

India Data-Centre Terminal Value: Hardware Obsolescence, Retrofit Cycles and Customer Stickiness

An Evidence-Gated Framework for Remaining Useful Life, Refresh Capital and Contract Durability

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Abstract

Terminal value can dominate a data-centre discounted cash-flow valuation even when the physical and commercial platform entering the terminal period is materially different from the asset acquired. Electrical systems age. Cooling architecture can become unsuitable for higher rack densities. Controls and firmware lose vendor support. Customer contracts renew, reprice or churn. Retrofit capital arrives in uneven cycles and can interrupt revenue while work is completed in a live facility. A perpetual-growth formula that extends current cash without confronting these transitions can overstate durable value.

This paper develops an India Data-Centre Terminal-Value Framework for boards, investors, lenders, developers and transaction advisers. It separates building shell, core electrical and mechanical systems, customer fit-out, IT equipment and software controls; distinguishes accounting life, physical life and economic life; and links the equipment-age register to vendor support, density readiness, refresh capital, service continuity and customer renewal. Discounted cash flow controls the analysis. Replacement cost, value per billable megawatt and exit-multiple analysis remain cross-checks rather than substitutes for asset-specific cash.

The worked case is wholly hypothetical. A 72 MW customer-usable campus carries 54 MW of average billable load. Sixty-two per cent of identified core equipment is more than seven years old. A five-year retrofit programme costs USD 210 million and improves power usage effectiveness from 1.44 to 1.28 while preparing selected halls for liquid cooling. The base case assumes 82 per cent customer renewal, an 11.5 per cent discount rate and 3.5 per cent terminal growth. It produces an illustrative enterprise value of USD 1.15 billion, compared with USD 0.76 billion in a deferred-refresh stress and USD 1.39 billion in a managed-refresh case. These figures do not describe an identified company, facility or transaction.

The analysis concludes that terminal value should begin with the serviceable asset and contracted customer base expected to exist at the terminal date. A credible case therefore needs an equipment register, remaining-useful-life assessment, vendor-support map, density and cooling plan, live-retrofit sequence, customer-cohort analysis and funded refresh-capital schedule. The investment committee should see which cash flows rely on renewal, which equipment must be replaced, which halls can support future workloads and which protections allocate the cost if technical or commercial evidence fails after signing.

JEL Classification: G12, G31, G32, L86, L94, O33

Keywords: India data centres, terminal value, hardware obsolescence, retrofit capital, customer retention, useful life, data-centre valuation, density migration, liquid cooling, discounted cash flow

1. Define the terminal-value decision

The decision question is which serviceable capacity, customer cash and residual rights can persist beyond the explicit forecast. The evidence record should begin with asset register, site and lease rights, capacity definitions, customer contracts, operating history and capital plan. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [1][2]

The principal failure is that a perpetuity can extend today's earnings after the equipment or contracts supporting them have expired. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to define the terminal asset, terminal service and terminal customer base before choosing a formula. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

2. Adopt an asset and service dictionary

The decision question is how shell, core infrastructure, fit-out, IT equipment, controls and contracted service are distinguished. The evidence record should begin with fixed-asset register, engineering drawings, commissioning records, customer demarcation and accounting policy. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [3][4]

The principal failure is that ownership and useful life can be assigned to the wrong party when facility and customer equipment are blended. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to approve one component dictionary linked to legal ownership, maintenance and cash responsibility. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Figure 1. Proposed terminal-value asset stack



Terminal value follows the serviceable stack and durable customer cash at the terminal date

Analytical framework; ownership and service responsibility require asset-specific verification.

Table 1. Terminal-value asset dictionary

Layer	Typical content	Principal terminal question
site and shell	land rights, structure and envelope	does the right outlive the forecast?
electrical core	grid intake, transformers, switchgear and UPS	what capacity remains serviceable?
mechanical core	chillers, heat rejection, pumps and water loops	which density can be cooled?
controls and network	monitoring, automation and connectivity	is support secure and interoperable?
customer fit-out	cages, racks, distribution and cooling interfaces	who owns and replaces it?
contracted service	capacity, resilience, connectivity and support	what renews and at what price?

Proposed definitions; legal ownership and contracts control treatment.

3. Fix the legal and site perimeter

The decision question is which land, leases, buildings, utility rights, permits, equipment and contracts belong to the valuation. The evidence record should begin with title and lease records, permits, licences, utility agreements, insurance and change-of-control terms. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [5][6]

The principal failure is that valuable capacity can depend on rights outside the acquired entity or shorter than the terminal period. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to map each right to its holder, location, expiry, transfer condition and replacement path. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

4. Segment shell, core systems and fit-out

The decision question is which components create long-duration real estate utility and which require recurring technical replacement. The evidence record should begin with architectural, electrical and mechanical schedules, bills of quantity, asset tags and maintenance records. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [3][7]

The principal failure is that one blended depreciation schedule can conceal rapidly ageing power, cooling and control components. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to model component lives, replacement triggers and cash responsibility separately. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

5. Assess electrical topology and density

The decision question is whether substations, transformers, switchgear, UPS, busways and distribution can support future rack loads. The evidence record should begin with single-line diagrams, protection studies, nameplate data, loading, fault levels, redundancy and test results. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [8][9]

The principal failure is that headline megawatts can remain physically present while distribution limits make them commercially obsolete. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to calculate usable power at rack level under the required resilience standard. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

6. Assess cooling and liquid-cooling readiness

The decision question is whether heat rejection, water loops, floor layout and controls can support higher-density workloads. The evidence record should begin with cooling schematics, environmental logs, water quality, rack specifications, commissioning and vendor evidence. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [8][10]

The principal failure is that facility capacity can lose relevance when cooling cannot serve the workload customers want to deploy. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to classify halls by air, hybrid and liquid-cooling readiness and cost each transition. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

7. Build the equipment-age register

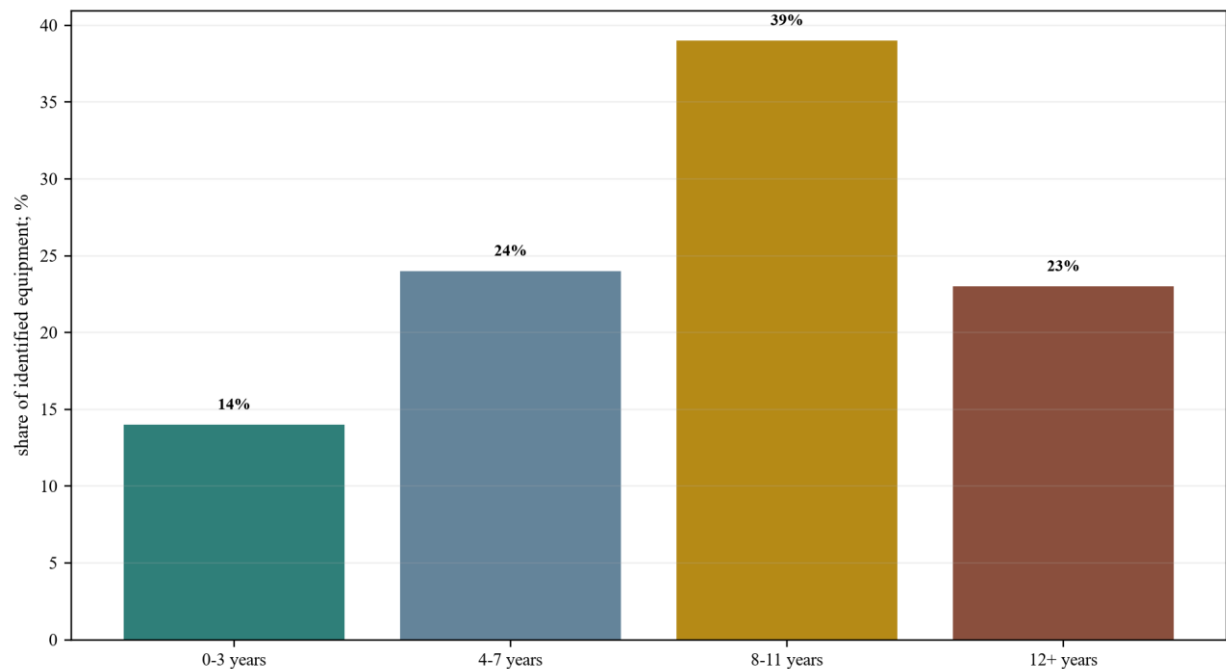
The decision question is what was installed, commissioned, refurbished or replaced and when. The evidence record should begin with purchase records, asset tags, serial numbers, warranties, maintenance history and physical inspection. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [3][11]

The principal failure is that book records can retain assets that have been replaced, cannibalised or operated beyond supported life. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to reconcile finance, engineering and physical evidence to one dated component register. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Figure 2. Hypothetical equipment-age profile



Wholly hypothetical share of identified core equipment; figures do not describe an identified facility.

8. Estimate remaining useful life

The decision question is how condition, duty cycle, environment, maintenance and support alter remaining service potential. The evidence record should begin with inspection, failure history, load profile, thermal records, oil or battery tests and manufacturer guidance. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [7][11]

The principal failure is that chronological age alone can understate deterioration or force premature replacement of healthy equipment. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to use condition-based ranges with a confidence grade and observable replacement trigger. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

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Table 2. Component-life evidence

Component	Evidence	Replacement trigger
transformer and switchgear	tests, loading, faults and parts	condition or capacity limit
UPS and batteries	runtime, impedance, temperature and events	performance threshold
chiller and heat rejection	efficiency, vibration, refrigerant and hours	cost or support threshold
pumps and fans	vibration, duty and maintenance	reliability or efficiency
controls	version, patching, licences and interfaces	support or security end
busway and rack distribution	loading, heat and connector condition	density or safety limit

Proposed diligence schedule; actual life depends on condition, duty and support.

9. Separate accounting, physical and economic life

The decision question is when depreciation, mechanical endurance and commercial fitness diverge. The evidence record should begin with accounting policy, engineering assessment, customer requirement, regulation and market evidence. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [3][12]

The principal failure is that an asset can be fully depreciated yet productive, or mechanically sound yet commercially unusable. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to forecast cash from economic serviceability and test accounting consequences separately. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

10. Map vendor support and spare parts

The decision question is which components retain warranty, parts, firmware and qualified service support. The evidence record should begin with original-equipment-manufacturer notices, service contracts, parts inventory, lead times and technician coverage. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [11][13]

The principal failure is that unsupported controls or proprietary components can convert a minor failure into prolonged loss of service. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to create an end-of-support calendar and secure replacement, spares or migration before the critical date. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

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Table 3. Obsolescence signals

Signal	Evidence	Potential cash effect
vendor support ends	manufacturer notice	forced migration or outage risk
spare-parts lead time rises	supplier quote and inventory	larger reserve and downtime
efficiency gap widens	metered benchmark	higher operating cost
density demand exceeds design	customer pipeline and engineering test	lost revenue or retrofit
control platform is unsupported	version and patch evidence	cyber and insurance exposure
failures cluster	maintenance history	accelerated capital

Proposed indicators; asset-specific verification remains necessary.

11. Test control-system obsolescence

The decision question is whether building, power and cooling controls remain secure, interoperable and maintainable. The evidence record should begin with software versions, licence terms, patch records, interfaces, cyber testing and recovery procedures. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [13][14]

The principal failure is that obsolete operational technology can impair visibility, resilience and insurability even when mechanical plant operates. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to price controlled migration, parallel operation and rollback capability. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

12. Model power-density migration

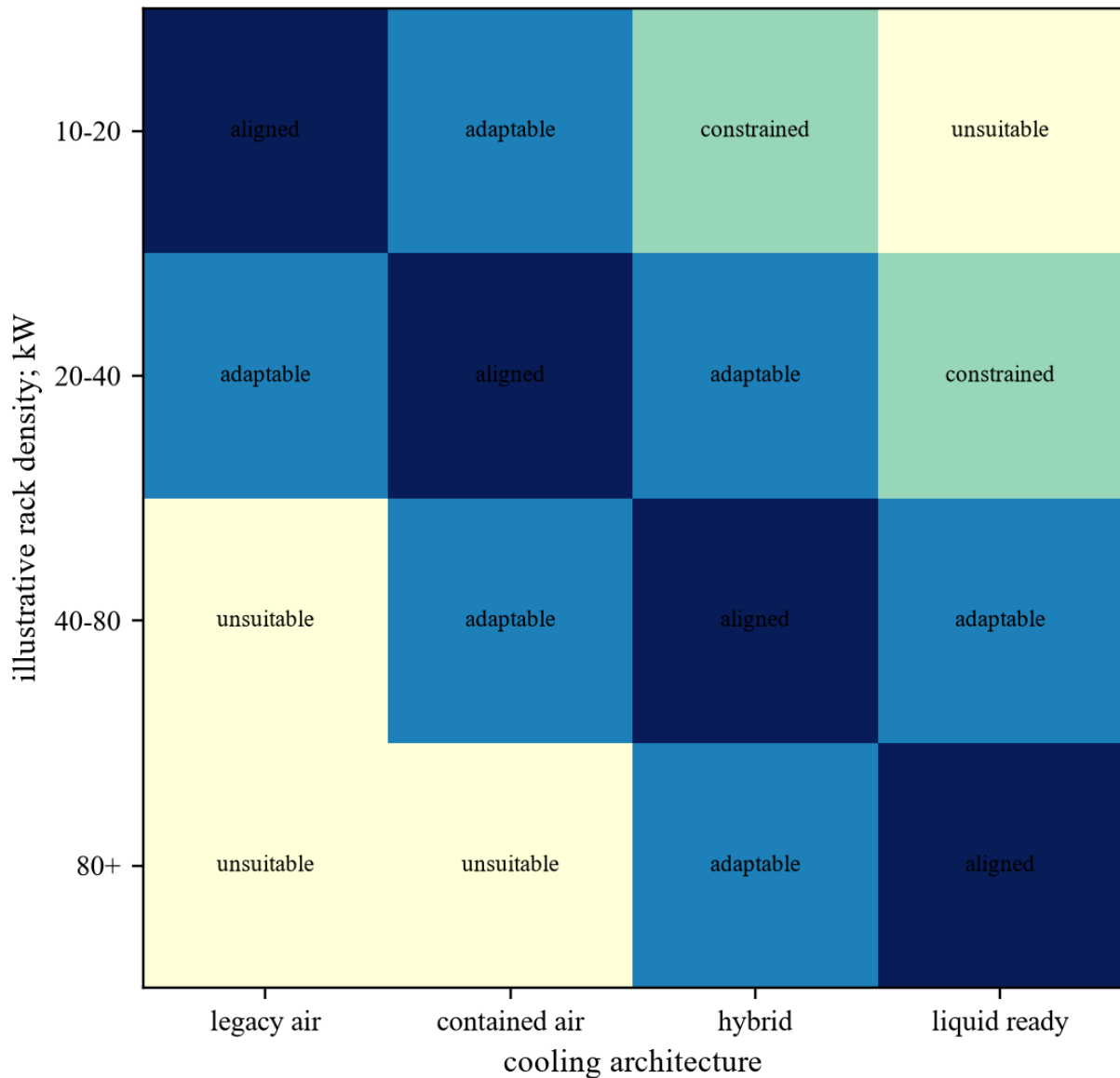
The decision question is how customer demand for conventional, accelerated-compute and high-density deployments changes saleable capacity. The evidence record should begin with rack-density history, pipeline requirements, power and cooling limits, customer design standards and market evidence. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [1][8]

The principal failure is that a static megawatt count can overstate future revenue if the halls cannot accept demanded configurations. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to translate demand into rack, hall, power, cooling and network requirements by cohort. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Figure 3. Proposed density and cooling-readiness map



Analytical framework; actual hall capability requires engineering verification.

13. Plan live-retrofit constraints

The decision question is how construction, isolation, testing and customer access can be sequenced without unacceptable service loss. The evidence record should begin with method statements, redundancy diagrams, maintenance windows, permits, contractor plan and customer consents. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [9][15]

The principal failure is that retrofit cost can be understated when temporary plant, night work, decanting and revenue interruption are omitted. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to build a hall-by-hall critical path with operational hold points and contingency capacity. Management estimates can support scenarios when they remain clearly identified as

assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

14. Prove commissioning and resilience

The decision question is whether new and retained systems perform together under normal, failure and recovery conditions. The evidence record should begin with integrated systems tests, load-bank results, failover records, defect closure and customer acceptance. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [8][15]

The principal failure is that equipment installation can be treated as completion before integrated performance is demonstrated. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to release value only after witnessed tests meet defined capacity and resilience criteria. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

15. Segment customer cohorts

The decision question is which hyperscale, enterprise, cloud, network and specialised-compute customers drive utilisation and margin. The evidence record should begin with contracts, invoices, capacity schedules, service credits, tenure, expansion and pipeline records. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [16][17]

The principal failure is that aggregate occupancy can hide concentration, uneconomic contracts and near-term expiries. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to analyse contracted load, revenue, margin and renewal date by customer cohort. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

16. Measure customer stickiness

The decision question is which switching costs, interconnections, migration effort, compliance needs and service quality support retention. The evidence record should begin with cross-connects, data migration plans, certification, outage history, support tickets and renewal behaviour. Each item should carry a

source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [16][18]

The principal failure is that customer tenure can be mistaken for future commitment when switching barriers are falling or service has weakened. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to score operational, technical, contractual and economic switching friction using observed evidence. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

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Table 4. Customer-stickiness evidence

Driver	Evidence	Valuation use
interconnection density	cross-connect inventory and traffic	migration complexity
data gravity	workload and dependency map	operational switching cost
compliance	certifications and customer approvals	requalification time
physical fit-out	ownership and removal obligations	exit cost
service quality	incidents, credits and tickets	renewal probability
price position	renewal history and competing offers	renewal price

Proposed cohort analysis; executed contracts and observed behaviour control conclusions.

17. Analyse renewal price and churn

The decision question is how expiries, options, notice, price resets, credits and competitive alternatives affect terminal revenue. The evidence record should begin with executed contracts, renewal correspondence, cohort retention, pricing history and market offers. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [17][19]

The principal failure is that one portfolio retention rate can hide renewal cliffs and adverse selection by the most profitable customers. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to forecast renewal probability, price and cost by contract cohort and month. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

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18. Separate sustaining, compliance, retrofit and expansion capital

The decision question is which expenditure preserves current service, satisfies obligations, changes capability or adds capacity. The evidence record should begin with capital ledger, engineering scope, regulation, customer commitment and benefits case. Each item should carry a source, date, owner, site and

reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [3][20]

The principal failure is that growth expenditure can be presented as maintenance or mandatory replacement can be deferred outside the forecast. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to classify each project by causal driver and reconcile it to capacity, cost and cash benefit. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

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Table 5. Capital classification

Capital class	Purpose	Terminal-value treatment
sustaining	preserve current service	recurring reinvestment
compliance	satisfy law or mandatory standard	required cash outflow
retrofit	change efficiency or capability	cost and evidenced benefit
replacement	retire end-of-life component	component-cycle cash
expansion	add saleable capacity	separate growth case
customer-funded	satisfy contracted specification	recognise reimbursement and obligation

Proposed classification; accounting and tax treatment require transaction-specific advice.

19. Build the refresh-capital cycle

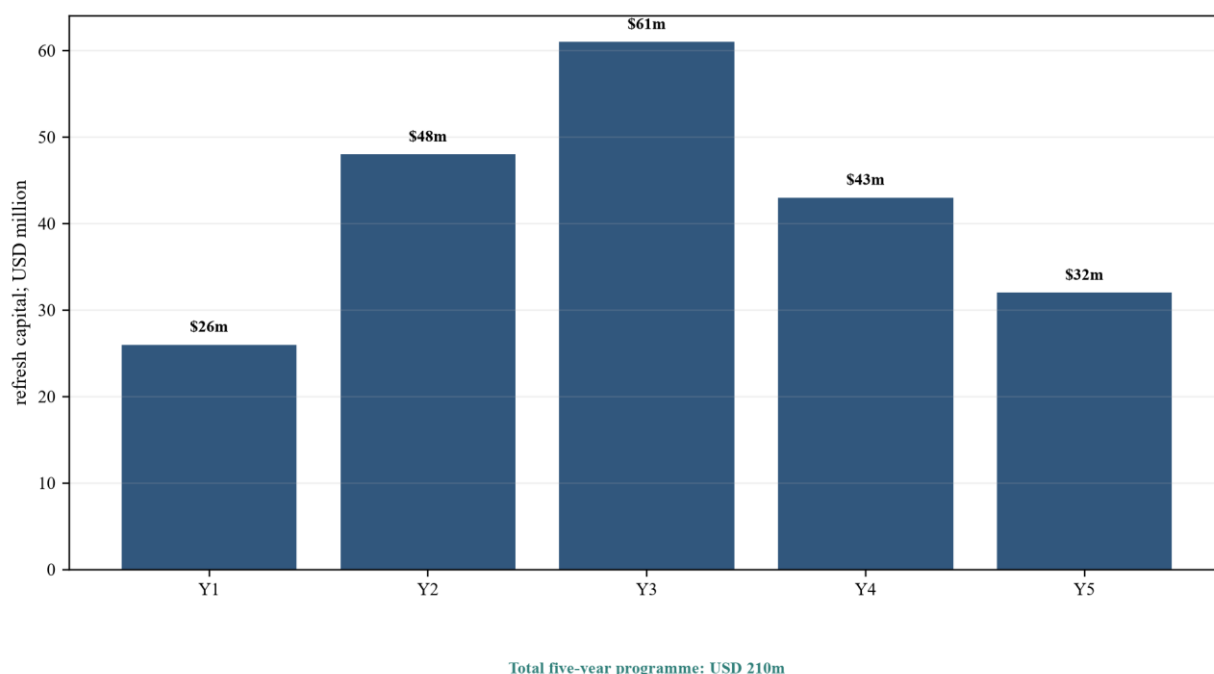
The decision question is when batteries, UPS modules, chillers, controls, switchgear and other systems require intervention. The evidence record should begin with condition evidence, maintenance strategy, vendor support, lead time, outage windows and procurement terms. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [7][11]

The principal failure is that a smooth annual allowance can miss clustered replacements and funding peaks. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to use component-level timing, probability and cost with explicit escalation and contingency. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Figure 4. Hypothetical five-year refresh-capital schedule



Wholly hypothetical USD millions; figures do not describe an identified facility.

20. Model downtime and lost revenue

The decision question is how planned and unplanned service interruption affects credits, churn, repair cost and customer confidence. The evidence record should begin with service-level agreements, event history, method statement, insurance and customer communication. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [15][17]

The principal failure is that capital budgets can omit revenue loss and contractual remedies created by the work itself. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to integrate operational disruption with project cost and customer-cohort cash. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

21. Estimate operating cash before terminal value

The decision question is how billable load, price, electricity, staffing, maintenance, tax and working capital create distributable cash. The evidence record should begin with meter data, invoices, customer billing, payroll, maintenance, tax and collection records. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [2][16]

The principal failure is that terminal-value assumptions can mask weak conversion from contracted revenue to collected and distributable cash. This matters because terminal value converts a future cash

stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to reconcile capacity to meter, invoice, collection and sustaining capital before applying terminal value. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

22. Determine the terminal-state asset

The decision question is which halls, components, contracts, capabilities and obligations exist at the end of the explicit forecast. The evidence record should begin with refresh programme, retirement plan, capacity test, customer schedule and legal-right expiry. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [2][12]

The principal failure is that the model can apply terminal growth to a capacity mix that cannot physically or contractually survive. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to prepare a terminal-date pro forma asset register and customer schedule. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

23. Apply the hypothetical worked case

The decision question is how a 72 MW campus, ageing equipment, USD 210 million retrofit and customer renewal interact. The evidence record should begin with the stated hypothetical operating, technical, capital and discount assumptions. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [21][22]

The principal failure is that a point estimate can disguise dependence on execution and renewal assumptions. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to show the entire capacity, capital, customer and cash bridge with no hidden plug. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Table 6. Hypothetical worked case

Metric	Base assumption	Stress or range
customer-usable capacity	72 MW	68-74 MW
average billable load	54 MW	47-59 MW
equipment over seven years	62%	50-72%
five-year retrofit capital	USD 210m	USD 170m-290m
PUE before and after	1.44 / 1.28	1.48 / 1.32 stress
customer renewal	82%	70-94%
discount rate	11.5%	10.5-13.0%
terminal growth	3.5%	2.5-4.0%
enterprise value	USD 1.15bn	USD 0.76bn-1.39bn

Wholly hypothetical; figures do not describe an identified company or facility.

24. Bridge explicit cash to terminal value

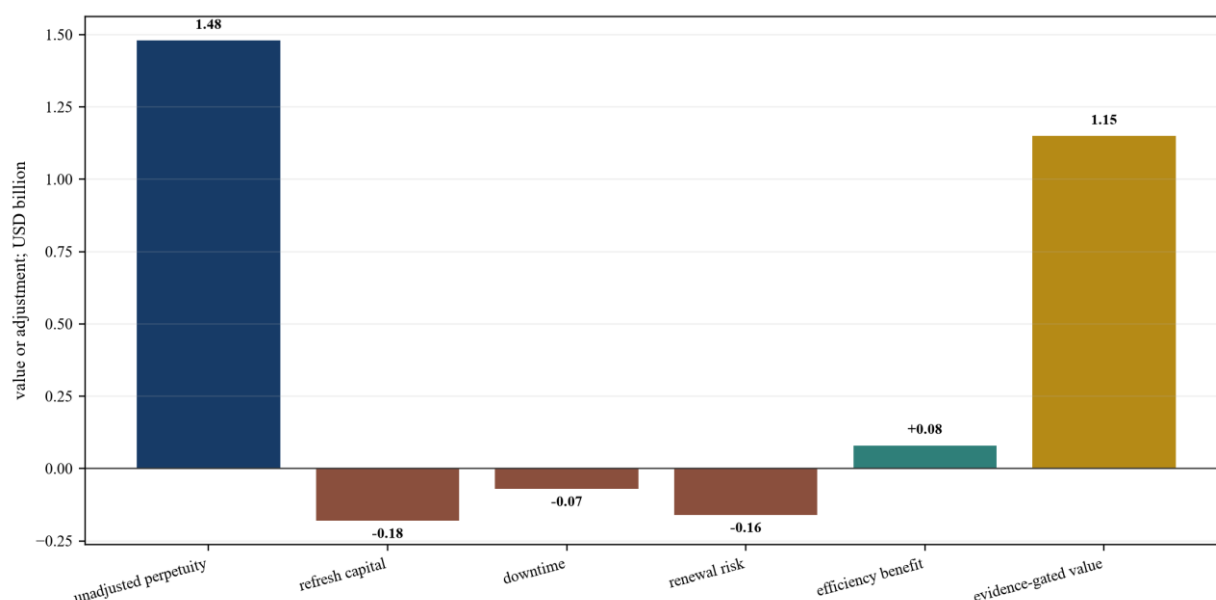
The decision question is how normalised terminal cash, growth, discount rate and reinvestment produce residual value. The evidence record should begin with explicit forecast, terminal asset, customer cohorts, refresh capital, tax and financing. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [2][12]

The principal failure is that the terminal year can contain temporary margin, underinvestment or a non-recurring ramp that is capitalised forever. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to normalise revenue, operating cost, sustaining capital and working capital before calculating residual value. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Figure 5. Hypothetical enterprise-value bridge



Wholly hypothetical USD billions; this is not a valuation opinion.

25. Stress obsolescence, capex and churn

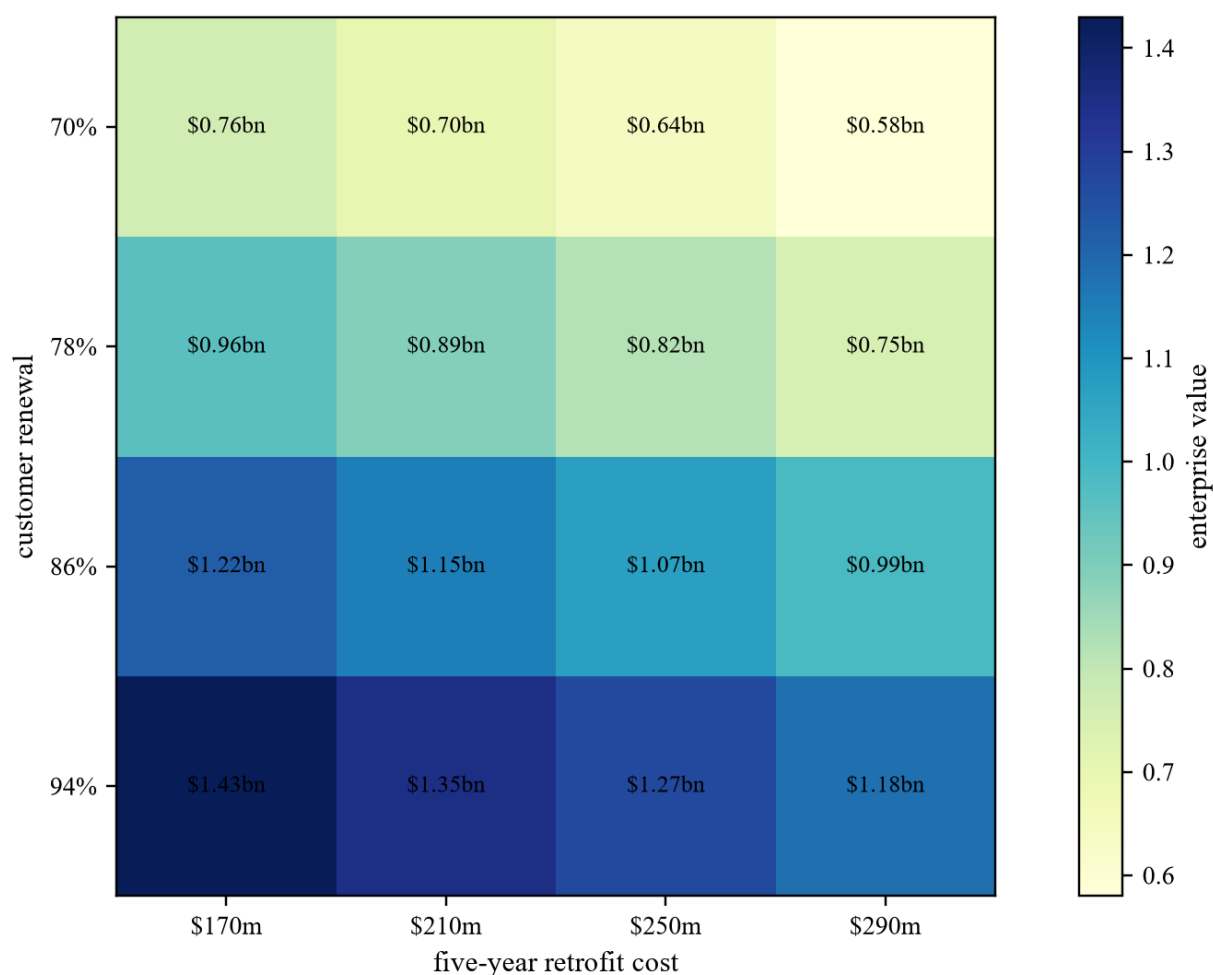
The decision question is which combinations of accelerated refresh, density shortfall, delay, cost overrun and renewal loss impair value. The evidence record should begin with scenario model, component risk, customer expiries, contractor plan and liquidity. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [11][19]

The principal failure is that single-variable sensitivities can miss compounding technical and commercial failure. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to run coherent downside cases with early indicators and funded management actions. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Figure 6. Hypothetical value sensitivity to renewal and retrofit cost



Wholly hypothetical USD billions; this is not a valuation opinion.

26. Match financing to the refresh cycle

The decision question is which debt tenor, amortisation, reserves and covenants fit uneven capital and renewal risk. The evidence record should begin with cash flow, capital schedule, customer contracts, collateral, debt terms and downside cases. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [23][24]

The principal failure is that debt service can peak when refresh spending rises and major customers approach renewal. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to align maturities, coverage tests, reserve releases and draw conditions with evidenced milestones. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

27. Translate diligence into price and protections

The decision question is which price adjustment, condition, warranty, indemnity, escrow or earn-out allocates terminal-value uncertainty. The evidence record should begin with technical findings, customer evidence, capital plan, financing and draft transaction documents. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [5][24]

The principal failure is that valuation qualifications can disappear from the signed allocation of risk. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to attach each material dependency to value, protection, owner, evidence and deadline. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

28. Reach the investment decision

The decision question is whether the serviceable terminal asset, durable customer cash and funded refresh plan justify commitment. The evidence record should begin with component register, terminal-state model, customer cohorts, downside liquidity, protections and board record. Each item should carry a source, date, owner, site and reconciliation status. National policy and market growth can explain demand context. Asset-specific documents determine remaining life, commercial capability and cash. [21][25]

The principal failure is that a secular data-growth narrative can displace asset-specific evidence about capability and cash. This matters because terminal value converts a future cash stream into a large present value. The model should expose the dependency and the event that confirms or rejects it.

The recommended response is to approve a range tied to verified serviceability, renewal and funded intervention. Management estimates can support scenarios when they remain clearly identified as assumptions. The base case should retain only evidenced rights, measured performance and costed obligations. Downside cases should combine related risks rather than move one input at a time.

The investment committee should record value at risk, the earliest observable indicator, the accountable owner and the intervention available before cash or capital is released. This converts terminal value from a distant mathematical output into a governed operating and capital programme.

Table 7. Investment-committee decision record

Decision	Evidence required	Possible action
serviceable terminal capacity	component and integrated-system tests	resize value
refresh programme	scope, sequence, bids and contingency	reserve or price adjustment
customer durability	contracts, cohort evidence and pricing	probability-weight cash
retrofit disruption	method, redundancy and customer consent	condition or protection
financing resilience	downside coverage and liquidity	resize or restructure
unresolved dependency	quantified cash and legal allocation	escrow, earn-out or decline

Proposed governance; transaction-specific approvals remain necessary.

Frequently asked questions

Q: Why can terminal value be unreliable for a data centre? A: It can extend current cash beyond the service life of equipment, site rights or customer contracts. A credible case starts with the serviceable asset and customer base expected at the terminal date and includes the capital required to sustain them.

Q: Is accounting useful life sufficient for valuation? A: No. Accounting life supports depreciation. Physical life depends on condition and duty. Economic life depends on efficiency, support, regulation and customer requirements. Valuation should use economic serviceability while reconciling accounting consequences.

Q: How should hardware obsolescence enter the DCF? A: The model should identify the affected component, loss of capability or support, timing, replacement cost, downtime and revenue consequence. A generic annual maintenance allowance can miss clustered refresh capital.

Q: Does high customer retention prove stickiness? A: Historical retention is evidence, not a guarantee. Analysis should also test contract expiry, price, interconnections, migration effort, compliance, physical fit-out, service performance and credible alternatives by cohort.

Q: How should liquid-cooling readiness affect value? A: Readiness can protect access to higher-density demand when engineering evidence supports heat rejection, water loops, controls, floor layout and operating capability. Required retrofit cost and disruption should be included before recognising benefit.

Q: What belongs in sustaining capital? A: Expenditure needed to preserve the current service and capacity belongs in recurring reinvestment. Compliance, capability-changing retrofit, replacement and expansion should be identified separately so that terminal cash is not overstated.

Q: How should live-retrofit risk be assessed? A: The plan should show isolation boundaries, temporary systems, maintenance windows, customer consents, testing, contingency capacity and revenue or service-credit exposure for each hall and stage.

Q: Which terminal-value cross-checks are useful? A: Replacement cost, value per billable megawatt and exit multiples can test reasonableness when capacity, utilisation, PUE, customer contracts, remaining capital and dates are normalised. They should reconcile to asset-specific cash.

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