The Carbon-Adjusted Data-Centre Yield

Comparing Power Pathways on a Like-for-Like Basis

Authored by Chennakeshav Adya
Independent Researcher
August 2026

Abstract

Data-centre investment committees are increasingly asked to compare power pathways that differ in price, reliability, emissions and contractual form. One project may rely on grid supply and annual energy-attribute certificates. Another may sign a renewable power purchase agreement. A third may combine grid supply, storage and firm low-carbon generation. Reported carbon outcomes can appear dramatically different even when the facilities draw from the same physical system.

This paper develops a carbon-adjusted yield framework for comparing data-centre power pathways on a like-for-like basis. It begins with an identical compute service, electricity-load profile, site boundary and availability requirement. It then separates physical grid exposure, contractual Scope 2 reporting, hourly carbon-free matching, direct on-site emissions, embodied capital and residual balancing. The framework converts energy cost, incremental capital, operating cost, carbon exposure, curtailment, shape mismatch and reliability into project cash flow without treating an accounting claim as a physical power flow.

The evidence base includes the International Energy Agency's global work on energy and artificial intelligence, GHG Protocol Scope 2 guidance, European Union data-centre reporting, United States Environmental Protection Agency electricity data, Australian national greenhouse-account factors and the United Nations 24/7 Carbon-Free Energy Compact. These sources show why geography, time, contractual instruments, residual mixes and calculation method matter.

Six figures present the comparison boundary, emissions lenses, power-pathway stack, hourly matching gap, carbon-adjusted yield bridge and investment gate. Six tables provide a data file, pathway comparison, claim-and-contract matrix, hypothetical financing case, stress matrix and 150-day execution plan. Every capacity, price, emission factor, cost, utilisation, schedule and financial result in the worked example is a hypothetical management assumption created solely to demonstrate the method.

Electricity procurement, power markets, greenhouse-gas accounting, environmental claims, engineering, reliability, planning, licensing, grid connection, project finance, tax, accounting, valuation and investment decisions require current advice from qualified professionals in the relevant jurisdictions. This paper provides general information for professional audiences and does not provide legal, regulatory, engineering, environmental, tax, accounting, valuation, credit or investment advice.

JEL Classification: G31, G32, L86, Q40, Q48, Q51, Q56

Keywords: data centres, carbon-adjusted yield, electricity procurement, scope 2 emissions, power purchase agreements, hourly matching, project finance, digital infrastructure, energy transition

1. Define the like-for-like service

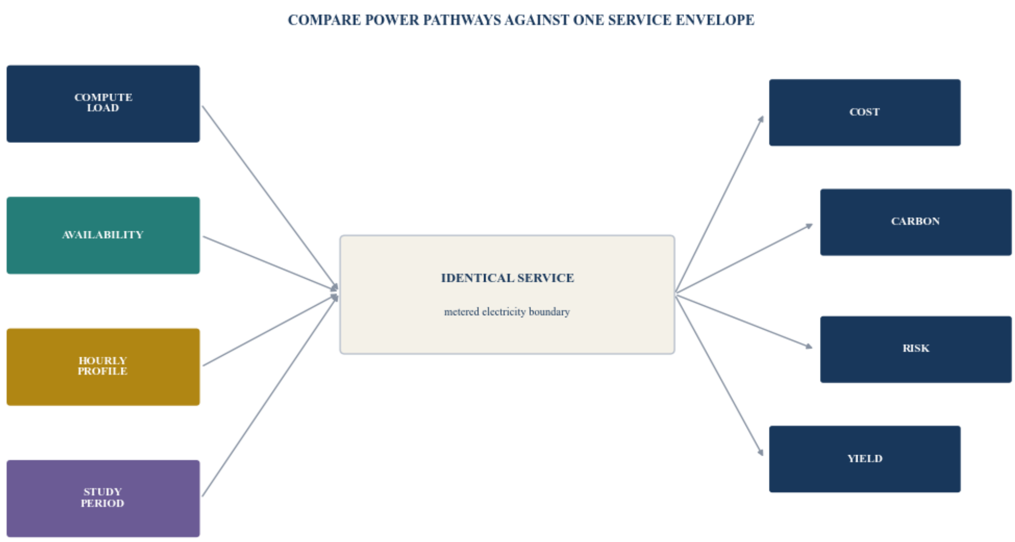
A power comparison is meaningful only when every pathway supports the same economic service. The reference case should state information-technology load, rack density, utilisation, facility overhead, availability, ramp, climate, backup duty, customer requirements and study period.

Nameplate data-centre capacity is insufficient. A pathway that appears inexpensive may deliver less usable compute during connection constraints, renewable shortfalls, maintenance or fuel disruption. Another pathway may carry higher capital while protecting customer service through firm capacity.

The study should therefore begin with hourly electricity demand and supported compute. Facility electricity includes information-technology equipment, cooling, pumps, fans, storage losses, network, lighting and other loads. Backup generation and on-site energy assets need separate fuel, maintenance and emissions treatment.

All pathways should use the same financial boundary. Land, building and compute equipment can remain constant while power-specific connection, generation, storage, contracts, collateral, reserves and operating costs change. The model should avoid giving one pathway credit for infrastructure excluded from another.

Figure 1. Like-for-like comparison boundary



Author framework. Every pathway should support the same compute, availability and study period.

2. Use three emissions lenses

Location-based Scope 2 emissions use average generation emission factors for the grid area serving consumption. This lens reflects the physical emissions intensity associated with where electricity is used, subject to the method and data period.

Market-based Scope 2 emissions use qualifying supplier or product information and contractual instruments. GHG Protocol requires dual reporting in markets where such instruments are available.[1][2] Market-based results describe contractual choices and claims. They may differ materially from the average physical grid.

Time-matched carbon-free energy compares consumption with carbon-free generation in each hour and relevant grid area. The United Nations 24/7 Carbon-Free Energy Compact identifies hourly matching, local procurement and technology inclusion among its principles.[3] This lens reveals hours when annual procurement volumes conceal a shortage.

The three lenses should remain distinct. Location-based results support geographic comparison and physical-grid exposure. Market-based results support recognised inventory reporting and contractual procurement claims. Hourly matching supports operational and transition analysis.

Direct emissions from on-site combustion belong in Scope 1 under applicable accounting rules. Upstream fuel, transmission losses, equipment manufacture and construction can sit outside operational Scope 2. The investment file should state which categories are included.

Figure 2. Three electricity-emissions lenses

Author framework based on GHG Protocol concepts and 24/7 carbon-free energy principles.

3. Establish the electricity data file

The load file should contain hourly metered or engineered electricity, facility overhead, losses, backup generation, storage charge and discharge, on-site generation, curtailment and imports or exports.

The generation file should identify source, location, technology, commissioning date, hourly output, ownership, contractual rights, attributes, retirement and residual treatment. Annual contract quantity alone cannot establish coincidence with load.

The emissions-factor file should record source, geography, vintage, unit, greenhouse gases, treatment of losses and update date. The United States EPA eGRID publishes subregion output emission rates and resource mixes.[4][5] Australia's National Greenhouse Accounts Factors provide updated electricity factors and methodology for national reporting.[6] These data illustrate why factors should be current and jurisdiction-specific.

The contract file should cover delivery point, volume, shape, profile, price, indexation, imbalance, curtailment, settlement, credit, collateral, change in law, attributes, additionality representations, termination and replacement.

Table 1. Carbon-adjusted yield data file

File	Minimum content	Control	Decision use
Load	hourly IT and facility electricity, ramp, weather, losses and outages	approved meter and forecast reconciliation	common service boundary
Grid	connection, tariff, congestion, losses, interruption and emission factor	utility and public data with vintage	physical cost and location-based emissions
Generation	technology, site, capacity, hourly output, availability and curtailment	metered or independent production evidence	volume and shape of clean supply
Contract	delivery, price, index, volume, imbalance, attributes and termination	legal review and settlement model	market-based claim and cash exposure
Storage	power, energy, efficiency, degradation and dispatch	control logs and warranty model	hourly matching and resilience
Carbon	reporting method, factor, residual mix, price and scenario	approved methodology and assurance	emissions and financial adjustment
Finance	capital, operating cost, debt, reserves, tax and residual value	integrated audited model	equity yield and downside

Evidence should be current, traceable and consistent across every pathway.

4. Map the power pathways

Grid-only supply offers simplicity and system diversity, though its price, emissions and connection timing depend on the local network and generation mix. Annual attribute procurement can change the market-based inventory result without changing hourly physical supply.

A physical or financial power purchase agreement can support new generation and provide price exposure. The data centre still receives balancing power through the grid unless the project is directly connected and capable of following the load.

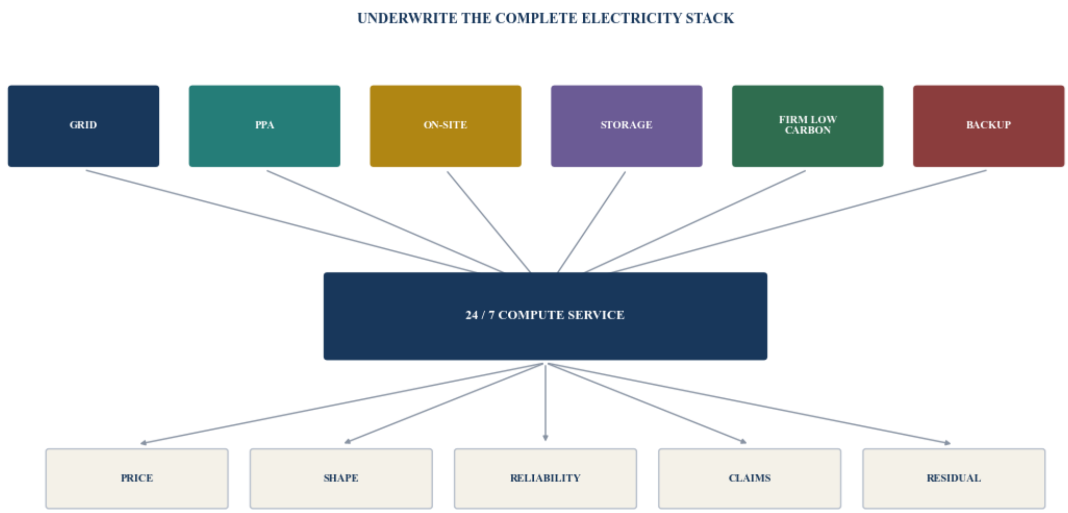
On-site solar or wind reduces imported energy when generation coincides with load. Land, permitting and intermittency limit contribution. Battery storage can shift energy across hours and provide resilience services, while duration, efficiency, degradation and charging source constrain its carbon result.

Firm low-carbon pathways may include nuclear, geothermal, hydro or other resources, depending on jurisdiction and evidence. Their availability, lead time, contract form, environmental attributes and system effects differ. Dispatchable combustion with carbon capture requires evidence on capture performance, upstream fuel and residual emissions.

The IEA expects a diverse mix to meet growing data-centre electricity demand, including renewables, natural gas and nuclear, with local constraints and timing shaping outcomes.[7][8]

The comparison should therefore test actual deliverability rather than a technology label.

Figure 3. Power-pathway stack



Author framework. Every pathway combines physical supply, balancing, contractual claims and residual exposure.

5. Price connection and deliverability

The lowest-carbon generation option can have little project value if it arrives after the data centre, sits behind a constrained network or lacks firm delivery. Connection date, import capacity, curtailment, congestion and reinforcement obligations should enter the base schedule.

The model should identify responsibility for network studies, security deposits, construction, energisation, delay and cancellation. Milestone payments can create material capital at risk before final capacity is committed.

A contracted generator may settle at a different market node from the data centre. Basis risk arises when prices diverge. Shape risk arises when output and load differ. Volume risk arises when generation is above or below contracted expectations. Balancing and sleeving charges can materially change delivered cost.

Curtailment terms should state whether the buyer pays, receives attributes, obtains deemed generation or bears replacement cost. A carbon claim may depend on attributes that are not delivered during curtailment.

6. Compare location-based exposure

Location-based emissions equal electricity consumption multiplied by an appropriate geographic emission factor, subject to the selected method. Average annual factors provide a common starting point. Hourly or marginal data can answer different questions when available and methodologically appropriate.

The factor should match the load geography and period. National averages can obscure regional differences. EPA's Power Profiler shows substantial variation among US eGRID subregions.[4] Australia's factors are jurisdiction-specific and updated through the National Greenhouse Accounts process.[6]

Location-based emissions can fall as the grid decarbonises, even without a new buyer contract. They can rise when fossil generation increases or new load changes dispatch. A long-term investment case should therefore use dated scenarios rather than hold one factor constant for twenty years.

Grid decarbonisation is a system scenario, not a contracted project cash flow. Its effect on carbon cost or customer demand should be modelled with an approved basis and sensitivity.

7. Test market-based claims

Market-based reporting depends on qualifying contractual instruments and the applicable accounting framework. GHG Protocol's Scope 2 Guidance sets quality criteria and a data hierarchy for supplier and product information, residual mixes and other factors.[1][2]

The diligence file should trace ownership and retirement of energy attributes, generation vintage, geographic market, reporting period, uniqueness, residual mix and any third-party assurance. Double counting can arise when several parties claim the same output or when attributes are sold separately from electricity.

A power purchase agreement combines commercial and environmental terms. The buyer may receive price settlement and attributes, one of those elements, or neither under some events. The legal agreement, registry and settlement should align.

Market-based results should not be described as physical delivery when the data centre continues to draw mixed grid electricity. Clear language preserves the value of the contractual claim and avoids overstating the operating condition.

Table 2. Power-pathway comparison

Pathway	Delivery profile	Main cost exposure	Carbon evidence	Principal risk
Grid supply	firm subject to network terms	tariff, congestion and escalation	location factor and supplier data	connection, price and grid carbon
Grid plus annual attributes	grid profile	grid cost plus attribute price	qualifying retired instruments	claim quality, residual mix and annual mismatch
Renewable PPA	generator profile plus grid balancing	strike, basis, shape and imbalance	contract, metering and attributes	volume, curtailment, basis and tenor
On-site renewable	local generation profile	capital, land, operation and lost output	project meter and retained attributes	intermittency, space and performance
Renewable plus storage	shifted but duration-limited	generation plus storage capital and losses	charge source, dispatch and metering	degradation, duration and replacement
Firm low-carbon supply	technology-specific firm or contracted profile	capital or long-term service price	generation and attribute evidence	delivery, concentration, outage and policy
Gas plus carbon capture	dispatchable subject to fuel	fuel, carbon, capture and transport	measured emissions and capture evidence	residual emissions, methane, capture and storage

Directional characteristics require project-specific market, engineering, contract and emissions evidence.

8. Measure hourly matching

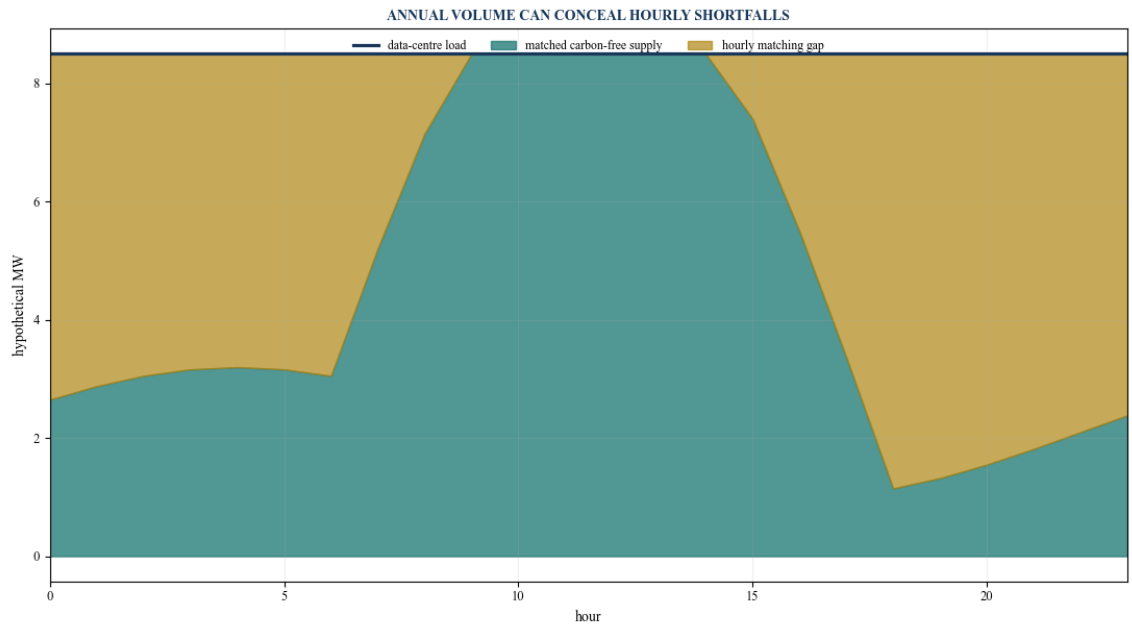
Annual renewable procurement can equal annual consumption while leaving many hours unmatched. Solar output concentrates in daylight. Wind can vary across days and seasons. Data-centre load is comparatively flat unless compute can shift.

Hourly matching divides the study into time intervals and compares eligible carbon-free supply with consumption in each interval and relevant region. Excess supply in one hour should not automatically offset a shortfall in another when the objective is 24/7 matching.

Storage can move eligible electricity, subject to charging source, efficiency and interval accounting. Flexible compute can move some workloads when customer contracts, data, latency and operations allow. Firm carbon-free generation can fill persistent gaps.

The metric should state whether matching is based on energy, power, attributes or physical scheduling. It should also address exports, curtailment, storage losses, backup generation and partial intervals.

Figure 4. Hourly carbon-free matching gap



Hypothetical management profile created to demonstrate the method; it is not measured project data.

9. Distinguish average and marginal effects

Average emissions allocate the emissions of a generation mix across consumption. Marginal analysis estimates the change in system emissions associated with a change in load, generation or operation. The two answer different questions.

A location-based corporate inventory generally uses prescribed average factors. An investment committee may also examine marginal or consequential effects when assessing load shifting, storage dispatch or new generation. The method, counterfactual and uncertainty should be explicit.

Avoided-emissions claims are especially sensitive to counterfactual choice. A renewable project can displace different generation across locations and hours. A storage asset can reduce or increase emissions depending on charging and discharge.

The base carbon-adjusted yield should use recognised inventory methods for reported emissions. Consequential impacts can be shown separately as a scenario. Mixing them into one number can create false precision.

10. Price carbon exposure

Carbon price can enter through a tax, emissions trading system, customer discount, financing term, internal price or future compliance scenario. Each pathway has a different legal and cash transmission.

The model should apply carbon price only to emissions within the selected liability or decision boundary. A project may report Scope 2 emissions without paying a direct carbon levy. The economic exposure could instead appear through power prices or customer requirements.

Use several carbon-price scenarios and state currency, base year, escalation and coverage. Avoid double counting when a power price already includes carbon cost or when a contract passes it through.

The adjustment should also recognise transaction and assurance costs. Data systems, registries, audits, legal advice, certificates, collateral and reporting create cash costs even when the claimed emission factor is low.

11. Build carbon into customer revenue

Some customers require renewable procurement, emissions reporting, location restrictions or hourly matching. These requirements can affect occupancy, price, contract term and renewal.

The operator should distinguish a contractual customer obligation from a marketing ambition. The service agreement should define energy product, reporting method, attribute allocation, data availability, assurance, change in standards and remedies.

Green revenue premiums should remain outside the base case until supported by contracts or comparable transactions. Carbon performance may protect demand rather than increase price. The appropriate economic benefit can be lower vacancy, longer term, reduced churn or access to a customer segment.

The European Union has established data-centre energy-performance and water reporting and is developing further rating and performance work.[9][10] Regulatory transparency can increase the value of consistent metering and comparable evidence across facilities.

12. Model reliability and backup emissions

Power carbon and reliability cannot be evaluated independently. Customers buy available compute. A low-emissions pathway that increases service interruption can destroy more value than its carbon benefit.

The reliability model should cover grid events, generator outages, renewable variability, storage duration, fuel continuity, maintenance, common-mode failure and restoration. It should translate each event into supported compute and customer remedies.

Backup engines can create direct emissions, local air impacts, fuel cost and permitting obligations. Their annual energy may be small while their availability value is high. Testing and real outage operation should be metered separately.

The comparison should show emissions in normal, stress and emergency operation. A grid and renewable combination may still require backup. A firm low-carbon supply may also require redundancy for maintenance or unplanned outage.

13. Account for embodied capital

Power pathways require different physical capital. Solar, wind, storage, network reinforcement, substations, generators, heat systems and long transmission connections carry embodied emissions and resource use.

Operational Scope 2 reporting does not automatically include these impacts. Investment evaluation can present lifecycle or embodied estimates separately when reliable evidence is available.

Embodied analysis should define equipment boundary, manufacturing geography, transport, construction, replacement and end of life. Storage replacement and short-lived equipment can be material. Double counting should be avoided when supplier declarations and project totals overlap.

Carbon-adjusted yield can include a shadow cost for embodied emissions as a scenario. The decision file should not combine a lifecycle estimate with an operational inventory without explaining the difference.

Table 3. Claim, contract and assurance matrix

Claim or metric	Evidence	Contract control	Assurance question
Location-based emissions	metered load and geographic factor	utility meter and factor source	does geography, period and loss treatment match?
Market-based emissions	qualifying product, supplier data or instruments	attribute ownership, retirement and residual mix	is the claim unique and within the eligible market?
Annual renewable coverage	annual consumption and retired renewable attributes	volume, vintage and settlement	does annual volume equal the reported boundary?
Hourly carbon-free matching	interval load and eligible interval generation	timestamp, region, storage and export rules	are shortages and excesses treated consistently?
Direct emissions	fuel quantity and equipment factors or measurement	fuel, meter and operating records	are testing and outages complete?
Embodied emissions	product declarations and lifecycle inventory	supplier data, scope and change control	are boundaries, replacements and overlaps clear?

The exact requirements depend on the reporting framework, jurisdiction, contract and customer obligation.

14. Integrate the financial model

The power module should feed the same project model used for revenue, capital, operating cost, debt and equity returns. It should carry hourly or representative-period electricity, demand charges, tariffs, PPA settlement, storage dispatch, fuel, attributes and carbon scenarios.

Power capital should include connection, substation, dedicated generation, storage, control systems, deposits, development and contingency. Operating costs should include energy, network, maintenance, land, insurance, licences, registry, assurance and collateral.

The model should distinguish accounting EBITDA from cash available for debt service and equity. Financial or virtual PPAs can create settlements outside site power bills. Margining and collateral can create liquidity needs even when lifetime economics appear favourable.

Debt sizing should reflect contracted cash and risk allocation. Lenders may give limited value to an uncontracted carbon premium or avoided carbon cost. A long-term PPA can reduce price volatility while creating termination and mark-to-market exposure.

15. Calculate carbon-adjusted yield

Unadjusted equity yield can be calculated from project cash under standard approved definitions. Carbon-adjusted yield then applies transparent adjustments for carbon price, incremental decarbonisation capital, reporting cost, customer value and other selected exposures.

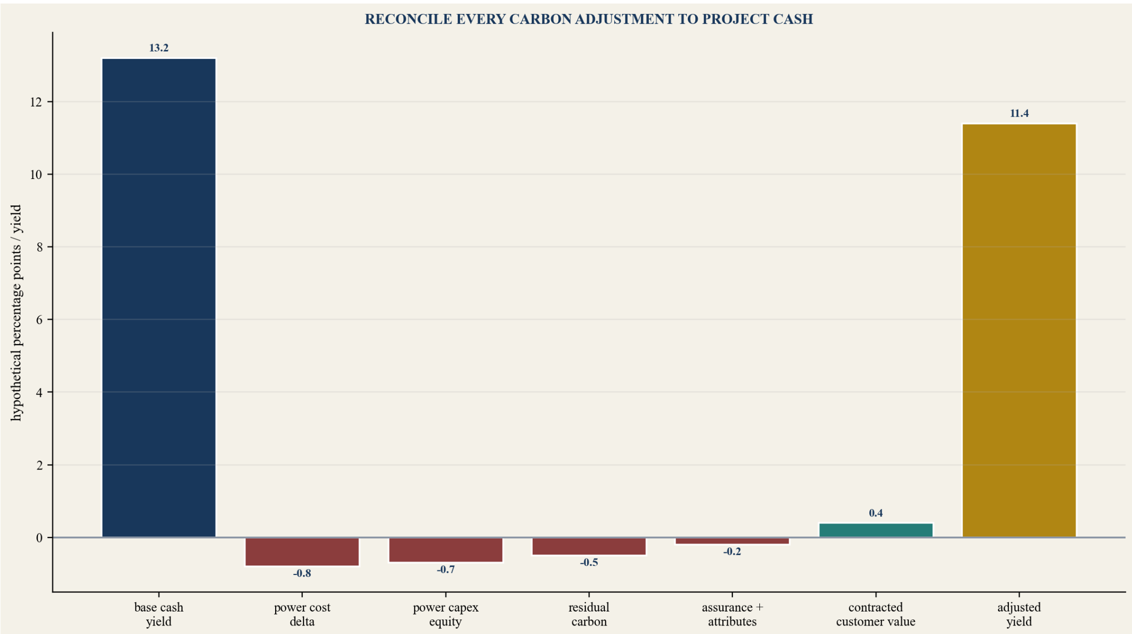
One approach is to calculate a carbon-adjusted cash yield:

Carbon-adjusted cash yield equals cash available to equity, less priced residual emissions and incremental assurance cost, plus contracted carbon-linked customer cash, divided by total equity invested including power-pathway equity.

This is a management measure rather than a universal accounting standard. The investment paper should show the conventional financial metric beside the adjustment and reconcile every item.

The framework can also calculate abatement cost, carbon-free matching percentage, emissions per useful compute unit, carbon value at risk and yield sensitivity per carbon-price increment.

Figure 5. Carbon-adjusted yield bridge



Hypothetical management values illustrate the reconciliation; they are not a forecast or actual project result.

16. Test a hypothetical 60 MW project

The following case demonstrates the method. Every value is a hypothetical management assumption. It does not describe an actual data centre, power contract or investment outcome.

Assume a 60 MW critical IT facility with average total site demand of 72 MW after facility overhead. Annual electricity consumption is 630,720 MWh before storage losses. The common property and compute case requires USD 420 million of equity before pathway-specific power capital.

Pathway A uses grid power and annual qualifying attributes. Pathway B adds a financial renewable PPA sized to annual consumption. Pathway C combines a renewable PPA, four-hour battery storage and firm low-carbon supply for part of the load. All pathways retain grid and emergency backup access.

Table 4. Hypothetical carbon-adjusted yield case

Item	Pathway A: grid plus annual attributes	Pathway B: renewable PPA	Pathway C: shaped low-carbon stack
Annual electricity	630,720 MWh	630,720 MWh	630,720 MWh plus storage losses
Power-specific equity	USD 8 million	USD 24 million	USD 112 million
Delivered energy and network cost	USD 75 per MWh	USD 70 per MWh expected	USD 78 per MWh expected
Location-based factor	0.42 tCO2e per MWh	0.42 tCO2e per MWh	0.42 tCO2e per MWh on residual imports
Market-based operational result	0.04 tCO2e per MWh	0.03 tCO2e per MWh	0.02 tCO2e per MWh
Hourly carbon-free match	46%	68%	91%
Annual operating cash before carbon adjustment	USD 58 million	USD 61 million	USD 64 million
Residual emissions priced at USD 75 per tonne	USD 1.89 million	USD 1.42 million	USD 0.95 million
Assurance, registry and attribute cost	USD 0.80 million	USD 0.95 million	USD 1.20 million
Carbon-adjusted cash yield	12.9%	13.1%	11.7%

Every number is a hypothetical management assumption created solely to demonstrate the method.

Pathway C produces the strongest hourly match and lowest priced residual emissions in the hypothetical case. Its larger power-specific equity reduces current cash yield. Pathway B produces the highest carbon-adjusted cash yield under the assumed price and capital, while leaving more hourly exposure than Pathway C.

These results can reverse under different energy price, carbon price, customer contract, capacity factor, storage cost, connection timing or equity structure. The framework provides a comparison method rather than a preferred technology.

17. Stress the comparison

The stress case should change connected variables together. A renewable generation shortfall can increase replacement energy, reduce attributes and raise market-based emissions. A grid-price spike can coincide with low renewable output. A connection delay can postpone revenue while deposits and interest remain outstanding.

Carbon-accounting rules can change the eligibility, geography or timing of claims. GHG Protocol began a Scope 2 revision process and consulted on proposed changes, so long-lived contracts should preserve data and adjustment rights.[11][12]

Customer demand can also change. A large buyer may require hourly evidence, reject certain technologies or seek audit access. The operator needs a change mechanism that allocates new compliance cost.

Table 5. Carbon-adjusted yield stress matrix

Stress	Hypothetical management case	Transmission	Required response
PPA underproduction	annual output 18% below plan	replacement power, fewer attributes and lower settlement	volume bands, diversification and liquidity reserve
Negative basis	generator node price falls while load node rises	adverse financial PPA settlement	basis limits, location analysis and hedge review
Connection delay	energisation slips 12 months	deferred revenue and capital carry	staged equipment, long-stop rights and alternative capacity
Carbon factor increase	residual factor rises 30%	higher priced emissions and customer exposure	disclose scenario, improve matching and contract pass-through
Carbon price increase	price reaches USD 150 per tonne	greater value difference among pathways	covenant headroom and phased abatement options
Rule change	hourly or geographic criteria tighten	attributes or PPA may no longer support claim	data rights, substitution and change-in-standard clause
Storage underperformance	usable energy 20% below plan	lower matching, capacity and arbitrage	warranty test, augmentation reserve and dispatch control
Customer claim default	contracted green premium is removed	lower revenue and stranded pathway capital	minimum payment, re-marketing and approval gate

Every scenario is a hypothetical management assumption and should be replaced with project-specific evidence.

18. Procure evidence and flexibility

Procurement should require comparable bids against one load, connection, availability, emissions and settlement envelope. Suppliers should state exclusions, dependencies and evidence sources.

Power proposals should provide hourly production, historical or model basis, curtailment, degradation, outage, price, index, basis location, imbalance, attributes, security, collateral and termination. Storage proposals should include efficiency, usable energy, degradation, augmentation and warranty tests.

The owner should retain access to meter, settlement, attribute, registry and operating data. Contracts should permit reasonable assurance and customer reporting. Proprietary dashboards without exportable evidence can weaken future claims and financing.

Flexibility can come from volume bands, staged capacity, technology-neutral carbon-free supply, substitution rights, portfolio procurement and scheduled re-openers. Too much flexibility can undermine bankability, so each option needs a clear price and decision process.

19. Establish the operating dashboard

The monthly dashboard should report compute served, total electricity, PUE, location-based emissions, market-based emissions, hourly match, direct emissions, backup operation, renewable generation, curtailment, storage losses, attributes, power cost and carbon-adjusted cash.

Forecast-to-actual variance should be explained by load, weather, grid factor, generation, price, outage, settlement and methodology. Restatements should be controlled and visible.

The operating team should reconcile utility meters, sub-meters, generator meters, storage, settlements and attribute registries. Finance, sustainability and operations should use the same underlying quantities.

Customer reports should follow contract definitions. Public claims should undergo legal and technical review. The dashboard should distinguish measured data, prescribed factors and modelled estimates.

20. Finance the pathway

The financing package should identify which costs and cash flows sit in the data-centre company, a generation project, storage company or separate contract. Cross-default and termination can transmit risk across entities.

Senior project debt can rely on contracted data-centre revenue and dependable operating cost assumptions. Dedicated generation or storage can use separate project finance when it has bankable offtake and asset rights. The data-centre credit may support a PPA even when generation debt is outside the facility.

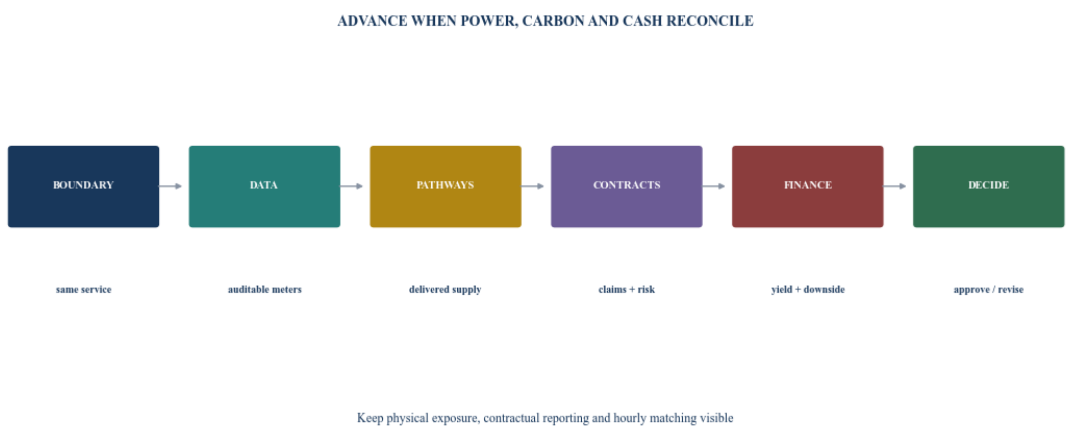
Lenders should receive the power model, contracts, carbon methodology, customer requirements and change scenarios. Reserve accounts may cover power-price volatility, PPA collateral, fuel, storage augmentation and carbon compliance.

The equity committee should see unadjusted yield, carbon-adjusted yield, hourly match, emissions, abatement cost and downside together. A lower current yield can be justified by contracted customer value or reduced future exposure, with the evidence explicitly stated.

21. Execute through 150 days

The comparison should move from boundary and data to market evidence, integrated modelling, contracts, financing and decision. Early agreement on methods reduces later dispute over claims.

Figure 6. Carbon-adjusted power investment gate



Author framework. Every gate requires approved evidence, ownership and a recorded decision.

Table 6. 150-day power-pathway execution plan

Days	Workstream	Principal output	Gate
1 to 15	comparison boundary	compute, load, availability, emissions and finance definitions	common service approved
16 to 35	data room	meters, forecasts, grid, factors, contracts and customer requirements	evidence quality accepted
36 to 60	pathway design	grid, PPA, on-site, storage, firm supply and backup cases	shortlist approved
61 to 85	market engagement	prices, profiles, connection, attributes, collateral and terms	executable offers received
86 to 105	integrated model	hourly power, emissions, settlements, capital, cash and yield	reconciled comparison accepted
106 to 125	contracts and claims	delivery, balancing, attributes, data, assurance, change and exit	risk allocation approved
126 to 140	financing and stress	debt, reserves, downside, carbon price and customer exposure	financeable case established
141 to 150	investment decision	preferred pathway, conditions, dashboard and implementation	approve, revise or decline

Sequencing is indicative and should reflect project location, procurement and connection status.

22. Set the investment decision

The committee should approve the service boundary, load, emissions methods, eligible claims, pathway, connection, generation, storage, backup, customer obligations, contracts, capital, financing, reserves, reporting and assurance.

Conditions should cover grid capacity, planning, generation completion, attribute ownership, meter and data access, storage performance, customer terms, carbon methodology, insurance, lender consent and independent acceptance.

The project should pause or resize when connection is uncertain, generation evidence is weak, annual claims conceal material hourly gaps without disclosure, PPA basis is uncontrolled, storage lacks augmentation, customer value is uncontracted or carbon-adjusted yield depends on a speculative price.

The approved decision should retain both conventional and carbon-adjusted financial metrics. It should state which emissions lens supports each claim and how future method changes will be handled.

23. Limitations and conclusion

Electricity markets, grid factors, generation, technology, contracts, reporting standards, climate policy, customer demand and capital markets can change. Decisions require current evidence from utilities, system operators, generators, customers, technology providers, environmental specialists, accountants, lawyers, lenders and qualified advisers.

The cited international sources describe global analysis, recognised reporting guidance and public data within their stated purposes. They do not establish the emissions, cost, reliability, claim or return of a specific project.

Every numerical value and result in the worked case is a hypothetical management assumption. No actual data centre, power contract, carbon claim, customer payment or investment result is represented.

A carbon-adjusted yield is useful when it reconciles an environmental objective to the same compute service and project cash. It should preserve the distinctions among physical grid exposure, contractual inventory reporting, hourly matching, direct emissions and embodied capital.

The strongest power pathway can differ by location, load, connection, customer and financing. Transparent boundaries, hourly evidence, enforceable contracts, current factors and explicit residual exposure allow investment committees to compare those pathways without false equivalence.

References

[1] GHG Protocol, Scope 2 Guidance, official standard and resources accessed 13 August 2026.
https://ghgprotocol.org/scope-2-guidance

[2] GHG Protocol, Scope 2 Frequently Asked Questions, official guidance accessed 13 August 2026.
https://ghgprotocol.org/scope-2-frequently-asked-questions

[3] United Nations, 24/7 Carbon-Free Energy Compact Principles, official compact. https://www.un.org/sites/un2.un.org/files/2021/09/principles_-_updated.pdf

[4] United States Environmental Protection Agency, Power Profiler, updated 1 October 2025. https://www.epa.gov/egrid/power-profiler

[5] United States Environmental Protection Agency, eGRID Summary Data, 2023 data released and revised in 2025. https://www.epa.gov/egrid/summary-data

[6] Australian Department of Climate Change, Energy, the Environment and Water, National Greenhouse Accounts Factors 2025. https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-factors-2025

[7] International Energy Agency, Energy and AI, 10 April 2025. https://www.iea.org/reports/energy-and-ai/

[8] International Energy Agency, Executive Summary, Energy and AI, official analysis accessed 13 August 2026. https://www.iea.org/reports/energy-and-ai/executive-summary

[9] European Commission Directorate-General for Energy, Energy Performance of Data Centres, official reporting page accessed 13 August 2026. https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive/energy-performance-data-centres_en

[10] European Commission Directorate-General for Energy, Minimum Performance Standards for EU Data Centres, official study page accessed 13 August 2026. https://energy.ec.europa.eu/resources/preparatory-studies/minimum-performance-standards-eu-data-centres_en

[11] GHG Protocol, Scope 2 Standard Advances, 1 August 2025. https://ghgprotocol.org/blog/scope-2-standard-advances-isb-approves-consultation-market-and-location-based-revisions

[12] GHG Protocol, Frequently Asked Questions: Scope 2 and Electricity Sector Consequential Accounting Public Consultations, official update accessed 13 August 2026. https://ghgprotocol.org/blog/frequently-asked-questions-scope-2-and-electricity-sector-consequential-accounting-public

About the Author

Chennakeshav Adya is an independent researcher and Managing Partner of Matchpoint Partners. His research focuses on investment strategy, capital formation, transaction execution, governance and operating-model design across international markets.