



Power IT Solutions

White Paper

Enterprise Risk Management

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Enterprise Risk Management

Enterprise risk management - the unified process of identifying, understanding, measuring, and managing all of the risks to which a firm is exposed - is the Holy Grail for CEOs, CROs, and board members alike. However, the reality today is that, for most energy firms, enterprise risk management remains an elusive goal. Over the past ten years, energy firms have become proficient at managing silos of risk. Any trading firm can run a value at risk (VaR) calculation on their power book or natural gas book – preferably the combined books. Physical asset position holders are adept at calculating analogous metrics such as earnings at risk or cash flow at risk – and maybe even MW or Btu at risk. Fewer firms can combine their trading and asset management activities into a single, unified view of their risk/return profile (risk management is really about managing risk *and* return). And fewer still can expand the view across all of the organization’s business processes. To be successful, firms need to manage their risks at the enterprise level.

Why an Enterprise Risk Management Approach?

To begin with, what risks does an organization face? In general, risks can be classified as one of four types:

- Market Risk - risks associated with changes in market factors such as commodity prices, exchange rates, basis, liquidity, and interest rates.
- Credit Risk – the risk that a counterparty may default or become less able to fulfill their contractual obligations (financial and physical).
- Business Risk – risks specific to the industry and markets in which a firm operates. For energy firms these may include:
 - Generating plant operating characteristics and constraints (availability, heat-rates, ramp rates, fuel and environmental constraints, transmission, etc.)
 - Weather (affect on plant operations, market prices, customer demand, etc.)
 - Environmental, regulatory, legal, and competitive (SIP call, California refunds, RTO structures, etc.)
- Operational Risk – the breakdown in management controls, information technology, processes, and people. For example:
 - Consistent measuring, monitoring, reporting, and decision making processes
 - Computer model risks (algorithms, accuracy, speed)
 - Technology and systems (are computers networked, do systems provide timely information)
 - Analytical skills – having a strong knowledge base to make informed, competitive decisions
 - People – such as a “rogue” trader, poor judgment by plant operators, etc.

In general, a firm faces all of these risks in varying proportions. One problem with the “silo approach” to risk mentioned above is that a firm’s risks are intertwined. The risks cannot be neatly divided across business processes. Additionally, “silo-ing” risk introduces both inefficiencies and inaccuracies into the process. Under the silo approach, diversification benefits may be lost or overstated. Different business units may perform similar tasks, employing redundant systems and people. Inconsistent data sources and assumptions may be introduced and valuation techniques and risk metrics may vary across the organization. Not only do these factors prevent the firm from gaining an accurate picture of their risk/return profile, they actually *increase* the organization’s operational risk.

Enterprise risk management seeks to address all of these risks across each of the firm’s business processes: asset operations, energy trading and marketing, operations and production, IT, planning and analysis, and corporate (Figure 1). In short, enterprise risk management allows the firm to produce a unified view of its risk/return dynamics and reduces operational risk.

Enterprise Risk Management

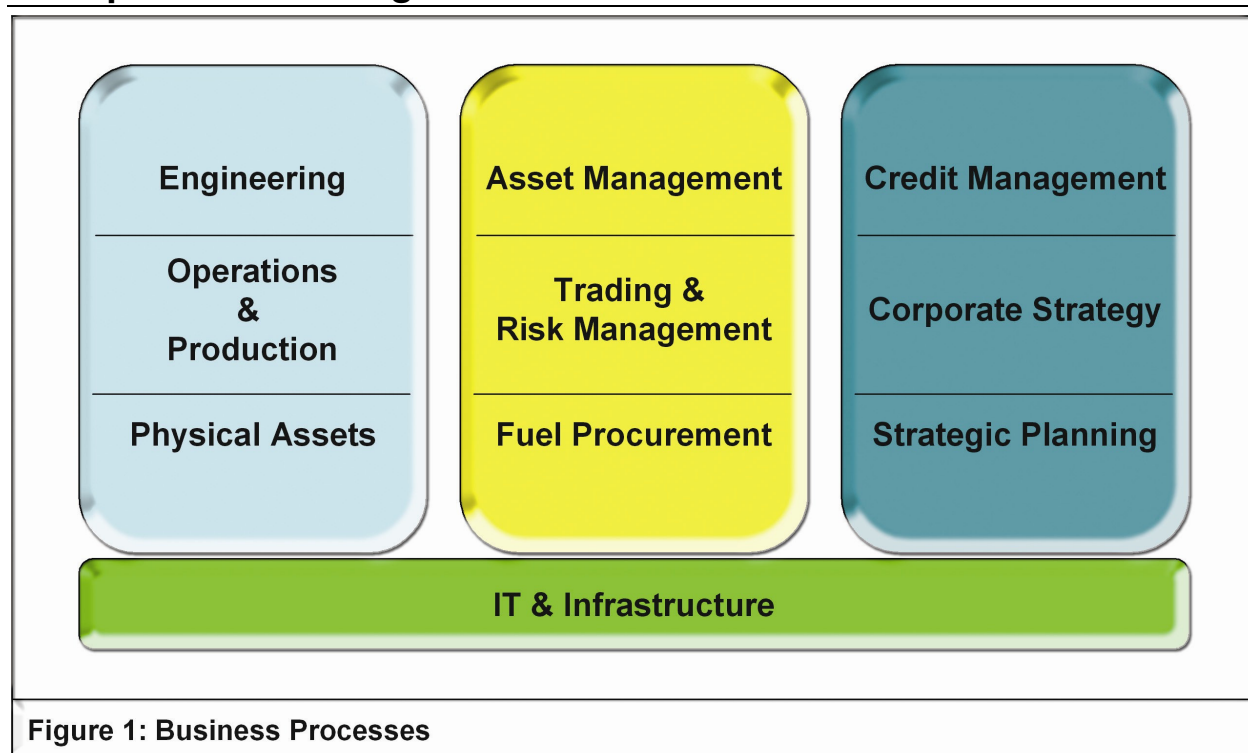


Figure 1: Business Processes

It is important to note that enterprise risk management does *not* mean performing all risk management and risk control functions from a single corporate office (although this can be done) using one giant computer. Enterprise risk entails incorporating risk management into all of a firm's business processes and decisions, training employees to make risk-adjusted decisions, ensuring consistent risk policies and procedures, providing risk controls, and communicating this with the firm's management and stakeholders.

Roadblocks to Managing Enterprise Risk

If enterprise risk is so important, why isn't everyone doing it? The truth is that many firms are taking significant steps towards implementing enterprise risk management but it is an on-going process that must be integrated into the very core of the business itself. There are two major roadblocks to achieving enterprise risk management. The first has to do with the "science" of risk management itself and the second with IT and infrastructure.

Roadblock 1: The "Science" of Risk Management

This is a problem because risk management is not an exact science. At the highest level, implementing an enterprise risk management process involves three steps. First, the firm must clearly define, document, and disseminate risk management policies and procedures. This is actually an ongoing activity between the board and the executive risk committee. Next, the firm starts implementing the systems to measure their risks. Finally, the firm commences activities to manage this risk.

The main rub in risk management comes in the second and third steps. One issue lies in the difference between risk and uncertainty. Risks are uncertainties to which we can assign a probability. For example, if you draw a single card from a standard deck of cards, you can calculate the exact probability of it being the seven of hearts. If you bet on it being the seven of hearts you can assess the risk of losing the bet and even take action to mitigate this risk. On the other hand, if I take a thousand decks of cards, mix them up and randomly create a deck of fifty-two, you will have no idea what the probability of drawing the seven of hearts is – there might not be a seven of hearts in the deck at all or there could be fifty-two of them! In the first case we are dealing with risk and in the second case we are dealing with uncertainty. If you are trying to manage risk but are dealing with uncertainty, you can learn some painful lessons very quickly. In essence, we might be measuring the wrong risks, or we might be applying the wrong measurement to the right risks.

[Note: The partners at Long Term Capital may have claimed that their "blow-up" - they lost around \$4.6 billion US - was a "ten sigma event" given their assumed distributions and correlations but others have argued that perhaps they were using the wrong distribution and the loss was much more probable than they realized! For some very

Enterprise Risk Management

interesting insight into these issues, I encourage you to go to Nassim Taleb's home page at <http://home.netcom.com/~ntaleb/>.

Another issue is that many of the risks a firm faces are “soft” risks, or risks that are difficult, if not impossible, to quantify. Most operational risks fall into this category. For example:

- What is the probability that one of your generating plant operators will encounter a situation they are not prepared for and cause the plant to trip off-line during the peak period?
- What is the probability that one of your credit analysts will type in a number incorrectly and expose the firm to significant, but unseen, credit risks?
- What is the probability that your most valuable employee will leave the firm?

Two significant difficulties we face in this situation are determining what type of probability distributions we use to measure these risks and how we develop the statistical parameters necessary to model these distributions?

Roadblock 2: IT and Infrastructure

The second roadblock involves IT and infrastructure. Take the simple example of an energy firm that owns a single electric generating plant and sells the output of the plant into the market. What are all of the parameters that affect the value of this plant and the risk in monetizing this value? At one extreme, there are plant processes that change second by second and affect the component health of the plant and the plant's availability. At the other extreme, we have financed the plant over a twenty year horizon and future economic growth scenarios and potential environmental regulations significantly affect the risk/return profile of the plant and the firm. In between these extremes, hourly traders need to know the current status of the plant (is it up or down, how fast can it ramp, how many MW are available, etc.), the structuring desk needs to know future expected plant availability and market conditions to sell the plant forward, planners and longer-term analysts need to produce risk-adjusted revenue and cash flow, fuel use, and plant operation projections that use longer-term plant operating characteristics combined with forecast market and regulatory conditions.

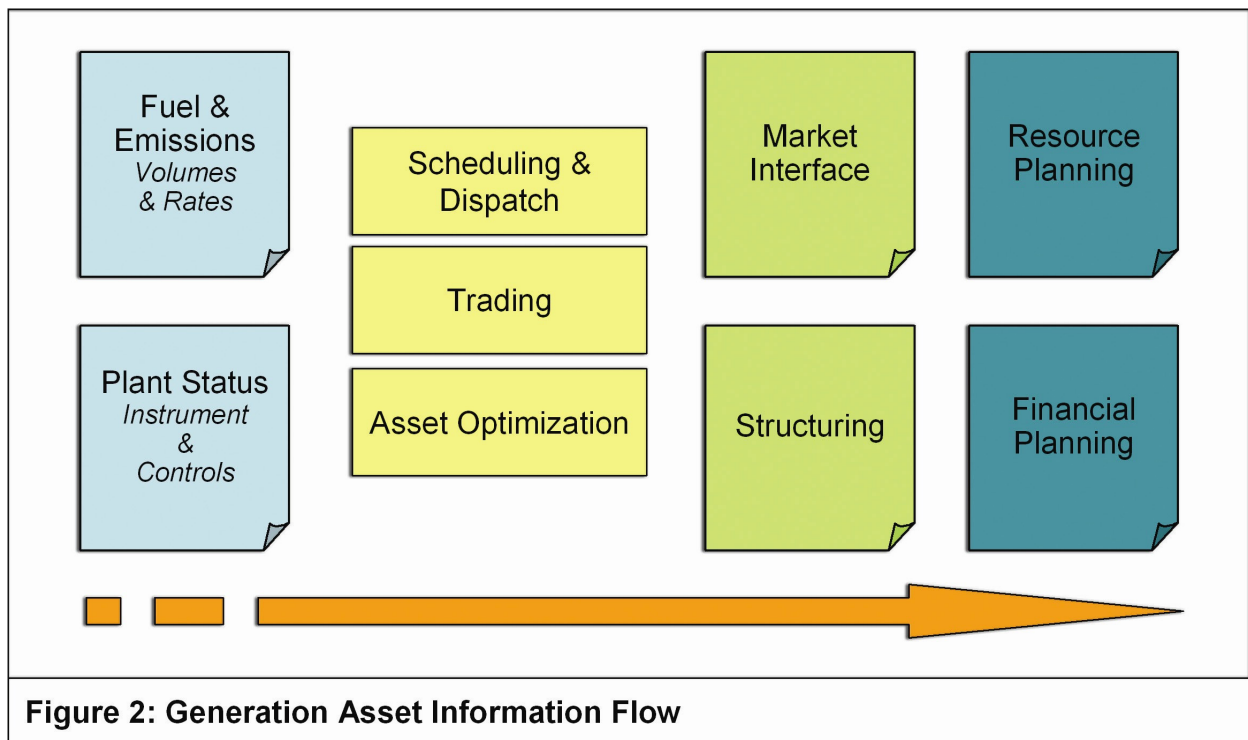


Figure 2: Generation Asset Information Flow

There is a tremendous amount of raw data and information that must be managed across this process. Multiple business entities within the firm are involved – each with their own needs and operating targets. Efficiently managing this process requires state-of-the-art IT and substantial infrastructure investment.

Enterprise Risk Management

Additionally, the most common physical energy products – such as generating assets, natural gas storage, cross-commodity transactions, and weather-sensitive demand – are extremely complex compared to financial transactions and do not lend themselves to closed-form valuation. Monte Carlo methods are the most widely-used technique in valuing these products. Of course, Monte Carlo simulations require significantly more computing power than closed-form solutions. With today's computer hardware, risk managers have tools they can apply to successfully address complex business analysis using Monte Carlo methods. Nevertheless, performing on-the-fly valuations of these physical energy products poses a continuing challenge.

Removing the Roadblocks - Managing Enterprise Risk

Given these issues, is enterprise risk management even possible? How can we remove these roadblocks? There are several things we can do. The first step is to implement enterprise risk management policies and procedures. These will form the framework around which we identify, understand, measure, and manage risk across the enterprise. The risk management policies and procedures should also include initiatives to educate employees on considering risks in their day-to-day decision making. *[There are many excellent sources that document developing and implementing risk management policies and procedures. Two such sources are the Committee of Chief Risk Officers Website (www.ccro.org) and "Managing Energy Risk: A Nontechnical Guide to Markets and Trading" by John Wengler.]*

The next step - to actually solve the risk versus uncertainty dilemma - is more challenging. The risk management industry has seen quantum advances in quantitative analysis theory and techniques in just the past twenty years and we can expect more in the future. For example, quite a bit of effort is currently expended to develop standards for measuring operational risk. However, while energy firms are waiting for the leading practitioners and academics to solve the problem, there are several things they can do to address these issues:

- Incorporate rigorous stress testing and scenario analysis across the decision-making process – from intra-day trading to long-term strategic planning. This will allow the firm to capture the range of what might happen and what could happen when making key business decisions.
- Use a blend of analytical approaches to embody fundamental and market-centric views and gain perspective on the full range of possible decision outcomes. Fundamental analysis, technical analysis, and experience each provide different yet complementary insights into how future events will effect current business decisions.
- Don't rely on a single risk metric – apply a combination of metrics such as risk-adjusted return on capital (RAROC), economic capital, VaR, cash flow at risk, earnings at risk, volume at risk, the "Greeks", etc. Each of these offers unique insight into the firm's risk dynamics. No single method will adequately portray the company's true exposure.

Removing the IT and infrastructure roadblock is arguably the easier of the two. Technological advances in computing power and software architecture have made enterprise risk management achievable now. Today's cutting-edge systems offer:

- Open system architecture
 - Communicate across applications and platforms
 - Intra- or inter-business process
 - From real-time to mid-term to long-term for data capture and analysis
 - New and legacy systems
 - Integrate proprietary analytics and valuation
 - Capitalize on the firms intellectual capital
 - Manage "soft" risks
- True front-to-back solutions
 - Reduce operational risk by enabling consistent assumptions & valuation methods across the enterprise
 - Eliminate risk silos with cross-commodity capabilities (i.e., managing risk across all commodities)
- Distributed processing, including distributed Monte Carlo
 - Allow for "on-the-fly" valuation of complex energy deals
 - Enable intra-day and even real-time portfolio and credit risk metrics
- Browser-based, n-tier architecture
 - Scalable as the number of users, size of the portfolio, and complexity of deals increases
 - Easily deployed across the enterprise to reduce versioning risk and lower upgrade and maintenance costs

Enterprise Risk Management

Conclusion

The traditional silo approach to risk management provides an incomplete and potentially inaccurate view of a firm's risk/return profile. Such an approach can actually *increase* operational risk exposure. To be successful, firms need to manage their risks enterprise-wide. As we have seen, this is not easy. However, the technology, processes, and analytical techniques are available today to bring firms closer to achieving their goal of enterprise risk management. Those organizations that apply today's best practice technology *first* will achieve a competitive advantage that drives real value to the firm's bottom line.