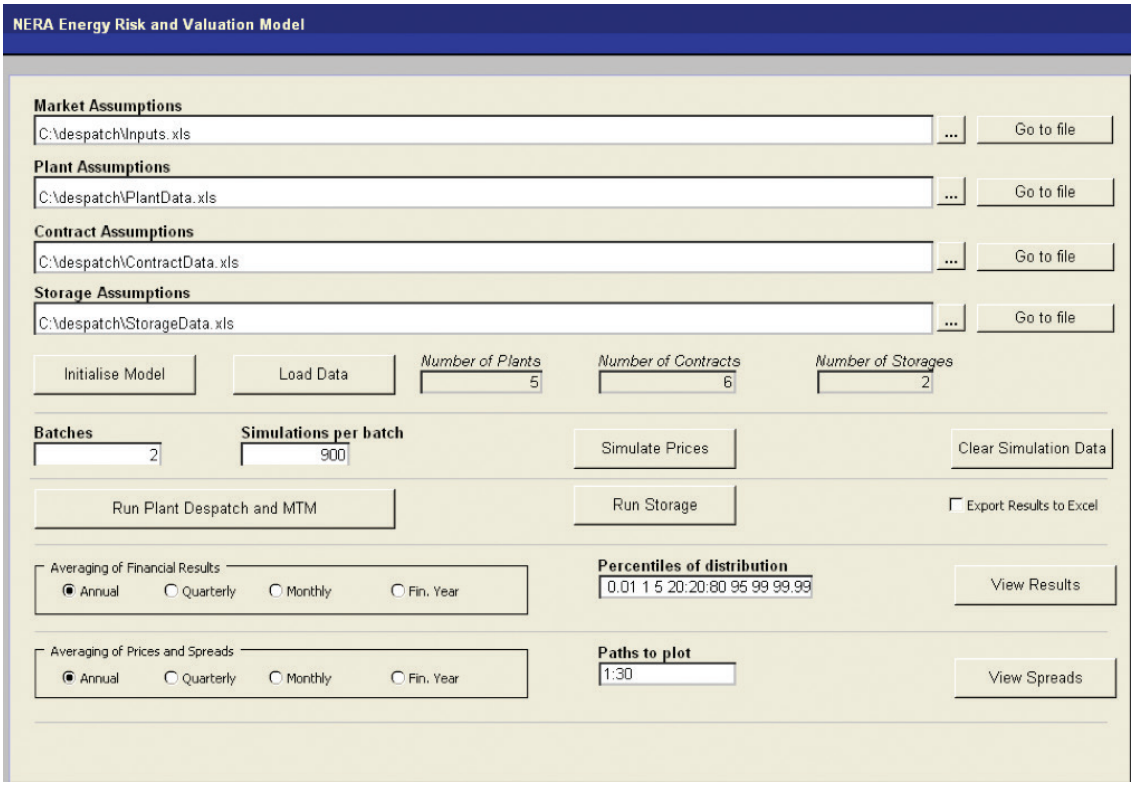
NERA
ECONOMIC CONSULTING

At A Glance

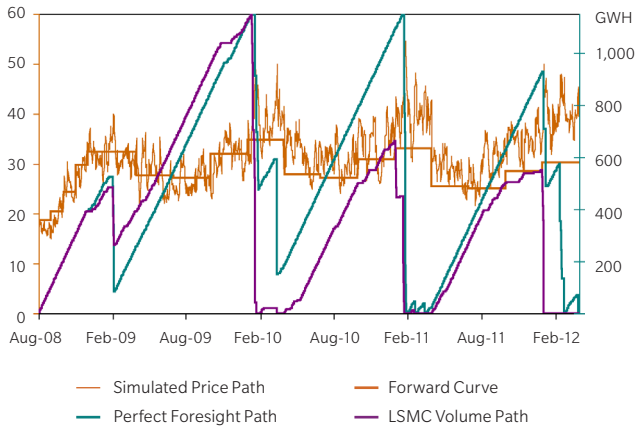
NERA E-StorM™

E-StorM™ forms a part of our EnergyMetrics™ suite of energy risk management and forecasting models used by NERA to help our clients with valuation and decision-making in connection with a range of energy assets, including gas storage, merchant power plants (thermal and hydro), interconnectors and contracts (plain vanilla, options, swings, swaps, etc.). The power of EnergyMetrics™ is its ability to assess the aggregated risk and return of a mixed portfolio of different assets taking into account stochastic nature of prices for power, fuels and CO2 as well as other variables. Combined with our expertise in the fundamental economics and competitive dynamics of energy markets, this powerful tool allows us to give clients an independent and insightful appraisal, not just mechanistic modelling results or software solutions. A screenshot of the main EnergyMetrics™ user interface is illustrated below.

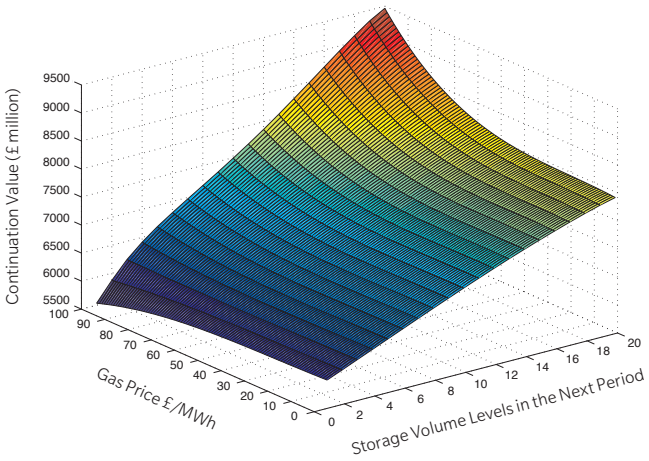


Insight in Economics™

E-StorM™ is a general option valuation model applicable to many types of commodities, but here we highlight its application to gas storage valuation. Rather than optimising with "perfect foresight", E-StorM™ recognises that the users of storage have to decide what to do on each day in conditions of uncertainty about future price evolution, as illustrated in the following figure.



The model decides the optimal action each day (i.e. inject, withdraw or do nothing), based on a probabilistic assessment of the expected value of the storage at the end of the day conditional on each choice (i.e. with more, less or the same gas in store). To do so the model estimates an expected "continuation value" of the storage at the end of the day, which depends on the current spot price and the level of gas in store, as illustrated in the graph below. The model then picks the action that maximises the expected sum of today's profit and the continuation value.



The following steps summarize the algorithm used by E-Storm™.

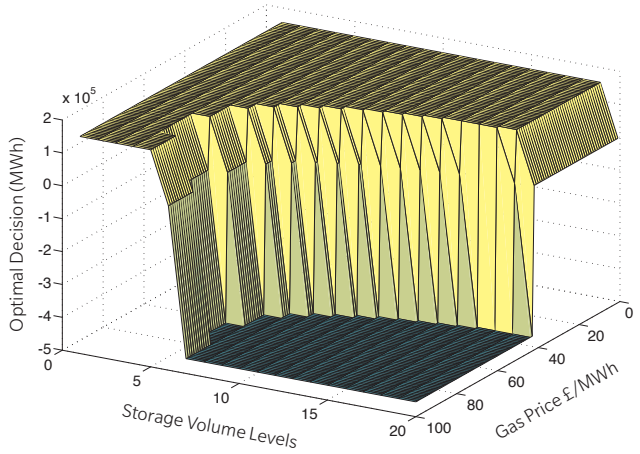
Step-By-Step Summary

The model uses the following step-by-step procedure:

1. Forecast a price path using statistical methods. E-StorM™ is completely flexible regarding the choice of the price process. One of the methods we adopted is as follows:
   - Take the forward curve for quarterly gas contracts and extrapolate it into the future towards the random long-term level of gas price, maintaining the quarterly shape observed in the forward curve.
   - Vary this price curve by assuming conditions like 2005/06 (severe winter plus infrastructure shock) occur with a frequency of 2/50 (=1/50 winter + 1/50 infrastructure shock)
   - Add volatility using a "mean reverting Brownian motion", i.e. random fluctuations plus a tendency for high prices to fall and low prices to rise, based on observed measures of volatility and mean reversion in historical prices.
2. Use Monte Carlo techniques to generate N separate price paths
3. Set the values for the following "Terminal Conditions" for the end of the modelling period (period t)
   - Level of storage
   - Continuation value at that time
4. Step back one period and calculate expected continuation values for each of the N prices at period (t-1)
   - Calculate continuation values for the current period (for each price and each level of storage), derived from releasing gas in the last period
   - Conduct a regression of the continuation values against the prices, to establish an expected continuation value for each price and storage level
   - Decide what is the best action to take in period (t-1)—inject, withdraw or do nothing—in order to maximise the sum of the current cashflow and expected continuation value in the next period, given the current level of prices, for all feasible levels of storage

The graph (below) illustrates an optimal decision surface as a function of the gas price and storage volume levels for a given point in time.

5. Step back one period and repeat the calculations and regressions for period (t-2)
6. Repeat the process back to the current day
7. Calculate the net revenues derived from the optimal series of actions for each price path



The combination of the best actions on each day, for each price path, amounts to a series of energy trades (inject/withdraw/nothing = buy/sell/no trade) at the current spot price (adjusted for the costs of injection and withdrawal). The revenue stream to be earned from the storage is the sum of net revenues from these trades, which can be discounted to provide an NPV. With N price paths, we obtain N possible revenue streams and NPVs. We take the mean annual revenue in each year divided by the space of the facility as our prediction of the market price of the storage capacity.

About NERA

NERA Economic Consulting (**www.nera.com**) is a global firm of experts dedicated to applying economic, finance, and quantitative principles to complex business and legal challenges. For over half a century, NERA's economists have been creating strategies, studies, reports, expert testimony, and policy recommendations for government authorities and the world's leading law firms and corporations. We bring academic rigor, objectivity, and real world industry experience to bear on issues arising from competition, regulation, public policy, strategy, finance, and litigation.

NERA's clients value our ability to apply and communicate state-of-the-art approaches clearly and convincingly, our commitment to deliver unbiased findings, and our reputation for quality and independence. Our clients rely on the integrity and skills of our unparalleled team of economists and other experts backed by the resources and reliability of one of the world's largest economic consultancies. With its main office in New York City, NERA serves clients from more than 20 offices across North America, Europe, and Asia Pacific.

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