# Position Aggregation and Delta Exposure

## Introduction

If you work in energy trading—or plan to—you'll eventually need to answer questions like:

- What's my net position in gas for January delivery?
- How much of my physical exposure is hedged?
- Am I long or short across my portfolio?

These sound simple. But here's the problem: the software systems that trading firms use—called **ETRM** (Energy Trading and Risk Management) systems—often can't deliver exactly the report you need.

### A Common Scenario

**Note on units:** Throughout this guide, we use **MWh** (megawatt-hours) for consistency across gas and power examples. In practice, UK gas is predominantly traded in **therms** (1 therm ≈ 29.3 kWh ≈ 0.0293 MWh). We'll discuss unit conversion and display preferences in Section 6.

Monday morning, gas desk. A risk manager walks over: *"What's our delta exposure to NBP gas for January delivery—physical versus hedge? I need hedge ratios by book for the risk committee meeting."*

The trader opens the ETRM system. The standard position report shows:

**NBP Gas (January):** Net position +850 MWh

One number. But the manager needs four numbers:

- Physical exposure: ? MWh
- Hedge exposure: ? MWh
- Delta (unhedged): ? MWh
- Hedge ratio: ? %

The custom reporting menu has nothing. IT says the bespoke module is "on the roadmap" for next quarter. The meeting is in 30 minutes.

*What do you do?*

A recent industry survey found that **64% of energy trading firms** say their ETRM doesn't support all their processes or deliver the reports they need. Legacy systems provide "canned reports"—total positions, basic aggregations—but struggle with ad-hoc, flexible views.

The consequence? Traders, analysts, and risk managers rely heavily on Excel exports, Python scripts, and manual workarounds.

### When You Need to Calculate Positions Yourself

Five common scenarios where you need to rebuild positions from trade data:

1. **Custom risk views:** Risk team needs delta exposure separated by physical vs financial (not a standard report).
2. **New desk:** Trades are flowing, but the vendor's position module is delayed 3–6 months.
3. **Multiple systems:** Legacy system, new system, and spreadsheets—no integration, manual reconciliation required.
4. **Customisation cost:** ETRM vendor wants £50k and 6 months for the report you need this week.
5. **Real-time needs:** System updates hourly, but you need intraday position views.

This guide teaches the fundamentals: **signed quantities, position aggregation, physical vs financial separation, delta exposure, and hedge ratios**. The mechanics that ETRM systems perform behind the scenes—and that you'll need to replicate when the system can't deliver what you need.

### How This Guide Works

This guide teaches by example. We'll start with simple 1–2 trade examples to introduce core concepts. Then, beginning in Section 2, we'll introduce a **reference portfolio of 6 trades**—think of it as our "practice trading book." We'll use this same portfolio throughout Sections 2–4, processing it through different lenses:

- **Section 2:** Separate physical vs financial positions
- **Section 3:** Calculate delta exposure and hedge ratios
- **Section 4:** Complete end-to-end position workflow

Using the same portfolio throughout reduces cognitive load and mirrors how real trading desks work: one book of trades, multiple analytical views.

### What You Won't Learn Here

This guide focuses on position management—knowing **what you have** and **how hedged you are**. It does not cover valuation or P&L calculation. For that, see the companion guide *Mark-to-Market P&L Calculation*, which builds on the position concepts you'll learn here.

## 1. What is a Position?

A "position" is your **net obligation** to buy or sell a commodity. If you've bought 200 MWh of gas and sold 150 MWh, your position is +50 MWh—you're net long.

*Trading terminology:* When you're **long**, you own something (or have agreed to buy it)—you profit if prices rise. When you're **short**, you owe something you don't have (or have agreed to sell it)—you profit if prices fall. "Net long 50 MWh" means after netting all trades, you have 50 MWh more to receive than to deliver.

### The Single Trade

The simplest case:

| Field | Value |
|---|---|
| Trade ID | TR-001 |
| Action | Buy |
| Commodity | NBP Gas |
| Quantity | 100 MWh |
| Price | £25/MWh |
| Delivery | January |

This is a straightforward gas purchase. You're committing to take delivery of 100 MWh of gas at the UK's National Balancing Point (NBP) in January, and you'll pay £25 per MWh.

*What is NBP?* NBP (National Balancing Point) is the UK's wholesale gas trading hub on the National Transmission System (NTS)—think of it as a virtual marketplace where all UK gas traders buy and sell. It's not a physical location, but a reference point in the transmission network where prices are set. Similar hubs exist in other countries: TTF in the Netherlands, THE in Germany, PEG in France.

*Note on prices:* The £25/MWh price is realistic for UK wholesale gas markets (equivalent to roughly 75 p/therm). These are commodity-only prices at the NBP hub—your actual delivered cost includes transport to your location, system balancing charges, and VAT. For this guide, we focus on wholesale hub prices. Actual market prices fluctuate with supply, demand, and weather, but we'll use round numbers to keep the arithmetic simple.

### Signed Quantity (The Key Concept)

To calculate positions, we need to convert "Buy" or "Sell" into numbers we can add up. We do this with **signed quantities**:

- **Buy** = Positive (+100 MWh)
- **Sell** = Negative (−100 MWh)

*Why use signs?* Because **netting**—combining offsetting trades to find your net position—is just addition. If you buy 100 and sell 60, your net position is:

$$+100 + (-60) = +40 \text{ MWh}$$

You're 40 MWh **long**—you have a net obligation to receive gas.

*What is "netting"?* It's the process of combining trades that offset each other. If you buy 100 MWh and sell 100 MWh of the same commodity for the same delivery period, the trades "net out" to zero—you have no remaining position.

Add a second trade:

| Trade ID | Action | Quantity | Signed Qty |
|---|---|---|---|
| TR-001 | Buy | 100 MWh | +100 MWh |
| TR-002 | Sell | 60 MWh | −60 MWh |
| **Net Position** | | | **+40 MWh** |

The arithmetic is trivial, but the concept is fundamental.

**Key Insight**

Signed quantities (+/-) let us net trades by simple addition. Buy = positive, Sell = negative. Position aggregation is just summing signed quantities.

**Think of it like a Warehouse**

If you **buy** gas, it goes *into* your warehouse (+).
If you **sell** it, it goes *out* of your warehouse (-).
Your position = what's in the warehouse right now.

- **Positive position:** You have gas (you're long)
- **Negative position:** You owe gas (you're short)

This physical intuition holds for financial hedges too: selling a financial hedge "takes risk out" of your portfolio, just like selling physical gas takes inventory out of the warehouse.

**Golden Formula #1: Position Aggregation**

$$\text{Net Position} = \sum (\text{Signed Quantities})$$

**Where:**

- Signed Quantity = $+Q$ for Buy, $-Q$ for Sell
- Sum over all trades with the same commodity, delivery period, and book

**Quick Check**

Calculate the signed quantity for each trade and the net position:

1. Buy 200 MWh NBP (January delivery)
2. Sell 150 MWh NBP (January delivery)
3. Buy 80 MWh NBP (January delivery)

*Answer:* $+200 - 150 + 80 = +130$ MWh net long

### Why Delivery Period Matters

Two gas trades only net together if they're for the *same delivery period.* You can't deliver February gas to meet a January obligation—the calendar month is part of the contract specification.

*Why do delivery periods matter so much?* Energy markets trade in fixed calendar periods because physical delivery must happen during specific days. A "January contract" means gas delivered during the month of January. The customer needs gas in January—they can't wait until February. This is why January and February positions never net against each other, even for the same commodity.

Example across three months:

| Trade ID | Action | Delivery | Qty | Signed Qty |
|---|---|---|---|---|
| TR-001 | Buy | January | 100 MWh | +100 |
| TR-002 | Sell | January | 60 MWh | −60 |
| TR-003 | Buy | February | 80 MWh | +80 |
| TR-004 | Sell | February | 80 MWh | −80 |
| TR-005 | Buy | March | 50 MWh | +50 |

Now we aggregate *by delivery period*:

| Delivery Period | Net Position |
|---|---|
| January | +100 − 60 = +40 MWh |
| February | +80 − 80 = 0 MWh |
| March | +50 MWh |

Notice that TR-003 and TR-004 net to zero for February—the position is **flat**. But January and March remain open.

### Why Commodity Matters

TTF gas (the European benchmark traded on the Dutch hub) and NBP gas (the UK National Balancing Point) are different commodities. They have different delivery points, different prices, and **they remain separate positions**—buying NBP doesn't offset selling TTF, even though both are natural gas.

*Why not?* Because you can't physically deliver TTF (Dutch hub) gas to meet an NBP (UK) obligation. The location is part of the contract specification.

*Typical prices:* TTF and NBP trade at similar levels (often within £1–3/MWh of each other), with NBP sometimes at a small premium due to UK import reliance. *Note:* TTF actually trades in EUR/MWh on ICE Endex, but for simplicity in this guide, we'll show TTF prices converted to GBP (assuming £1 = €1.16) so all examples use the same currency. We'll use TTF at £24/MWh and NBP at £25/MWh for round numbers.

Visualizing the Physical Separation

Think of a physical wall between the UK and Europe:

**UK (NBP) | WALL | Europe (TTF)**

You can't move gas across this wall to settle your trades—the physical delivery infrastructure is separate. This is why:

- NBP and TTF positions **never net** against each other
- Your ETRM must group them separately in position reports
- Traders manage NBP and TTF as distinct exposures

The same principle applies to other commodity pairs: Henry Hub (US) vs NBP (UK), Brent crude vs WTI, etc. Physical location dictates data grouping.

Here's a multi-commodity example:

| Trade ID | Commodity | Delivery | Qty | Signed Qty |
|---|---|---|---|---|
| TR-001 | NBP Gas | January | 100 MWh | +100 |
| TR-002 | NBP Gas | January | 60 MWh | −60 |
| TR-003 | TTF Gas | January | 150 MWh | +150 |
| TR-004 | TTF Gas | January | 100 MWh | −100 |

We aggregate by *commodity and delivery period*—trades only combine if both match:

| Commodity | Delivery | Net Position |
|---|---|---|
| NBP Gas | January | +40 MWh |
| TTF Gas | January | +50 MWh |

Even though both are "gas" and both are "January," they remain separate positions because they're different hubs.

### Why Book Matters

In trading, a **book** is like having separate bank accounts for different purposes (also called a "strategy" or "portfolio"). Just as you might have one account for bills (must be paid) and another for savings (optional growth), traders use:

- **Physical Book:** The "delivery obligations account"—actual supply contracts and customer sales you *must* fulfill (supply contracts, pipeline gas, customer sales).
- **Hedge Book:** The "price insurance account"—financial instruments that protect against price swings but don't require physical delivery (futures, swaps, options).

Even if two trades have the same commodity and delivery period, they **remain separate if they're in different books**—they don't combine into one net position.

*Why separate them?* Keeping books separate lets you answer two different questions: "Can we physically deliver?" (Physical Book) and "Are we protected from price risk?" (Hedge Book). Risk managers need both views to understand your full position.

Here's the same NBP January example, now split across books:

| Trade ID | Book | Commodity | Delivery | Signed Qty |
|---|---|---|---|---|
| TR-001 | Physical | NBP Gas | January | +100 |
| TR-002 | Physical | NBP Gas | January | −60 |
| TR-003 | Hedge | NBP Gas | January | −80 |

Aggregate by *commodity, delivery, and book*:

| Book | Commodity | Delivery | Net Position |
|---|---|---|---|
| Physical | NBP Gas | January | +40 MWh |
| Hedge | NBP Gas | January | −80 MWh |

Now we can see the structure: you're +40 MWh long physical gas, and you've sold 80 MWh of futures to hedge. (We'll calculate whether that's enough hedging in Section 4.)

**Quick Check**

Which of these trades combine to form a net position?

1. Buy 100 MWh NBP January (Physical Book)
2. Sell 80 MWh NBP January (Hedge Book)
3. Buy 50 MWh TTF January (Physical Book)
4. Sell 100 MWh NBP January (Physical Book)

*Answer:* Only trades 1 and 4 combine (same commodity, period, *and* book). Result: $+100 - 100 = 0$ MWh in the Physical/NBP/January bucket. Trades 2 and 3 remain separate.

### The Aggregation Rule

We can now state the general rule for position aggregation:

**Position Aggregation Rule**

Group trades by:

- Commodity (NBP, TTF, Power, etc.)
- Delivery Period (January, February, etc.)
- Book (Physical, Hedge, etc.)

Sum the signed quantities within each group.

In formula form:

$$\boxed{\text{Position} = \sum_{\text{same group}} \text{Signed Quantity}}$$

where "same group" means matching commodity, delivery period, *and* book.

This is the foundation. Everything else—delta exposure, coverage metrics, mark-to-market P&L—builds on this simple aggregation.

**Practice: Full Aggregation**

Before moving on, try aggregating these 8 trades into a position table:

| ID | Commodity | Delivery | Book | Signed Qty |
|---|---|---|---|---|
| TR-001 | NBP Gas | January | Physical | +150 |
| TR-002 | NBP Gas | January | Hedge | −120 |
| TR-003 | TTF Gas | January | Physical | +200 |
| TR-004 | NBP Gas | February | Physical | +100 |
| TR-005 | TTF Gas | January | Hedge | −180 |
| TR-006 | NBP Gas | January | Physical | −50 |
| TR-007 | NBP Gas | February | Hedge | −90 |
| TR-008 | TTF Gas | January | Physical | −30 |

*Hint:* You should end up with 6 distinct position buckets (some commodity/period/book combinations appear multiple times).

*Answer:*

| Commodity | Delivery | Book | Net Position |
|---|---|---|---|
| NBP Gas | January | Physical | $+150 - 50 = +100$ MWh |
| NBP Gas | January | Hedge | −120 MWh |
| NBP Gas | February | Physical | +100 MWh |
| NBP Gas | February | Hedge | −90 MWh |
| TTF Gas | January | Physical | $+200 - 30 = +170$ MWh |
| TTF Gas | January | Hedge | −180 MWh |

This is the fundamental building block of all ETRM position reporting. Whether your system processes 8 trades or 8,000, the logic is identical: group by commodity + delivery + book, sum signed quantities. Master this, and you can rebuild any position report by hand when your ETRM inevitably fails at 8:30 AM before a critical meeting.

## 2. Physical vs Financial: Understanding the Split

In Section 1, we separated trades into "Physical" and "Hedge" books. Now: why this separation matters and what it tells us about risk.

### What is a Physical Trade?

A **physical trade** involves actual delivery of the commodity. Gas molecules move through a pipeline. Electricity flows across transmission lines. Money changes hands, and so does the physical product.

Examples of physical trades:

- **Gas Supply Agreement:** You buy 1,000 MWh/day of NBP gas from a producer for January delivery.
- **Power Purchase Agreement (PPA):** You buy the output of a wind farm—500 MWh/day for a year.
- **Customer Sales:** You sell gas to an industrial customer who needs it for their factory.

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The key characteristic: **physical delivery is the intention.** You expect molecules or electrons to actually move.[1]

### What is a Financial Trade?

A **financial trade** (also called a "hedge" or "derivative") is a contract where no physical delivery occurs. Instead, the two parties settle the difference in cash based on a reference price.

Examples of financial trades:

- **Futures contract:** A standardized agreement to buy or sell at a future date at a price fixed today. For example, you sell 1,000 MWh of NBP gas futures on ICE (Intercontinental Exchange). At expiry, you settle financially against the published index price—no actual gas changes hands, just cash based on the price difference.
- **Swap:** An agreement to exchange cash flows. You agree with a bank to pay a fixed price (£25/MWh) and receive a floating price (whatever the market is on settlement day). Only the net difference is cash-settled.
- **Contract for Difference (CFD):** Similar to a swap, but often used for electricity. You lock in a price today, and at settlement you receive (or pay) the difference between that fixed price and the market price.

The key characteristic: **cash settlement only.** No physical commodity moves. These are tools for managing price risk, not for arranging actual delivery.

*What is a hedge, really?* Think of a hedge like insurance for price risk. If you're committed to buy gas at whatever the market price is in January (you're exposed to price risk), you can hedge by agreeing to sell at a fixed price. If the market moves against you on the physical side, you're protected by a gain on the hedge side. The two sides offset each other.

| **Physical Trades** | **Financial Trades** |
|---|---|
| Actual commodity delivery | Cash settlement only |
| Molecules/electrons move | No physical movement |
| Supply contracts, customer sales | Futures, swaps, CFDs |
| Purpose: meet delivery obligations | Purpose: manage price risk |
| Traded bilaterally or spot markets | Traded on exchanges or OTC |

### Why the Separation Matters

Imagine you run a small gas trading desk. You have:

- A supply contract to **buy** 1,000 MWh of gas in January (physical).
- A customer contract to **sell** 800 MWh of gas in January (physical).

[1] In the UK gas market, physical delivery nominations are submitted through National Grid's *Gemini* system, which matches shippers' supply and demand positions and schedules gas flows through the network. This converts your trading position into actual physical operations.

If you aggregate everything into one number, you'd see: $+1{,}000 - 800 = +200$ MWh net long.

But here's the detail: **you're obligated to physically deliver 800 MWh to your customer.** If you can't, you face penalties, lost reputation, and potentially regulatory action. The 200 MWh net position doesn't capture the *gross* physical commitment.

Now add a hedge:

- You sell 200 MWh of NBP futures (financial).

If you combine everything: $+1{,}000 - 800 - 200 = 0$ MWh. Looks perfectly balanced.

But separating physical vs financial reveals the structure:

| **Book** | **Commodity** | **Delivery** | **Net Position** |
|---|---|---|---:|
| Physical | NBP Gas | January | $+1{,}000 - 800 = +200$ MWh |
| Hedge | NBP Gas | January | $-200$ MWh |

Now you can see:

- You have a +200 MWh physical surplus (buy 1,000, sell 800).
- You've hedged the price risk by selling 200 MWh of futures.
- Your physical delivery obligations are clear (800 MWh must be delivered).

This is what risk managers need to see. The separation answers two different questions:

1. **Physical Book:** Can we meet our delivery obligations? Do we have enough supply?
2. **Hedge Book:** Have we locked in prices to protect against market moves?

### Who Hedges and Who Trades?

An astute question: *"If I'm 100% hedged, how do I make money?"*

The answer depends on *why* you're in the market:

- **Commercial hedging:** A utility company buys gas to supply customers at fixed retail prices. They hedge 90–100% to lock in margins and avoid price risk. They make money on the retail markup, not on gas price movements.
- **Proprietary trading:** A trading desk takes intentional directional bets. They might run 20–50% unhedged exposure, betting on price movements. They make money by being right about market direction.
- **Hybrid model:** Many mid-market firms do both. Commercial book (highly hedged) protects customer supply. Prop trading book (partially hedged) seeks profit from market views.

The position and P&L tools in this guide work for all three models. The difference is your *target coverage level*, not the mechanics.

**Our Reference Portfolio (The "Golden Thread")**

From this point forward, we'll use the same 6-trade portfolio throughout this guide. Think of it as your "practice trading book"—we'll process it through position aggregation (Section 1), physical/financial separation (Section 2), delta exposure (Section 3), and mark-to-market P&L (Section 4).

**The Portfolio (6 trades):**

| ID | Book | Commodity | Delivery | Action | Qty | Signed Qty |
|---|---|---|---|---|---:|---:|
| TR-001 | Physical | NBP Gas | January | Buy | 500 MWh | +500 |
| TR-002 | Physical | NBP Gas | January | Sell | 300 MWh | −300 |
| TR-003 | Hedge | NBP Gas | January | Sell | 150 MWh | −150 |
| TR-004 | Physical | NBP Gas | February | Buy | 400 MWh | +400 |
| TR-005 | Physical | NBP Gas | February | Sell | 320 MWh | −320 |
| TR-006 | Hedge | NBP Gas | February | Sell | 60 MWh | −60 |

**Apply the aggregation rule:** Group by commodity + delivery + book, then sum signed quantities.

| Book | Commodity | Delivery | Net Position |
|---|---|---|---:|
| Physical | NBP Gas | January | +500 − 300 = +200 MWh |
| Hedge | NBP Gas | January | −150 MWh |
| Physical | NBP Gas | February | +400 − 320 = +80 MWh |
| Hedge | NBP Gas | February | −60 MWh |

**What this portfolio shows:**

- **January:** Physical surplus of +200 MWh, partially hedged with −150 MWh of futures. You have +50 MWh of unhedged exposure.
- **February:** Physical surplus of +80 MWh, partially hedged with −60 MWh. You have +20 MWh of unhedged exposure.
- **Two delivery periods:** January and February remain separate (you can't deliver February gas to meet January obligations).
- **Partial hedging:** This is realistic—most mid-market firms run 70–80% financial hedge coverage, balancing risk management with market views.

*We'll use this portfolio throughout Sections 2–5. You'll see the same 6 trades aggregated, separated, marked to market, and processed through a complete workflow. This mirrors how real trading desks work: one book of trades, multiple analytical lenses.*

**Quick Check**

A trading desk has these positions for February NBP gas:

**Physical:**

- Buy 600 MWh (supply contract)
- Sell 500 MWh (customer contract)

**Hedge:**

- Sell 80 MWh (ICE futures)

Questions:

1. What's the physical net position?
2. What's the hedge net position?
3. What's the total net position?
4. Is the desk fully hedged?

*Answers:*

1. Physical: $+600 - 500 = +100$ MWh
2. Hedge: $-80$ MWh
3. Total: $+100 - 80 = +20$ MWh
4. No—there's 20 MWh of **unhedged** exposure. If prices rise, the desk gains on this 20 MWh. If prices fall, the desk loses.

This is exactly the kind of question a risk manager asks every morning: "What's our unhedged exposure today?" Being able to answer it quickly—without waiting for the ETRM's nightly batch—is critical when markets are moving.

### How to Classify Trades

In practice, how do you know if a trade is physical or financial?

**Physical trades typically include:**

- Supply contracts with producers or terminals
- Sales to end customers (industrial, commercial, residential)
- Bilateral OTC deals where both parties expect delivery
- Balancing Market trades (buying/selling actual electrons or molecules for immediate delivery)

**Financial trades typically include:**

- Exchange-traded futures (ICE, EEX, CME)
- OTC swaps with banks or financial counterparties
- Contracts for Difference (CFDs)[2]

[2] Not to be confused with the UK government's CfD (Contract for Difference) support scheme for renewable energy projects. Here, CFD refers to the general financial derivative where parties exchange the difference between opening and closing prices.

- Options (calls and puts)

**Grey area:** Some OTC bilateral trades can be either physical or financial depending on the contract terms. The key question: *Do both parties intend actual delivery, or is this purely price hedging?*

In your ETRM system, you'll typically tag each trade with a "Book" or "Strategy" field. This might be:

- "Physical" vs "Hedge"
- "Trading" vs "Hedging"
- Specific names like "UK-Physical" vs "UK-Financial"

The naming doesn't matter—what matters is the **consistent separation so you can aggregate and report by type.**

**Practice: Classify Trades**

Classify each of these as Physical or Financial:

1. ICE NBP futures contract for March delivery
2. Gas supply agreement with a Norwegian producer
3. OTC swap with Goldman Sachs (cash-settled against the NBP index)
4. Sale of power to a data centre (actual delivery via grid connection)
5. TTF futures bought on EEX

*Answers:*

1. **Financial** (exchange futures, cash-settled)
2. **Physical** (supply contract, actual gas delivery)
3. **Financial** (swap, cash-settled)
4. **Physical** (customer sale, actual electrons delivered)
5. **Financial** (exchange futures, cash-settled)

### Portfolio Organization: Analytics vs Operations

**Critical distinction:** Tracking physical vs financial positions is an *analytical* need, not an *operational* portfolio structure.

Many ETRM implementations get this wrong. They create separate portfolios: "Physical Book" and "Financial Book." This creates problems.

**Bad practice: Separate Physical/Financial Portfolios**

Consider this trade:

- "Buy 500 MWh physical gas, pay Heren day-ahead index"

Is this physical or financial?

- It requires physical delivery (physical characteristic)

- But it's priced against a financial index (financial characteristic)

**Key Insight: Physical Delivery $\neq$ Physical Price Risk**

This trade requires **physical delivery** (you'll receive actual gas), but your **price risk is financial** (Heren index).
This is why organizing portfolios by "Physical vs Financial" fails. Many real-world trades have characteristics of both. You can't cleanly separate them without creating reporting errors.
This is the most conceptually challenging aspect of ETRM position reporting—and the most common design mistake.

If you have separate Physical and Financial portfolios, where does it go?

**Option 1:** Put it in Physical portfolio

- Problem: Your financial index exposure is now hidden in the Physical book
- Your basis risk reporting (Heren vs Argus) is wrong

**Option 2:** Put it in Financial portfolio

- Problem: Your physical delivery obligations are now hidden in the Financial book
- Your nominations and cashflow forecasts are wrong

**Option 3:** Split it into two "legs" (one Physical, one Financial)

- Problem: Your gross exposure is now wrong (you've double-counted 500 MWh)
- Your counterparty credit exposure is distorted

**All three options create errors.** The problem is the portfolio structure itself.

**Good practice: Portfolios by Ownership, Not Instrument Type**

Portfolios should be organized by:

- **Trader responsibility:** Trader A's book, Trader B's book
- **P&L ownership:** Proprietary trading vs Hedging vs Customer supply
- **Strategy:** Basis trading (NBP vs TTF), Spread trading (Power vs Gas)
- **Regulatory/accounting:** Different legal entities, different tax treatments

*Not* by instrument type (physical vs financial).

**Use the "Book" field for analytics:**

Tag each trade with a "Book" or "Type" field:

- Book = "Physical" or "Hedge"
- Strategy = "Customer Supply" or "Prop Trading"

This lets you:

- **Report** physical vs financial split for basis risk analysis
- **Report** cashflow (physical obligations vs financial settlements)
- **Report** nominations (physical delivery requirements)

But *operationally*, a trader managing both physical supply and financial hedges has them in the **same portfolio.**

**Why this matters:**

If a trader is managing a commercial book (customer supply + hedges), they need to see:

- Total customer demand (physical)
- Total hedges (physical supply contracts + financial futures)
- Net unhedged exposure (delta)
- Basis risk (which indices, which timings)

Splitting physical and financial into separate portfolios *hides* this view. The trader would have to manually reconcile two portfolios to understand their risk.

**Key Insight**

Physical vs financial separation is an **analytical dimension** (for reporting), not an **organizational dimension** (for portfolio structure). Use Book tags for analytics. Organize portfolios by trader, strategy, or P&L ownership.

**Advanced: Ambiguous Classification**

Consider these three trades, all for February NBP gas:

1. Buy 500 MWh physical gas at fixed price £27/MWh (pure physical, fixed price)
2. Pay Heren day-ahead, receive fixed price £27/MWh (pure financial swap, no delivery)
3. Buy 500 MWh physical gas, pay Heren day-ahead (physical delivery, index pricing)

Questions:

1. If you organize portfolios by "Physical Book" and "Financial Book," which portfolio does trade #3 go into?
2. What goes wrong if you put it in the Physical portfolio?
3. What goes wrong if you put it in the Financial portfolio?
4. What goes wrong if you split it into two legs (one Physical, one Financial)?
5. How would you organize portfolios to avoid this problem?

*Discussion:*
Trade #3 is ambiguous because it has *both* physical delivery and financial index risk.

- If Physical portfolio: Financial index exposure (Heren) is hidden. Your basis risk report (tracking Heren exposure) misses 500 MWh.
- If Financial portfolio: Physical delivery obligation is hidden. Your nominations report (tracking physical delivery) misses 500 MWh.
- If split into two legs: You've created 1,000 MWh gross exposure from a 500 MWh trade. Counterparty credit reports are wrong. You can't trace back to the original contract.
- Solution: Single portfolio (e.g., "Gas Trading Desk"), tag the trade with Book = "Physical" (because delivery is required) *and* Index = "Heren Day-Ahead" (for basis risk analytics). Report both dimensions separately, but don't split the portfolio.

This exercise shows why industry practitioners (like those at major trading firms) don't organize portfolios by physical vs financial. The ambiguous cases break the model.

## 3. Delta Exposure and Coverage Metrics

*What is "delta"?* In trading and finance, "delta" means "the difference" or "the change." When we talk about delta exposure, we mean: what's the unhedged portion of your position—the part exposed to price movements?

**Terminology note:** In **energy trading**, "delta" is used interchangeably with "Net Position" or "Unhedged Exposure." In **options trading**, "delta" is a Greek sensitivity measuring how much an option's price changes for a £1 move in the underlying. This guide uses the energy trading definition.

The question from the introduction: *"What's our delta exposure, and what's our hedge ratio?"*

**Terminology note:** In this section, we'll use precise terminology. Industry practitioners use "hedge ratio" to mean the proportion of *natural exposure* (customer demand, generation output) that's been hedged. We'll cover that definition later. First, we'll look at "financial hedge coverage"—the proportion of physical trades offset by financial instruments.

### What is Delta Exposure?

**Delta exposure** is your **net unhedged position** after accounting for both physical and financial trades.

**Golden Formula #2: Delta Exposure**

$$\text{Delta Exposure} = \text{Physical Position} + \text{Hedge Position}$$

**Note:** Hedge positions are typically negative (sells) if you're long physical, so this becomes:

$$\text{Delta} = (+\text{Physical Long}) + (-\text{Hedge Short}) = \text{Net Unhedged}$$

### Why "Delta"?

In trading, "delta" means "change" or "difference." Options traders use "delta" to measure sensitivity to price changes. Here, delta exposure measures your **net sensitivity to price movements**—the amount of your position that's *not* protected by hedges.

### Delta as Action (Trader's View)

More importantly, delta tells you *what to trade* to get flat:

- **Delta = +50 MWh** means "I need to *sell* 50 MWh to close out my exposure"
- **Delta =** −30 **MWh** means "I need to *buy* 30 MWh to close out my exposure"
- **Delta = 0 MWh** means "I'm flat—no action needed"

This is how traders actually use delta. It's not just a number on a report—it's an *instruction*. When a trader says "What's my delta for January?" they're really asking "How much do I need to trade to neutralize my position?"

**Example:** You calculate delta for January NBP gas and get +50 MWh. A trader immediately thinks: "I'm long 50 MWh unhedged. If I want to get flat, I need to sell 50 MWh of futures before the market closes."

The delta number (**+50 MWh**) becomes the trade size (**Sell 50 MWh**).

### Worked Calculation

Using our reference portfolio from Section 2, we already have the aggregated positions. Now we calculate delta exposure and hedge ratios.

**Aggregated Positions (from Section 2):**

| Book | Commodity | Delivery | Net Position |
|---|---|---|---|
| Physical | NBP Gas | January | +200 MWh |
| Hedge | NBP Gas | January | −150 MWh |
| Physical | NBP Gas | February | +80 MWh |
| Hedge | NBP Gas | February | −60 MWh |

**Calculate delta exposure for each delivery period:**

*January:*

$$\text{Delta}_{\text{Jan}} = +200 + (-150) = +50 \text{ MWh}$$

*February:*

$$\text{Delta}_{\text{Feb}} = +80 + (-60) = +20 \text{ MWh}$$

**Interpretation:**

- **January:** You have **50 MWh of unhedged long exposure.** If NBP gas prices rise by £1/MWh, you gain £50. If prices fall by £1/MWh, you lose £50.
- **February:** You have **20 MWh of unhedged long exposure.** A £1/MWh price move = £20 gain or loss.

The hedged portions (150 MWh in January, 60 MWh in February)? Price movements don't affect you there—gains on the physical side are offset by losses on the hedge side (and vice versa).

**Key Insight**

Delta exposure = Physical + Hedge. It shows your unhedged position—the part exposed to price risk. For our portfolio: January delta = +50 MWh, February delta = +20 MWh.

### Financial Hedge Coverage

The **financial hedge coverage** tells you what percentage of your physical book is offset by financial instruments (futures, swaps, options).

Formula:

$$\boxed{\text{Financial Hedge Coverage} = \frac{|\text{Financial Position}|}{|\text{Physical Position}|} \times 100\%}$$

We use absolute values (the $|\cdot|$ symbols) because we care about the *size* of the hedge, not the direction.

*Why absolute values matter:* Without them, you'd calculate: $-150/+200 = -0.75 = -75\%$. That looks negative, as if you have *bad* coverage. But you don't—you have 75% coverage! The negative sign just means "sold hedge to offset long physical" (which is correct hedging). Absolute values remove the direction confusion:

$$\frac{|-150|}{|+200|} = \frac{150}{200} = 75\% \text{ (correct coverage)}$$

**The ratio measures <u>how much</u> is hedged, not <u>which way</u> it's hedged.**
This is a frequent point of confusion for junior analysts. Absolute values prevent the hedge direction (buy vs sell) from making the coverage percentage look negative when it's actually positive.

**Calculate financial hedge coverage for our portfolio:**

*January:*

$$\text{Financial Hedge Coverage}_{\text{Jan}} = \frac{|-150|}{|+200|} \times 100\% = \frac{150}{200} \times 100\% = 75\%$$

*February:*

$$\text{Financial Hedge Coverage}_{\text{Feb}} = \frac{|-60|}{|+80|} \times 100\% = \frac{60}{80} \times 100\% = 75\%$$

**Interpretation: 75% of your physical book is offset by financial hedges** in both January and February. The remaining 25% (50 MWh in January, 20 MWh in February) is unhedged.

### True Hedge Ratio: Natural Exposure Coverage

The metrics above (delta exposure and financial hedge coverage) measure how physical and financial *trades* relate to each other. But there's a more fundamental question: **how much of your *natural exposure* is hedged?**

**Natural exposure** is your underlying business risk—the exposure you'd have even without any trading activity:

- **Retailers:** Customer demand (you're obligated to supply)
- **Generators:** Power plant output (you're obligated to deliver)
- **Suppliers:** Long-term supply contracts (you're obligated to take)

The **hedge ratio** (industry-standard definition) measures what proportion of this natural exposure you've protected—using *any* instruments, physical or financial.

Formula:

$$\boxed{\text{Hedge Ratio} = \frac{|\text{Total Hedges (Physical + Financial)}|}{|\text{Natural Exposure}|} \times 100\%}$$

### Example: Energy Retailer

An energy retailer has 10,000 MWh of forecast customer demand for February. They've hedged this exposure with:

- 6,000 MWh physical supply contract (baseload)
- 2,500 MWh ICE futures (financial)

*Calculate hedge ratio:*

$$\text{Hedge Ratio} = \frac{|6{,}000 + 2{,}500|}{|10{,}000|} \times 100\% = \frac{8{,}500}{10{,}000} \times 100\% = 85\%$$

**Interpretation:** 85% of customer demand is hedged. The remaining 15% (1,500 MWh) is unhedged—exposed to spot market prices.

Notice: The hedge ratio doesn't care *how* you hedged (physical vs financial). It only cares that 8,500 MWh of the 10,000 MWh natural exposure is protected.

**Key Insight**

Industry practitioners use "hedge ratio" to mean: *What proportion of my natural exposure is hedged?* This is different from "financial hedge coverage" (what proportion of physical trades are offset by financial trades), which we calculated earlier. Both metrics are useful, but for different purposes.

**Why both metrics matter:**

- **Hedge ratio (natural exposure):** Answers "Am I exposed to market risk?" (strategic view)
- **Financial hedge coverage (physical vs financial):** Answers "What's my basis risk?" and "What are my cashflow/nomination obligations?" (operational view)

The rest of this guide focuses on the operational view—calculating positions from trades—but it's important to understand both perspectives.

### Why These Metrics Matter

Delta exposure and financial hedge coverage are **internal risk management tools.** Why you need them:

#### 1. Risk Limits

Many trading desks have policies like:

- "No book can have less than 70% financial hedge coverage"
- "Maximum delta exposure: £50k per commodity per month"
- "Unhedged positions require approval from the Head of Trading"

Your 75% financial hedge coverage would pass the first rule. For January, if your risk limit is £40k and prices are £27/MWh, your delta exposure is 50 MWh $\times$ £27 = £1,350—well within limits.

#### 2. Margin Requirements

Exchanges require you to post collateral (margin) for open positions. Unhedged positions typically require *more* margin than hedged positions because they're riskier.

#### 3. P&L Volatility

A 20% unhedged position means 20% of price movements flow through to your profit and loss. If you're comfortable with that volatility, fine. If not, you increase your financial hedge coverage.

#### 4. Regulatory Context (UK 2025)

Interestingly, there's **no explicit regulatory requirement** in the UK to report delta exposure or financial hedge coverage. Ofgem (the energy regulator) focuses on capital adequacy and liquidity, not position-level metrics.

This is exactly why ETRM systems often don't provide these reports as standard—they're not mandatory, so vendors prioritise other features. But for *internal* risk management, you need them.

**Calculate Delta and Financial Hedge Coverage**

Before moving on, test your understanding. A power trading desk has these positions for March:

| Book | Net Position |
|---|---|
| Physical | +500 MWh |
| Hedge | −450 MWh |

Calculate:

1. Delta exposure (Hint: Physical + Hedge)
2. Financial hedge coverage (Hint: Use absolute values)

*Answers:*

1. Delta $= +500 + (-450) = +50$ MWh
2. Financial Hedge Coverage $= \frac{450}{500} \times 100\% = 90\%$

### Multi-Commodity Example

In practice, you'll track delta exposure and financial hedge coverage for *each commodity and delivery period separately.* Here's a more complete picture of a trading book:

| Commodity | Period | Physical | Hedge | Delta | Coverage % |
|---|---|---|---|---|---|
| NBP Gas | January | +200 | −150 | +50 | 75% |
| NBP Gas | February | +80 | −60 | +20 | 75% |

Notice:

- Each row is a separate "bucket" (commodity + delivery period).
- January and February remain separate—they don't net together because delivery periods are different.
- Both periods have the same 75% financial hedge coverage, showing consistent risk management across the portfolio.
- Total unhedged exposure: 50 MWh (Jan) + 20 MWh (Feb) = 70 MWh across both months.

**This is the report structure your risk manager needs.** Not just one aggregated number, but positions broken down by delivery period with clear delta and hedge coverage metrics.

Now you know how to build it.

**Multi-Commodity Delta**

Calculate delta exposure and financial hedge coverage for each row. (Hint: Delta = Physical + Hedge; Coverage% = $\frac{|\text{Hedge}|}{|\text{Physical}|} \times 100\%$)

| Commodity | Period | Physical | Hedge | Delta | Coverage % |
|---|---|---|---|---|---|
| NBP Gas | March | +1,000 | −800 | ? | ? |
| TTF Gas | March | +300 | −300 | ? | ? |
| UK Power | March | −200 | +180 | ? | ? |

*Answers:*

| Commodity | Period | Physical | Hedge | Delta | Coverage % |
|---|---|---|---|---|---|
| NBP Gas | March | +1,000 | −800 | +200 | 80% |
| TTF Gas | March | +300 | −300 | 0 | 100% |
| UK Power | March | −200 | +180 | −20 | 90% |

Risk managers review reports like this every morning before the day-ahead auction. They're checking: Which commodities have unhedged exposure? Is financial hedge coverage within policy limits? Where's the risk concentration? This 30-second scan tells them where to focus their attention for the day.

**Extension**

Your trading desk has a 75% financial hedge coverage policy—no delivery period should fall below 70% or exceed 80%. You have these positions for April NBP gas:

| Book | Net Position |
|---|---|
| Physical | +1,200 MWh |
| Hedge | −800 MWh |

Questions:

1. What's your current financial hedge coverage? Is it within policy?
2. How many MWh of additional hedge do you need to reach exactly 75%? (Hint: Solve for $H$ where $\frac{H}{1200} = 0.75$)
3. If you're short physical (−500 MWh) instead, would you buy or sell hedges to reach 75%?

*This is the kind of calculation traders make multiple times per day when rebalancing their books to meet risk limits.*

### Aggregation vs Granularity: Systems vs Traders

The reports we've shown so far are *granular*—one row per commodity per delivery period. This is how ETRM systems typically present data:

| Commodity | Period | Physical | Hedge | Delta | Coverage % |
|---|---|---|---|---|---|
| NBP Gas | Jan 2026 | +200 | −150 | +50 | 75% |
| NBP Gas | Feb 2026 | +80 | −60 | +20 | 75% |
| NBP Gas | Mar 2026 | +150 | −100 | +50 | 67% |
| TTF Gas | Jan 2026 | +300 | −250 | +50 | 83% |
| TTF Gas | Feb 2026 | +180 | −150 | +30 | 83% |
| UK Power | Jan 2026 | −400 | +350 | −50 | 88% |
| UK Power | Feb 2026 | −320 | +280 | −40 | 88% |

**Problem:** This is 7 rows of numbers. A real trading desk might have 40+ rows (multiple commodities × 12 months × different products). **Traders can't process 40 big numbers at a glance.**

**What traders actually want:** Start with *aggregation*, then drill down to detail when needed.

#### Aggregated View (What Traders See First)

| Commodity | Physical | Hedge | Delta | Coverage % |
|---|---|---|---|---|
| NBP Gas (Q1 2026) | +430 | −310 | +120 | 72% |
| TTF Gas (Q1 2026) | +480 | −400 | +80 | 83% |
| UK Power (Q1 2026) | −720 | +630 | −90 | 88% |
| **Total** | **+190** | −80 | **+110** | — |

Now it's 3 rows. The trader can see at a glance:

- NBP Gas: Net long 120 MWh, 72% covered
- TTF Gas: Net long 80 MWh, 83% covered
- UK Power: Net short 90 MWh, 88% covered

*Then* they drill down: "NBP looks under-hedged. Show me the monthly split." → Expand to Jan/Feb/Mar rows.

#### The Workflow: Granular → Aggregated → Drill Down

1. **Calculate granular:** Your system computes positions at the finest level (commodity × delivery month × book). This is your "source of truth."
2. **Present aggregated:** Show traders the rolled-up view (commodity × quarter or commodity × year). This is the "executive summary."
3. **Enable drill-down:** When traders spot something interesting (e.g., low coverage on NBP), they can expand to see monthly detail and basis risk breakdown.

**Why this matters:**

- **Systems default to granular** because it's easier to code: one query, one table, dump everything.

- **Traders need aggregated first** because humans can't process 40 numbers in a 30-second morning review.
- **It's easy to go from granular → aggregated** (just sum). It's *impossible* to go from aggregated → granular (you've lost the detail).

**Key Insight**

Build granular, store granular, but *present* aggregated. Let traders expand to detail when they need it. Don't make them scroll through 40 rows every morning to figure out if they're exposed.

**Implementation tip:** In Python/Excel, always calculate at the finest granularity. Then create aggregated views using groupby or pivot tables. Example:

```
# Calculate granular (commodity + month + book)
granular = trades.groupby(['Commodity', 'Month', 'Book'])['SignedQty'].sum()

# Aggregate to quarterly view for trader dashboard
quarterly = granular.groupby(['Commodity', 'Quarter']).sum()

# Trader sees quarterly view, can drill to monthly when needed
```

### Basis Risk: Why the Physical/Financial Split Really Matters

Earlier, we separated trades into Physical and Hedge (financial) books. We calculated delta exposure and financial hedge coverage. But here's a critical insight: **even if your delta is zero and your financial hedge coverage is 100%, you can still lose money.**

Why? **Basis risk.**

**Basis risk** is the risk that your hedges don't move in perfect lockstep with your physical exposure. This happens when:

- Physical and financial settle against *different reference prices*
- Hedges fix at *different times* than your physical exposure
- You have exposures across *different locations or hubs*

This is why tracking the physical/financial split matters—not for portfolio organization (we'll cover that next), but for understanding where basis risk lives.

### Example 1: Index Basis Risk

You have these February 2026 NBP gas positions:

- **Physical:** +100 MWh supply contract, settled at Heren day-ahead index
- **Financial:** −100 MWh swap, settled at Argus day-ahead index

On paper: Delta = 0 MWh. You're "fully hedged." But what if Heren fixes at £28/MWh and Argus fixes at £27.50/MWh on a particular day?

*Calculate your loss:*

- Physical position: Pay £28/MWh × 100 MWh = £2,800
- Financial hedge: Receive £27.50/MWh × 100 MWh = £2,750
- Net loss: £2,800 − £2,750 = **£50**

Even though you were "hedged" (zero delta), you lost £50 because the two indices diverged. Multiply this across a month, and it adds up.

**Key insight:** If you only track "delta exposure," you'd see zero and assume you're protected. But you're exposed to **index basis risk**—the spread between Heren and Argus.

#### Example 2: Calendar Basis Risk

You have these February 2026 positions:

- **Physical:** +100 MWh customer demand (delivered daily through February)
- **Financial:** −100 MWh month-ahead swap (fixes daily through January)

On paper: Delta = 0 MWh. Fully hedged.

But the month-ahead swap **fixes gradually through January**—each day in January, a portion of the swap settles based on that day's forward curve. By the end of January, the entire swap is fixed.

Meanwhile, your physical delivery happens in *February.* If prices move between January (when your hedge fixed) and February (when you deliver), you're exposed.

*Scenario:* You sold 100 MWh February month-ahead in early January at £27/MWh (hedge locked in). Then bought 100 MWh February day-ahead through the month to cover physical delivery, averaging £28/MWh.

Result: You *thought* you were hedged, but you lost £1/MWh × 100 MWh = £100 because your hedge fixed *before* your physical exposure materialized.

**Key insight:** The timing of settlement matters. Month-ahead and day-ahead don't net perfectly—one fixes in January, the other in February.

*Why do these prices differ?* Day-ahead prices reflect **immediate conditions**: tomorrow's weather forecast, unplanned outages, wind generation predictions. Month-ahead prices reflect **broader seasonal sentiment**: expected temperatures, planned maintenance schedules, storage levels. When a cold snap hits in February (after your month-ahead hedge fixed in January), day-ahead prices spike—but your hedge is already locked at the old January price.

#### Example 3: Multiple Reference Sources

In practice, your February book might look like this:

| Trade Type | Reference | Volume |
|---|---|---|
| Physical delivery | NBP physical hub | +100 MWh |
| Financial swap | Heren day-ahead | −60 MWh |
| Financial swap | Argus day-ahead | −30 MWh |
| Financial swap | Argus month-ahead | −10 MWh |
| **Total** | | **0 MWh** |

Delta exposure: 0 MWh. Looks perfectly hedged.

But you're exposed to:

- Heren vs Argus day-ahead spread (60 MWh vs 30 MWh)
- Argus day-ahead vs month-ahead timing (30 MWh vs 10 MWh)
- NBP physical vs all financial indices

If these spreads move against you, you lose money even though your delta is zero.

**This is why you need to track the split.** Not to organize portfolios (bad idea, as we'll see next), but to *see* your basis exposures.

### Why This Matters for ETRM Position Reports

When your risk manager asks for "delta exposure by delivery month," they want to see:

1. Net unhedged volume (delta)
2. Physical vs financial breakdown
3. **Reference source breakdown** (Heren vs Argus, day-ahead vs month-ahead)

Most ETRMs don't provide #3 out of the box. You need to build it yourself.

> **Key Insight**
>
> Separating physical and financial positions isn't about portfolio structure—it's about seeing basis risk. Even with zero delta, you're exposed if your hedges settle against different indices or at different times than your physical exposure.

## 4. Putting It All Together: The Complete Workflow

Using our reference portfolio from Sections 2–4, let's walk through the complete workflow step by step. This demonstrates how all the pieces—position aggregation, delta exposure, and MTM P&L—fit together.

*Note:* In a real ETRM, this workflow would handle 2,500 trades, but the fundamental mechanics remain identical to our 6-trade example.

### Step 1: Load Trade Data

Your ETRM exports a CSV file with all trades. Here's our reference portfolio:

| ID | Book | Commodity | Delivery | Action | Qty | Price (£/MWh) |
|---|---|---|---|---|---|---|
| TR-001 | Physical | NBP Gas | January | Buy | 500 | 25.00 |
| TR-002 | Physical | NBP Gas | January | Sell | 300 | 26.00 |
| TR-003 | Hedge | NBP Gas | January | Sell | 150 | 25.50 |
| TR-004 | Physical | NBP Gas | February | Buy | 400 | 24.00 |
| TR-005 | Physical | NBP Gas | February | Sell | 320 | 25.00 |
| TR-006 | Hedge | NBP Gas | February | Sell | 60 | 24.50 |

**Step 2: Calculate Signed Quantities**

Convert "Buy/Sell" to +/– for each trade:

| ID | Book | Commodity | Delivery | Action | Qty | Price (£/MWh) | Signed |
|---|---|---|---|---|---|---|---|
| TR-001 | Physical | NBP Gas | January | Buy | 500 | 25.00 | +500 |
| TR-002 | Physical | NBP Gas | January | Sell | 300 | 26.00 | −300 |
| TR-003 | Hedge | NBP Gas | January | Sell | 150 | 25.50 | −150 |
| TR-004 | Physical | NBP Gas | February | Buy | 400 | 24.00 | +400 |
| TR-005 | Physical | NBP Gas | February | Sell | 320 | 25.00 | −320 |
| TR-006 | Hedge | NBP Gas | February | Sell | 60 | 24.50 | −60 |

**Step 3: Aggregate Positions**

Group by Commodity + Delivery + Book, sum the signed quantities:

| Commodity | Delivery | Book | Net Position |
|---|---|---|---|
| NBP Gas | January | Physical | +500 − 300 = +200 MWh |
| NBP Gas | January | Hedge | −150 MWh |
| NBP Gas | February | Physical | +400 − 320 = +80 MWh |
| NBP Gas | February | Hedge | −60 MWh |

**Step 4: Calculate Delta Exposure and Financial Hedge Coverage**

For each commodity/delivery, combine Physical + Hedge:

| Commodity | Period | Physical | Hedge | Delta | Coverage % |
|---|---|---|---|---|---|
| NBP Gas | January | +200 | −150 | +50 | 75% |
| NBP Gas | February | +80 | −60 | +20 | 75% |

**Exposure Report complete.** Both January and February have 75% financial hedge coverage. Total unhedged exposure: 70 MWh (50 + 20).

**Step 5: Join Market Prices**

Current market prices (late December):

| Commodity | Delivery | Market Price |
|---|---|---|
| NBP Gas | January | £27/MWh |
| NBP Gas | February | £26/MWh |

Match each trade to its market price by commodity + delivery.

### Step 6: Calculate MTM P&L

For each trade: (Market Price − Trade Price) × Signed Qty.

## 5. Why This Matters: Real-World Context

You now understand how to aggregate positions, calculate delta exposure, and compute mark-to-market P&L. But why does this matter? Why can't you just trust your ETRM to do this for you?

This section explains the real-world context behind this guide—why traders, analysts, and risk managers need to be able to build these reports from scratch.

### The Question That Started This Guide

A student in one of my energy trading courses asked:

> *"I'm working on a personal project to build a position P&L tool. I've got the basics working, but I'm stuck on how to aggregate positions properly when I have multiple trades for the same commodity. My ETRM system gives me one number, but when I try to replicate it manually, I get different results. How do traders actually do this in practice?"*

This is the classic ETRM problem: the system gives you *an* answer, but you can't verify it, you can't customize it, and you don't know if it's correct.

Here's what makes this situation worse:

- The ETRM might be aggregating incorrectly (mixing commodities, wrong delivery periods, missing trades).
- The ETRM might be using yesterday's prices (stale market data).
- The ETRM might not separate physical and hedge books the way you need.
- The ETRM might not calculate coverage metrics at all (remember: 64% of firms report their ETRM doesn't deliver the reports they need).

**The result:** You're making risk decisions based on a black box. You don't know if the exposure report is right. You don't know if the P&L is accurate. And when your risk manager asks, "How much unhedged gas do we have for January?" you can't answer with confidence.

### Why ETRMs Fall Short

Energy Trading and Risk Management (ETRM) systems are expensive, complex, and—at best—deliver 80% of what you need.

Here's why they struggle with ad-hoc reporting:

1. **Canned reports:** ETRMs ship with pre-built reports designed for generic use cases. If your business has a specific workflow (e.g., you separate physical and hedge books differently, or you track delta by delivery day instead of delivery month), the canned reports won't match.
2. **Customization is expensive:** Want a new report? That's a change request. It goes to the vendor's backlog. You'll get a quote for £20k–50k and a 6-month delivery timeline. For a single report.
3. **Data quality issues:** ETRMs rely on clean, complete data entry. If traders book trades inconsistently (wrong commodity codes, missing delivery dates, incorrect book assignments), the reports will be wrong. Garbage in, garbage out.
4. **Batch processing:** Many ETRMs run nightly batch jobs to calculate positions and P&L. If you need real-time updates (because the market is moving fast and you're hitting risk limits), you're out of luck.
5. **Black box calculations:** You can see the final number, but you can't see the intermediate steps. If the P&L looks wrong, you can't debug it. You're forced to trust the system or raise a ticket with IT.

**The industry response:** Traders and analysts build their own tools. Excel spreadsheets, Python scripts, manual position trackers. This is not a workaround—it's how trading desks actually operate.

### Trust, But Verify

There's a principle in trading: *trust, but verify.*

Your ETRM gives you a position report. **Trust it as a starting point.** But before you make a £500k hedging decision based on that report, **verify it.**

How do you verify it?

1. Export the raw trade data (CSV from your ETRM).
2. Build your own aggregation (using the methods from this guide).
3. Compare your result to the ETRM's report.
4. If they match, great—you've validated the ETRM.
5. If they don't match, investigate: Are trades missing? Are units inconsistent? Is the ETRM using a different grouping logic?

This is not paranoia. It's due diligence. Here are real examples of ETRM failures:

- **Missing trades:** A trader booked a 500 MWh gas purchase in a separate system (manual OTC trade). The ETRM didn't know about it. The exposure report understated the long position by 500 MWh. The desk was massively under-hedged and lost £15k when prices spiked.

- **Unit conversion error:** Physical supply contracts were entered in therms. Financial hedges were entered in MWh. The ETRM aggregated them without converting. The position report was off by a factor of 29.3071 (the UK standard therm-to-MWh conversion).

- **Stale market prices:** The ETRM's market data feed failed overnight. The P&L report was calculated using yesterday's prices. Traders made hedging decisions based on stale P&L, losing £8k on unnecessary trades.

- **Wrong delivery period:** A trader booked a "January delivery" trade, but the ETRM defaulted to "January day-ahead" instead of "January month-ahead." The trade was aggregated into the wrong delivery bucket. The financial hedge coverage was reported as 85% when it was actually 100% (fully hedged).

None of these are catastrophic, multi-million pound disasters. They're small, insidious errors that add up over time. A £10k loss here, a £5k loss there. Over a year, it's real money.

### The Value of Understanding Fundamentals

When you understand how position aggregation, delta exposure, and MTM P&L work, you gain three things:

1. **Independence:** You're not reliant on the ETRM. If the system is down, you can build the report manually in Excel. If the system gives a weird number, you can verify it.

2. **Credibility:** When you walk into a meeting with the risk manager or the CFO and they ask, "How did you calculate this?" you can explain it. You're not just passing along a black-box number from the ETRM.

3. **Career value:** Traders, risk managers, and analysts who understand the fundamentals are more valuable than those who just click buttons in the ETRM. You can build custom tools, you can debug errors, and you can adapt when the business changes.

This is why learning the fundamentals matters. It's not about replacing the ETRM. It's about being able to *think independently* and *validate what the ETRM tells you.*

### What To Do Next

If you're building a position P&L tool (like the student who asked the original question), here's the path forward:

1. **Start with a small dataset:** 5–10 trades, one commodity, one delivery period. Build the aggregation logic manually in Excel.

2. **Validate against known results:** Use simple examples where you know the correct answer (like the worked examples in this guide). If your logic matches, you're on the right track.

3. **Add complexity gradually:** Multiple commodities, multiple delivery periods, physical vs hedge separation. Build each piece step-by-step.

4. **Automate with Python:** Once your Excel version works, translate it into Python (or your preferred language). Use the workflow from Section 7.

5. **Integrate with real data:** Connect to your ETRM's CSV exports or API. Run your tool daily and compare results to the ETRM's official reports.

6. **Extend with advanced features:** Add scenario analysis ("what if gas prices rise 10%?"), VaR calculations, or forward curve modeling. But only after you've nailed the basics.

The journey from "I don't understand how position aggregation works" to "I can build a production-grade position P&L tool" takes time. But every step forward makes you more independent, more credible, and more valuable.

### A Final Thought

Energy trading is a domain where small mistakes compound into large losses. A £1/MWh error on a 10,000 MWh portfolio is £10,000. Multiply that by 252 trading days per year, and it's £2.5 million.

Understanding the fundamentals—signed quantities, aggregation logic, delta exposure, MTM P&L—is not optional.

Your ETRM is a tool. A powerful one, but still just a tool. Don't let it become a black box that makes decisions for you.

Learn the fundamentals. Build the reports yourself. Verify the numbers. Trust, but verify.

## 6. Common Pitfalls and How to Avoid Them

You've learned the mechanics of position aggregation, delta exposure, and mark-to-market P&L. Now: the mistakes that trip people up in practice—even experienced traders and analysts.

These aren't theoretical edge cases. They're real errors that cause wrong exposure reports, missed risk, and incorrect P&L.

### Pitfall 1: Mixing Commodities That Look Similar

**The mistake:** Aggregating NBP and TTF gas together because "they're both gas."

**Why it's wrong:**

- NBP (National Balancing Point) is the UK gas market. Prices settle in GBP.
- TTF (Title Transfer Facility) is the Dutch/European gas market. Prices settle in EUR (or GBP equivalent with forex conversion).
- Even if you convert to the same currency, the price basis is different. NBP and TTF can move differently due to pipeline constraints, LNG flows, or local demand.

If you net them together, you'll understate your actual exposure. A +500 MWh NBP position and a −500 MWh TTF position is **not** zero delta—it's two separate unhedged positions.

**The fix: Always group by the exact commodity specification.** Treat NBP and TTF as completely separate. Same for UK baseload vs UK peakload power, or Brent crude vs WTI crude.

#### Pitfall 2: Ignoring Delivery Periods

**The mistake:** Summing all gas trades without checking delivery dates.

**Example:**

| Commodity | Delivery | Signed Qty |
|---|---|---:|
| NBP Gas | January | +200 |
| NBP Gas | February | −200 |

If you aggregate without grouping by delivery period, you'd report zero net position. But in reality:

- You're **long 200 MWh in January** (exposed to January price movements)
- You're **short 200 MWh in February** (exposed to February price movements)

If January prices spike but February stays flat, you'll make money in January and lose nothing in February. If you'd reported "zero delta," you'd miss this risk entirely.

**The fix: Always group by commodity + delivery period + book.** Never aggregate across different months unless you're explicitly building a forward curve view.

#### Pitfall 3: Unit Conversion Errors

Energy markets use inconsistent units. A single mistake here can be catastrophic.

**Common unit traps:**

- **Gas:** MWh (megawatt-hours) vs therms vs cubic meters. UK gas trades in therms or MWh. European gas trades in MWh. US gas trades in MMBtu.
- **Power:** MW (megawatts, capacity) vs MWh (megawatt-hours, energy). A 10 MW plant running for 24 hours delivers 240 MWh.
- **Time periods:** Day-ahead power is MWh per delivery day. Month-ahead gas is total MWh for the full month.

**Real-world example:**

You export trades from your ETRM. Physical gas trades are in therms. Financial futures are in MWh. You forget to convert.

| Trade | Commodity | Quantity | Unit |
|---|---|---:|---:|
| Physical supply | NBP Gas | 29,307 | therms |
| ICE future | NBP Gas | −1,000 | MWh |

**Mistake:** You sum 29,307 + (−1,000) = 28,307 and report a massive long position.

**Correct:** 29,307 therms ≈ 1,000 MWh (conversion: 1 MWh = 29.3071 therms). After conversion:

| Trade | Commodity | Quantity (MWh) |
|---|---|---|
| Physical supply | NBP Gas | 1,000 |
| ICE future | NBP Gas | −1,000 |
| **Net Position:** | | **0 MWh** |

You're fully hedged, not massively long.

**The fix:**

1. **Standardize all trades to a single unit *before* aggregation.**
2. **Document the conversion factors** you're using (UK standard: 1 MWh = 29.3071 therms, 1 therm = 0.0341 MWh).
3. **Add a "Unit" column** in your data and flag any trades that don't match your standard.

#### Power Units vs Energy Units: Systems vs Traders

Here's a critical UX distinction: **Traders think in power units (kth/day for gas, MW for power), but systems should calculate in energy units (therms, MWh).**

**Why traders prefer power units:**

- **Gas:** kth/day (kilotherms per day, i.e., 1,000 therms per day) describes *flow rate*—easier to compare against customer demand or pipeline capacity. This is standard UK gas market terminology.
- **Power:** MW (megawatts) describes *generation capacity*—easier to compare against plant output or grid constraints

**Why systems should use energy units:**

- **Math doesn't work on power units.** You can't add "10 kth/day for January" and "5 kth/day for February"—they have different numbers of days (31 vs 28).
- **Energy units aggregate correctly.** 310,000 therms (Jan) + 140,000 therms (Feb) = 450,000 therms (Q1). The math is simple.

**Best practice: Calculate in energy, display in power**

1. **Store and calculate** positions in energy units (therms, MWh)
2. **Convert for display** when presenting to traders:
   - Gas: Divide by days in period, then by 1,000 for kth/day. "310,000 therms for January" → "10.0 kth/day" (310,000 ÷ 31 ÷ 1,000)
   - Power: For monthly contracts, divide total MWh by hours in month. "744 MWh for January" → "1 MW average" (744 ÷ 744 hours)
3. **Label clearly** so traders know which they're seeing

**Example: Gas position report**

| **Month** | **Position (therms)** | **Days** | **Position (kth/day)** |
|---|---|---|---|
| January | 310,000 | 31 | 10.0 |
| February | 140,000 | 28 | 5.0 |
| March | 217,000 | 31 | 7.0 |
| **Q1 Total** | **667,000** | — | — |

Notice: You can sum the energy column (667,000 therms), but you *can't* sum the kth/day column ($10 + 5 + 7 = 22$, which is meaningless). The kth/day display is for trader intuition, not for math.

*Note on Calorific Value (CV):* The 29.3071 therms/MWh factor assumes a standard CV of 39.5 MJ/m³. Actual CV varies by gas source: North Sea gas ( 39.0–39.5 MJ/m³), LNG imports (40+ MJ/m³), Norwegian pipeline gas ( 39.3 MJ/m³). For billing and settlement, Xenta (the UK invoicing system) uses actual measured CV, which can shift the conversion factor by ±1–2%. For position aggregation, the standard factor is sufficient—but for invoice reconciliation, use CV-adjusted conversions from your shipper statements.

**Unit Conversion: Building Muscle Memory**

Your ETRM position report shows **310,000 MWh** of NBP gas for January delivery.
A broker calls and quotes you on **10 kth/day for the full month of January**.
Questions:

1. Convert your position from MWh to therms
2. Convert your position from therms to kth/day (for January, 31 days)
3. How much of your position does the broker's quote cover?

*Answers:*

1. 310,000 MWh × 29.3071 therms/MWh = 9,085,201 therms
2. 9,085,201 therms ÷ 31 days ÷ 1,000 = 293.1 kth/day
3. The broker quote is 10 kth/day. Your position is 293.1 kth/day. The quote covers 10/293.1 = 3.4% of your position.

**Key takeaway:** UK gas markets quote in kth/day. You don't need to convert between MWh, therms, and kth/day instantly in your head, but you need to understand the relative magnitudes. When a broker says "10 kth/day," you should immediately recognize whether that's a small or large portion of your 310,000 MWh position. Practice until you can estimate these conversions within 10–20%.

### Pitfall 4: Delivery Period Ambiguities & Data Granularity Mismatches

**The mistake:** Treating "January delivery" as universal, when gas and power have different timing conventions.

**Gas markets (UK):** January delivery means gas delivered during January, but the UK gas day runs **05:00 to 05:00** (not midnight to midnight). A "Wednesday gas trade" refers to the gas day running Wednesday 05:00 to Thursday 04:59. This 5-hour offset from calendar days is a common source of systematic errors when aggregating gas and power positions.

*Why 05:00?* It's the period of lowest demand, minimizing market disruption at the rollover. Other markets use different offsets: the US gas day runs 09:00–09:00 Central Time.

**Power markets:** January delivery means power delivered during January, but:

- **Day-ahead:** Settles for each individual calendar day (e.g., 3 Jan from 00:00–23:59).
- **Month-ahead:** Settles for the full month, but settlement periods differ by exchange (some use UTC, others local time).

**Why this matters:** If you're trading across multiple exchanges or time zones, a "January delivery" trade on ICE Endex (UTC) starts at a different clock time than a "January delivery" OTC contract (UK local time, GMT or BST depending on season).

During daylight saving transitions (March and October in the UK), this causes off-by-one-hour errors.

**The data aggregation trap:** When building analytics dashboards or P&L reports that combine gas and power:

- **Power data** arrives in 30-minute settlement periods (from Elexon/NESO)
- **Gas data** is typically daily or hourly
- **Gas days** start at 05:00, power days at 00:00

If you naively "join" gas and power data by "day," you'll systematically misalign them by 5 hours. Example: Wednesday's gas position (05:00 Wed to 05:00 Thu) will be joined with Wednesday's power position (00:00 Wed to 00:00 Thu), creating a 5-hour overlap with Tuesday's gas and a 5-hour gap with Thursday's gas.

For analytics requiring sub-daily granularity (e.g., spark spread calculations or real-time P&L), you must either:

1. Interpolate daily gas prices into 30-minute intervals (assumes flat intraday profile—often wrong)
2. Use rolling averages (e.g., average power price from 05:00–05:00 to match gas day)
3. Explicitly model the gas day offset in your join logic

**The fix:**

- **Always store delivery periods with explicit start/end timestamps in UTC.**
- **If your ETRM only stores "Jan-2024" as text, clarify the convention** in your documentation.
- **For day-ahead power, track the exact settlement date** (not just "January").
- **Document your interpolation/aggregation strategy** when combining gas and power data at different granularities.

- **Test your logic across gas day boundaries** (especially around 05:00) to catch systematic offset errors.

**The bottom line:** "January delivery" isn't universally defined. UTC vs local time, DST transitions, gas day offsets (05:00–05:00 UK, 09:00–09:00 US), and data granularity mismatches (30-min power vs daily gas) create systematic errors. Store timestamps explicitly and document your aggregation strategy. See the *Physical Foundations* guide for more detail on gas day timing.

#### Pitfall 5: Price Basis Mismatches

**The mistake:** Using the wrong market price when calculating MTM P&L.

**Example:**

You have a **day-ahead ICE power trade** for 3 January delivery. You mark it to market using the **month-ahead January price** (£60/MWh) instead of the **day-ahead 3 Jan price** (£58/MWh).

Result: Your P&L is off by £2/MWh × trade quantity. If the trade is 1,000 MWh, you've overstated P&L by £2,000.

**Why this happens:**

- Different products have different price curves (day-ahead vs month-ahead vs quarter-ahead).
- Your market price feed might only provide month-ahead curves, forcing you to approximate.
- Manual price entry errors (copying the wrong row from a spreadsheet).

**The fix:**

1. **Match each trade to the *exact* market price** for its delivery period and product type.
2. **If you only have month-ahead curves, document the approximation** and flag it as a limitation.
3. **For high-value trades, manually verify the price** against exchange settlement data.

**The bottom line:** Day-ahead, month-ahead, and quarter-ahead prices differ. Using the wrong curve overstates or understates MTM P&L. Match trade to exact market price.

#### Pitfall 6: Double-Counting Trades

**The mistake:** The same trade appears twice in your aggregation.

**How this happens:**

- Your ETRM exports the same trade twice (e.g., once from the front-office system, once from the back-office settlement system).
- A trader manually logs a trade in Excel while also entering it in the ETRM.
- You merge data from multiple sources (ETRM + broker confirmations + exchange reports) without deduplicating.

**Example:**

| ID | Commodity | Signed Qty | Price | Source |
|---|---|---|---|---|
| TR-045 | NBP Gas | +500 | £25 | ETRM Export |
| TR-045 | NBP Gas | +500 | £25 | Broker Confirm |

If you don't deduplicate by trade ID, you'll report +1,000 MWh instead of +500 MWh.

**The fix:**

1. **Use a unique trade ID as the primary key.** Remove duplicates before aggregation.
2. **If merging multiple sources, reconcile by checking:** same commodity, same delivery, same quantity, same price, same counterparty.
3. **Add data validation:** if two trades have the same ID but different quantities, flag an error.

### Pitfall 7: Missing Trades

The opposite problem: trades that exist but don't appear in your report.

**How this happens:**

- ETRM export filters out certain trade types (e.g., only exports confirmed trades, missing pending/provisional ones).
- Manual trades logged in a separate spreadsheet that you forgot to merge.
- Trades entered late in the day after your morning export.
- Trades booked in a different system (e.g., physical supply contracts in a separate procurement tool).

**Why this is dangerous:** You think you're fully hedged (100% financial hedge coverage), but you're missing a 200 MWh physical purchase. Your actual delta is +200 MWh, not zero. If prices move against you, the loss will be a nasty surprise.

**The fix:**

1. **Cross-check your position report against multiple sources** (ETRM + broker confirms + exchange positions + manual logs).
2. **Run a reconciliation check:** does your net position match your expected exposure based on known contracts?
3. **Add a "last updated" timestamp** to your report so you know if trades are missing due to timing.

### Pitfall 8: Forgetting to Update Market Prices

**The mistake:** Your P&L report uses yesterday's prices (or last week's prices) because you forgot to refresh your market data feed.

**Example:**

It's 10 AM on 15 December. NBP gas opened at £27/MWh but has rallied to £29/MWh due to a supply outage. Your P&L report still shows £27 because your market prices were cached from the 9 AM snapshot.

Your risk manager sees +£500 P&L. The real P&L is +£1,500. They make a hedging decision based on stale data.

**The fix:**

- **Always timestamp your market prices.** Display "Prices as of: 10:15 AM, 15-Dec-2024" at the top of your report.
- **If you're calculating P&L manually, refresh prices immediately before running the calc** from your broker screen or exchange API.
- **Automate price updates if possible** (e.g., pull from an API every 15 minutes).

**Summary: A Checklist for Accurate Reports**

Before you finalize any position or P&L report, run through this checklist:

1. **Unit consistency:** All trades converted to the same unit (MWh, therms, etc.)?
2. **Commodity separation:** NBP vs TTF vs Power kept separate?
3. **Delivery period granularity:** Grouped by the correct delivery period (day, month, quarter)?
4. **Book separation:** Physical vs Hedge kept separate?
5. **Deduplication:** No duplicate trade IDs?
6. **Completeness:** Cross-checked against broker confirms and exchange positions?
7. **Price freshness:** Market prices updated recently (timestamp visible)?
8. **Price basis match:** Each trade marked to the correct market price (day-ahead, month-ahead, etc.)?

Get these right, and you'll build reports that are not only correct but *trustworthy*—the kind of reports that risk managers, traders, and auditors can rely on when it matters.

## 7. Python Implementation: A High-Level Overview

You can build these reports manually in Excel. But once you understand the fundamentals, automating the process with Python (or any scripting language) makes it faster, more repeatable, and less error-prone.

*This section is not a coding tutorial.* Instead, it shows the conceptual workflow so you know what's possible and where to start if you want to automate your position and P&L reporting.

The code works with our 6-trade reference portfolio from Sections 2–5, but scales to thousands of trades with no changes to the logic.

### Why Python?

Python is widely used in energy trading for several reasons:

- **Pandas:** A library built for data manipulation (loading CSVs, grouping, aggregating, joining).
- **Easy integration:** Connect to APIs (market data feeds, ETRM exports), databases, and Excel files.
- **Reproducibility:** Save your script, run it every morning with fresh data, get consistent results.
- **Extensibility:** Add new features (VaR calculations, scenario analysis, charting) as you grow.

If you're more comfortable with R, Julia, or even advanced Excel Power Query, the concepts are the same—you're just using different tools.

### The Workflow in Code (Conceptual)

Here's the complete workflow from Section 5, expressed as pseudocode:

1. **Load trade data:**
    - Read CSV export from ETRM (or pull from API/database)
    - Result: DataFrame with columns [TradeID, Book, Commodity, Delivery, Action, Quantity, Price]
2. **Calculate signed quantities:**
    - Add a new column: `SignedQty = Quantity if Action == "Buy" else -Quantity`
    - Result: Each row now has +/− quantity
3. **Aggregate positions:**
    - Group by [Commodity, Delivery, Book]
    - Sum `SignedQty` for each group
    - Result: Net position for each commodity/delivery/book combination
4. **Calculate delta and coverage metrics:**
    - Pivot the aggregated data: one row per commodity/delivery, columns for Physical and Hedge positions
    - Add columns: `Delta = Physical + Hedge`, `Coverage = abs(Hedge) / abs(Physical)`

- Result: Exposure report

5. **Load market prices:**
    - Read from CSV, API, or manual input
    - Result: DataFrame with columns [Commodity, Delivery, MarketPrice]
6. **Join prices to trades:**
    - Merge market prices into the original trade data by [Commodity, Delivery]
    - Result: Each trade now has its trade price and current market price
7. **Calculate MTM P&L:**
    - Add column: `MTM_PnL = (MarketPrice - TradePrice) * SignedQty`
    - Group by Book, sum `MTM_PnL`
    - Result: P&L report (Physical, Hedge, Total)
8. **Export reports:**
    - Write exposure report to Excel/CSV
    - Write P&L report to Excel/CSV
    - Optionally: email to risk manager, save to shared drive, display on a dashboard

#### What a Python Script Looks Like (Very Simplified)

Here's the essence of the code, stripped to the core logic (not production-ready, just illustrative):

```
import pandas as pd

# Step 1: Load trades
trades = pd.read_csv("etrm_export.csv")

# Step 2: Calculate signed quantities
trades['SignedQty'] = trades.apply(
    lambda row: row['Quantity'] if row['Action'] == 'Buy'
                else -row['Quantity'],
    axis=1
)

# Step 3: Aggregate positions
positions = trades.groupby(['Commodity', 'Delivery', 'Book'])['SignedQty'].sum()
positions = positions.reset_index()

# Step 4: Calculate delta and coverage metrics
exposure = positions.pivot_table(
```

```
    index=['Commodity', 'Delivery'],
    columns='Book',
    values='SignedQty',
    fill_value=0
)
exposure['Delta'] = exposure['Physical'] + exposure['Hedge']
exposure['Coverage'] = (abs(exposure['Hedge']) / abs(exposure['Physical'])) * 100

# Step 5: Load market prices
prices = pd.read_csv("market_prices.csv")

# Step 6: Join prices to trades
trades = trades.merge(prices, on=['Commodity', 'Delivery'], how='left')

# Step 7: Calculate MTM P&L
trades['MTM_PnL'] = (trades['MarketPrice'] - trades['Price']) * trades['SignedQty']
pnl = trades.groupby('Book')['MTM_PnL'].sum()

# Step 8: Export
exposure.to_csv("exposure_report.csv")
pnl.to_csv("pnl_report.csv")
print("Reports generated successfully.")
```

**That's the entire workflow in 30 lines of Python.**

Of course, production code adds error handling, logging, unit tests, data validation, and more. But the core logic is this simple.

### When to Automate (And When Not To)

**Automate when:**

- You run the same report every day or multiple times per day.
- You have more than 50 trades to process manually.
- You need consistent results (human errors creep into manual Excel work).
- You want to add advanced features (scenario analysis, stress testing, charting).

**Don't automate when:**

- You're still figuring out the business logic (build in Excel first, automate later).
- The process changes frequently (every week the requirements shift).
- You don't have clean, structured input data (fix your data quality first).

Automation is powerful, but it's not a substitute for understanding the fundamentals. Start by building the reports manually (Excel is fine). Once you can do it by hand and explain every step, *then* automate.

### Beyond Python: Integration with ETRMs and Market Data

Once you've built the basic pipeline, you can extend it:

- **ETRM APIs:** Many ETRMs (Allegro, Endur, RightAngle) have APIs or database access. Instead of CSV exports, pull trade data directly.
- **Market data feeds:** Subscribe to real-time market data (ICE, Bloomberg, Refinitiv). Update your P&L every 15 minutes automatically.
- **Dashboards:** Use tools like Plotly, Dash, or Streamlit to build interactive dashboards. Your risk manager can view exposure and P&L in a web browser, refreshed live.
- **Alerts:** Set thresholds (e.g., "if delta exceeds 500 MWh, send an email"). Automate risk monitoring.

The fundamentals stay the same. You're still aggregating signed quantities, calculating delta, and marking to market. You've just made it faster and more integrated.

### What We've Built

You now understand:

1. The conceptual workflow for automating position and P&L reporting.
2. What a Python implementation looks like at a high level.
3. When to automate (and when to stick with manual processes).
4. How to extend the basic pipeline with APIs, market data, and dashboards.

If you want to learn Python for energy trading, start with the manual Excel process first. Once you can build these reports by hand, translating the logic into code will be straightforward.

## Summary: Key Takeaways

You now understand the fundamentals of position management in energy trading.

### Core Concepts

- **Signed quantities** (+/) make position aggregation simple addition: Buy = positive, Sell = negative
- **The aggregation rule** (Commodity + Delivery + Book) is universal across all trading systems
- **Net position** tells you your obligation to buy or sell a commodity for a specific delivery period

**Physical vs Financial Split**

- **Physical book** tracks delivery obligations (can you meet commitments?)
- **Financial book** tracks price hedges (have you locked in prices?)
- Keeping them separate reveals operational risk (delivery) vs market risk (price)

**Delta Exposure**

- **Delta = Physical + Financial** shows your unhedged exposure
- Positive delta: you profit if prices rise, lose if they fall
- Negative delta: you profit if prices fall, lose if they rise
- **Hedge ratio** tracks what percentage of physical exposure is hedged

**Why This Matters**

- Risk managers use delta to set position limits and track policy compliance
- Traders use hedge ratios to decide when to add or reduce hedges
- Operations teams use physical positions to manage delivery and nominations
- The same position can look "fine" in aggregate but reveal serious mismatches when split by book

**The Golden Formulas**

1. **Position Aggregation:** Net Position = $\sum$(Signed Quantities) grouped by Commodity + Delivery + Book
2. **Delta Exposure:** Delta = Physical Net + Financial Net
3. **Hedge Ratio:** Hedge Ratio = |Financial Net| / |Physical Net| × 100%

**What's Next?**

You now know **what positions you have** and **how hedged you are**. The next question is: what are these positions worth, and are you making or losing money?

That's where mark-to-market P&L comes in. The companion guide *Mark-to-Market P&L Calculation* builds on these position concepts to show you how to:

- Value positions using current market prices
- Calculate unrealized and realized P&L
- Track daily P&L changes and attribution
- Identify when stale data or wrong curves corrupt valuations

Position management is the foundation. P&L measurement is the next layer. Master positions first—then you're ready for P&L.

## About Jordan Dimov

Portfolio CTO and energy trading software specialist with over 20 years of software engineering experience and 7 years in the energy commodities sector. Based in London since 2011, working through A115 Ltd, a London-based contracting and consulting company.

Previous roles include trading platform development at Shell, Centrica Energy, and Limejump, delivering systems for front office trading, middle office risk management, and back office settlement across gas, power, and environmental markets.

### Professional Services

#### Individual & Team Training

- Energy trading bootcamps for software engineers
- ETRM development training for technical teams

#### Technical Consulting

- Architectural review and validation sprints
- Code review and technical assessment
- Bespoke energy trading software development

#### Business Development

- Strategic advisory for energy trading technology firms
- Investor relations support in the energy trading sector

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