



Why a single forecast understates the value of energy storage

This note asks a practical question: is an EnergyBoard a profit-seeking investment, or a way of hedging a business risk? Novele assesses its value not against a single forecast but across a range of potential futures.

Energy storage is typically assessed with one calculation: assume a rate of power-price growth, project the resulting savings, discount them, and confirm the net present value is positive. This answers a single question — is the investment worthwhile if that forecast proves correct? But the forecast is only one of many possible futures, and the futures in which storage matters most are rarely the central case.

A single forecast omits what makes storage worth holding.

ASYMMETRIC RANGE

A sharp rise in power prices harms the business more than an equally likely fall benefits it — and, in Novele's view, sharp rises are the more probable shock.

TIMING OF SHOCKS

The same long-run average may arrive as a gradual climb or as a sudden shock, and when it lands changes the value delivered.

LIMITED DOWNSIDE

Savings begin in the first year, so even flat prices offset much of the cost, and tax incentives reduce it further. The realistic worst case is a partial shortfall; the upside is open-ended.

STARTING POINT

Hedging a volatile input is ordinary practice

Businesses hedge volatile input costs as a matter of routine — airlines fix jet fuel, manufacturers hedge metals and currencies, borrowers fix interest rates. The aim is rarely to bet on prices; it is to remove a large, unpredictable risk so the business can plan, protect its margin, and commit to customers with confidence.

Energy is becoming exactly this kind of input: large enough to matter, and volatile enough to disrupt. An EnergyBoard is simply an instrument for hedging it, and it does two jobs at once — it caps the exposure to price shocks, and it makes the energy cost predictable to plan around. The rest of this note concerns how to value that instrument properly.

01 One forecast, an asymmetric range of outcomes

The conventional appraisal selects one price path — usually a central estimate — and values the asset along it. In practice the business is exposed not to that central line but to whichever of many possible futures actually occurs. The important feature of that range is its asymmetry: it is weighted against the business, for two distinct reasons.

A large rise costs more than a large fall saves. A cheaper-than-expected year is a modest benefit; an unexpectedly expensive one can absorb a full year's margin. Even were sharp moves up and down equally likely, they would not be equally consequential.

Sharp moves upward are also the more likely. The forces that move energy prices — supply disruption, conflict, grid constraints, policy change — tend to drive them sharply higher rather than lower. Novele judges large upward surprises the more probable of the two.

Valuing storage at the central case alone therefore disregards the part of the range that matters most.

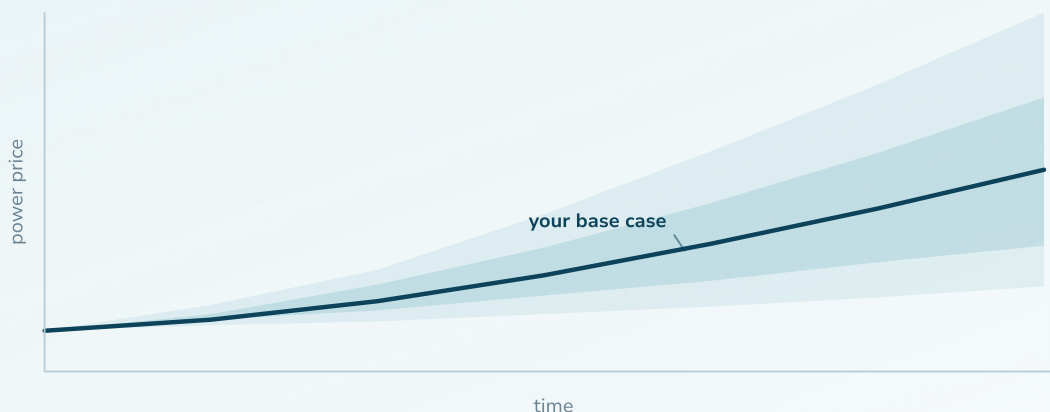


Figure 1. The appraisal values the asset along a single path (bold). In practice the business is exposed to the entire shaded range of futures, which is wider on the upside.

02 A limited downside and an open-ended upside

Section 1 concerned the asymmetry in prices. It matters because it produces a sharper asymmetry in the position: whatever prices do, the EnergyBoard's downside is capped while its upside is not. This is the more powerful statement, and the one the decision turns on.

The right question is not the single-forecast figure, nor the worst case, but the expected outcome — the result the business would obtain on average if the same decision played out across all the futures that might occur, each weighted by how likely it is judged to be. That average already reflects the protection, because it is lifted by the futures in which the EnergyBoard matters most.

It also helps to see what the EnergyBoard is worth at any moment as two parts: the savings it will deliver at today's price — value held from day one — and the protection it carries should prices rise, worth more the more uncertain the future. In the language of options these are its intrinsic value and its option value, and the price of the EnergyBoard is the premium. The distinctive feature here is that it is a premium for an option already in the money — already paying out from day one, not a wager that may expire worthless.

The realistic floor is a flat-price world. Even if power costs never rise, the asset continues to reduce the annual bill, and those savings accumulate. They may not recover the full cost, but they offset a substantial part of it — and tax incentives reduce the outlay to begin with. The worst plausible outcome is a partial shortfall, not a total loss.

That outcome coincides with a favorable environment. Stable, low power costs are the good case for the business. The asset's weakest result therefore arises precisely when conditions are most benign — a modest cost incurred in a good state of the world.

The upside has no comparable ceiling. The faster prices rise, the sooner the asset repays and the more it continues to return; and prices do not merely drift — infrequent but severe shocks occur, and in those futures the position is materially advantageous. It is this asymmetry that the investment secures.

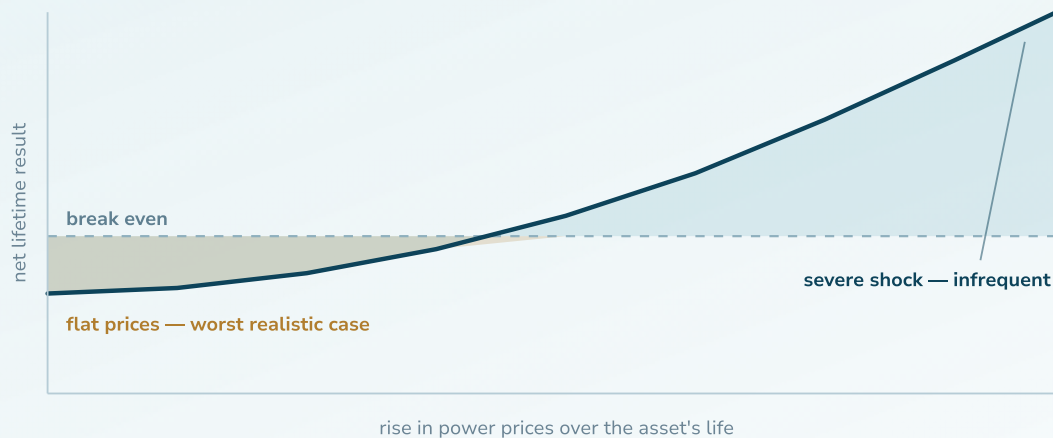


Figure 2. Net lifetime result against the rise in power prices over the asset's life. The left-hand end is floored — under flat prices the savings still offset most of the cost — while the right-hand end is unbounded, rare severe shocks producing substantial gains. A limited downside against an open-ended upside.

03 The timing of shocks, not only the average

In Novele's view the future is more likely to bring shocks than a smooth trend. What matters for an EnergyBoard is then not only the average rate of increase, but when those shocks land. Two futures with the same average growth can differ materially: a quiet period followed by a sharp move up, or a gradual climb to the same end point.

The timing changes the value delivered: an earlier shock is both costlier to be unprotected against and less discounted, and it leaves more of the asset's life spent under elevated prices. A single growth rate cannot distinguish these futures — it captures only the average end point. Representing the value requires a view of how prices might move, not merely where they settle.

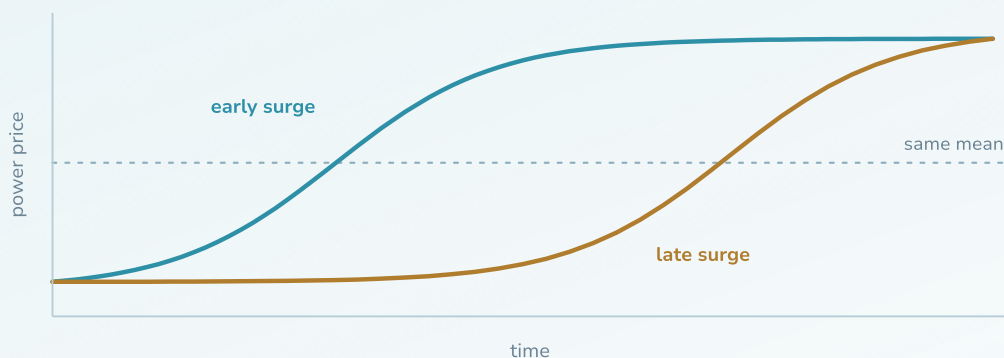


Figure 3. Two price paths with the same average growth but a shock at different times. The value delivered differs, yet a single growth rate treats the two paths as identical.

OUR APPROACH

Valuing storage across the full range of futures

The sections above argue that the future is a range rather than a point, that the range is weighted against the business, and that the timing of shocks shapes the outcome — each an observation about what prices might do. What follows is a framework to place a value on those price moves rather than assume them away.

The conventional appraisal reduces the future to a single growth rate and values the asset along that one line. Novele's keeps the range intact, modelling the change in price in each year: most years are calm, but every year carries a chance of a dramatic move — and, once one occurs, the shock may last more than a single year. Simulating many thousands of futures built up year by year, the EnergyBoard is valued in each. The asymmetry, the limited downside and open-ended upside, and the timing of shocks are then priced by the model, not stripped out by the choice of a single number.

The result is a distribution of outcomes rather than a single figure, summarized by two numbers instead of one: the **expected result** across all futures, which restores the upside a single forecast omits; and the **adverse cases**, which show how the asset performs when the outcome is unfavorable.

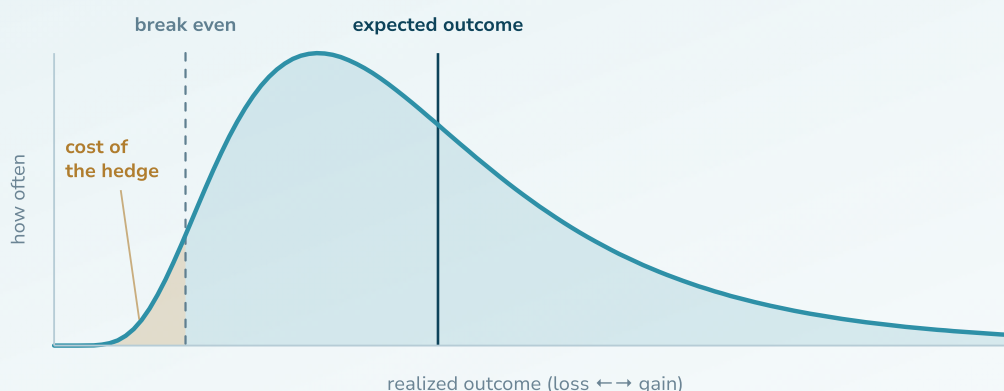


Figure 4. The distribution of possible outcomes across many simulated futures. Most outcomes are gains; the shaded region left of break-even marks the futures in which the asset returns less than its cost — best read as the cost of the hedge.

None of this implies the conventional NPV is incorrect; it answers a narrower question — whether the investment succeeds if the forecast holds. Assessing the full range answers the question the business actually faces: what is it worth to be protected when the forecast is wrong? Asked this way, the decision shifts from a wager on a single forecast to the valuation of a hedge.

If prices stay low and the realized return does not meet the investment hurdle, or turns out negative, that shortfall is, in Novele's view, better read not as a failed investment but as the cost of the hedge. A negative outcome is an insurance premium — the price paid for protection that this particular future did not call upon. As with any insurance, paying it and not needing it is the good result, not the bad one.

Consider the EnergyBoard as risk mitigation. Framed this way, the question is no longer *will the investment pay off?* but the one a business asks of any hedge: **is this cost a fair price for what it buys** — a cap on a large, unpredictable risk, and the increased certainty to plan and price with confidence? That is the judgment this approach is built to inform.

A Appendix — how the range of futures is generated

The distribution in Figure 4 is not drawn by hand. It comes from a simple model of how power prices move, simulated many thousands of times. Two ideas do the work.

A.1 Each year's move is drawn from one of two distributions

In most years power prices rise moderately — perhaps a little more than expected, perhaps a little less, but the range of changes is small. In a few years, though, prices jump sharply, and the size of those jumps can itself vary a great deal. The model captures this with two settings for a year.

In more precise terms, each year's tariff change is drawn from one of two distributions. The calm regime is narrow and centered near the planning budget; the stress regime is wider and shifted sharply to the right — the same random draw (ϵ) amplified by a higher mean and a larger volatility. Most path-years are calm, so the two combine into a single distribution with a long right tail.



Figure A. The two regimes as distributions of the annual price change. The calm regime is narrow, near the planning budget; the stress regime is lower, wider and shifted right. Each year is drawn from their weighted sum — the mixture.

A.2 A yearly coin decides which distribution applies

Each year is either a state of calm or a state of stress, and the model then decides whether that state carries into the next year or changes. From calm, a small chance triggers a switch to stress; from stress, a larger chance returns to calm. Because that return is not immediate, a stress episode, once started, could persist for more than one year before resolving. The shocks in pricing therefore emerge from the model; they are not placed by hand.

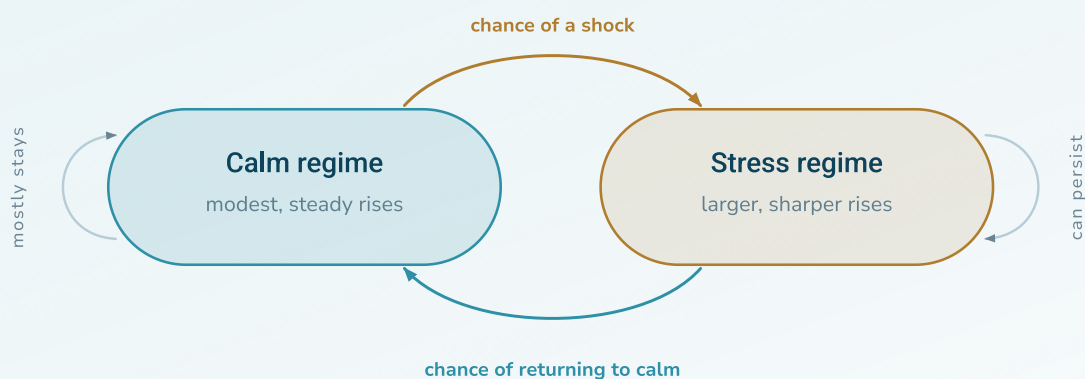


Figure B. The yearly switch between regimes. A small chance of entering stress and a larger chance of leaving it; the delay in leaving is what lets a shock persist across years.

The parameters are judgmental — the two growth rates, the two variabilities, and the switching probabilities are Novele's estimates, and reasonable people may choose differently. The merit of the approach is that it makes those judgments explicit and shows their consequences across the whole range, rather than concealing them within a single forecast.

Running this process over the asset's life, many thousands of times, yields many thousands of price paths and, for each, the EnergyBoard's outcome; collected, they form the distribution in Figure 4. From it the expected outcome and the adverse cases are read.

TWO CAVEATS

There is no market in which these particular savings can be traded, so the figure is a considered expectation under a stated model, not a market price.

A small number of extreme futures can dominate the average, so it is prudent to report a trimmed mean, or an adverse-case figure, alongside the headline expectation.