POWER THAT GIVES BACK

Clean Data Centers, Microgrids, and the Community Dividend



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Publication and reader notice

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This book develops the author's community-positive infrastructure vision associated with Keystone Strategies International VC & Development, or KSI. It is a technical and commercial decision book for developers, investors, public officials, utilities, operators, and community leaders. It is neither a construction specification nor an offer of securities. Qualified engineering, environmental, legal, tax, insurance, and financial review is necessary for an actual project.

The 20 MW campus, all prices and cost models, named hypothetical situations, and proposed contractual mechanisms are original illustrative examples. They are not an operating KSI project, vendor quotations, promised investment returns, or verified technology performance. The discussion of a candidate glyceride or ester dielectric cooling fluid is a development proposition. No qualification dossier, independent pilot dataset, or installed-project performance record was supplied for this edition.

Research was checked on October 9, 2026. Forecasts retain their source dates and uncertainty. Rules, tariffs, prices, technology specifications, and public programs can change. The source register identifies primary references and their use. AI-assisted conceptual artwork depicts imagined facilities and people, not actual KSI installations or clients. The author should approve the manuscript, credits, and production specifications before release.

Why this book goes further

Pumping the New World Oil: Data Centers in America makes the broader case that digital infrastructure must answer to the communities that host it. The Community-Positive Data Center Development course introduces the practical vocabulary of closed-loop cooling, microgrids, and community benefits. This book moves into the room where the capital is committed and the obligations are signed.

Here the question is how to make a proposal survive engineering, commercial, and public scrutiny. We follow one illustrative campus through its electric load, thermal design, water boundary, battery dispatch, tariffs, financing, workforce obligations, and operating evidence. The reader will see why a promising feature can fail in combination with another, why a good annual energy balance can hide a bad hour, and why a public benefit requires somebody with an enforceable duty to deliver it.

The position is straightforward. Build infrastructure that earns its place. Give investors a project they can diligence. Give operators a system they can maintain. Give the community evidence it can inspect and benefits it can recognize. A project that cannot explain who pays, who benefits, and what happens when it fails is not ready for the trust it is requesting.

No reader needs to be an electrical engineer to follow the reasoning. The calculations use ordinary arithmetic. Units are defined. More detailed design belongs with qualified specialists. The purpose is to equip the people who approve budgets and negotiate commitments to ask better questions before a mistake becomes concrete, copper, or a twenty-year obligation.

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I The project has to earn its place



Conceptual artwork. The value of a campus is tested beyond its fence.

1 The public bargain inside the power bill

The first serious meeting about a data center should include the people who will live beside it. By the time the rendering reaches a council chamber, several choices may already have hardened: the site, the cooling architecture, the utility request, the financing assumptions, and the developer's estimate of what public cooperation will cost. A meeting held after those decisions is often a request for acceptance dressed as a conversation.

A better project begins with a public bargain that can be translated into engineering and money. The campus will draw electricity, occupy land, create traffic, reject heat, and rely on public institutions. In return, it may create tax revenue, productive employment, more resilient energy assets, useful heat, and affordable-energy benefits. None of those outcomes follows automatically from a building permit. Each requires a pathway from the asset to a named beneficiary.

A community dividend, as used here, means a measurable benefit attributable to the project, with a defined recipient, delivery mechanism, funding source, verification method, and remedy. The term does not imply a corporate dividend, a security, or guaranteed cash. It can include a bill credit, a funded apprenticeship, a paid local contract, or a tested resilience service. Using one attractive phrase for all four does not make them interchangeable.

Consider a developer who says the campus will support local prosperity because it will buy substantial electricity. More sales can help spread some utility costs. Large new demand can also require generation, transmission, and distribution investment, with uncertain allocation among customer classes. The useful question is the net effect under the actual regulatory arrangement. A headline about economic growth cannot answer it. A cost-of-service analysis and the signed customer obligations can.

The same discipline applies to jobs. Construction may employ many tradespeople for a limited period. Permanent operating employment has a different profile. Indirect employment depends

on procurement and the local economy. Counting all three together and presenting the result as permanent neighborhood jobs creates a promise the project cannot keep. The public bargain needs separate counts, wages or wage bands where appropriate, hours, qualification routes, and a reporting period.

Make the claim traceable

Start with a claim register before a marketing campaign. For every public statement, record its boundary and evidence. If the promise is lower water use, identify the baseline cooling system, the climate, the workload, the meter, and whether electricity-generation water is included. If the promise is resilience, identify the buildings served, the electrical boundary, critical loads, outage duration, and fuel constraints. If the promise is lower household bills, identify the billing mechanism and who carries the funding obligation.

This register is commercially valuable. It exposes commitments before they become contradictory. The cooling team may assume a water-saving dry-cooler design while the financial team prices a more efficient evaporative alternative. The community team may promise electricity during an outage while the electrical team designs an island that excludes neighboring buildings. The investment team may book every kilowatt-hour of solar output as campus savings while the public team allocates that same output to household credits. One physical asset cannot satisfy incompatible claims just because different departments own the slides.

A public bargain also needs a counterfactual. What would happen without the project? A road improvement required to accommodate construction traffic is different from an improvement that solves an existing community problem. Compliance with a permit is different from an additional benefit. Paying the full cost of a dedicated utility upgrade may prevent harm to other customers; it should not automatically be represented as a discretionary donation.

Listen where the costs land

Community engagement must include the people most exposed to the project's burdens, not only those easiest to invite. A school near a truck route may care about delivery timing. A neighboring business may care about power quality. Residents may care about low-frequency sound at night. A municipal finance director may care about whether the taxable property will depreciate faster than expected. These concerns point to different technical and contractual questions.

The answer is not to grant every request. Some requests conflict, some exceed the project's capacity, and some cannot lawfully be implemented as proposed. The answer is to explain the constraints and document the decision. An engagement process earns credibility when a community concern actually changes something: a setback, an operating window, a noise limit, a training budget, a disclosure requirement, or the decision not to use a site.

Investors should care about this discipline for practical reasons. Unresolved community impacts can become delay, litigation, operating limits, insurance problems, and reputational

damage. Yet the case for fair dealing does not depend entirely on avoided delay. The people supplying the land, water system, electrical network, and public services deserve a bargain that can withstand daylight.

The opening test is simple. Can the project team explain, in one page, what the community receives, what it may bear, and what evidence will settle a disagreement? If that page cannot be written honestly, the project needs more development before it needs more publicity.

2 The demand boom and the danger of easy forecasts

A powerful market can still produce a bad investment. Rising demand for computing does not prove that every parcel with a substation nearby can support a financeable campus. National electricity projections describe a system-level possibility. They do not establish a local customer's credit, a utility's delivery date, or the commercial life of a particular building.

The U.S. Department of Energy's United States Data Center Energy Usage Report: 2025 Update estimates 192 TWh of data-center electricity use in 2024, about 4.7% of U.S. use. Its reference case reaches 649 TWh in 2030. The compounded uncertainty scenarios span 521 to 843 TWh. Those are modeled futures, not measured 2030 demand. The update revises equipment-shipment and operating assumptions and explicitly acknowledges uncertainty. [1]

The figures are important because they establish scale. They are dangerous when stripped of method. A developer can repeat the high case as if every megawatt will arrive on schedule. An opponent can repeat the same case as if every proposed project will inevitably be built. Both remove the constraints that determine what is feasible: power availability, equipment supply, customer economics, financing, labor, permitting, and the ability to make useful computing profitable.

A serious investment committee separates at least four things: announced campus capacity, contracted capacity, energized capacity, and actual demand. Announcements can overlap. A customer can explore several regions for one deployment. A utility request can exceed the load that will eventually materialize. Installed equipment may run below nameplate. Each stage has a different evidentiary value and a different risk of double counting.

Underwrite the customer before the headline

The customer is not an abstraction called AI. It is a counterparty with workloads, a balance sheet, service requirements, and alternatives. The developer must understand what that customer is buying. Is it a powered shell, a fully fitted facility, rack space, managed infrastructure, or delivered computation? Who owns the IT equipment? Who pays electricity? Who funds the next cooling retrofit? The answer determines both revenue and exposure.

A ten-year property lease and a short-cycle accelerator business can coexist, but the mismatch needs to be managed. Equipment power density may change. A cooling specification may become obsolete. A customer may consolidate workloads or fail. A building that is easy to repurpose for one generation of servers may be expensive to adapt for another. The residual

value should be tested against a plausible replacement customer, not assumed from the original tenant's growth forecast.

Demand diligence should begin with documents. Executed contracts have more weight than letters of interest. Security deposits and guarantees matter more than expressions of enthusiasm. A load ramp should correspond to equipment delivery and customer commissioning milestones. If the project depends on an anchor customer, show what happens when that anchor takes half the capacity or arrives a year late.

Power delivery is a separate business risk

A utility's preliminary service indication is not the same as an executable energization obligation. Study results, network upgrades, equipment procurement, rights of way, construction interfaces, and operating conditions can all affect the date. The land agreement, customer agreement, financing agreement, and utility agreement should not each assume someone else carries the delay.

The safest development strategy is not necessarily the smallest project. It is the one that commits capital in proportion to verified demand and deliverable infrastructure. Phasing can reduce stranded capacity, but repeated mobilization and fragmented electrical works can increase cost. A phased design should preserve the final architecture while defining what each phase can operate independently.

Keep two forecasts. The first is the commercial forecast used to test opportunity. The second is the commitment forecast used to decide what the project can responsibly promise. The latter should exclude speculative benefits, uncertain incentives, and uncontracted energy sales. It should have explicit downside cases rather than a generic contingency percentage hiding every uncertainty.

What changes a decision

The most valuable forecasting question is not whether demand will be large. It is what evidence would make the project team change its plan. If the answer is nothing, the forecast has become a belief. A credible plan names its triggers: a customer prepayment, a utility study milestone, an equipment-price ceiling, a maximum cooling-retrofit cost, or a minimum lease-up threshold.

The team should also watch for correlated risks. High regional demand can raise land value while making power harder to secure. Strong accelerator demand can support rental pricing while increasing replacement costs. A hot-weather constraint can increase both cooling load and grid stress. These risks do not disappear because each spreadsheet tab contains a reasonable average.

The market deserves ambition. The capital deserves discrimination. Demand growth is a reason to investigate carefully, not permission to stop investigating.

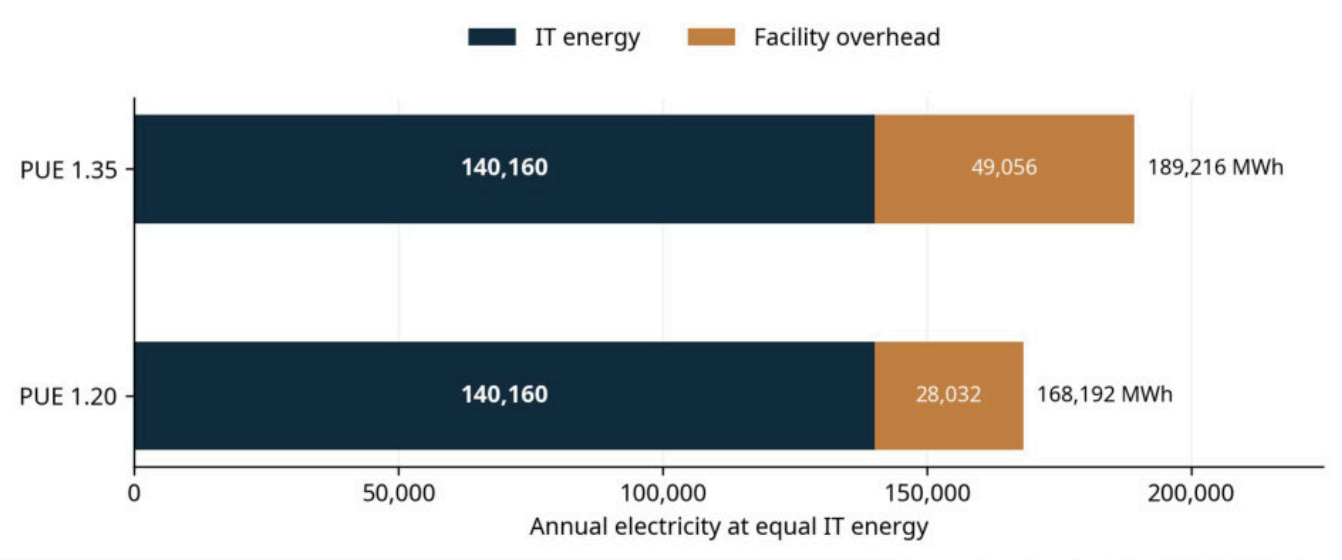
3 A boundary that makes the numbers honest

The word clean is too small to carry a complete engineering claim. A facility can have low on-site cooling-water consumption and still rely on water-consuming generation elsewhere. It can procure renewable-energy attributes and still draw electricity from a mixed grid at night. It can use efficient cooling while wasting computing cycles. The first step toward honest performance is to draw the boundary.

For the worked campus in this book, the core boundary is the facility electricity meter and the IT distribution meters. We distinguish the IT load from the entire facility load. We then add separate ledgers for on-site water, fuel, purchased electricity attributes, embodied impacts, exported electricity, recovered heat, and community benefits. This layered approach keeps each claim attached to the part of the system it actually describes.

Power is a rate. Energy is an amount accumulated over time. One megawatt sustained for one hour equals one megawatt-hour. A 20 MW IT campus operating at an average 80% of its design IT power draws an average 16 MW at the IT equipment. Over 8,760 hours, its annual IT energy is 140,160 MWh. That utilization assumption describes average electrical loading, not processor utilization or occupancy. Those terms must not be substituted for one another.

Assume annual power usage effectiveness, or PUE, of 1.20. Total facility energy is then 168,192 MWh. The difference, 28,032 MWh, covers facility overhead within this simplified boundary. A comparison design at PUE 1.35 would consume 189,216 MWh for the same IT energy. The modeled difference is 21,024 MWh a year. No vendor or KSI performance is implied.



Illustrative annual electricity balance. Equal IT work and boundary are essential to comparison.

A ratio can improve while the total gets worse

PUE is total facility energy divided by IT energy. It describes infrastructure overhead relative to IT consumption. It does not measure the usefulness of the computing. DOE's design guide