



# Energy, Carbon and Environmental Market Forecasting Services

**December 2011**

## Energy Edge Forecasting Services

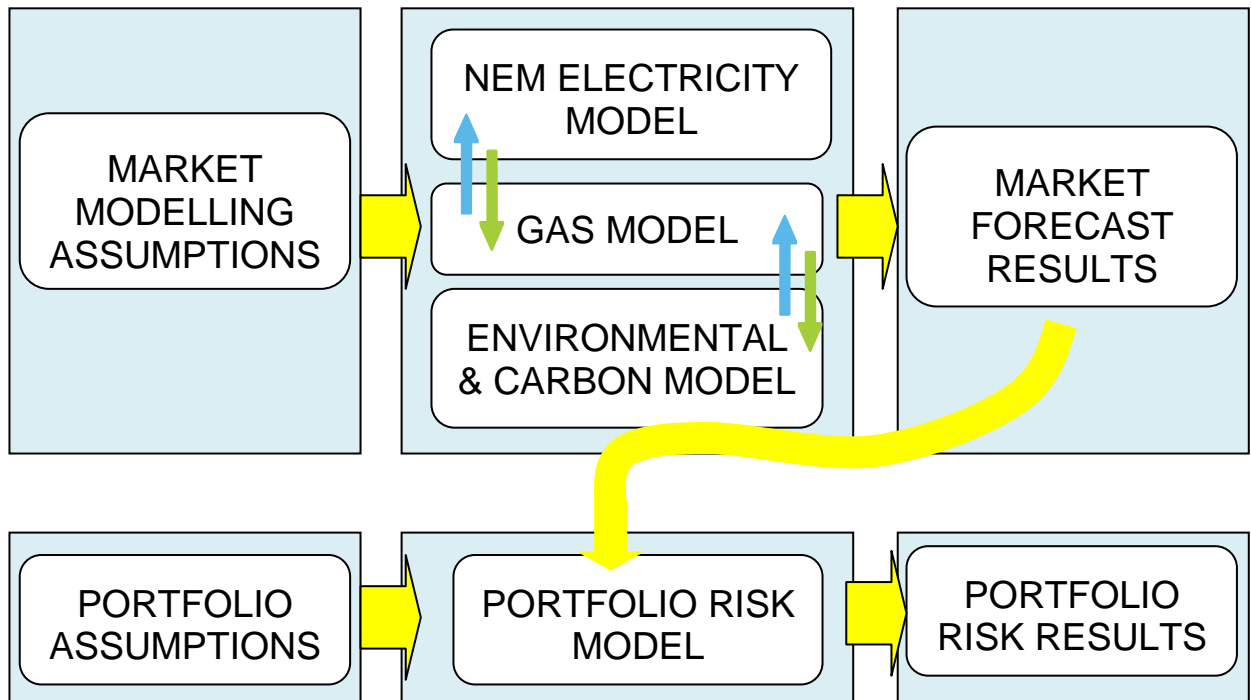
Energy Edge offers Energy and Environmental Market Forecasting services using proprietary modeling software and applying the team's experience in markets and understanding of current issues and participant behaviour.

Clients can choose from a standard forecasting report with Energy Edge's own model inputs or we can work with clients to refine model parameters, choose the right modeling methodology and customize the outputs and summary statistics.

Choose from *Market Point Forecasts* (single likely outcome) or *Market Risk Forecasts* (range of outcomes), across a range of market commodities. Forecasting reports are delivered with a market commentary about the key drivers of market outcomes.

You can extend the forecasting services to *Portfolio Risk Modeling*. We can apply the results of the Market Risk Forecasts to your own portfolio, or scenario investment portfolios including physical assets, supply contracts and derivatives.

The Energy Edge forecasting approach covers the National Electricity Market and associated fuel, carbon and environmental markets. Forecasting is performed with several modeling approaches which can accommodate short term and long term forecasts.



## The Forecasting Approach

Establish forecasting requirements	<p>Contact Energy Edge to discuss your forecasting needs.</p> <p>Do you need a one-off forecasting or ongoing forecasts; do you require a single commodity forecast or a range of commodities;</p>
Select the degree of customization	Purchase a standard report or customize the forecast
Collaborate to refine model assumptions	Energy Edge engages with you to develop the model parameters and assumptions. We apply a documented process to liaise in determining the full range of modeling inputs, whether they adopt your own assumptions, the Energy Edge assumptions or a combination.
Establish model outputs and format	Discuss with Energy Edge the format of your results; do you need prices, generation levels, carbon emission levels, gas balances or more. Would you like results broken down by month, quarter, year or in peak or flat periods?
Energy Edge modeling	Energy Edge will conduct modeling using the agreed upon approach. Draft and final reports will be delivered with an opportunity for clients to review results and affirm the presentation formats.
Extend to Portfolio Risk Modelling	The Market Price Forecasts can be extended to the Portfolio Risk Model to analyse the financial risk and performance of your portfolio. Energy Edge can work through the portfolio assumptions of physical and financial securities to deliver the Portfolio Risk analysis report.

## Technical Forecasting Methodology

Energy Edge applies a *structural* or *equilibrium* forecasting approach depending upon the horizon of the analysis and the resolution required for the results.

### ***Structural Model***

Our structural model uses our proprietary software system for market modelling built on the Market Edge technology. The software simulates the NEM dispatch engine rules by aggregating power station offers across the NEM and dispatching in a way similar to the AEMO NEM dispatch algorithm.

- ***NEM Elements:*** The forecasting model handles the key elements of the AEMO dispatch logic including bid aggregation, interconnector constraints and losses and key market constraints.
- ***Simulation approach:*** The Energy Edge structural model handles randomized forced outages and demands, stochastic interconnector limits and a nonlinear interconnector loss model.
- ***Market Interrelationships:*** Generator bids are constructed within the model on the basis of fuel and environmental costs and revenues, creating a fully integrated market model. Participants' behavioural characteristics are calibrated into the portfolios by the modeling team.

### ***Equilibrium Model***

The equilibrium modelling approach is a top down model based on long-run equilibrium economic modelling. The initial stage establishes long-run equilibrium market prices on the basis of investment costs. The second stage performs randomized simulations on the basis that markets operate in a dynamic way and that long-run equilibrium is only enjoyed on average across the business cycle.

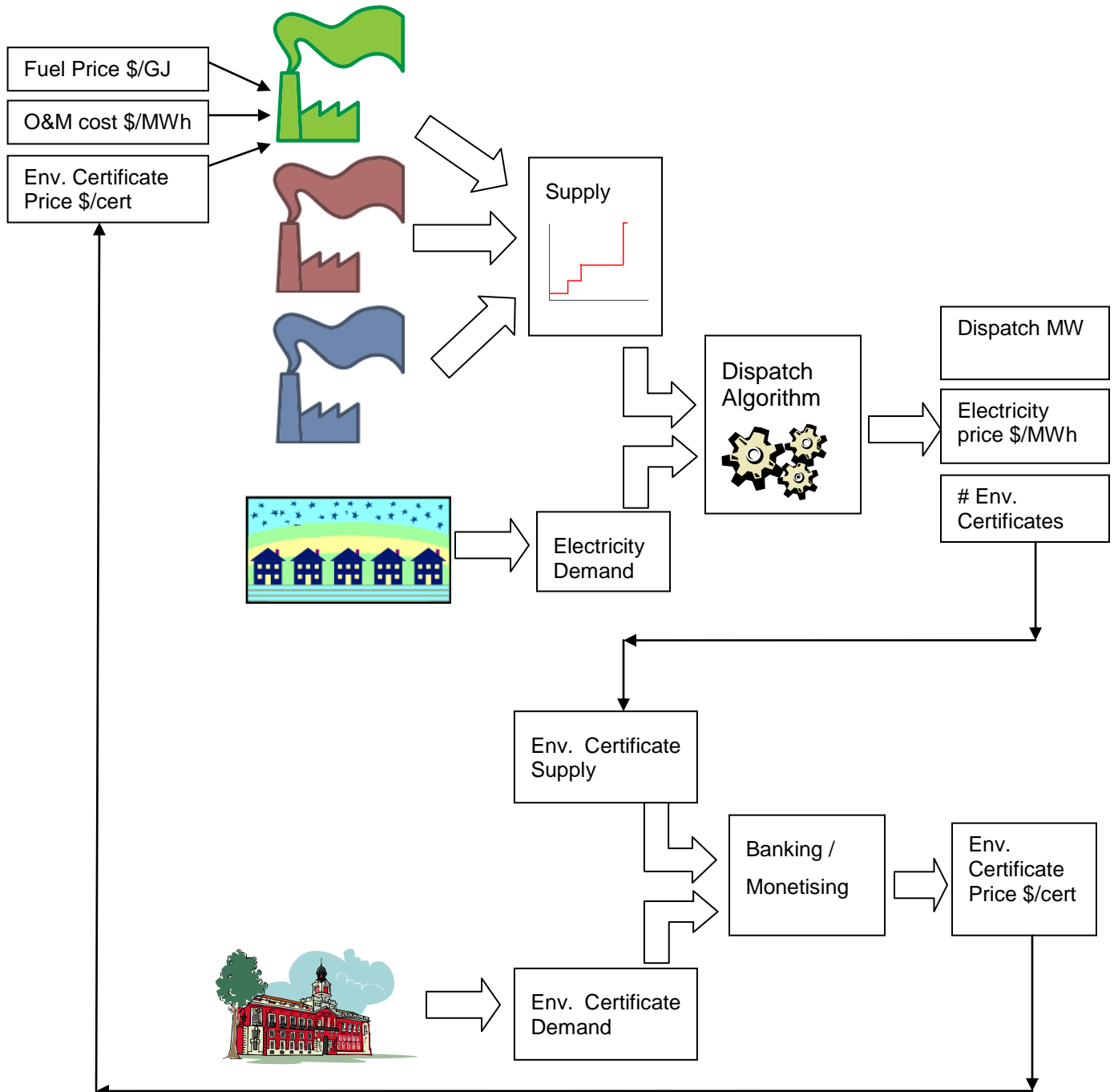
- ***Forward Market Interactions:*** The model integrates available market forward price data for short term forecasts. Risk premiums and historical price patterns are applied to model prices to a finer resolution.
- ***Market Derived Quantities:*** Market price forecasts are established as the weighted Long-Run-Marginal production costs beyond the short-term horizon. Under economic equilibrium, the cost of meeting the demand is based on a risk-adjusted cost of production, where the cost of production itself depends on various market-linked commodities, capital costs and operational costs.
- ***Environmental Market Closed Loop:*** Environmental and Carbon markets in turn affect the electricity prices. The model applies a closed loop approach to model the interrelationship between fuel, environmental and electricity markets.

## Where are Market Forecasts Used?

Market Forecasting services and the Portfolio Risk model add value for:

- ***Trading and risk management.***
  - Independent Market Forecasts for electricity, gas, carbon and other traded quantities to support trading and risk decisions
  - Risk profiles of existing and proposed portfolios
  - Competitor analysis
  - Portfolio optimization
- ***Energy procurement***
  - Establish likely energy purchase prices as well as best-case and worst-case scenarios
  - Determine expected energy and compliance costs for the portfolio
  - Compare alternative strategies: spot purchases, retail contracts or wholesale hedging
- ***Due diligence:***
  - Independent and transparent third party Market Forecast
  - Expected Portfolio earnings and earnings risk profiles
- ***Financial investment.***
  - Calculation of Portfolio Earnings, Net present value and portfolio earnings risk profiles
  - Establish the lowest risk profile of the portfolio under optimal hedging
- ***Corporate Budgeting and Business Planning***
  - Validation of business plan forecasts and conclusions
  - Risk assessment of potential financial outcomes compared with budget estimates Market Forecasting Approaches

# Energy Edge Multi-Commodity Market Model



## Energy Edge Fact Sheet

Energy Edge is an innovative consulting organisation that specialises in commercial and market risk management services and business activities. Energy Edge helps clients in utilities to meet their needs for managing commercial and market risk, trading requirements and exposures to environmental and energy costs.

The Energy Edge team has a combination of financial and commodity market experience through the full spectrum of trading and risk management areas, commercial and corporate finance activities. This breadth and depth of experience combined with extremely strong commercial, analytical, mathematical and software development skills forms the base from which Energy Edge provides a range of consultancy services to entities directly and indirectly impacted by energy, environmental and other commodity markets.

**Recent Projects:** Some recent projects undertaken by Energy Edge include

- Designing, developing and implementing pricing and risk management software tools in energy markets
- Carbon Market and Compliance Readiness Reviews
- Development and implementation of Trading and Risk Management functions for emerging energy companies
- Developing and installing contract management software for urban water market settlement and invoicing
- Implementation, design, configuration and testing of third party software across front office, middle office and back office processes
- Project Management and delivery of Gas STTM trading and risk management capabilities
- Designing and developing electricity price benchmarking tools and transfer pricing processes
- Commercialization strategies and feasibility studies for gas and gas generation projects
- Due diligence work for major utility acquisitions
- Valuation of real options embedded in gas supply agreements
- Enterprise wide reviews of carbon risk and opportunities
- Policy and procedure reviews and
- Delivery of a trader and risk manager decision support suite of software tools Market Edge, based on specific Energy Edge intellectual property.

### **Trading and market risk management**

- Trading strategy development
- Portfolio optimisation
- Training
- Market research and surveys
- Policy development and reviews
- Risk identification and measurement services

### **Commercial Advice**

- Assistance in due diligence processes
- Assistance in business plan development
- Analysis of commercial implications arising from regulatory or market changes
- Competitor analysis under different market structure scenarios
- Enterprise Wide Services
- Treasury risk management services
- Assistance to Internal audit teams
- Fitness for full retail competition
- Review of business risks and their correlations with other markets
- Development and implementation of Trading and Risk Management functions for emerging energy companies

### **Systems and Software**

- Development and installation of a Water Contract Management system.
- Development and implementation of customised analytical and pricing tools
- Development and installation of the Energy Edge proprietary trading and risk management software *Market Edge*.
- Project management of systems and software projects
- Retrospective documentation, standardisation and process management for ad-hoc in-house systems and tools.

### **Environmental Markets**

- Market structure advice
- Policy advice
- Modelling of environmental markets, price forecasts and assessment of commercial implications
- Assistance in registration and accreditation processes
- Environmental product strategy development
- Enterprise wide carbon risk assessments and management planning

### ***Biographies of key personnel***

#### **■ Angus Macleod, Managing Director**

Angus has over twelve years experience in the Australian energy markets in roles establishing electricity trading desks and managing trading operations. His experience has spanned market trading activities and managing large commercial negotiations and projects. He was elected Chairman of the AFMA Electricity Committee in 2005 and 2006. Angus has experience in front and middle office roles across a range of markets including base metals, precious metals, foreign exchange, equity and interest rate markets. He has a further seven years experience in domestic and international financial and commodity markets and over four years as an auditor for Deloitte

In the role of Managing Director of Energy Edge since June 2006, Angus has lead a team to provide a wide array of clients with high quality advice and solutions across electricity, gas, Carbon and environmental trading and risk management issues.

#### **■ Elliot Tonkes, Director Risk and Analytics**

Elliot is an experienced and highly regarded risk manager and market analyst with an outstanding background in commercial and academic environments with over ten years' experience in the Australian energy, carbon and environmental product market. He has experience in energy and environmental markets as the chief risk and market analyst at a major generator. leading small teams to perform forecasting, risk quantification, pricing and analysis of derivatives and structured financial products, strategy evaluation, project valuation, system development and software implementation.

As Director of Risk and Analytics at Energy Edge since September 2006, Elliot has provided high quality advice to boards through to executive teams, risk managers, analysts, and traders. Elliot has implemented solutions for a range of risk management issues in electricity, gas, carbon and other environmental product markets. Elliot is also responsible for the design and development of Energy's suite of proprietary software and project managed several major deal capture and risk management bespoke software development projects for our clients.

#### **■ Dr Antony Stace, Risk and Trading Consultant**

Antony is a highly experienced risk and market modeler with significant experience in electricity, carbon, environmental products and other commodity and financial markets. Antony has experience in electricity businesses as a consultant with exposure to spot and contract trading systems, including experience as a spot trader.

As a Key Modelling Consultant at Energy Edge, Antony ensures quality model inputs, and keeps a close-ear to the ground for market intelligence and spot trading behavior. He is able to convey complex modelling principles and results in an insightful way for clients.

#### **■ Other team members**

Other members of the Energy Edge team can be found at the website:  
[www.energyedge.com.au](http://www.energyedge.com.au)

## More Information

For more information on the Forecasting Services, Software Products or Energy Edge's other services visit [www.energyedge.com.au](http://www.energyedge.com.au) or alternatively phone Angus Macleod on 0419 739 260 or send an email to [amacleod@energyedge.com.au](mailto:amacleod@energyedge.com.au)