

*Pricing, hedging, and risk management for energy and power markets.*

### Product Description

Energy markets are not governed by the same rules as financial markets. That's why energy derivatives valuation requires derivative pricing models built specifically to address the unique nature of these markets. Seasonality, mean reversion, and price spikes are just a few of the issues in energy markets; as are the unique features of the derivative contracts traded. Whether evaluating half-hourly exercise frequencies in the case of power options, or a first-of-month indexed strike price in the case of natural gas options, the derivatives pricing software must be flexible enough to accommodate the plethora of contract provisions, yet intuitive enough for ease of input.

@ENERGY/Basics is a derivative pricing and risk management toolkit designed to evaluate exchange-traded and over-the-counter derivatives traded in the power, natural gas, oil, coal, metal, and soft commodity industries. @ENERGY/Basics is one of the modules of the @ENERGY suite.

**What makes @ENERGY/Basics unique?** @ENERGY is the most comprehensive energy derivatives software toolkit available today. No other application can match @ENERGY in terms of breadth of instrument coverage or depth of models supported. @ENERGY is fully documented, rigorously tested, highly optimized, and comes with all the features that energy companies have come to expect from FEA analytics. That's why the largest energy marketers, producers, and consumers rely on @ENERGY to generate daily mark-to-market numbers, to support deal-structuring activities, and to hedge exposures across their entire portfolio.

### Key Features

**Cutting-edge Pricing Models.** @ENERGY/Basics can value options using several methodologies. The Black-Scholes model values options using lognormal price diffusion. The mean-reversion model also uses lognormal price diffusion but accounts for the tendency of commodity prices to move back to a long-run average level. The truncated distribution model includes mean reversion and allows specifying a lower price bound. Two types of models are available to handle the price spikes observed in power markets. The mean-reverting jump-diffusion model accounts for spikes followed by quick reversion to average price levels. FEA's regime-switching jump diffusion model allows for greater flexibility in defining jump characteristics which results in a much more realistic depiction of price spikes. Lastly, a multi-factor seasonal PCA model is available for pricing swaptions.

**Flexible Inputs.** With @ENERGY/Basics you can:

- Value American and European options with the same function
- Specify a straddle in addition to put and call options
- Express time periods with dates or tenors
- Specify a long, short, or closed position
- Specify entire price and volatility curves or only spot observations
- Incorporate volatility smiles in your valuation
- Switch pricing models and their parameters on the fly
- Specify a value date different than your system time
- Easily switch between options on physical and options on futures
- Easily build and price customized strips on a variety of options
- Use optional and default arguments to enter the minimal amount of information necessary to get results

**Comprehensive Results.** Several price and risk measures can be calculated with a single function call including scalar risk measures (delta, gamma, vega, theta, and so forth). The functions also return delta, gamma, and vega risk curves, which give your true exposure to the entire price and volatility term structure, not just the spot as with traditional risk measures. These risk curves permit precise hedging. @ENERGY calculates implied volatilities from options prices.

**Calibration.** @ENERGY calculates the mean-reversion rate, forward volatility curve, spot (implied) volatility curve, and average spot volatility using option market prices/implied volatilities or the historical volatilities of futures. You can also calibrate volatility inputs to an existing market smile, using a “sticky strike” or “sticky delta” model.

### Coverage

The supported set of instruments can be extended by combining and chaining functions to value complex transactions. @ENERGY/Basics values common exchange-traded and over-the-counter derivatives and calibrates model parameters using market prices:

- Forwards, index swaps, index swap options, exotic swaps
- American and European options
- Average-price options, average-strike options
- Forward-start options
- Barrier options, digital options
- Lookback options
- Variable-quantity options

@ENERGY/Basics includes templates for specialized purposes such as power-daily contracts, gas-daily contracts, gas monthly contracts, option portfolios and option combinations. FEA regularly expands instrument coverage and publishes new spreadsheet templates. In addition, @ENERGY includes several utility functions such as a path simulator to allow for visualization of the price behavior of each model.

### Software Architecture

@ENERGY is a Microsoft Excel® Add-In that is written completely in C/C++ providing for extremely fast calculations. It includes Excel Add-In functions (XLL files), customizable Excel templates, and documentation. When installed, @ENERGY XLLs add functions to Excel that are used like the built-in worksheet functions, allowing users to customize the included templates or create new ones. @ENERGY is also available as the ErgLib C library for Unix and Windows programmers who want to incorporate @ENERGY functions into custom and third-party C, C++, Visual Basic, and SQL database applications.