ensure both an easy to use approach for risk owners and consistency across the business for effective portfolio analysis.
- Whoever defines the methodology (“Policy Maker”) should ensure proper flexibility of the requirements in order to cover all business specific risks (see figure 6).

Methodologies and Tools

A key success factor in achieving the bottomline of effectiveness and efficiency is the availability of appropriate methodologies and tools relating to:

- Execution of exposure evaluations
- Portfolio analysis
- Monitoring and feedback on risk management strategy

Assuming that local legislation, agreements and laws are the primary drivers for the five types of Exposure to Risk evaluations (especially Exposure to People harm), the definition of the methodology consists of choosing the best option for each of a number of drivers, including:

- Level of risk aversion in the definition of a catastrophic accident and scenario (number of fatalities, production, loss pollution scenario, asset damage set-up).
- Extent of data about residual reserves, ensuring that the asset replacement option is the one which maximizes the profitability of the field (specific to Exposure to Asset damage).

Figure 6. Clear roles across the organization

	Responsibilities	Key drivers
Policy makers	<ul style="list-style-type: none"> ■ Set policies and define the methodology requirements across divisions 	<ul style="list-style-type: none"> ■ Portfolio view ■ Consistency across business ■ Link with Profit & Loss and Balance Sheet
Calculation Model Custodian	<ul style="list-style-type: none"> ■ Translate the methodology requirements into a Calculation Model for the Risk Owners ■ Provide methodological support to Risk Owners 	<ul style="list-style-type: none"> ■ Robustness of operative criteria ■ Coverage of business specific risk
Risk Owners	<ul style="list-style-type: none"> ■ Carry out evaluations in compliance with accuracy and frequency requirements 	<ul style="list-style-type: none"> ■ Easy to use approaches

Source: Arthur D. Little analysis

- Comprehensiveness of Exposure to Risk cost items
- Level of cost estimate accuracy (allowance figures vs bespoke cost estimate models or asset-specific and exposure-specific studies);
- Level of standardization (framework and operative procedures vs high-level guidelines);
- Level of flexibility in disregarding the EtR evaluation requirements for indirect liabilities (e.g. not operated assets).

In support of the opportunity to gain efficiency by reducing insurance costs, a crucial lever is setting adequate tools (e.g. EtR Evaluation Dashboard) for monitoring Exposure to Risk values provided by risk owners, carry out portfolio analysis for reporting purposes and provide feedback on the definition of risk retention/ transfer limits.

Conclusions

A key objective for Oil & Gas companies is minimizing the potential for long-term liability on their balance sheet by managing their risk portfolios.

It is not enough to just work on the Initial Risk Management through mitigation or preventive actions – residual “catastrophic” risks provide threats to accomplishing this objective. Oil & Gas companies need to adopt appropriate measures relating to their Exposure to Risk portfolios to establish optimal industrial risk retention/transfer strategies.

Leveraging its experience in the international benchmarking of Exposure to Asset damage, Arthur D. Little proposes an approach that comprehensively defines and implements a fit-for-purpose Exposure to Risk Evaluation Model, reflecting key business governance, business portfolio, and managerial specificities of individual Oil & Gas companies.

Arthur D. Little’s three-pronged approach aims to achieve effectiveness (awareness of Exposure to Risk portfolio) and efficiency (reduced insurance costs and internal process costs) through:

- Assessment of consistency between a company’s strategic key drivers and its existing Exposure to Risk Evaluation Model.
- Definition of optimal Exposure to Risk Evaluation Strategy, from Organization and Processes to specific Methodologies and Tools for the five types of Exposure to Risk.
- Change Management and coordination of the implementation of a newly introduced approach in local business units.



Contact

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Arthur D. Little

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