

Power Technology and Markets Analysis - Program 178

Program Overview

Program Description

Electric utilities face very large investment decisions with very long-term consequences. However, tremendous uncertainties exist in many dimensions, including technology development, fuel markets, and energy markets. And these uncertainties are all interconnected -- ripples from the worldwide economic downturn continue to spread through the industry and reach into the upstream industries on which the power sector relies. Analysis and integration of the huge amount of available information, opinion, and uncertainty is critical to a successful technology strategy. Additionally, increased public scrutiny and media coverage of the electric sector requires objective, credible technical information with which to inform regulators, policymakers, and media. Aging infrastructures, long-term growth in electricity demand, a competitive and increasingly complex marketplace, and changing regulatory environment require that optimal technology development and investment strategy incorporate tools and data that enable an integrated understanding of technology options, costs, and market drivers. This diverse set of resources should include:

- Comprehensive, credible, and up-to-date data and analyses of
 - technology performance and costs, and
 - fuel markets and infrastructures;
- Consistent analysis methodologies for
 - technology costs and performance, and
 - price and cost volatility;
- And tools for
 - short- and long-term planning;
 - assessment of market risks; and
 - analysis of fuel, power, transmission and emissions markets.

Research Value

The Power Technology and Market Analysis program integrates three key areas of EPRI research -- the Technical Assessment Guide (TAG[®]), fuel markets, and power markets/enterprise risk. Together, they provide:

- Comprehensive and credible data, methodologies, and tools, resulting in a sound technical basis for technology planning, investments, and market strategies;
- Complementary research to the other areas; e.g. fuel markets and volatility analysis can enhance quality of technology cost estimates;
- Collaborative research and development, which allows participants to leverage the credibility and objectivity of EPRI's industry-wide data and analysis in making key technology and business decisions.

Approach

- Technical reports capture industry-wide cost and market data, establish reference values, define standard analysis methods, and provide analysis of key trends.
- Software tools provide customizable and flexible application of accepted methodologies to analysis of technology costs, asset portfolio planning, market risk, and price/cost volatility.
- Critical technology cost and market data are provided to EPRI's public domain research conducted under the Energy Technology Assessment Center.

Accomplishments

- EPRI's Technical Assessment Guide (TAG[®]) is recognized as the authoritative source for up-to-date technology information. Its credibility is well-accepted by regulators, and TAG[®] is sought after as a critical resource for both U.S. and international agencies and researchers.
- EPRI's fuel markets research continues to expand understanding of the link between power plant project developments and domestic and global fuel markets, changing assessments of fuel supply and availability, and impacts of changes in infrastructures critical to the fuel supply chain
- EPRI's power markets and risk research maintains and updates the Energy Book System software for asset valuation and risk management, and the FastFit software for forward electricity price curve and volatility analysis, as well as defining market risk analysis methodologies.

Current Year Activities

The Power Technology and Market Risk program will focus on two strategic objectives in 2010:

- Existing data sets, tools, and services to participants will be maintained and enhanced, particularly in the TAG[®] and power markets and risk areas.
 - Annual deliverables such as the TAG[®] technology report and the Annual EPRI-EEI Power & Fuel Supply Seminar will be provided.
 - EPRI will continue to feature TAG[®] prominently as a basis for many of its public domain research activities.
- New value will be created through application of existing tools to new areas and through new research.
 - Volatility analysis methods from the power market and risk area will be applied to technology costs to help bound estimates of future costs.
 - The fuel markets area will assess long-term effects of unconventional gas reserves on fuel cost assumptions for levelized electricity cost analysis.

Methods for valuation of options to extend existing asset lifetimes will be investigated

Estimated 2010 Program Funding

\$1.3M

Program Manager

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Summary of Projects

178A Technology-Based Business Planning Information and Services (TAG) (069229)

Project Set Description

Faced with an aging infrastructure, increasing demand, a competitive and increasingly complex marketplace, and changing regulatory environment, the electric industry needs a variety of resources. The Electric Power Research Institute's (EPRI's) Technical Assessment Guide (TAG[®]) project delivers time-critical, technology-based business planning information, tools, and services that help planners, technologists, engineers, marketers, and financiers optimize capital investments in generation, storage, and transmission and distribution infrastructure. Research priorities in 2010 will include:

- Production of the annual "Power Generation and Storage Technology Options" report capturing the latest industry data on technologies and costs.
- Complementary research will be completed via supplemental projects addressing customization of technology evaluation via the TAGWEB[™] software, and system-wide planning via the EGEAS software. In 2009, work has begun to integrate TAGWEB[™] and EGEAS, and a supplemental project for the integrated TAGWEB[™] EGEAS software will be offered in 2010.

Project Number	Project Title	Description
P178.001	Technical Assessment Guide (TAG [®])	The TAG [®] focuses on power industry and fuel market developments and asset management questions, drawing on previous studies, premiere analysts, databases, and market simulation techniques to provide critical planning information. Project participants obtain a one-year license for up to five users of the TAG [®] -Web software package at the beginning of the year.

P178.001 Technical Assessment Guide (TAG[®]) (065783)

Key Research Question

With demand for power and costs for new power generation facilities increasing, energy companies need credible and consistent information on the performance and cost of both conventional and emerging power system technologies. Implementation of effective capital-intensive and long-asset-life technologies is more important than ever before. Developing and implementing strategic technology solutions requires linking technology plans to business plans, which in turn requires critical information on the technologies. Such information includes consistent, credible, up-to-date data on the performance and cost of conventional and emerging electricity technologies.

Approach

The program offers a range of tools -- from cost and performance reports to customizable software and technology-planning case studies -- that target specific, current issues while staying focused on technology trends. Research covers issues such as cost escalation and credit squeeze for new plants, in addition to the annual cost and performance update for as many as 12 power generation and storage technologies. Examples include understanding and clarifying escalation or decline in project costs, the impact of significant amounts of renewable technologies in the system on baseload technologies, and the role of combustion turbines/combined-cycle systems in planning for new capacity in the near term.

Impact

Benefits of collaborative research in this area include:

- Up-to-date market and technology-relevant databases, methods, and tools
- Fast responses to current issues
- Cost and performance data and evaluation tools help participants make decisions on technology choices and facilitate integrated resource planning and interaction with regulatory agencies.
- TAG[®] is an authoritative source of cost and performance information on advanced and conventional generation, storage, transmission and distribution, and environmental control technologies. The TAG[®] program format and content is updated annually to meet changing industry conditions.
- Technology planning case studies provide information “upstream” of technology information.
- Project participation includes membership in the Electric Utility Planning User Group (EUPUG), which serves as a forum for planning managers and directors to share ideas and concepts in a peer group.

How to Apply Results

Project technical reports help participants with preliminary technology screening, preliminary project planning, negotiating with vendors, and communicating options for new generation capacity to company upper management and regulatory agencies where applicable. EPRI's program staff performs industry issue-specific analyses to enhance the application of results. Software provides consistent cost and performance information and methodologies that allow users to customize information to company-specific situations in advanced and conventional generation, storage, and environmental control technologies.

2010 Products

Product Title & Description	Planned Completion Date	Product Type
Power Generation and Storage Technology Options	12/31/10	Technical Report
TAG[®]-Web (one-year licensing agreement)	12/31/10	Software

178B Understanding Power and Fuel Markets and Generation Response (069230)

Project Set Description

Electric utilities need comprehensive, up-to-date information and analysis of risks related to fuel markets . Stakes are high -- the value of a five-year coal supply for one 500-MW plant is \$400–\$500 million or more. These costs affect an entire company—through rates, possible non-recovery, and budgets for non-fuel investment—and tie profitability to a volatile commodity. The Electric Power Research Institute's (EPRI's) Understanding Power and Fuel Markets and Generation Response project assesses energy market developments to provide in-depth understanding of the changing generation infrastructure; related markets in coal, natural gas (NG), and emission allowances; and impacts on generation assets. Research priorities in 2010 will include:

- Assessment of the impacts of the global recession on fuel markets and power sector growth
- Assessment of power industry development paths and gas market risk, in light of continued development of gas shales, and global developments in liquefaction and LNG trade
- Anticipating impacts of CO₂ measures on the fuel industries and procurement
- Guidance on exchange rate impacts across the fuel spectrum
- Identifying constraints and lags in achieving major changes in capacity additions, retirements, and supporting fuel infrastructure.

Project Number	Project Title	Description
P178.002	Power and Fuel Markets and Generation Response	This project focuses on power industry and fuel market developments and asset management questions, drawing on previous studies, premiere analysts, databases, and market simulation techniques to provide critical planning information.

P178.002 Power and Fuel Markets and Generation Response (069232)

Key Research Question

Planners are confronted with a variety of information and opinions. In the U.S. power sector, fossil fuel costs are \$90 billion per year. Natural gas accounts for 54% of this expense, and the power sector has become a critical driver on the demand side of that market. Fuel expenses dominate dispatch and often drive rate cases at regulated companies. There is a great deal of uncertainty about future energy and commodity prices. Global factors have grown in importance. Moreover, the generation mix is beginning a period of rapid change. The rapid buildup of wind capacity is now torn between forces of inexpensive natural gas, economic recession, and economic stimulus. Immediate questions concern market and operational impacts. Longer term, questions of technology choice, fuel use, and just how quickly major changes in the generation mix can be achieved become important. A crosscutting theme is how much the power industry turns to "gas by default."

Approach

This project integrates knowledge of the electricity sector with the vast scope of fuel market analyses, databases, and market simulations into key assessments and analyses that enable treatment of uncertainty in fuel markets in technology planning. Considering its importance to the power industry, natural gas continues to be of particular significance. EPRI's brings unmatched knowledge of how the power industry and competition between different forms of generation.

Impact

The Power and Fuel Market program provides in-depth understanding of changing and complex market and industry circumstances. Research in this program enables participants to:

- Understand the extent and sources of risk in fuel markets, including the period of oversupply, through information on boundaries on sustainable price movements (ceilings and floors, the latter tracking coal-gas competition), as well as guidance on longer-term considerations used in fuel strategy and technology evaluations
- Gain benchmarks on practices of fuel management, forecasting, and hedging risk, including the effects of CO₂ measures
- Anticipate market and operational changes across generation portfolios associated with the expansion of renewables, identify revenue-enhancing and revenue-reducing measures, and assess changes in asset valuation (i.e., the value or vulnerability of a premium for highly flexible generation)
- Understand what controls the speed of turning over generation, and what responses may be triggered (e.g. gas generation)

How to Apply Results

Project findings on power industry development and fuel market topics are used in forecasting, generation and capacity planning, market analysis and risk management, fuel procurement and strategy, and strategies for environmental compliance. This represents a wide spectrum of interrelated activities. This research identifies uncertainties, and allows anticipation of emerging factors and changes in risk. In 2008, EPRI's study of the expansion of gas supplies, pipelines and storage facilities also helped a company make judgments about gas hedging.

2010 Products

Product Title & Description	Planned Completion Date	Product Type
Energy Markets and Generation Response Article Series: This newsletter provides timely and topical analyses on topics of broad industry interest, such as tracking shifts in announced power plants and their likelihood. These updates and an annual natural gas outlook have become staples of this series. Other topics include oil and steel markets, the recession's impacts across the power and fuel industries and markets, and the phenomenon and implications of "coal-gas" switching.	12/31/10	Technical Update
EPRI-EEI Annual Power & Fuel Supply Seminar: Initially offered in 1981, this seminar is an annual event, bringing together new findings supported by EPRI research, perspectives from outside experts, and new topics which may warrant in-depth research in the future. Topics have included global markets and environmental policy, oil's spike and impacts on other fuel costs, dilemmas facing new capacity in light of the financial crisis, transformation of U.S. natural gas markets, and impacts of global factors on U.S. coal markets.	12/31/10	Workshop, Training, or Conference
Power Industry Development Paths and Natural Gas Market Risks: Gas Markets in Oversupply? The goal of this study is to provide insights on upside and downside market risk, based on fundamental drivers of both demand and supply. Factors such as the natural-gas-directed rig count, low prices, and fall-offs in demand will be evaluated for their impact on the market balance of gas supply and demand. This study will update detailed 2009 research via analysis of both conventional and unconventional (shales, tight gas) production declines and rebound. It also will assess developments in international markets, such as contraction of scheduled LNG liquefaction development and the contraction/rebound of depressed LNG demand in Asian and European markets.	12/31/10	Technical Report
Fuel Management Issues: The volatility of fuel prices encountered in 2008 left many wondering, "Is fuel manageable anymore?" The possible movement of CO ₂ measures into the foreground, natural gas hedging protocols, top coal market issues, the value of coal sourcing flexibility (addressed in a 2008 EPRI study), and the ever-present challenges of forecasting will be addressed. The approach will include formation of an industry-led survey to gauge techniques and practices of fuel management.	12/31/10	Technical Update

178C Power Markets and Enterprise Risk (069231)

Project Set Description

The energy business is prone to substantial and complex financial risk. The Electric Power Research Institute's (EPRI's) Power Markets and Enterprise Risk project set helps participants make more effective business decisions by providing critical information on key industry uncertainties, including price volatility of fuel, power, transmission and emissions markets; regulatory uncertainty, such as carbon restrictions or capacity markets; transmission load relief calls (TLRs) and transmission allocation or pricing schemes; load uncertainty, including disruptive developments such as energy efficiency, demand response, and plug-in hybrid vehicles; and a comprehensive, integrated view of enterprise risk. Research priorities in 2010 will include:

- improved methods for energy firms to address valuation, risk management and optimization of their asset portfolios in the face of highly volatility markets and regulatory conditions
- Assessment of the contribution to portfolio risk by CO₂ constraints
- Impacts of transmission congestion, demand response, and capacity market mechanisms

- New and updated methodologies for forecasting, valuation, and risk analysis
- Assessment, and integration and development of methods to address broader “enterprise risk.”

Project Number	Project Title	Description
P178.003	Forecasting Prices and Volatility of Power, Fuel, Transmission, and Carbon	Provide capability to estimate future market behavior to enable planning, deployment, and risk management.
P178.004	Optimizing Portfolio Risk and Return: Energy, Assets, and Carbon	Manage portfolios of contracts and assets to optimize financial benefit within permitted risk tolerances.
P178.005	Enterprise Risk Management for the Energy Business	Adapt enterprise risk techniques for energy firms, with a focus on electricity companies
P178.006	Managing the Risk of Integrating Demand Response and Intermittent Resources	Understand the risk implications and optimize use of demand response and intermittent resources.

P178.003 Forecasting Prices and Volatility of Power, Fuel, Transmission, and Carbon (062068)

Key Research Question

Power and fuel market forward prices, volatilities, and correlations, along with those of related markets in capacity, transmission, and emissions, are critical inputs for a wide variety of business functions. These include resource planning, financial management, asset management, asset valuation, deployment optimization, and risk management. Market forward prices and anticipated market behavior determine the expected cash flows that underlie the value of the assets of an energy firm. Such assets include generation, transmission, derivative contracts, demand response opportunities, storage, and obligations to serve retail customers. Price volatility in these markets often is extremely high, undercutting the credibility of any specific price forecast but providing value to real options and flexible business strategies. These prices provide an opportunity for off-system sales and purchases, as well as a benchmark for assessing the cost-effectiveness of resource commitments. The ability to estimate forward curves and market behavior is critical to making business decisions that minimize cash flow uncertainty and inspire confidence in stakeholders.

Approach

This project provides methodology and understanding needed to estimate forward prices, volatilities, and correlations between markets—that is, the market descriptions needed to drive planning, risk management and asset valuation models. Forecast methods will be adapted to the current market environment. In 2010, this project will investigate special topics pertinent to making price/volatility/correlation forecasting more accurate, less labor-intensive, and more transparent to decision-makers. Forecasting forward prices for electricity, as well as the volatility and correlation of those prices, is a complex undertaking that involves issues such as statistical estimation, valuation analyses, stochastic process modeling, data management, and investment behavior. Specific topics will be chosen in close coordination with participants in early 2010. Likely topics include:

- Modeling of CO₂, capacity and transmission markets' impact on investment behavior.
- Estimation of the forward curve and volatility term structure for CO₂ allowance prices, along with relationships to other markets.
- Integration of the impact of demand response and energy efficiency on forecasting, with emphasis on potential for price peak shaving and reduced volatility
- Integration of option price information in fuel markets with historical price movements to gain insights into forward-looking volatility estimates of power prices.

- Integration of market projections of alternative forecasting methodologies.
- Identification of stochastic process models that more faithfully represent the highly skewed distributions observed in locational market prices and financial transmission rights.

In 2010, this project will utilize a mix of participant and user group funds to enhance elements of its suite of forecasting products:

- The FastFit model adopts a *statistical* approach to estimating price/volatility/correlations from current and past market data. This model fills in the seasonal and monthly shapes in lumpy annual forward contracts and estimates three-factor volatilities, mean reversion rates, and correlations that reflect the current market.
- The FastForward model adopts a *structural* approach to price/volatility/correlation forecasting. This approach captures the potential for structural change in markets, the effect of market-driven investment in new generating capacity on prices and volatility, and regional price differentials. It also provides rich insight into the key drivers of prices and volatility beyond the horizon of observable market prices.
- The Static Equilibrium model adopts a long-term view of candidate technologies to determine an appropriate long-term asset mix for the industry. In effect, it provides a long-term target range for the other forecasting methods.

Impact

The deliverables in this project will provide: Enhanced accuracy and confidence in projections of market behavior,

- Reduced uncertainty in growth of cash flows
- More effective and efficient use of assets, and
- Increased stakeholder confidence

Research results will be used to ensure development of state-of-the-art algorithms and software. Software implementation will serve as a test bed for research ideas, ensuring that the published studies are applicable to real-world problems.

How to Apply Results

Energy firms increasingly tend to centralize their market forecasting activity and develop corporate specialists in this function. This is because forecasting results influence the work of numerous high-profile groups within the firm, such as risk management, trading, the chief risk officer (CRO), the chief financial officer (CFO), and resource planning for power, fuels, and emissions. Participants will gain knowledge and skills by attending EPRI seminars and webcasts, reviewing EPRI reports, participating in task forces, and implementing EPRI's software products. Participants may also collaborate in research projects designed to help them solve the tougher problems, ultimately providing forecasts based on the extra insight needed to support the critical decision-makers in their companies.

2010 Products

Product Title & Description	Planned Completion Date	Product Type
Energy Price Forecasting in an Era of Intermittent Generation and Carbon Constraints: Recent experience in some energy markets suggests that we may have entered a "new band" of substantially higher price volatility. This may be exacerbated by large-scale introduction of intermittent sources. On the other hand, large-scale price demand-response in electricity may mitigate price spikes. How should price models for electricity and fuels be modified for valuation and risk management? Should we explicitly incorporate the possibility that "black swans" to upset our best plans?	12/31/10	Technical Update
Webcasts on Price Modeling: Webcasts will be presented on current topics related to forecasting and price modeling, with an emphasis on ensuring that price models more closely track observed prices.	12/31/10	Workshop, Training, or Conference
Forecasting Software – update: New breakthrough algorithms will be delivered either via spreadsheet or update to existing software. Routine software updates will be funded by user groups.	12/31/10	Software

P178.004 Optimizing Portfolio Risk and Return: Energy, Assets, and Carbon (062069)

Key Research Question

Energy companies are subject to a variety of commodity-related risks, including fluctuations in power prices, fuel prices, demand response, emissions allowance availability and pricing (soon to include carbon), transmission congestion pricing, capacity markets, load growth, credit exposures, unanticipated breakdowns, and market regulation. Some of these exposures, such as power and fuel prices, may be remarkably volatile and move in tandem in a manner that exacerbates risk. Others are new, hard to gauge, or subject to changes in market regulation and market design. Decision-makers need the means to assess the net risk of their portfolio of energy assets, both short- and long-term. They need this information to guide adjustments in the portfolio mix and optimize cash flows while ensuring that risk remains within corporate policy and the expectations of stakeholders. Assessing risk many months and years into the future is recommended, because many energy assets cannot be created and deployed quickly. Risk must be assessed within a corporate perspective — that is, one that facilitates netting out risks derived from different assets and exposures — to avoid over-hedging that can ultimately *increase* risk. Market risk exposure affects decisions regarding the deployment, use, purchase, and sale of assets, which in turn must be reflected in decisions regarding optimizing the portfolio with respect to risk. Asset value is particularly dependent on the flexibilities built into assets, such as the ability to support rapid changes in deployment, which can prove extremely advantageous in volatile markets. These issues influence a wide variety of job functions including trading, risk reporting, risk management, resource planning, marketing, and financial management.

Approach

This project will provide methods and tools that help market participants optimize their energy asset portfolios with respect to future cash flows and exposure to risk. A comprehensive, market-based framework enables valuation and risk assessment over a wide variety of assets and risks. Research studies will address newly developing issues as well as bridging the gap between risk management theory and practice. Candidate topics include:

- New opportunities not addressed adequately in existing frameworks for risk and optimization, such as CO₂, demand response, transmission congestion, or capacity
- Optimization of hedging opportunities relative to portfolio composition and market behavior
- Market circumstances that do not fit existing models, such lack of liquidity or boom/bust behavior
- Market dynamics that do not fit existing models

- Newly available procedures, such as measures of portfolio risk or means of portfolio optimization
- Studies of best practices in the industry
- New algorithms for valuation of assets and representations of price behavior
- Optimization of business strategies, such as bidding around assets, operating in a partially competitive environment, or operating in a situation where actions affect the market
- Integrating the effects of poor market liquidity on risk modeling
- Relating business objectives to risk limits
- Integrating the tradeoffs among hedging different types of risk.

This project will address incorporation of new methods of financial engineering to the extent that they are deemed relevant and sound. For example, a "real options" approach to valuation of physical assets is now considered mandatory for assets that have operational flexibility in volatile markets. Existing software tools, such as the *Energy Book System* for asset valuation and risk management, will be incrementally improved as research suggests new ideas for experimentation and implementation based on available funding from participants and user groups.

Impact

The deliverables in this project will provide participants with:

- Enhanced accuracy and confidence in projections of portfolio behavior under a variety of potential market conditions
- Improved efficiency of asset utilization
- Increased stakeholder confidence
- Increased revenue, while smoothing the growth of surplus and/or profits

Deliverables will improve capabilities in the following essential business functions:

- Risk management
- Derivative contract valuation
- Portfolio optimization
- Physical asset valuation
- Capital budget allocation
- Pricing and structuring retail products

How to Apply Results

Energy companies form teams to perform the functions of risk management, resource planning, trading, and centralized financial analysis and reporting. Teams can improve their capabilities by participating in EPRI task forces, seminars and webcasts, as well as studying the associated reports and implementing EPRI software. Further, such staff can help direct EPRI research, thereby ensuring that EPRI is addressing their most pressing needs.

This project offers research for stakeholders already sophisticated in market-based valuation and risk management, as well as training and business assessments for less experienced stakeholders.

Studies performed in the special topics area will help ensure development of state-of-the-art software. Software development and implementation will serve as a test bed for ideas developed in the studies.

2010 Products

Product Title & Description	Planned Completion Date	Product Type
Optimal Hedging of Energy Risk under Intermittent Generation and Carbon Constraints: This report will address means of optimizing the hedging of market, load and operational risks, with an emphasis on dealing with the expected introduction of large-scale intermittent generation (e.g., wind, solar) and some form of carbon constraints.	12/31/10	Technical Update
Webcasts and/or seminar in risk analysis and portfolio optimization: This program will present innovative webcasts on energy risk management, valuation and portfolio optimization that reflect member needs and future directions of the industry. The seminar, "Principles of Valuation and Risk Management in Energy Markets," also will be offered if there is sufficient member demand.	12/31/10	Workshop, Training, or Conference
Software for Risk Management and Portfolio Optimization: New algorithms for valuation and hedging of risks will be delivered either as updates to existing software (Energy Book System) or via spreadsheet. Routine software updates will be funded by user groups.	12/31/10	Software

P178.005 Enterprise Risk Management for the Energy Business (067433)

Key Research Question

Frameworks, such as "COSO" (developed by the Committee of Sponsoring Organizations of the Treadway Commission), have been developed outside of the energy industry for systematically uncovering and dealing with enterprise risks. Various consultants and industry organizations, such as the Committee of Chief Risk Officers (CCRO), have attempted to develop industry-specific frameworks for the energy industry. To varying degrees, energy companies have been addressing a large array of risks utilizing some of these frameworks, but the effort is uneven and organizations are concerned about high levels of redundancy between available approaches. "Enterprise Risk Management" (ERM) covers the extensive array of energy business risks, and provides a framework in which to enumerate, assess and deal with them. The risks typically include:

- Market Risk: Risk associated with markets such as power, fuel, emissions, interest rates, and foreign exchange rates,.
- Volumetric Risk: Risk associated with the quantities of goods and services that customers will demand
- Credit Risk: Risk associated with the ability of customers and vendors to pay or deliver
- Operational Risk: Risk associated with the performance of technical or managerial systems
- Event Risk: Risk associated with unfortunate events such as fire, earthquake, terrorism, flood, or theft
- Regulatory Risk: For example, risk associated with changes in market design or the introduction of restrictions on carbon
- Legal Risk: Risk associated with the interpretation or enforcement of contracts and laws
- Model Risk: Risk associated with the use of theoretical models for valuation or risk management
- Public Perception Risk: Risk associated with stakeholder perception of your firm, which can influence market share, pricing, willingness of firms to engage in long term contracts, employee retention, and relationships with regulators

Some types of risk are clearly more easily quantifiable than others. Some have received a lot of attention, such as commodity risk, to the point that there is a large body of well-developed theory, practice and infrastructure pertaining to them, but others have not.

Approach

This new project will facilitate and accelerate the energy industry's ability to assess and deal with "enterprise risks." This project will use existing work to the extent possible, provide a source of consolidated information, identify research needs, and develop research projects as dictated by the priorities of participants. The project will have a bias toward collaboration with existing industry institutions that focus on enterprise risk, and will coordinate with research in related EPRI programs as well. This project surveys of the existing frameworks and studies of frameworks that have been developed either specifically for the energy industry or more generally by the risk-management community. The project will survey ERM practitioners in the energy field to determine which frameworks and approaches have been tried and are most successful, and to identify open questions that will serve as a basis for further research. Project participants will guide the focus as to particular types of risk. The deliverables will be a combination of report(s) and webcast(s), and possibly a workshop. The goal is to provide an overview of the applicable frameworks, and their apparent strengths and weakness in practice, so participants can determine how their current approaches compare to others and make effective adjustments.

Impact

This project will help participants identify risk exposures and to manage them in effectively. Participants will save time, identify the most successful approaches, and ultimately smooth out cash flows as well as public perceptions of their risk profiles. A focus on enterprise risk can help avoid substantial financial difficulty. Additional benefits are likely to include greater access to capital markets and lower interest rates. At least one bond rating firm (S&P) has announced that it assesses ERM efforts as part of their process of rating energy companies.

How to Apply Results

Staff responsible for enterprise risk as a whole (e.g., chief risk officer) or who analyze and manage particular risks will work with the EPRI task force, engage in surveys, benefit from reports, webcasts and seminars that emerge from this project, and participate in customized supplemental research projects.

2010 Products

Product Title & Description	Planned Completion Date	Product Type
Energy-Enterprise Risk Management: Dealing with Complex, Interacting Financial and Regulatory Uncertainties: The study will survey approaches being used for overall enterprise risk management at energy companies, and address their degree of success and further needs. Special attention will be paid to needs developing due to uncertainties in regulation (e.g. carbon) and other technology developments such as smart grid and intermittent generation.	12/31/10	Technical Update
Webcasts: Managing Enterprise Risk for Energy Firms: Practices and experiences of enterprise risk management in the energy industry will be covered in one or more educational webcasts.	12/31/10	Workshop, Training, or Conference

P178.006 Managing the Risk of Integrating Demand Response and Intermittent Resources (065559)

Key Research Question

Energy companies are rapidly increasing their use of demand response and variable output generation resources due to considerations including economic pressures, new policies, global climate change and the efficiencies offered by advanced metering systems. How should firms manage the risk of these sources of power? Issues include:

- A company's short- and long-term risk management will need to accommodate the differing characteristics of the various types of demand response and variable output generation resources relative to traditional resources.
- Risk measures and risk reporting will need to be adjusted.
- New models or changes to existing models will be required.
- New avenues of communication will be needed within a company.
- Adjustments to hedging practices will be required.
- Questions about the role of market design in facilitating the effective use of demand response and variable output generation resources must be answered:
 - How can a power market design impact the effectiveness of demand response and variable output generation resource programs and enhance their value?
 - Which approaches to demand response and variable output generation resource investments will be facilitated by any given market design, and how might energy companies respond?
 - What are the business and technical hurdles facing implementation of new programs and markets accommodating demand response and variable output generation resources?

Approach

This project provides a risk-centered assessment of the behavioral characteristics of demand response and variable output generation resources. Central to this effort will be aspects such as:

- Techniques for triggering the resource
- Profiling and modeling the uncertainty of availability
- Enumerating the relationship to the availability of other resources (correlations, positive or negative)
- Seasonal and regional considerations
- Relationship to other enabling resources, such as transmission

This project will then assess the impact on standard and suggested energy risk practices, with an emphasis on net portfolio risk looking forward over months and years, as well as stress testing (e.g. dealing with disruptive negative events). A portion of this effort will involve surveying existing practices as a source of ideas as well as calibration to see where the de facto research frontier lies. This project will pay particular attention to the relationship between regional market designs and their impact on the effectiveness, availability and integration of demand response and variable output generation resources into the energy portfolio. Design parameters that inhibit or encourage widespread integration into existing utility businesses will be identified. Project activities will include the following two approaches:

- Empirically investigating the potential for such programs to provide new value and risk mitigation techniques to utilities and customers by providing a practical method for identifying the most promising prospects under specific business conditions (e.g., rate structures, market design, and energy prices).
- Investigating the electricity supply chain and decision-making process, from bulk electricity production and transmission all the way to end use. Especially important is the relationship to power markets and the ability to realize the benefits of demand response and variable output generation resources under evolving and uncertain regulatory and market conditions.

Impact

This project will help participants answer questions such as:

- What is the big picture perspective of integrating and capturing the value of new demand response and intermittent generation programs into existing businesses?
- How can demand response and intermittent resources be integrated into the risk management practices of the company and ultimately lead to greater stability of cash flow?

Ultimately, this project will help energy companies incorporate demand response and intermittent resources into their portfolios, from both an economic and operational perspective. Regulators will find project insights helpful for understanding the fine points of market design.

How to Apply Results

Energy efficiency, demand response, and market design decision-makers at all levels can use the initial products of this project to mitigate risk and enhance the value to be captured by integrating demand-side resources. Participants will learn new methods of integrating and capturing value from specific projects in their services areas. They will also be better equipped to integrate demand-side resources to support their business objectives.

Energy risk managers will use the results to adapt their procedures, reflecting the behavioral characteristics of demand response and intermittent resources.

2010 Products

Product Title & Description	Planned Completion Date	Product Type
Modeling Demand Response and Intermittent Generation for Energy Risk Management: This report will instruct stakeholders on methods of integrating intermittent resources into their energy risk management procedures, with a particular emphasis on demand-side resources.	12/31/10	Technical Update