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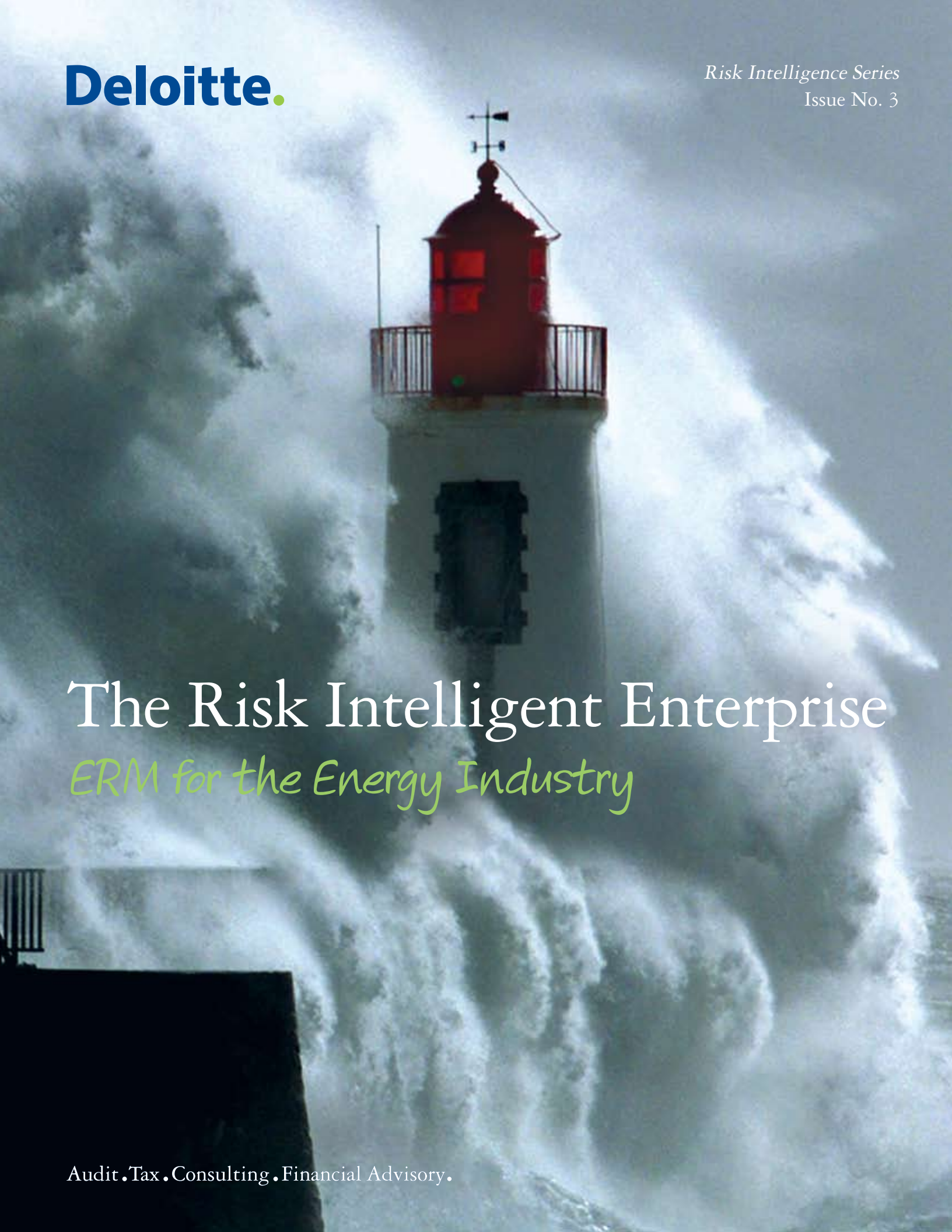

The Risk Intelligent Enterprise

ERM for the Energy Industry

Audit . Tax . Consulting . Financial Advisory .

Table of Contents

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ERM for the Energy Industry

Preface

Risk is nothing new to the energy industry. Indeed, the past few decades have witnessed spectacular examples of risk events and consequences. Damage to energy infrastructure from natural disasters, loss of assets from expropriation, failures in corporate governance, losses from derivative trading, and downgrades in credit ratings are just a few of the perils faced by energy companies. While some traditional risk management approaches may have served the industry well in the past, the scope, complexity, and interdependencies of emerging risks are forcing many energy companies to adopt comprehensive and integrated approaches. Such companies are on the path to becoming Risk Intelligent Enterprises.

Substantial effort has been directed toward developing enhanced approaches to risk management in the energy industry, particularly in the past decade. Enterprise risk management (ERM), also known as enterprise-wide, integrated, holistic, strategic, or corporate risk management, has emerged as an attractive solution. However, relatively few energy companies have fully embraced the ERM framework, designed and implemented the necessary ERM capabilities and begun to realize the anticipated value. Several theoretical and practical challenges must be resolved before energy companies are able to develop ERM into a mature capability and thereby create and preserve the value they seek.

This paper outlines key trends, issues, and drivers surrounding ERM in the energy industry, introduces the ERM capability and capability maturity model concepts, outlines challenges in building Risk Intelligent Energy Enterprises, and describes a way to move forward with ERM. Refer to *The Risk Intelligent Enterprise: ERM Done Right* and related papers in this series by Deloitte & Touche LLP (Deloitte & Touche) for additional information.

The Risk Intelligent Enterprise

ERM for the Energy Industry

Key Trends, Issues, and Drivers

Despite a plethora of studies, surveys, reports, and proposed standards issued in recent years, relatively few standard frameworks or reliable sources of ERM leading practices have emerged for the energy industry. No single ERM framework has outlined comprehensive and concise theoretical and practical foundations, comprising basic ERM terminology (or lexicon), categorization (or taxonomy), and methodology (or approach). Leading practices are largely theoretical rather than practical, are based on anecdotal rather than empirical evidence and are fragmented across jurisdictions, industries, and framework components.

Leading Practices: Committee of Chief Risk Officers and Standard & Poor's

The Committee of Chief Risk Officers (CCRO) is a diverse coalition of senior risk professionals from more than 30 energy companies committed to developing best practices to strengthen and standardize risk management in the energy industry. The CCRO has developed a series of white papers to help raise the awareness on the topic and shape ERM practices in the industry. The Enterprise Risk Metrics Working Group was formed to develop the recently published Enterprise Risk Management and Supporting Metrics white paper, a practical guide that will meaningfully advance the discussion on ERM within the industry.

Standard & Poor's (S&P) has implemented the Risk Management Practices Evaluation during its 2006 annual review of energy companies with large trading and marketing operations. As part of the overall rating assessment, the review evaluates the effectiveness of a firm's risk management practices and benchmarks the quality of risk management. The approach developed by S&P focuses on three key aspects: policies, infrastructure, and methodologies (PIM). Initially, the PIM approach covers primarily qualitative analysis. Over time, S&P expects to provide both qualitative and quantitative assessments of risk management practices at energy companies.

Despite a wealth of empirical evidence and real-world lessons learned, energy companies continue to take unintended or unexpected risks by following patterns of behavior, often with the ultimate outcome of destroying value. Many energy companies have experienced difficulty adopting ERM for a variety of reasons, including resistance to perceived centralization of responsibilities, lack of well-defined objectives, fragmented accountability, lack of resources, and inadequate data, systems, and infrastructure. Finally, in contrast to the situation in some other management areas such as corporate governance and internal control over financial reporting, ERM is still widely viewed as an optional capability.

While much remains to be done for ERM to evolve, the business case for developing a mature ERM capability at many energy companies appears to be favorable. The Deloitte & Touche publication *Assessing the Value of Enterprise Risk Management* provides insights on the business case for ERM. Boards and senior managers are seeking ways to integrate management functions and implement continuous improvement to fulfill their fiduciary responsibilities. Regulators, credit rating agencies, shareholders, and other stakeholders are also applying increased pressure on boards and senior management to embrace ERM as a means of creating and preserving value. The Committee of Chief Risk Officers (CCRO) and Standard & Poor's (S&P) have led efforts to establish leading practices for the energy industry.

While these trends and issues provide useful context around ERM for the energy industry, the drivers for this change are based on risk exposures faced by energy companies. Our publication *Globalization and Energy Supply: Strategic Risk in the 21st Century* provides insights on specific risk exposures related to globalization and operating environment.

Inability to meet the demand for energy is a critical risk shared by many energy companies. Dependence on energy continues to grow and most energy companies have commitments or obligations to deliver energy to their customers. According to the *International Energy Agency's World Energy Outlook 2005*, global energy needs could be more than 50% higher in 2030 than today and investments of US$17 trillion for infrastructure will be required by then to meet growing demand. Concentration adds another dimension to this supply risk. Developing countries such as China and India will account for most of the demand growth while the Middle East, Africa, Latin America, and Russia will remain supply centers. Threats to the energy value chain in producing regions caused by war, civil unrest, and natural disasters also represent critical risk factors.

Internal operational risks, such as failures of processes and systems or human error, also figure prominently in the risk profile of energy companies. For example, oil and gas companies continue to struggle with the processes to estimate and disclose reserves while electric utilities and their customers experience outages caused in part by human error and information system failures. The aging workforce in many developed countries is yet another emerging operational risk with the potential to impact the energy industry. Deloitte & Touche's publication *The Talent Crisis in Upstream Oil & Gas: Strategies to Attract and Engage Generation Y* provides insights into this emerging risk exposure. Hurricane Katrina and the August 2003 blackout illustrate the nature of operational risks for energy infrastructure and the potential economic, social, and environmental impacts.

Disruptive technologies and climate change are two wildcards with the potential to radically change the balance of energy demand and supply.

Disruptive technologies and climate change are two wildcards with the potential to radically change the balance of energy demand and supply. Commercially feasible techniques to extract oil from nonconventional sources such as the oil sands of western Canada, infrastructure to transport natural gas over long distances using liquefied natural gas (LNG) and small-scale "distributed" electricity generators located near demand centers are examples of potentially disruptive energy technologies. Risks from more frequent, intense, and potentially damaging weather events as well as the more immediate and tangible requirements to reduce greenhouse gas (GHG) emissions are examples of climate change effects.

Energy companies also face an array of political, legal, and regulatory risks. Those with international operations are particularly susceptible to commercial and security threats arising from currency inconvertibility or transfer restrictions, breach of sovereign contracts, nationalization, confiscation or "creeping" expropriation of energy assets, and war and civil unrest. Recent events affecting oil and gas companies in Venezuela demonstrate the uncertainty and potential for losses caused by political risk as well as some potential remedies.

Operational Risk: Hurricane Katrina and the August 2003 Blackout

Hurricane Katrina and the August 2003 electricity blackout are recent and significant examples of operational risks for energy infrastructure in North America. Three weeks after Hurricane Katrina, 55% of oil production and 34% of natural gas production remained disabled in the region while refining and pipeline capacity had been reduced significantly. This caused the U.S. government to draw on the Strategic Petroleum Reserve (SPR) and resulted in gasoline prices soaring more than 70% in some areas. Real losses to energy infrastructure totaled over US$20 billion, but lost economic opportunity was estimated at more than US$100 billion.

The August 2003 electricity blackout affected 50 million people in the U.S. Midwest and Northeast as well as the Canadian province of Ontario when 61,800 megawatts (MW) came offline as a result of weather conditions, forced transmission outages, human errors and information system failures. The event caused 18.9 million work hours to be lost and total economic damage in the range of US$4-10 billion. Reliability of the transmission network in North America continues to be a source of concern.

Sources: Risk Management Solutions. Hurricane Katrina: Profile of a Super Cat. 2005. U.S.-Canada Power System Outage Task Force. Final Report on the August 13, 2003 Blackout in the United States and Canada: Causes and Recommendations. 2004.

Political Risk: Expropriation in Venezuela

Early in 2005, the Venezuelan government indicated that the rules for foreign oil and gas companies would change. First, they would be forced to allow the state-owned oil company, Petroleos de Venezuela SA (PDVSA), to take a controlling share. Second, the income tax rate would be increased to 50% from 34% and this new tax rate would be applied retroactively to profits made over the previous five years. Third, royalty payments to the government would be nearly doubled. Companies were given six months to agree to new terms with PDVSA. Several companies, representing 25 oilfields, accepted the new terms while others either voluntarily returned oilfields or failed to comply.

In 2006, oilfields operated by Eni and Total were seized by the Venezuelan government as a result of the companies' failure to agree to the new legal framework. It is unclear whether the Venezuelan government will compensate foreign companies for their losses and continue to exclude joint ventures operating in the Orinoco belt from some or all of the new legal provisions. Foreign companies invested US$16 billion in developing energy infrastructure in the Orinoco belt, unlike the 32 conventional oilfields elsewhere. Major foreign companies that could be affected by such a change in policy include BP, ExxonMobil, ConocoPhillips, Chevron, Total and Statoil. Some foreign investors are considering whether to pursue legal action to enforce their contractual rights or seek compensation for arbitrary expropriation in international law under applicable Bilateral Investment Treaties (BITs).

Source: Watson, Farley & Williams. Venezuela Oil & Gas Briefing. 2006.

Legal and Regulatory Risk: Enforcing Market Behavior

In the past three years, the U.S. Federal Energy Regulatory Commission (FERC) has investigated energy companies to determine whether they engaged in various market manipulation practices. In several cases the energy companies have reached settlement agreements with FERC. Three major settlements have involved payment of refunds totaling US$8.5 million and payment of fines and civil penalties totaling US$25 million. The recent enactment of the Energy Policy Act of 2005 (EPAct) gave FERC the strong enforcement authority it traditionally has lacked and which it repeatedly sought from the U.S. Congress to better address market manipulation and other misconduct that is damaging to competitive markets. Among other things, the EPAct empowers FERC to assess civil penalties of up to US$1 million per day per violation of any provision of Part II of the Federal Power Act (FPA), the Natural Gas Act (NGA) and Natural Gas Policy Act (NGPA). It also grants the U.S. federal courts the power to impose substantial fines and lengthy jail terms and, in some cases, the power to ban individuals from holding positions in the energy industry for life.

Sources: Various FERC stipulation and consent agreement orders and related policy documents.

Commodity Trading Risks: Derivatives at China Aviation Oil

China Aviation Oil (CAO) progressively engaged in derivative trading that evolved from hedging activities to protect the cost of airline fuel for the Republic of China into speculative derivative trading. In an effort to recover from the company's previous market losses, positions were rolled over and options on bigger volumes were sold to generate sufficient cash to settle losses on the existing position – a practice that resulted in exponentially increased risk exposure. The out-of-the-money position was not being marked to market and the premiums received were brought into revenue so traders appeared to be earning money. Unrealized losses accumulated until the margin calls became too large to manage and CAO finally disclosed its mismanagement of derivatives. CAO showed losses of US$554 million over approximately 18 months, resulting in indictment of the CEO and technically bankrupting the state-owned enterprise.

Source: Deloitte Touche Tohmatsu. The China Aviation Oil Debacle. 2006

Unexpected changes to legal and regulatory institutions beyond those traditionally covered by political risk can also shape risk exposures for energy companies. In the oil and gas sector, hearings and investigations into the production and pricing behavior of energy companies as well as legal and regulatory actions arising from damage to the environment present both commercial and reputational exposures. In the electricity and natural gas sectors, restructuring and the introduction of competitive markets continue to challenge existing regulatory institutions and redefine standards of conduct. Recent enforcement actions by the U.S. Federal Energy Regulatory Commission and new powers granted through the U.S. Energy Policy Act of 2005 provide an example of regulatory risks.

Exposure to price risk depends on the part(s) of the energy value chain in which a company operates — those with "upstream" operations tend to fare well in times of high and volatile energy prices, while those on the "downstream" side feel the pain.

Energy price volatility is a visible and proximate risk factor for energy companies and the modern economies that depend on energy resources. In recent years, prices for the key energy commodities — oil, natural gas, and electricity — have experienced high volatility within a broader pattern of escalation. Exposure to price risk depends on the part(s) of the energy value chain in which a company operates — those with "upstream" operations tend to fare well in times of high and volatile energy prices, while those on the "downstream" side feel the pain. These inherent risk exposures across the value chain are often given as a rationale for vertical integration in many sectors of the energy industry. Exposures to price fluctuations can also be hedged through the use of derivatives; however, this practice can result in new and quite different risk exposures, as was the case with China Aviation Oil.

Like most industries, the energy industry is subjected to periodic business cycles driven by prevailing economic conditions, the risks discussed above, and other factors. Strong demand for energy fueled by economic growth coupled with threats to major supply centers have laid the foundation for an energy "boom" in recent years. However, certain business models, such as the merchant electricity generator in the post-Enron environment, have experienced a period of difficulty amid high expectations. Escalations in counterparty credit risk and capital adequacy problems were the most direct and obvious outcomes. In "bust" periods, risks often hinder investment in energy infrastructure and threaten the commercial viability of emerging technologies such as oil from oil sands and electricity from renewable resources.

The ERM Capability and its Evolution

The practice of ERM in the energy industry is in its early stages. As mentioned earlier, the lack of an appropriate framework is a key factor limiting the widespread adoption of ERM. Several definitions and attributes for ERM have been proposed. Each perspective brings its own strengths and weaknesses. Below are a few representative risk management and ERM definitions.

Representative Risk Management and ERM Definitions

Committee of Sponsoring Organizations of the Treadway Commission (COSO):

A process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.

Standards Australia and Standards New Zealand:

The culture, processes and structures that are directed towards realizing potential opportunities while managing adverse effects; [involves] the systematic application of management policies, procedures and practices to the tasks of communicating, establishing the context, identifying, analyzing, evaluating, treating, monitoring and reviewing risk.

Casualty Actuarial Society (CAS):

The discipline by which an organization in any industry assesses, controls, exploits, finances, and monitors risks from all sources for the purpose of increasing the organization's short- and long-term value to its stakeholders.

Our working definition of ERM is:

A capability that involves establishing the context as well as identifying, analyzing, integrating, evaluating, treating, monitoring, and communicating risks across the enterprise in a way that is aligned with the enterprise's objectives and risk appetite.

Our working definition of capability is:

A logical grouping of governance and policies, processes and procedures, people and organization, and technology and infrastructure, which together enable the enterprise to achieve its objectives and provide value to its stakeholders.

In most industries and companies, ERM remains a relatively new and unproven capability with little agreement about the end destination and stages of transition. For various reasons, the financial services industry and, more recently, the energy industry have become early adopters and pioneers in the ongoing evolution of the ERM capability. The maturity of a particular company's ERM capability can be gauged in terms of its progress toward achieving most of the key attributes or milestones described in the table below and in the appendix, which contains a summary-level overview of the ERM capability maturity model.

While these industries may be leading the way in implementing ERM, they still have considerable room for improvement — and others are catching up or may even be more advanced in some areas. Many energy companies are asking the question: What will it take to move beyond our current stage of ERM?

The maturity of a particular company's ERM capability can be gauged in terms of its progress toward achieving most of the key attributes or milestones.

ERM Capability Components

Component	Description
Governance	Governance and strategy consist of the objectives and values the enterprise strives to achieve. Policies embed those objectives and values in the enterprise by articulating principles and activities regarding how to achieve the objectives. Policies are the link to strategy and accountability — they put a strategy in play.
Process	Processes are groups of related activities that together produce a result of value to a customer or stakeholder. Procedures are documented activities described in sufficient detail that a person with relevant knowledge, skills, and abilities but without in-depth familiarity of the activity can nonetheless perform the activity.
People	People are critical to the success of any organization. As processes become increasingly automated, the competence of people becomes proportionally more important because the activities being performed by people become more sophisticated and require judgment and the capacity for rapid decision making.
Technology	Technology is at the heart of efforts to make processes as efficient and value-adding as possible. Risk Intelligent Enterprises have technology that not only stores and processes information internally, but also provides relevant information to other capabilities such as strategic planning and finance.

Building the Risk Intelligent Energy Enterprise

Several energy companies have designed and implemented robust risk management capabilities, particularly in traditional areas such as insurable hazard risks related to natural disasters and similar events as well as readily quantifiable financial risks. In a recent survey conducted on behalf of the CCRO, the vast majority of energy companies polled indicated that they are pursuing a formal ERM program while very few indicated that their ERM capabilities were fully operational. Moving beyond the initial stages of implementing ERM to build Risk Intelligent Enterprises will require improvements in key areas. Some of the remaining challenges faced by energy companies and suggestions for moving toward the Risk Intelligent Enterprise are discussed below.

Moving Beyond Framework

An early task facing energy companies is the evaluation, selection, and customization of a suitable ERM framework. While this is certainly an important part of building an ERM capability, energy companies should ensure that the level of effort and resources allocated to this task is proportionate to the overall program.

Most leading risk management and ERM frameworks address the necessary conceptual foundations for an ERM capability: terminology (or lexicon) to establish a common language; classification (or taxonomy) to help determine the nature and magnitude of the enterprise's risk exposures; and process to describe the various activities undertaken to manage risks across the enterprise.

There are many similarities across ERM frameworks and most frameworks will require some customization to meet each energy company's unique needs. Adapting the lexicon and risk type taxonomy from a leading ERM framework and making any necessary modifications can reduce the time and effort of this task. The table below provides a sample energy company risk type taxonomy.

Energy companies will have to ensure that their taxonomies allow for a comprehensive view of the enterprise's portfolio of risk exposures.

Risk Type Taxonomy

Readily Quantifiable Risk Types	Difficult-to-Quantify Risk Types
Market/price risk	Strategic/franchise risk
Credit/default risk	Operational risk
Modeling/valuation risk	Staffing/organization risk
Financing/financial risk	Regulatory risk
Operations risk	Political risk
Volumetric risk	Technological risk
Business continuity risk	Legal risk
Financial reporting risk	
Environmental risk	

Source: Adapted from CCRO. Introduction and Executive Summaries of CCRO Recommendations. 2002.

Several taxonomies have been proposed and some definitions for risk types are widely accepted; however, no taxonomy has emerged as dominant. Energy companies will have to ensure that their taxonomies allow for a comprehensive view of the enterprise's portfolio of risk exposures. Some useful considerations for customizing an ERM framework along with its underlying taxonomy include: degree of loss ("downside") or relative gain ("upside"); quantitative or qualitative nature; external or internal causal events; and level of interdependency or correlation with other risk types.

Leading ERM frameworks also describe a standard set of activities for a risk management process such as identification, analysis, evaluation, treatment, monitoring, and reviewing. Most process-related differences between frameworks arise from variations on these activities. For example, "assessment" may be used to describe a few of these activities, "integration" might be added to the list, and "treatment" could be replaced with "response." Whatever labels are used to describe activities in the process, the energy company should ensure that they are communicated, understood, and applied throughout the enterprise.

Establishing an Enabling Environment

The success of an ERM capability will ultimately depend on a few critical enablers. The initiative must be championed and supported by people and business units throughout the enterprise. Authority and accountability for risk decision making must be clearly communicated and enforced through an enterprise risk management policy and other guiding documents. For example, energy companies should instill practices that reinforce effective risk governance and oversight, including the establishment of explicit risk appetite and corresponding measures, limits, and monitoring for risk-taking behavior.

More formal enablers should be augmented with informal enablers to reinforce the "tone at the top," including principles of good governance, codes of conduct, and statements of shared values. The recent failure of Enron demonstrates the need for solid governance and oversight.

The Downfall of Enron

At the time of its collapse in December 2001, Enron was listed as the seventh largest company in the United States of America, with more than US$100 billion in gross revenues and 20,000 employees worldwide. While Enron's business model and trading strategies are often blamed for the company's failure, findings from two investigations suggest that a lack of proper governance and oversight was a key contributing factor. Reports issued in 2002 by the U.S. Senate and a Special Investigative Committee of Enron's board of directors (known as the Powers Report) described similar findings and conclusions. For example, the U.S. Senate report cited six areas in which Enron's board of directors played a role in the collapse and bankruptcy of the company: (1) fiduciary failure, including ignoring numerous indications of questionable practices by senior management; (2) high-risk accounting; (3) inappropriate conflicts of interest; (4) extensive undisclosed off-the-books activity; (5) excessive compensation; and (6) lack of independence of the board of directors and the company's auditor. The Powers Report also indicates that controls over the controversial related-party transactions employed by Enron were not sufficiently rigorous and the implementation of such controls suffered from inadequate oversight by the board of directors and senior management.

Establishing an enabling environment for ERM can involve significant organizational and cultural changes, including the way in which risks and risk-taking are perceived. Energy companies in the early stages of their ERM journeys might begin by appointing a chief risk officer (CRO) and establishing an enterprise risk management committee. It is crucial to obtain agreement on the sharing of responsibility and accountability for risk management with centralized or corporate areas — such as CRO, legal, regulatory, and insurance, as well as the enterprise risk management committee — and decentralized or business unit areas — such as business unit executives, risk managers, and operating committees. Energy companies must also expand the traditional view of risk as direct loss to form the broader notion that a missed opportunity or damage to reputation may be as important as a direct loss. Finally, they should focus on developing basic ERM tools, such as risk registers and reporting dashboards before moving to more advanced tools, such as risk engines and event and loss databases.

Achieving Enterprise-Wide Coverage

Many energy companies have developed fairly robust approaches to manage a few risk types in isolation, including insurable hazard risks and readily quantifiable market (or price) risk and credit risk. Some also rely on relatively haphazard or unsophisticated quantitative and qualitative risk analysis techniques to address other risk types on an individual basis. Many energy companies also focus their risk management activities on business units that are assumed to include the most significant risk exposures such as commodity trading. Moving beyond a fragmented ERM capability involves expanding the coverage of risk management activities to encompass all material risk types and business units. The matrix below illustrates a representative energy company's coverage in the early maturity stages.

Risk Coverage Matrix

Risk Type	Business Unit 1 *Generation*	Business Unit 2 *Retail Supply*	Business Unit 3 *Networks*	Business Unit 4 *Corporate*
Market/price	●	●	■	○
Credit/default	●	●	●	■
Modeling/valuation	●	●	■	○
Financing/financial	●	■	●	○
Operations	●	●	■	○
Strategic/franchise	?	?	?	●
Political	?	?	?	●
Technological	?	?	?	●
Regulatory	?	?	●	●
Legal	?	?	●	●

Key: ● = High exposure ■ = Medium exposure ○ = Low exposure **?** = Unknown exposure

Such an approach does not mean that all risk exposures are given equal consideration or are managed in the same way; rather, it means that the enterprise is able to make a more informed and conscious decision on which risks it should actively manage and how it should manage these exposures. For example, the enterprise may elect to self-insure certain nonmaterial exposures depending on its overall risk profile and risk appetite.

Achieving greater coverage requires developing and applying different approaches to analyze and manage the readily quantitative risk types described above and the more qualitative strategic, political, legal, and regulatory risk types. For example, commodity trading business units may decide that individual transactions and risk exposures should be directly modeled, measured, reported, and monitored. In contrast, techniques such as scenario analysis may be appropriate for more qualitative risk types. A hybrid approach employing the best of probability- and vulnerability-based techniques may eventually emerge to address risk exposures associated with "low-likelihood, high-impact" events.

While achieving enterprise-wide coverage may be an objective of an energy company's ERM capability, it must also be pursued within the context of existing guidelines and constraints. For example, regulatory restrictions on the sharing of information between functionally separated business units and risk management guidelines for the protection of critical infrastructure and key resources present challenges for several U.S. energy companies.

Adopting a portfolio view of risk allows energy companies to take advantage of naturally offsetting risk exposures and opportunities to optimize risk treatment strategies.

Taking Advantage of Portfolio Effects

Once an energy company has expanded coverage across risk types and business units, the next step may be the integration and aggregation of these exposures to provide a truly enterprise perspective. Such a perspective is critical for informed "top-down" management of the enterprise's risks, while more detailed attention to each particular risk type or business unit is required for effective "bottom-up" management of specific exposures. Adopting a portfolio view of risk allows energy companies to take advantage of naturally offsetting risk exposures and opportunities to optimize risk treatment strategies. For example, energy companies might decide to rationalize insurance to cover residual rather than inherent risk exposures or share certain risk exposures through joint ventures with other companies.

Influences that Shape an ERM Capability

Legislation, regulations, and guidelines issued by relevant authorities can influence the scope and nature of an energy company's ERM capability. For a regulatory perspective, in 2003 the U.S. Federal Energy Regulatory Commission (FERC) issued Order No. 2004 Standards of Conduct for Transmission Providers to reinforce independent functioning and nondiscrimination rules for transmission of natural gas and electricity. Among other things, this regulation restricted the sharing of certain activities, personnel, and information between the transmission business unit and energy affiliates within an integrated utility. While these restrictions have been clarified in subsequent orders, energy companies must still be careful to observe the regulations in the performance of risk management duties.

With regard to guidelines, in 2006 the U.S. Department of Homeland Security published its National Infrastructure Protection Plan (NIPP), which contained a risk management framework that applies to certain critical infrastructure and key resources in the United States of America. The U.S. Department of Energy is the primary agency responsible for overseeing the protection of critical infrastructure across much of the oil, natural gas, and electricity sectors under this risk management framework. Affected energy companies will be expected to communicate relevant risk information using the concepts embedded in this framework.

For risk-intensive enterprises, such as many energy companies, the ability to measure and manage risk exposures from both the top down and bottom up is important to become fully Risk Intelligent — to build informed risk-taking and optimization into relevant decision-making levels throughout the enterprise. Integration and aggregation also allow energy companies to employ aggregate or portfolio risk measures such as the more sophisticated versions of cash flow at risk (CFaR) and earnings at risk (EaR), described in the sidebar.

Some leading energy companies are investigating and pursuing the use of sophisticated network- and pattern-recognition tools and techniques to analyze risk and more accurately model interdependencies between risks and understand concentrations of risk exposures. While taking advantage of portfolio effects at this stage of ERM capability maturity will enable more effective management of the enterprise's overall risk exposure, the board of directors and senior management may still tend to deploy capital with the overarching objective of preserving value rather than creating value.

Incorporating Risk into Strategy

Once the board of directors and senior management better understand how individual risk exposures — arising from each risk type and business unit — contribute to the enterprise's aggregate risk exposure, they are positioned to use risk in a more strategic way. Relying on the aggregate risk measures described above, energy companies can incorporate risk into related management areas such as strategic planning, capital investment and allocation, and performance measurement. With a clear risk appetite and risk tolerance to guide it, the enterprise is thus able to pursue new opportunities to create value for stakeholders.

At this stage of ERM capability maturity, the enterprise is able to align its risk management activities and measures with related activities and measures such as capital investment and allocation and overall enterprise performance. Under this regime, the enterprise's risk, capital and performance can be evaluated at various levels, from the overall enterprise level through to the business unit, project, product, or even the transaction levels. The critical link between risk, capital and performance dimensions is captured through the emerging disciplines of performance measurement, including measures such as economic value added (EVA) and shareholder value added (SVA), and risk-adjusted performance measurement (RAPM), including measures such as risk-adjusted return on capital (RAROC).

Incorporating risk into capital and performance activities through advanced measurement techniques can provide the board of directors and senior management with the necessary confidence to start deploying capital with the overarching objective of creating value rather than simply preserving value.

Enterprise Risk Measures: Cash Flow at Risk and Earnings at Risk

Cash flow at risk (CFaR) and earnings at risk (EaR) are the most popular aggregate risk measures in use or under development at energy companies. In a recent survey on ERM practices in the energy industry conducted on behalf of the Committee of Chief Risk Officers (CCRO), more than 80% of energy company respondents indicated that they planned to use CFaR as a risk measure in the future, while more than 50% of respondents planned to use EaR. Both of these aggregate risk measures are usually based on sophisticated causal models in which specific risk factors drive the degree of future uncertainty around key cash flow or earnings components. More restrictive measures such as value at risk (VaR) focus on one or a few risk types while less sophisticated variations of CFaR and EaR are based on pro forma models that use historical ratios to predict future uncertainty in performance. These measures enable a comparison of the enterprise's aggregate risk with its overall risk appetite.

Investing in Infrastructure: The Case of Nuclear Energy

Nuclear energy supplies 16% of the world's electricity needs and 25% of the electricity in developed countries. However, several nuclear generation facilities are nearing the end of their operational life spans and energy companies, governments and regulators are struggling with the challenges of refurbishing existing facilities and building new facilities. Decisions to invest in nuclear capacity are affected by an array of risk factors: substantial capital costs, competing technologies, licensing and construction difficulties, potential fuel supply depletion, radioactive waste disposal, security and operational safety, and uncertainty of returns. Despite these challenges, many governments — including the United States of America and the United Kingdom — are working with enterprises in the private sector to help ensure that nuclear energy remains a viable option. The U.S. Department of Energy's commitment to provide a total of US$2 billion in federal risk insurance as an incentive for the energy companies that build the next six U.S. nuclear generation facilities is an example. This insurance will cover costs associated with certain legal or regulatory delays that stall licensing and construction.

Sources: International Energy Agency. Energy Technology Perspectives: Scenarios & Strategies to 2050. 2006. Various national energy policy documents.

A Way Forward

Building the Risk Intelligent Energy Enterprise has proven to be a daunting task, even for energy companies with the most advanced and sophisticated ERM capabilities. Given the scope and complexity of implementing the ERM capability and the diversity of starting points among most energy companies, a flexible approach is probably most appropriate. Below is an approach that can be effective for many enterprises embarking on an ERM journey.

Start with the End in Mind

Each energy company faces a unique set of circumstances and needs with respect to an ERM capability. While most leading energy companies will strive to achieve the "Integrated" or "Strategic" attributes and milestones described above and in the appendix, such an approach may not be suitable for all energy companies. The board of directors and senior management should consider the objectives and risk appetite of the enterprise when crafting their vision for ERM and devising a strategy to achieving the outcome. The expectations of shareholders, lenders, regulators, credit rating agencies, analysts, and other stakeholders should be taken into account in this process.

Establish the ERM Baseline

At the outset it is useful to assess the enterprise's ERM capability, relative to capability components that correspond to each stage in the capability maturity model, to establish a baseline. The outcome of this diagnostic should provide the board of directors and senior management with sufficient information to evaluate the nature and extent of gaps between the current and desired ERM capability maturity stages. It should also provide the relevant data to perform a cost-benefit analysis for the ERM capability and prepare a business case.

The board of directors and senior management should consider the objectives and risk appetite of the enterprise when crafting their vision for ERM and devising a strategy to achieving the outcome.

Commit to the ERM Program

Developing an ERM capability can require substantial effort as well as scarce resources and senior management attention. The benefits and costs of moving from less-advanced to more-advanced stages of the ERM capability maturity model should be carefully considered before launching the program. Below are some of the benefits of a robust ERM capability.

Benefits of ERM for Energy Enterprises

1. Achieving compliance with laws and regulations, particularly regarding governance and oversight
2. Receiving favorable treatment from credit agencies, insurers, analysts, and other stakeholders
3. Understanding concentrations of risk exposures across risk types, commodities, and business units
4. Taking advantage of inherent portfolio effects across risk types, commodities, and business units
5. Identifying situations where the company's aggregate risk exposure exceeds its risk appetite
6. Optimizing risk control/response approaches across risk types, commodities, and business units
7. Freeing up capital and making improved capital investment and capital allocation decisions
8. Identifying opportunities to offer tailored risk management products and services for customers
9. Incorporating the "cost of risk" into business development and performance management decisions
10. Enabling management of risk exposures using a balanced "bottom-up" and "top-down" approach

If the cost-benefit analysis is favorable and a solid business case can be made for building or enhancing an ERM capability, then the board of directors and senior management should commit to pursuing an ERM program. Such commitment should involve establishing a team, developing a mandate and allocating necessary resources. Depending on needs, the team could comprise a mix of part-time personnel redeployed from other parts of the enterprise but may require additional full-time team members.

Build/Enhance the ERM Capability

The ERM program should start its planning with the gaps identified when the ERM baseline was established earlier. This will ensure that the program's scope is aligned with the enterprise's most significant ERM capability needs as well as the business case. The ERM program plan should address each major capability component — governance and policies, processes, and procedures, people and organization, and technology and infrastructure. Milestones should be based on key attributes in the ERM capability maturity model so that the program team can effectively monitor and report on progress to the board of directors and senior management. Systems and infrastructure promises to be perhaps the most challenging capability component for energy companies, as described in the below box.

IT Challenges for the ERM Capability

Despite a proliferation of vendors competing in the ERM marketplace, no single package solution has emerged to provide the necessary functionality to support the entire ERM capability. Some more established vendors offer risk analysis solutions that enable users to make better informed decisions using specified risk parameters and robust data input. However, functionality to allow users to perform a full range of ERM analyses such as modeling detailed event-trees and scenarios, calculating aggregate risk measures, facilitating capital investment and allocation, and generating risk management reports remains elusive. Data management functionality — the cornerstone of reliable and accurate reporting, valuation, forecasting, and risk measurement — is also under development. If the ERM databases are not secure, flexible, and accessible, then the resulting risk analysis, evaluation, and management will be suspect. Since a fully functional ERM IT solution for most energy companies will comprise multiple systems and databases, there is little doubt that system and data integration will continue to play a critical role in the success of the overall ERM program.

Despite such challenges, many energy companies have moved forward initially by performing enterprise risk assessments, implementing risk registers, developing risk treatment plans, and monitoring the status of certain high-priority risk exposures. Although some energy companies have considered implementing most or all components of an ERM capability at once, many have instead chosen an incremental approach for the program. Starting with a few risk types or business units can provide opportunities to establish credibility and bolster support through early wins while gradually changing the enterprise's culture and learning valuable lessons along the way.

Sustain the ERM Capability

As with most of today's critical management capabilities, sustaining the ERM capability at most energy companies will require a process of continuous improvement. Changes in prevailing conditions in the operating environment, the enterprise's composition and objectives, or the expectations of key stakeholders may require additional effort to maintain the desired stage of ERM capability maturity. Moving to more advanced stages will likely involve an iterative process based on the ERM program steps described above.

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Appendix

ERM Capability Maturity Model

1	2	3	4	5
Initial/Ad Hoc	**Fragmented**	**Comprehensive**	**Integrated**	**Strategic**
• Risk management objectives and policies are mainly undefined. • Risk management activities across the enterprise are ad hoc, possibly chaotic. • Processes and procedures are undefined and/or inconsistently applied. • Some hazard risks are covered by insurance, other risks are mainly self-insured. • People are unaware of their risks and react to events and risks as they emerge. • Relevant experience gained is not used to improve the risk management process.	• Risk management objectives and policies are mainly undefined. • Risk management is an established function within some or all business units. • Business units manage their risks independently and without coordination. • Risk management activities include some risk types, such as insurable (hazard), readily quantifiable (market and credit), or compliance-related (regulatory). • Most activities are performed by a small number of specialists in the key risk areas.	• Policies define some relevant aspects of risk governance and oversight. • Risk management activities span an array of risk types and all business units. • Risk management is an established function within all business units. • Difficult-to-quantify risks (operational) are managed in addition to other risk types. • Business units coordinate for certain common risk types, but risk exposures are measured separately. • Risks are related to strategic objectives.	• Policies define most relevant aspects of risk governance and oversight. • Risk management is integrated across business units and, possibly, with strategic planning. • Risks are managed on a portfolio basis with aggregation across risk types and business units. • All relevant risk types are quantified and aggregated, possibly using a metric such as Cash Flow at Risk. • Risk treatment strategies and approaches are fully integrated.	• Policies define all relevant aspects of risk governance and oversight. • Risk management activities focus on value creation as well as value preservation. • Strategic plans and capital allocations are dynamically re-evaluated based on new risk information. • Risk management is built into all activities across risk types and business units. • Risk management is a source of competitive advantage used to identify and pursue attractive business opportunities.

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