



March 20, 2026

Best Practices for Hedging in Energy Markets: FAQ

As U.S. power market stakeholders grapple with the effects of increasing renewable penetration, soaring load growth, skyrocketing capacity market prices, and evolving reliability risks, hedging has become a central tool for managing risk and stabilizing returns. Effective hedging in modern energy markets requires the use of sophisticated analytics software solutions that can help align financial strategies with physical asset behavior, market structure, and a range of future outcomes.

What is the Primary Objective of Hedging in Power Markets?

At its core, hedging is about reducing cash flow volatility while preserving upside where possible, as illustrated in **Figure 1**. For generators, this means ensuring revenue stability over time, both operationally and in terms of facilitating project finance. For load-serving entities (LSEs), hedging can control cost variability in the face of volatile spot prices. For IPPs and developers, hedging can preserve the ability to service debt while retaining as much merchant upside as possible.

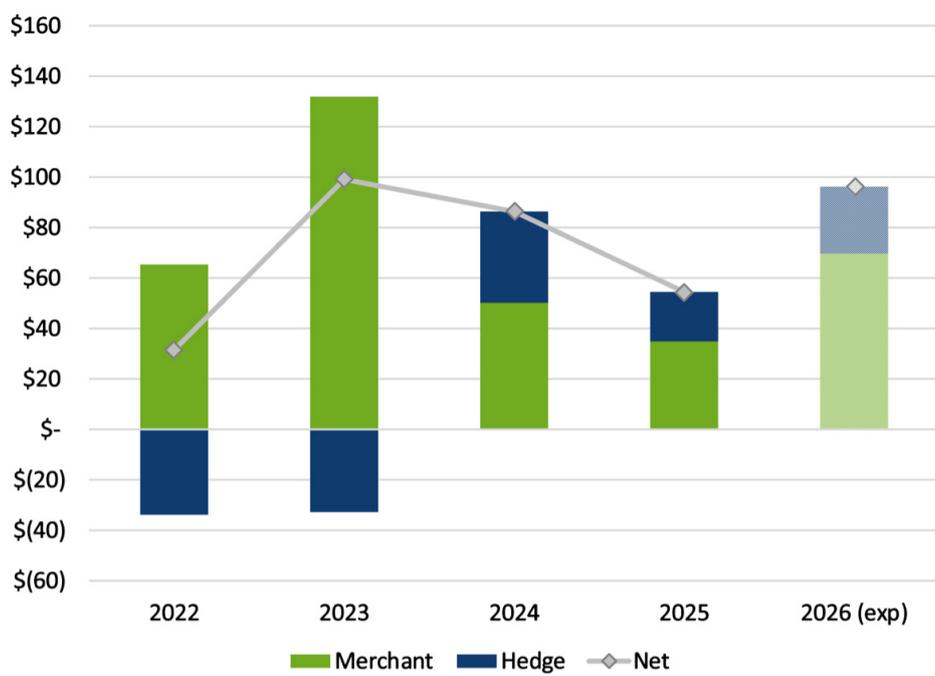


Figure 1. Mar–Nov Hedged 2-Hour Storage Revenues at ERCOT North (\$/kW-yr)

Forward market hedging allows both generators and load-serving entities to smooth irregular scarcity conditions into average expected values, transforming a boom-and-bust revenue environment into one that is more predictable and bankable. In so doing, it supports project finance, improves bankability, and enables more confident long-term planning.

Fundamentally, hedging involves optimizing the tradeoff between risk and reward – not just eliminating risk. Overhedging can suppress upside or lead to systematically overpaying for protection, while underhedging can expose portfolios to unacceptable downside risk.

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Why is Hedging Especially Important in Modern Energy Markets?

Several structural shifts in power markets are increasing both the need for and the complexity of hedging. These including the following:

- Weather-driven risk is intensifying. As renewable penetration grows, weather increasingly serves as the primary driver of risk and revenue, which impacts generation output, price formation, load levels, and system reliability simultaneously. For producers, weather patterns directly affect revenue volatility and project bankability. For offtakers, those same dynamics influence procurement costs and the effectiveness of existing hedging strategies.
- Renewables and storage are reshaping price dynamics. Large additions of solar, wind, and battery energy storage systems (BESS) have introduced new patterns of price volatility, negative pricing, and widening day-ahead/real-time (DART) spreads that require updated approaches to hedge design.
- Forward markets are increasingly misaligned with fundamentals. In markets such as ERCOT, a structural imbalance between forward market buyers and sellers has driven forward prices well above what underlying supply fundamentals support. Participants who fail to understand this divergence risk systematically overpaying for hedged positions—or leaving significant value on the table.

These dynamics mean that traditional, static hedging approaches are often insufficient. Instead, market participants must adopt dynamic, analytics-driven strategies that reflect evolving risk profiles. Hedge optimization requires balancing risk and reward based on an organization’s specific objectives: there is no one-size-fits-all strategy.

How Should Participants Balance Financial and Physical Hedges?

The optimal blend of financial and physical hedges depends on the characteristics of the specific market in which an asset operates. The most robust strategies layer financial instruments on top of physical assets, using each to address the limitations of the other. Key considerations include the following:

- **Financial hedges**, such as exchange-traded futures, OTC swaps, or block hedges, are generally well suited for markets with lower volatility. They lock in predictable prices and offer a stable revenue stream, acting as a safeguard against unforeseen price dips.

- **Physical hedges**, such as unit-contingent PPAs, or solar-plus-storage assets, play a more prominent role in markets characterized by significant price spikes and wide day-ahead/real-time (DART) spreads. By directly aligning energy delivery with payment, these instruments allow asset owners to capture high-value pricing events within the context of market structure and volatility.

It is important to note that two hedge structures may offer similar average returns, but the uncertainty around those returns can differ substantially. Thus, using cash flow analysis with uncertainty bands is a valuable tool for benchmarking hedge performance across instrument types.

What Does Optimal Hedging Look Like in Today's Energy Markets?

Successful hedging programs share several characteristics that distinguish them from more reactive or ad hoc approaches. These include:

- **Using sophisticated analytics software solutions.** Leading organizations leverage advanced modeling platforms that simulate market outcomes at hourly and sub-hourly resolution, accounting for weather-driven correlations across load, generation, outages, and fuel prices.
- **Calibrating strategies to specific market conditions.** Rather than applying a generic hedging template, successful hedging programs reflect the dynamics, such as supply stack composition, renewable penetration, DART spreads, and forward market accuracy, specific to the markets in which assets operate.
- **Adopting a 'profitability' lens rather than a 'fundability' lens.** Organizations that optimize for long-term profitability – rather than simply doing what is needed to get a project financed – can unlock additional asset returns during the financing stage while increasing project IRR. This requires clearly understanding which financial structures are optimal prior to financing, not after.
- **Integrating diversification as a structural hedge.** Rather than relying solely on financial instruments, leading programs diversify portfolios across technologies, geographies, and markets to reduce risk and improve cash flow stability.
- **Making risk management and trading policies a priority.** Successful hedging is contingent on having well-designed policies, procedures, and risk management infrastructure that embed disciplined decision-making into organizational processes.

How Should Market Participants Determine the Optimal Hedge Size?

Hedge sizing is one of the most consequential decisions an asset owner or operator can make. Because hedge risks vary by year, season, and hour, finding the 'right' hedge requires the use of a rigorous, data-driven process. Key steps in that process include:

- **Leverage a model that correlates weather with load, renewable generation, outages, and fuel prices.** Simulations should run at hourly or sub-hourly intervals to capture the full distribution of potential outcomes.
- **Quantify downside using Gross Margin at Risk (GMAR).** GMAR reflects a generator's ability to cover on-peak contract loss events and the on-peak contract's ability to supplement revenues when prices are depressed. By analyzing the duration and cost of loss events, operators can identify the hedge size at which project revenues become insensitive to market conditions.
- **Evaluate risk profiles by month.** The optimal hedge position can vary significantly throughout the year, as illustrated in **Figure 2**. Winter months are often characterized by long-duration loss events and higher risk exposure for battery operators, while summer months may carry different risk shapes. Adjusting hedge sizes monthly avoids the pitfall of overhedging in low-risk periods and underhedging during high-risk ones.

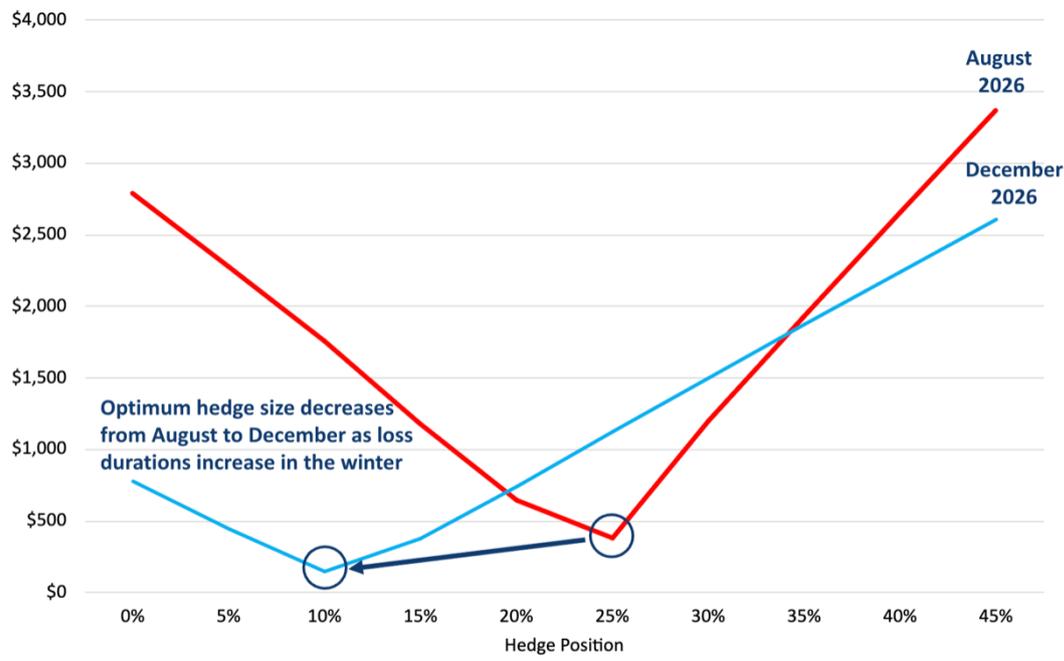


Figure 2. BESS + On-Peak Forward Sale Monthly GMAR (\$)

How Does Portfolio Diversification Function as a Hedge?

By combining assets with different production profiles, market exposures, or geographic locations, portfolios can naturally smooth variability. This approach effectively creates a structural hedge, reducing reliance on financial instruments and improving resilience to market shocks. Key dimensions of diversification include:

- **Technology diversification.** Combining multiple asset types, such as solar, storage, and wind, reduces exposure to any single generation profile.
- **Geographic diversification.** Even within a single market, assets positioned in different areas can produce complementary generation profiles. For example, a wind asset on the Texas Gulf Coast that generally produces more during evening hours, can be paired with a Panhandle wind asset that generates more in the morning, thus reducing hourly price exposure.
- **Market and nodal diversification.** Spreading a portfolio across different market nodes or across different ISOs reduces exposure to localized congestion, pricing anomalies, or regulatory changes that may affect one part of the portfolio while leaving others unaffected.

How Should Organizations Structure Governance and Risk Management for Hedging?

Formal governance frameworks are crucial components for successful hedging. They improve decision quality, provide accountability, ensure transparency, and allow reporting at any level of management. Best practices include the following:

- **Establishing clear trading risk management policies and procedures.** These documents establish guardrails around asset operations and hedging strategies, accounting for stakeholder risk tolerance, defining hedging protocols, setting authority delegation, and establishing risk and compliance oversight.
- **Ensuring credit and trading access.** Organizations must ensure they have the operational infrastructure to hedge using exchange-traded futures and/or over-the-counter (OTC) swaps. Without appropriate credit arrangements and counterparty agreements in place, even the most well-designed hedging strategy cannot be executed.

- **Establishing hedge execution protocols.** These should specify how to ensure asset-backed hedging (rather than speculation), how to layer hedges over time, trading liquidity thresholds, risk and loss limits, and the performance metrics by which hedging activity will be evaluated.
- **Standardizing reporting and communication.** Stakeholders at all levels, from asset managers to boards to lenders, require visibility into hedge positions and their performance. Establishing clear reporting practices eliminates ambiguity and signifies a strong commitment to disciplined risk management.

What are Key Considerations for Putting Hedges into Practice?

Once hedging strategies have been developed, and governance guardrails are in place, hedge execution is the next step. Best practices for disciplined hedging programs include the following:

- **Layer hedges over time rather than executing in a single transaction.** Spreading hedge execution across multiple time periods reduces exposure to the risk of transacting at a temporarily unfavorable price. This is especially important in markets where forward prices are volatile or structurally misaligned with fundamentals.
- **Ensure all hedging is asset-backed.** Hedging should reflect the physical output or load profile of the underlying asset. Positions that are not backed by physical generation or load expose organizations to basis risk and can produce losses that exceed any risk management benefit.
- **Establish liquidity thresholds before trading.** Not all forward market products are equally liquid. Super-peak and TB4 contracts in ERCOT, for example, are thinly traded relative to on-peak blocks. Execution protocols should specify minimum liquidity requirements to ensure that hedges can be entered and adjusted efficiently.
- **Define performance metrics and review hedges regularly.** Hedge performance should be measured against pre-defined benchmarks, rather than evaluated in hindsight against outcomes that were not foreseeable at the time of execution. Regular strategy reviews, conducted at defined intervals, allow organizations to adjust hedge sizes as market conditions and risk profiles evolve.

Interested in Learning More?

The Ascend PowerSIMM™ suite is an energy analytics platform that captures the new and evolving dynamics of electricity markets. Utilities, public power entities, renewable developers, and community choice aggregators utilize PowerSIMM for optimal energy portfolio management, risk management, resource planning, and project optimization. Contact us to learn more.

About Ascend Analytics

Ascend Analytics is the leading provider of market intelligence and analytics solutions for the power industry.

The company's offerings enable decision makers in power development and supply procurement to maximize the value of planning, operating, and managing risk for renewable, storage, and other assets. From real-time to 30-year horizons, their forecasts and insights are at the foundation of over \$50 billion in project financing assessments.

Ascend provides energy market stakeholders with the clarity and confidence to successfully navigate the rapidly shifting energy landscape. Visit us at ascendanalytics.com