

# ***Market Edge***

## **Energy Trading Deal Capture, Risk Management and Decision Support System**

**December 2011**

## What is *Market Edge*?

*Market Edge* is a suite of deal capture, risk, decision support and portfolio management components designed specifically for the Australian energy markets. System component capabilities span electricity, gas, carbon and environmental product trading and risk management activities. The system performs predefined and configurable market queries, data analysis, information management and portfolio analysis. Components contain integrated tools to perform derivative pricing and risk quantification in a desktop environment. *Market Edge* performs standard and ad-hoc analysis tasks to provide traders, risk managers and commercial analysts with the information they need to find trends, calculate risks and enhance returns.

The components within *Market Edge* enable traders, analysts and risk managers to instantly query and visualize market data. A large selection of data sets and reports are predefined with the facility for users to add further data and analysis queries.

Advanced features in *Market Edge* include derivative pricing tools, mark to market and settlement engines, physical and financial portfolio risk analysis tools, portfolio optimization, credit risk tools and performance benchmarking methods. Additional components implement Hedge Effectiveness calculations.

*Market Edge* contains an inbuilt deal capture facility which manages contract portfolios. Various meta data is captured such as counterparty and broker information. The contract management system incorporates a configurable workflow facility. All changes to contract metadata are managed using date-effective versioning for auditing purposes, and to allow users to reproduce reports replicating the historical data and status of the original report runs. Standard adaptors in *Market Edge* allow users to upload meter data, forecast data, risk scenarios and simulations. For instance, the system will enable a user to upload a simulation of 100 pool price traces, load the existing contract portfolio, add some hypothetical contracts, perform a settlement run, and produce plots of the distribution of settlement cash flows.

## *Market Edge* Functionality

The *Market Edge* suite provides decision support tools for energy, carbon and environmental product trading in physical and financial markets. The software is designed to capture and manage primary data, query and visualize data and perform statistical analysis. The system analyses data by various configurable time buckets (period types).

The functionality is accessed through user interfaces with configuration files and saved settings. Scheduled tasks can be set up to initiate uploads and run regular reports. *Market Edge* consists of a series of tools which access a common data set. Tools are classified into the components below. Security is controlled with a managed password or Windows integrated security. Access to tools and functionality within each component is administered by allocating user and group permissions to various features.

## ***Data Visualisation***

- Query physical or financial data by period type.
- Summarise and plot data by period type (e.g. peak, offpeak, superpeak, seven-day-peak, etc).
- Summarise and plot data by resolution (e.g. half-hour, day, week, month, calendar year, etc).
- Map data between disparate time scales (e.g. 5-minute data to 30-minute or daily data).
- Plot time series and other graphs (e.g. line plot, duration curve, histogram, intensity plot).
- Plot and fit relationships between market data (e.g. price versus demand, interregional and intertemporal price spreads).
- Plot forward price data as time series (e.g. view standard forward products, view time series of inferred forward prices, calculate annualized volatility).
- Visualize pool bids (e.g. view pool bids by unit or corporation).
- Visualize “stacked” market data (e.g. stack contracts by strike price, stack plant capacity by merit order, stack dispatch volumes by carbon intensity).
- Visualize relationships between market variables (e.g. price versus demand, or gas spot price versus electricity price or \$300 cap payoffs versus swap payoffs)

## ***Data Analysis***

- Define complex operations on available data sets and save (e.g. calculate the likely payoff from a structured contract involving gas payments, unit availability, loss factors, electricity price and dispatch volumes)
- Perform operations on half-hourly data, decompose data into configurable time buckets (e.g. peak, offpeak, over all Januaries) and perform analysis across samples (e.g. min and max over all stress tests).

## ***Data Management***

- Integrate with NEM Infoserver data.
- Upload forward data from Excel or CSV: AFMA, ICAP, SFE or user-defined.
- Upload Prophet or other forecast data.
- Upload user-defined CSV data: temperature, demand projections, customer loads.
- Integrate with a contract capture database.
- Bulk upload derivative contract data from CSV.

The *Market Edge* data format is documented, and users with a working knowledge of Matlab can use their own Matlab programs to access and write the same format.

The Market Edge data store incorporates a MS SQL relational database containing administrative, market and model data. Large data sets are contained in an efficient binary file format enabling lower disk volumes and high speed loading and writing.

### ***Time Management***

- Define and save day types and period types (e.g. peak, offpeak, superpeak, seven-day-peak, etc).
- Upload special days (e.g. public holidays, outage dates, school holidays, etc).
- Query time structures (e.g. hours per quarter, logical peak and offpeak periods, etc).

### ***Forward Curve Processing***

- Create a consistent forward curve from overlapping input data.
- Create a half-hourly forward curve from user defined reference shapes (e.g. historical pool or forecast price data) and with selected matching (e.g. match working days and nonworking days).
- Manage carbon, environmental product and energy forward curves consistently.

### ***Derivative Pricing***

- Pricing tools for various standard and exotic derivatives:
  - **Swaps:** price against a half-hourly curve. Permits fully sculptured price and volume.
  - **Caps:** use the cap pricing model, the generic pricing model, simulation-based pricing or price against a cap forward curve.
  - **Futures:** price against published futures prices.
  - **Swaptions:** value using a Black-Scholes framework customized to electricity options using a half-hourly curve or a known forward price. Permits fully sculptured price and volume. Calibrate volatilities. Use a single discount rate or load a yield curve.
  - **Asians:** value using a customized Black-Scholes framework customized against the standard forward curve, or a defined alternative forward price. Permits sculptured volumes. Calibrate volatilities.
  - **Generic pricing:** price exotic contracts using the generic pricing model which references any exotic derivative against liquid products to establish a fair price and hedging strategy. Use the tool to price gas contracts, SRA contracts, caps with non-standard strikes, callable swaps and contracts with flex or swing etc..
  - **Simulation based pricing:** price exotic or structured contracts using a simulation based approach from the risk-adjusted NPV of expected cashflows arising from the contract.

## ***Deal Capture***

- Capture contracts
  - Maintained in date-effective versions which recognize the nature of the contract at historical points in time e.g. managing option exercises and expiries and contract price resets.
  - Capture authorization workflow
  - Roll back contracts to historical workflow status.
- Configure various contract and market settings
  - Configure counterparties (contact details, credit level, master agreements)
  - Configure brokers (contact details, brokerage rates)
  - Configure commodities and sub-commodities e.g. Environmental Product vintages or fuel types
  - Configure instruments (settlement rules, mark-to-market rules, position reporting rules)
  - Configure settlement maps
  - Configure contract status (pending, authorized, confirmed, etc) and user permissions to make the transitions

## ***Portfolio Management***

- View, query and filter the contract portfolio.
- Group contracts into user-defined Contract Sets with a user-defined label to retrieve at various other screens
- Load and merge multiple contract portfolios.
- Manage additional contracts (real or hypothetical) through the deal editor.
- View position graphs by selected contracts (e.g. full portfolio, by counterparty, by commodity, by instrument, by Contract Set or by trading book).
- Produce position reports for physical inventory (e.g. physical certificate holdings by commodity, vintage etc...)
- Calculate volume weighted contract prices by selected contracts.
- Run portfolio summary report by selected contracts.
- Perform settlement run on actual pool prices or simulated prices.
- Perform mark-to-market on actual forward curve or simulated curves.

The Market Edge suite is configurable to define various commodities for settlement in an interval market (e.g. electricity and gas) or point delivery (e.g. carbon, other environmental products and hard commodities).

The system has sufficient flexibility to allow the user to define any market traded commodity, e.g. CER, LNG, Oil and Gold, as well as Australian energy, carbon and

environmental commodities. The full range of Market Edge functionalities applies to any user configured commodity.

## **Benchmarking**

- Calculate portfolio trading performance against a reference strategy based on historical forward prices.
- Evaluate impact of trade execution *timing* decisions and *instrument selection* on contract trading performance.
- Evaluate trading *volume* decisions based on pool price outcomes.

## **Portfolio Risk and Optimisation**

- Conduct optimal portfolio selection
  - Optimise the portfolio by: minimum variance, optimal Sharpe ratio, maximum return subject to risk constraints, minimum risk statistic
  - Impose optimization constraints: risk statistic constraint, limits on traded securities.
  - Include a portfolio of physical assets and existing contracts, and allow user-definition of market-available tradable securities to reflect real life trading constraints such as market liquidity issues.
- Perform market simulations for electricity, gas, carbon and other commodity prices with configurable market volatility and correlation structures.
- Undertake electricity generator dispatch modeling, with various power station operating profiles and bidding strategies:
  - Economic bidding, user-defined bid profile
  - Bidding based on SRMC, including market linked gas costs, carbon costs and other environmental product costs and revenues
  - Ramp rates, energy constraints, forced outages, planned outages
- Calculate financial risk measures of a portfolio including:
  - Electricity generators costs and revenues
  - Derivative and physical contracts e.g. Whole of Meter Retail Contracts and PPA's
  - Carbon contracts and spot purchases
  - Environmental certificate contracts, liabilities, creations and spot transactions
  - Gas and fuel contracts and generation exposures
  - A defined trading strategy
  - Other user-defined cash flows generated externally and imported
- Cash Flow at Risk
- Earnings at Risk
- Value at Risk

- Collateral at Risk (futures contract variation margins)

### ***Credit Risk Model***

- Calculate current credit exposures
- Calculate distributions of future credit exposure under future market outcomes

### ***Administrative Features***

- Audit logging with log search and viewing screen
- Security and Access
  - Screen for definition of SQL connection strings
  - User detection through a) Windows login or b) Password control
  - User allocation to Roles
  - Role allocation to System Actions
  - User allocation to System Actions
- Configurable commodities, sub-commodities, instruments, counterparties, status, status flow, time, dealing party, brokers, settlement map, books, settlement rule, mtm rule, etc..

### ***Additional Customised Features***

Energy Edge has implemented customized software for several focused business purposes and has the capability to enhance the Market Edge base product with bespoke development. Energy Edge holds a large library of energy business oriented software which can be integrated with the base model.

Product Sheets for any of the Additional Customised Features listed below are available upon request.

### **Credit Risk Tools**

Energy Edge has produced a separate Credit Risk Tool based on similar development technology to the Market Edge suite. The software is capable of sophisticated counterparty credit risk analysis incorporating derivative contracts and static and dynamic credit support agreements. It applies market simulations and probabilistic default models to establish probabilities of losses and risk metrics around credit losses.

The CRT is a separate product to the Market Edge tools, but capable of integration with a shared underlying database and technology.

### **Hedge Effectiveness**

Implement hedge accounting management to satisfy Australian and International financial reporting standards. The Hedge Effectiveness module incorporates the following stages:

- allocation and de-designation of contracts to hedges
- performance of an initial effectiveness test
- performance of ongoing effectiveness tests



- calculation of portion of cash flow that is effective and can reside in hedge reserve until contract settlement
- management of reporting to accounting journals depending on hedge effectiveness status

## **Inventory management**

Manage the inventory of Carbon and Environmental Product certificates, taking into account:

- limited lifetimes
- ability to substitute certificates in alternative schemes
- comparison with the expected exposures and contract positions
- contracted receipt dates and acquittal timetables
- Vintages
- Alternative accounting treatments;

## **Nominations management**

Manage the preparation and issuance of contract nominations for gas

## **Physical market trading**

Manage the preparation and issuance of electricity generator bids.

Display market data including dispatch levels, bid profiles, market outcomes, weather conditions.

Perform mobile alerting: Two-way SMS and Email messaging, phone redirection, user-configurable alert definitions.

## ***Market Edge Architecture***

*Market Edge* is built in the Matlab environment on Windows. Energy Edge offers the software in an executable form interacting with a MS SQL database.. The system supports multiple users who can access commonly saved queries and functions.

Data structures reside in CSV files or in Matlab's own binary MAT format, enabling users with knowledge of Matlab to directly interface with the data. *Market Edge* keeps a local copy of key data to enable the system to perform extremely rapid data queries and calculations: analysis of large data sets of pool prices or dispatch volumes are almost instantaneous.

Users can license all components or a subset of the *Market Edge* capabilities.

The integration of *Market Edge* to various client data sources will inevitably require some customization due to varying data locations and formats and operating environments.



## Documentation

The methodologies contained in the *Market Edge* suite are completely documented. Formulas and assumptions for the pricing methodologies are explicit to enable a user to reproduce the models in spreadsheet or by manual calculation.

*Market Edge* documentation also includes user manuals to step new users through standard tasks.

## Case Testing

Numerous Case Testing documents and supporting materials are available.

The case tests step users through the function steps and operations to confirm system features and will confirm that test cases reveal the correct numerical and graphical outputs for the specially manufactured case test examples.

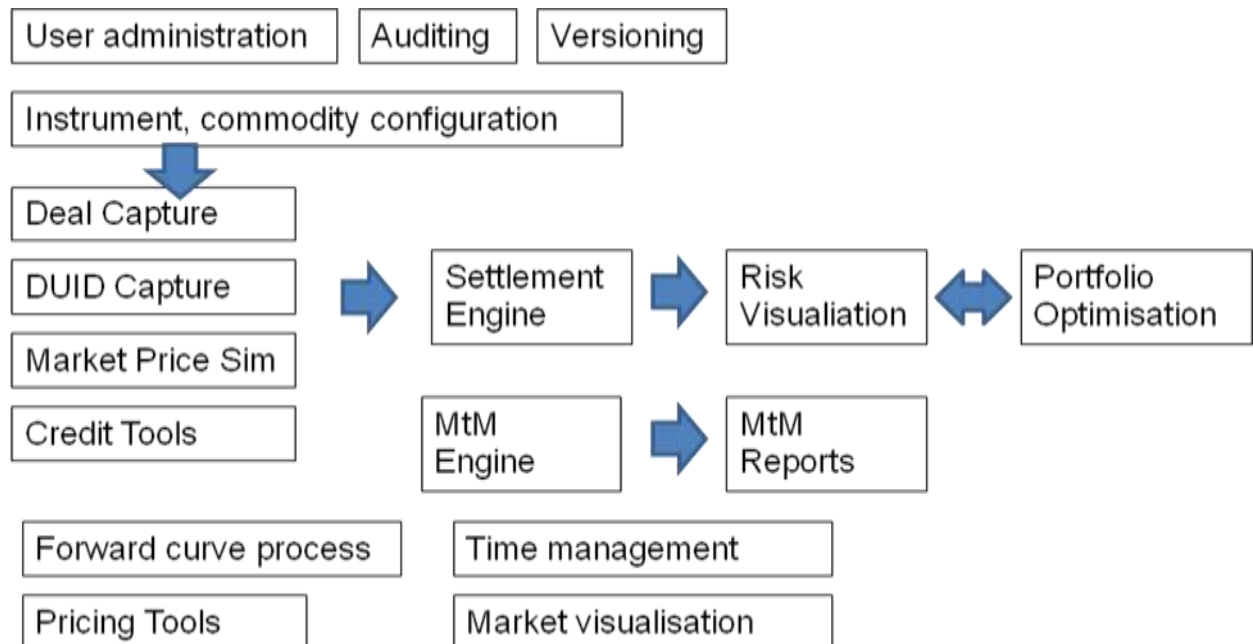
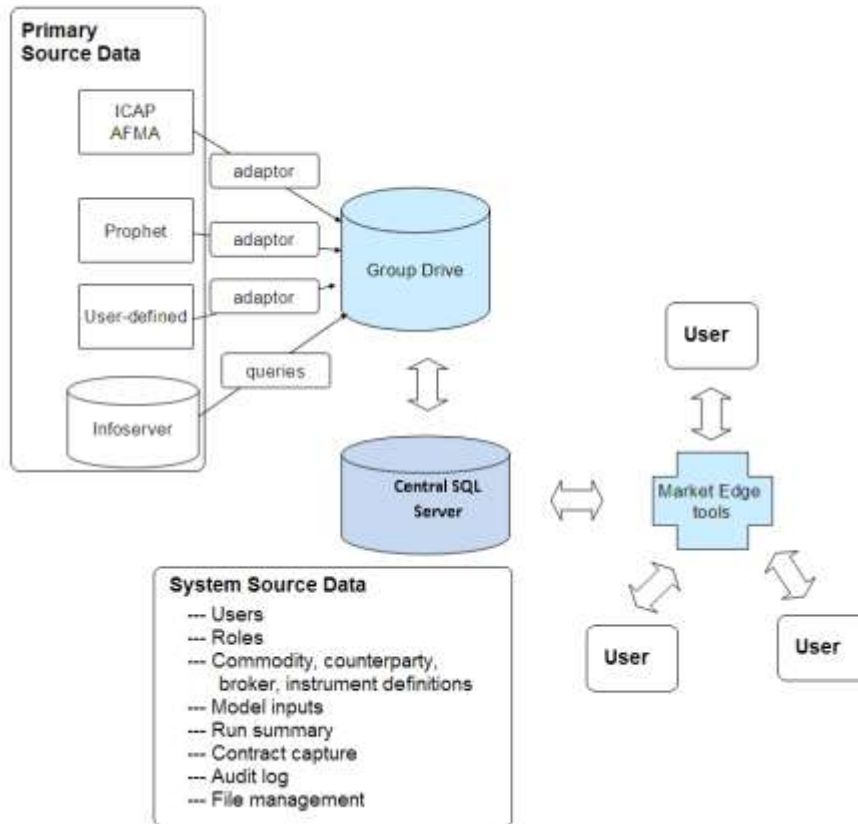
## Module Specifications

### ***Architecture***

Data management: Market Edge interacts with a centralized MS SQL database. The database contains the key system configuration data and performs data capture and management. Large data files are captured in efficient binary files in a group or local area. The architecture allows for a formal relational database for managing the high level data, for example, user access, audit logs, instrument configuration and counterparty management. However, the bulk low level data, such as gigabyte simulation files are captured in compressed binary format enabling an efficient use of disk, an easy method of backing up and deleting extraneous files and a very fast load and write speed.

Primary data for Market Edge is uploaded from the client's database at scheduled periods into local binary files (e.g. meter data or infoserver data). Data can also be uploaded from standard CSV formats (e.g. Vencorp gas price data or environmental product forward price data) into local files.

The tools are run from an executable program on clients' local machines, harnessing the power of modern desktops instead of a queued server model. A global drive can hold the executable program, and the processing is performed using the resources of the local computer.



## ***Data Analysis and Visualisation Tools***

**Key purpose:** The data analysis and visualization tools are designed to provide decision support to enable traders, commercial analysts and risk managers to quickly and easily answer queries on market data. For example:

- *What are historical pool price statistics?*
- *What are forecast price statistics?*
- *What is a competitor's bid stack?*
- *What is the payoff from a particular structured derivative product?*

**Tools:** The data analysis and visualization features in Market Edge are comprised of the following tools

- Market Viewer
- Trace Viewer
- Forward Viewer
- Market Analyser
- Market Relationship Viewer
- Bid Viewer
- Stacking Tool
- SFE Data Tool
- Yield Curve Data Tool

**Data:** Data accessed and viewed through these tools include:

- Trace data which is any interval data drawn from a database, or created by the user or imported from CSV files
- NEM data (for example, 30 minute pool price, demand, interconnector flows, 5 minute dispatch, ancillary service data)
- Forward data (for example, ICAP or AFMA forward prices for energy and Environmental products)
- Meter data (for example, NMI, gas volumes, generator dispatch)
- Bid data (electricity power station bid data)
- SFE (d-cypha Trade) data
- ECX (EUA and CER) data
- AFMA Yield curve data
- Other user definable data sources

**Functions:** Functions performed by these tools include:

- Perform operations on the original data (e.g. calculate \$300 cap payoff)
- Map data frequency (e.g. 5-minute data to 30 minute data)

- Bucket data (e.g. display market stats in peak and offpeak periods by month or quarter)
- Calculate annualized volatility
- View forward price spreads and trends
- View stacked market bids for a single plant or collection of units
- Stack and sort market data (e.g. stack dispatch volumes in order of carbon intensity)
- Perform complex market calculations, (e.g. synthesise the formula for accumulation of Interregional Settlement Residues)
- View relationships between imported and derived market variables (e.g. price and demand or gas consumption level and temperature)
- View and capture futures prices
- View and capture yield curve data

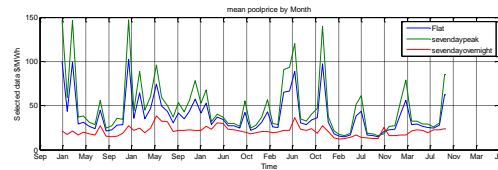
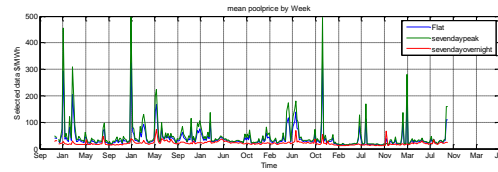
**Integration:** These tools integrate with other system features in the following way:

- The relationship viewer will calibrate a relationship, e.g. price volatility, to send into the *Derivative Pricing* tools
- The Market Analyser will enable a complex cash flow relationship to be created, and then sent into the *Portfolio Cash Flow* tool.

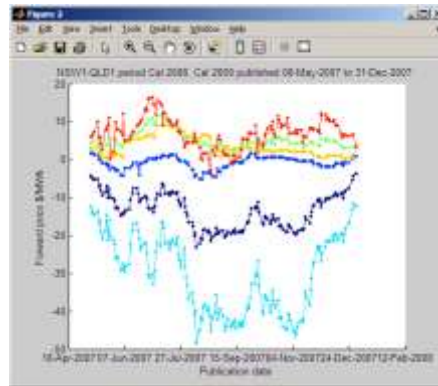
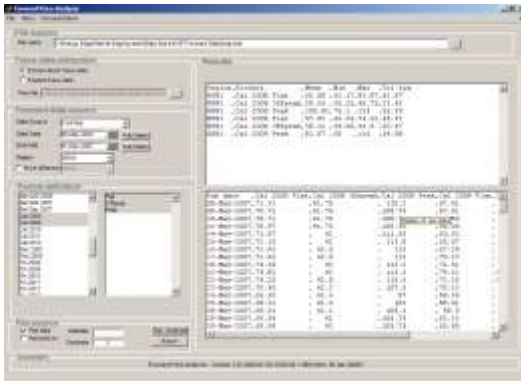
**Documentation:** Separate documentation exists for each of the tools.

**Screen shots:**

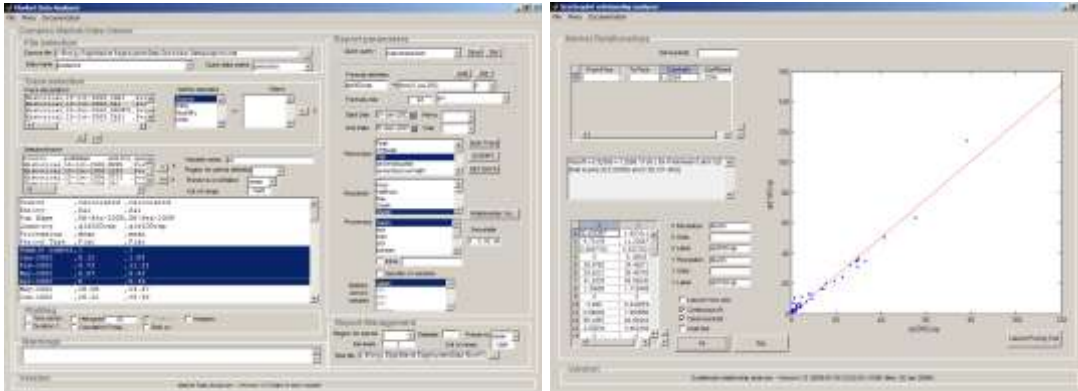
**Trace Viewer (below) with sample graphical output**



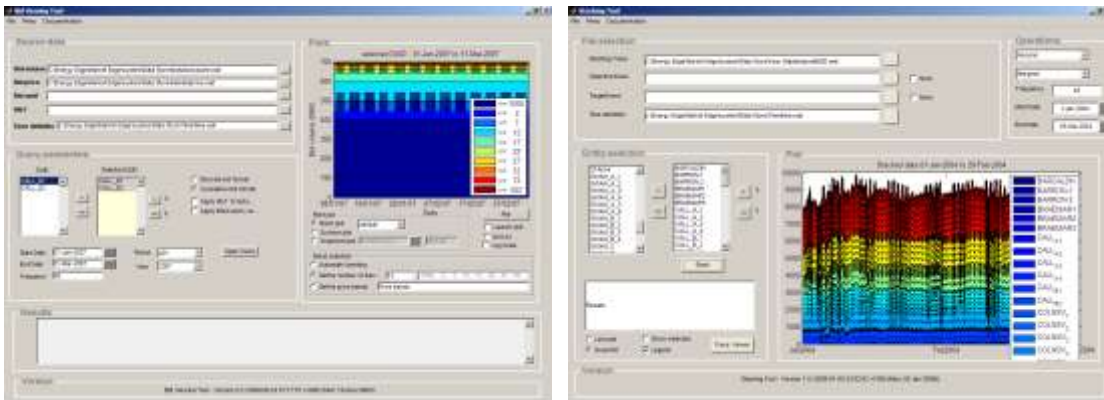
**Forward Data Viewer (below) with sample graphical output**



**Market Analyser and Relationship Viewer (below):**



**Bid Viewer (below) and Trace Stacking Tool**



## Forward Curve Processing

**Key purpose:** The forward curve processing tools perform two key roles:

- i. Create an arbitrage free curve from the various conflicting sources of market data
- ii. Create a sculptured curve at the user defined resolution (particularly for electricity)

The output provides a data feed which is appropriate for market-consensus price forecasting and for derivative pricing.

**Tools:** The forward processing tools in Market Edge are comprised of the following tools

- Forward price balancing tool
- Forward price profiling tool

**Data:** Data accessed and viewed through these tools include:

- Commodity forward price data
- Reference price shapes (e.g. historical pool prices, or user-imported forecast)

**Functions:** Functions performed by these tools include:

- Perform balancing to attain an arbitrage free curve
- Produce a fully sculptured forward curve

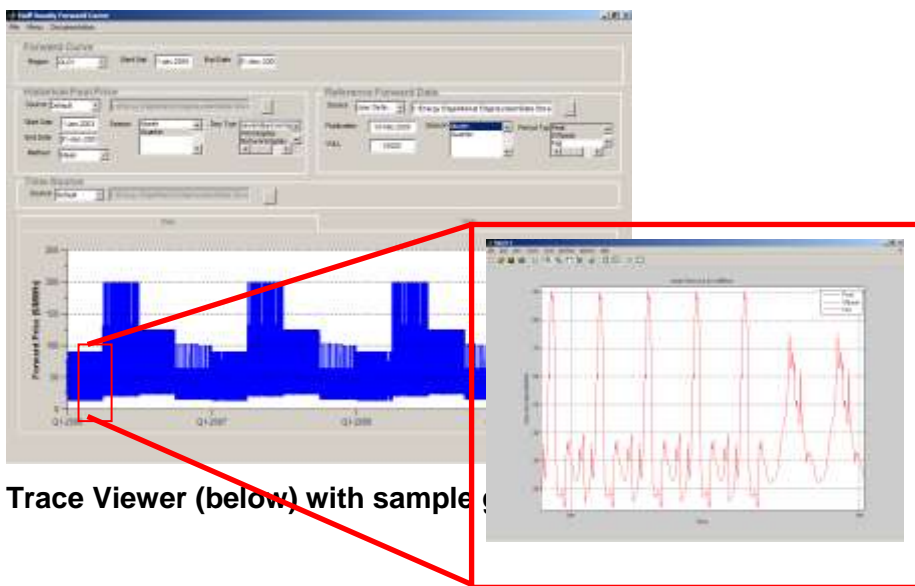
**Integration:** These tools integrate with other system features in the following way:

- The forward price will feed into the *Derivative Pricing* tools

**Documentation:** Separate documentation exists for each of the tools.

**Screen shots:**

### Forward Price Profiling tool (below)



**Trace Viewer (below) with sample (**

## **Portfolio Management**

**Key purpose:** The portfolio management tools are intended to handle deal capture, settlements, mark to market and other contract reporting features.

Market Edge system is able to integrate to download and query data from an external third party deal capture system, or it is available to capture deals directly.

The Market Edge suite is able to manage point delivery contracts (e.g. carbon and other environmental certificates) as well as continuously delivered contracts (e.g. electricity contracts in an interval market). The system is user-configurable to manage electricity, carbon, gas, environmental certificates and more.

**Tools:** The portfolio management features in Market Edge are comprised of the following tools

- Contract upload: Contract upload from CSV or Database source
- Contract entry: Contract entry and edit screen
- Contract viewer: Portfolio query and summarising tool
- Contract settlement tool: Perform settlement run on actual pool prices or simulated prices.
- Contract mark-to-market tool: Perform mark-to-market fair valuation on actual forward curve or simulated curves.
- Contract position tool: View position graphs by selected contracts (e.g. full portfolio, by counterparty, by instrument or by trading book). Calculate volume weighted contract prices by selected contracts.
- Contract summary: Run portfolio summary report by selected contracts.

**Data:** Data accessed and viewed through these tools include:

- Contract data
- Market data for settlements and marking-to-market

**Functions:** Functions performed by these tools include:

- Each tool provides functionality as described above

**Integration:** These tools integrate with other system features in the following way:

- The simulated settlement data will feed into *Cash Flow Analysis* tool. The main contract viewer is available as an advanced filtering interface to create Contract Sets to select in other portfolio analysis tools.

**Documentation:** Separate documentation exists for each of the tools.



Screen shots:

Contract Position tool (below) and Contract Settlement screen

**Contract Selection**

Address Date: 31-Dec-2014 11:11:44

**Position Selection**

Period Name	Start Date	End Date	Peak	Off-Peak
1-2013	1-2013	31-12-2013	1.00	1.00
1-2014	1-2014	31-12-2014	1.00	1.00
1-2015	1-2015	31-12-2015	1.00	1.00
1-2016	1-2016	31-12-2016	1.00	1.00
1-2017	1-2017	31-12-2017	1.00	1.00
1-2018	1-2018	31-12-2018	1.00	1.00
1-2019	1-2019	31-12-2019	1.00	1.00
1-2020	1-2020	31-12-2020	1.00	1.00
1-2021	1-2021	31-12-2021	1.00	1.00
1-2022	1-2022	31-12-2022	1.00	1.00
1-2023	1-2023	31-12-2023	1.00	1.00
1-2024	1-2024	31-12-2024	1.00	1.00
1-2025	1-2025	31-12-2025	1.00	1.00
1-2026	1-2026	31-12-2026	1.00	1.00
1-2027	1-2027	31-12-2027	1.00	1.00
1-2028	1-2028	31-12-2028	1.00	1.00
1-2029	1-2029	31-12-2029	1.00	1.00
1-2030	1-2030	31-12-2030	1.00	1.00

**Query Parameters**

Start Date: 01-Jan-2012, End Date: 31-Dec-2012, Period: Year

Position type: Peak, Off-Peak, 7-Day Average, 7-Day Straddle, Invoicing Date, Non-Invoicing Date, Fueler Peak, Invoicing Date

Position: All, Peak, Off-Peak, 7-Day Average, 7-Day Straddle, Invoicing Date, Non-Invoicing Date, Fueler Peak, Invoicing Date

Processing: None, All, Peak, Off-Peak, 7-Day Average, 7-Day Straddle, Invoicing Date, Non-Invoicing Date, Fueler Peak, Invoicing Date

Region for period selection: All, Default, 1

Physical holdings only:  Checked position, accumulated start date:

File: Current Time (2014/12/31 11:01:44 AM)

Validity: Year (23/12/2014 12:34:59 PM)

Contract No: From/Default row

Yield Curve: Invoicing 1st Day

Forward Curve: From 1st/2nd/3rd row

**Contracts**

Address Date: 31-Dec-2014 11:11:44

**Market Data**

Fuel Price: Default, Market Volume: From/Default, Future Price: Default, Time: Current Time (2014/12/31 11:01:44 AM)

**Additional options**

Contract: From/Default

**Display Options**

Contract: All, Market: All, Fueler: All, Invoicing Date: All, Non-Invoicing Date: All, Fueler Peak: All, Invoicing Date: All

**Settlement Options**

Contract Underlying Delivery Period: All Settlements, All Settlements, All Settlements

Start Date: , End Date: , Report: All, Report: All, Report: All

**Results**

Contract

Settlement Tool - Version 1.0 (2014.01.08.07.02.20 - 1100 (PK) 28 (04) 2014)

## ***Trading Benchmarking Tools***

**Key purpose:** The trading benchmark tools establish the value added by trading strategies by comparing with an index strategy.

**Tools:** The benchmarking in Market Edge is performed by the following tools

- Execution Trading Benchmarking: Value of executed contracts
- Volume Trading Benchmarking: Value by target different hedge volumes
- Product Mix Benchmarking: Value added by selecting alternative financial products to most commonly traded products for each particular commodity e.g. electricity swaps or environmental product forwards.

**Data:** Data accessed and viewed through these tools include:

- Contract data
- Market prices for settlements and marking-to-market

**Functions:** Functions performed by these tools include:

- Each tool provides functionality as described above

**Documentation:** Separate documentation exists for each of the tools.

## ***Portfolio Risk and Optimisation***

**Key purpose:** The portfolio risk module performs cash flow and earnings risk analysis, Value at Risk and Credit Risk analysis of a portfolio of physical and financial securities.

**Tools:** The Risk Model suite in Market Edge contain the following tools

- Market price simulator
- Forced outage simulator
- Generator dispatch simulator
- Contract and physical settlements simulator
- Cash flow and Earnings analyser
- Credit risk analyser

**Data:** Data accessed and viewed through these tools include:

- Contract data
- Power station data
- Market price data

**Functions:** Functions performed by these tools include:

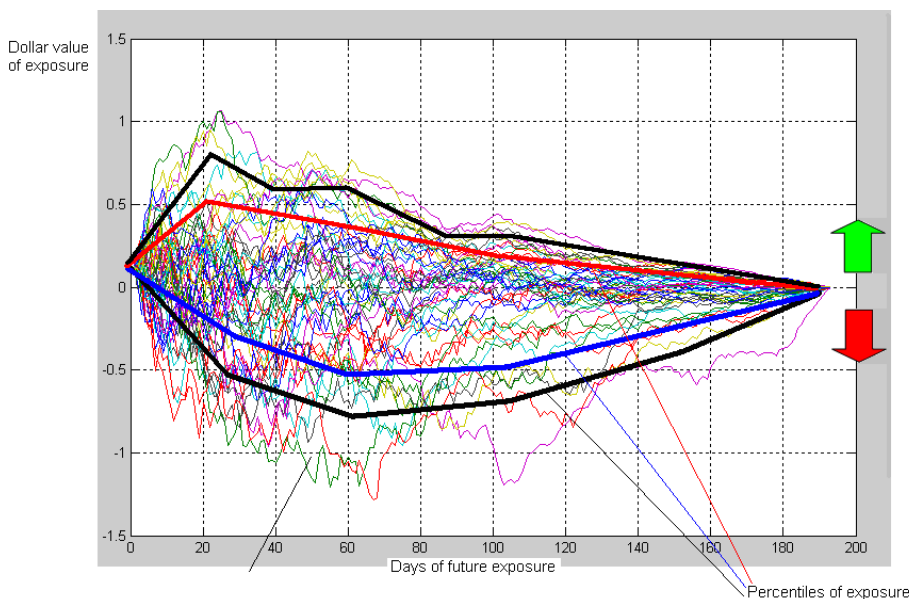
- Create realistic electricity spot, forward and futures price simulations
- Create realistic carbon and other environmental product spot, forward and futures price simulations
- Create realistic simulations of other commodities e.g. gas, LNG and Oil in *interval* and *point-delivery* markets.
- Perform what-if analysis of new plant, bidding strategies and contract strategies
- View cash flow exposures
- Produce risk metrics
- Apply the optimal portfolio selection problem against various constraints and objectives, including:
  - Minimum variance portfolio
  - Maximum risk-adjusted return
  - Maximum return subject to EaR constraint
  - Minimise EaR
  - Upper and lower constraints on volumes traded for individual securities
  - Forced compliance trading (for carbon and environmental commodities)
  - Optimisation in conjunction with forced compliance trading
  - Perform optimal static hedging of a structured contract against vanilla securities

**Documentation:** Separate documentation exists for each of the tools.

**Integration:** Users can define cash flows arising from structured products or deals through the *Market Analyzer* and then import them into this tool

Users can create simulations of cash flows from other corporate exposures and then import them into the risk tools for incorporation with other portfolio exposures.

### Distribution of future Credit Exposures



### Cash flow analysis tool with a *Cash Flow Worm* or *Earnings Histogram*

## ***Derivative Pricing Tools***

**Key purpose:** The derivative pricing tools provide initial valuation of standard and exotic derivatives in various commodity markets e.g. electricity, gas, carbon, other Environmental Products, Oil etc....

**Tools:** The key derivative pricing tools include:

- *Forward/swap pricing tool:* value of standard or profiled swap or forward contracts
- *Cap pricing tool* to establish the value of financial cap contracts based on forward swap or cap prices
- *Option pricing tools* for applications of standard option pricing formulas
- *Asian option pricing tools* customized from the Black-Scholes framework for an interval market and able to handle sculptured volumes and prices.
- *Swaption pricing tools* customized from the Black-Scholes framework for an interval market and able to handle sculptured volumes and prices.
- *Generic pricing tool:* valuation of structured contracts using universal method across arbitrary commodities and volume or price profiles.
- *Simulation based pricing tool:* valuation of the contract value from a simulation based method using risk-adjusted NPV of expected cashflows
- *Volatility visualization tool:* View market volatilities
- *Discounting tool:* management of yield curve and discount factors

**Data:** Data accessed and viewed through these tools include:

- Contract data
- Market prices and volatilities

**Functions:** Functions performed by these tools include:

- Each tool provides functionality as described above

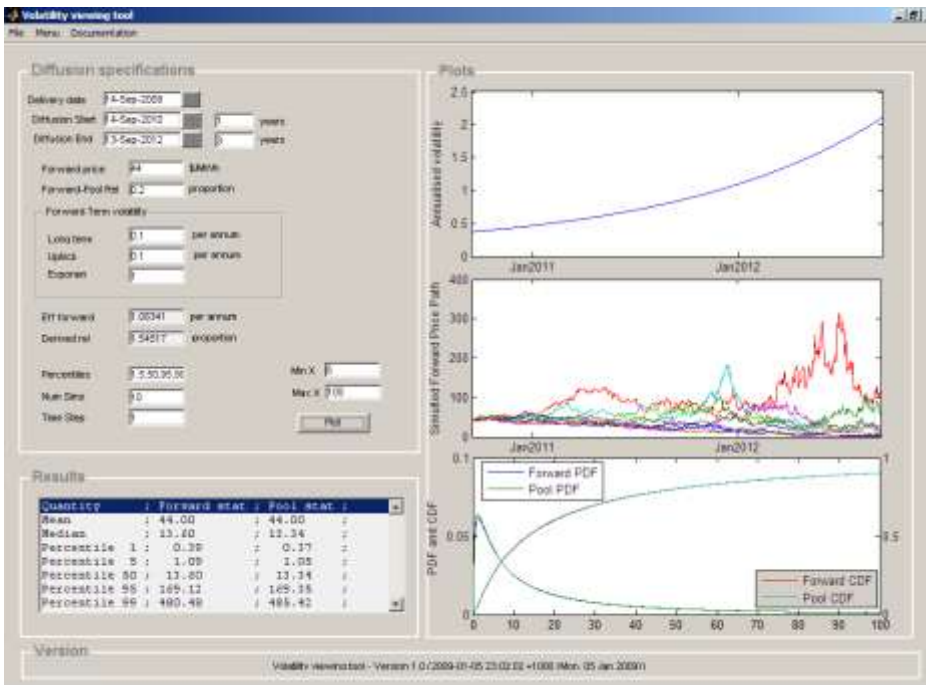
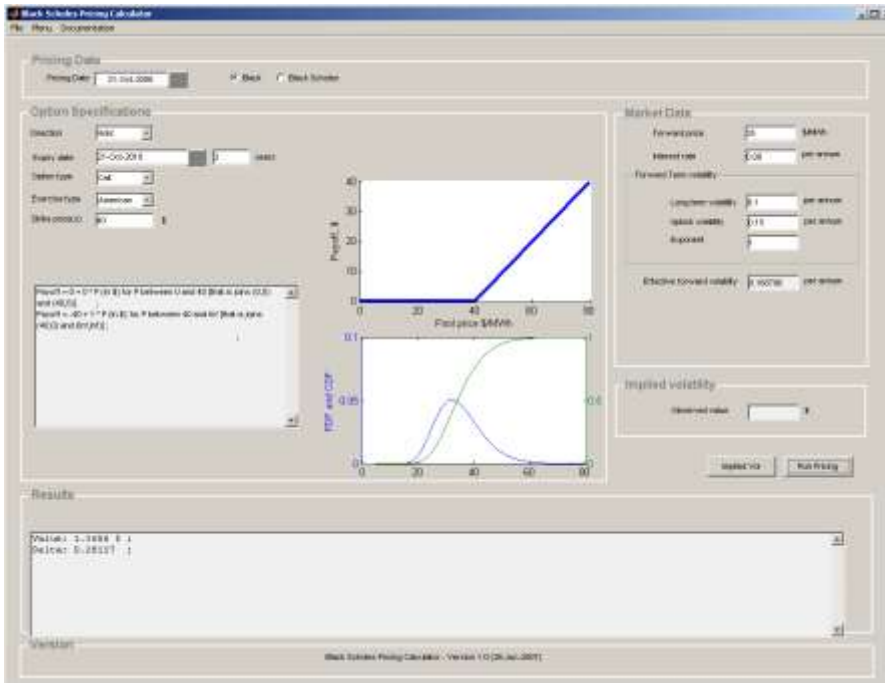
**Integration:** These tools integrate with other system features in the following way:

- The *Forward Viewer* and *Market Viewer* provide market volatility calibration
- The *Market Analyser* and *Market Relationship Viewer* create market relationships for submission to the generic pricing tool e.g. different cap pay-off relationships

**Documentation:** Separate documentation exists for each of the tools.

Screen shots:

Option pricing tool (below) and Volatility Visualisation tool



## **Contract Capture**

**Key purpose:** The contract capture screen and database enables the entry and viewing of contracts for electricity, carbon, gas, other environmental products and other commodities.

The contracts become available for other processes thereafter (settlements, MtM, risk analysis).

**Tool:** Contract management facilities are:

- Viewing contracts
- Roll back through contract history for previous versions
- Update contracts (e.g. exercise or terminate)
- Filter, group and summarise contracts

**Data:** The key contract attributes are covered

- Date range
- Commodity (configurable)
- Instrument type (configurable)
- Counterparty
- Broker, brokerage
- Volume, price, premium, premium date, settlement map
- Along with numerous other attributes

**Functions:** Functions performed by the deal capture includes:

- Capturing versions of a contract to allow full backward reproducibility and auditable data revisions
- Status flow through a user configurable set of statuses, with configurable settings for assigning permissions to modify contract status

**Integration:** These tools integrate with other system features in the following way:

- Settlement, mark-to-market, portfolio risk module, position reporting all leverage off contracts defined and captured through the deal capture module.

**Documentation:** Separate documentation exists for each of the tools.







## ***Administrative Tools***

**Key purpose:** The administrative tools provide the configuration and management of the Market Edge system, as well as providing ancillary information in their own right.

**Tools:** The administrative functionality is contained in:

- Role-based security: define user groups, manage access to components and functionality, manage passwords or use Windows integrated security.
- Time management: define period types, day types and query for time statistics
- Upload functions: upload data into the system
- Database query functions: access databases to make updated data copies

**Data:** Data accessed and viewed through these tools include:

- Externally defined data and databases

**Functions:** Functions performed by these tools include:

- Each tool provides functionality as described above

**Integration:** These tools integrate with other system features in the following way:

- All tools access the time management functions and data uploaded into the system.

**Documentation:** Separate documentation exists for each of the tools.

## **More Information**

Energy Edge has developed and markets the *Market Edge* solution.

For more information on *Market Edge* or Energy Edge's other services visit

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