Financing AI computing capacity in Jamaica under independent power and water constraints

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Abstract

Jamaica is exploring investment in artificial intelligence infrastructure. A prospective operator must sell computing services while providing power without drawing on the national grid and avoiding additional pressure on public water systems. We model a facility that rents space and power to tenants, sells time on its own graphics processing units, or combines both. We compare eight scenarios spanning three facility sizes and several workload allocations over 15 operating years. Public records establish that institutions in Jamaica already operate and buy hosting services. They do not establish the volume or price of future orders. At 1 MW of IT capacity with one quarter assigned to operator-owned GPUs, the median discounted net present value (NPV) is minus US$6.27 million; 30.58% of 10,000 scenarios clear the 10% real investment hurdle. At the assumed prices, renting the same service volumes costs US$3.40 million less in present value. An all-GPU facility clears the hurdle in its central case, but that result reverses if prices keep falling after each hardware refresh. The analysis identifies the terms worth testing with customers and suppliers before committing capital. No location, power contract or customer order has been secured for the modelled facility. **Keywords** data centre economics, island energy systems, scenario analysis, graphics processors, Jamaica

1 Which investment is Jamaica considering?

A company can participate in the compute market by hosting a customer's equipment or by buying equipment and selling its output. A government can use either service without owning the building. These distinctions matter in Jamaica because the party that pays for the equipment carries the cost of replacing it. The party that operates the plant also needs a commercial agreement for power that can run through a prolonged interruption.

In November 2026 the Government announced approval to sign an exploratory memorandum with investors. On 18 November the information minister described conditions on public electricity and water. The previous day's parliamentary pitch for Portmore identified a candidate community. Neither announcement specified a site, customer, technology or construction budget [1, 2]. We examine the investor's decision to fund capacity and the public authority's decision to give it support. The two decisions require different evidence.

We ask which combinations of workload, capital cost and utilisation recover a specified return, and how much employment, electricity use and direct water demand accompany them. We hold the investment period constant across alternatives. The companion Portmore paper uses the same calculations to evaluate local service and hazard constraints. It provides no independent replication of the financial results.

2 What operating experience establishes

Jamaica already has a domestic hosting market. eGov Jamaica reported 100% uptime for its hosted solutions during FY2024/25 after changes to cooling, power, networking and storage. Its reporting boundary covers an existing public-service platform and a specific year [3]. The Passport, Immigration and Citizenship Agency's 2025 retender for eighteen months of colocation reached awarded status. The procurement portal shows an opened bid, with no financial value displayed [4]. Together, these records show a service in use and an identified buyer. They supply neither the price of a new service nor evidence that the buyer will switch. For research computing, UNESCO identifies the SPARKS system at UWI Mona, launched in 2016 to support climate modelling and storage [5]. A grant-funded research platform can establish the need for scientific computing while leaving commercial demand unmeasured.

Other markets clarify the costs which promoters often combine. In Virginia, a legislative review found that operator interviews put employment in a typical 250,000-square-foot building at about 50 full-time positions, including contractors. At peak construction, a project could have around 1,500 people on site [6]. The building size, services and labour market differ from the cases below. We therefore avoid converting the interview figures to a Jamaican jobs-per-megawatt rate. Turner & Townsend's Southeast Asian estimates vary by city, power density and cooling specification [7]. They support separate procurement of the shell, electrical plant, heat rejection and information technology. They cannot establish freight, duties, civil works or construction productivity at a Jamaican site.

The IEA estimates that data centres worldwide consumed about 485 TWh in 2025. Its central projection reaches about 950 TWh in 2030 [8]. None of that projected growth is allocated to Jamaica in our cash flows. A training run hired abroad is technically addressable demand only if a Jamaican operator can deliver the specified hardware, interconnect, storage, uptime and price.

3 Model, comparators and evidential limits

The unit of analysis is a prospective project, measured in constant US dollars. One megawatt (MW) of information technology (IT) capacity means the rated electrical load available to computing equipment. The building also needs electricity for cooling and power conversion. Power usage effectiveness (PUE) is total facility energy divided by IT energy. Water usage effectiveness (WUE) is litres of water per kWh of IT energy within the stated cooling boundary. Operator reports on direct and power-generation water use cover different physical processes [9]. We report only the boundaries supported by the model.

JLL gave a global 2025 construction average of US$10.7 million/MW. CBRE reported a US$196.25/kW-month average asking price for 250–500 kW in its North American primary wholesale markets [10, 11]. We use US$12 million/MW and US$200/kW-month as scenario assumptions, subject to scope and location differences. The reference eight-GPU system includes a power allowance for networking above NVIDIA's maximum system figure [12]. Natural-gas emissions use the standard fuel factor of 53.06 kg CO_2/MMBtu [13].

Rented capacity earns a recurring fee per contracted kilowatt plus the modelled recovery of tenant energy costs. The accelerator service sells billed GPU-hours. A GPU-hour is one processor available for one paid hour, irrespective of the number of requests completed. Accelerator generation, memory, batch size and latency affect how many requests that hour can serve. Our outputs cannot be converted into numbers of chatbot responses, model parameters trained or research projects completed without a benchmark on the customer's actual workload. Reserving capacity is also different from executing work on every reserved server. For capacity C

in IT MW and owned GPU share s, the number of eight-GPU nodes is $n = \lfloor 1000Cs/11.2 \rfloor$. The remaining tenant allocation is $K = 1000C(1-s)$ kW. Rounding leaves unused power in the GPU allocation. Let u_t be the occupied share, H_t the powered hours after interruptions, P_t the price per billed GPU-hour and R_t the price per kW-month. With B_t denoting tenant power reimbursements, annual revenues are

$$S_t = 8nH_tu_tP_t + 12Ku_tR_t(H_t/8760) + B_t.$$

Occupied tenant space averages 72% of its reserved electrical load. Owned GPU systems draw 27% of design load at idle and 100% at full use. The model multiplies IT energy by process PUE and adds an auxiliary load that declines as occupancy increases. Reimbursement recovers 90% of the allocated tenant share of energy and firm-capacity charges. No second energy charge is levied on GPU users.

The operating cash flow is $S_t - O_t - F_t$, where O_t covers fuel and capacity service, staff, maintenance, insurance, connectivity, water and retained storm repairs. F_t covers hardware refresh. With construction capital I_0, grant G_0, discount rate r and delay d, investor NPV is

$$G_0 - I_0 + \sum_{t=1}^{15} \frac{S_t - O_t - F_t}{(1+r)^{t+d}}.$$

We use no terminal value. The point case applies expected annual loss days and repair costs; a simulated project receives distinct yearly events. A normal operating-year exhibit uses year six, at mature occupancy, immediately after refresh and without an outage. This distinction matters: multiplying that year's surplus by 15 overstates the return.

Separate research agents retrieved source records, implemented the cash-flow and resource model, and reconstructed annual results from the stated assumptions. A reporting check compared selected public figures with stored model outputs, including values deliberately altered to test detection. These checks can identify transcription and arithmetic errors without establishing a market price, a hazard probability or a water right.

The islanded reference arrangement buys firm service from an independent generator. The project pays a capacity charge and a variable energy charge. This avoids counting generation capital both in the data-centre investment and in the supplier's tariff. An alternative combines a solar array, storage and engine support. The model uses a prescribed annual supply split for that comparison. It cannot certify hourly adequacy, fuel availability, emissions permits or the availability of land. For a transparent engineering bound, a continuous 1 MW facility needs 8,760 MWh per year. At an assumed 20% capacity factor, 5 MWp of solar produces the same annual energy before storage losses. If solar output were zero for 72 hours, an 80% usable battery fraction and 95% discharge efficiency would require at least $72/(0.80 \times 0.95) = 94.7$ MWh of nameplate storage per continuous MW, before reserve or ageing. These are arithmetic examples, not a site design.

National tariffs provide an excluded comparator. The published large-power class average for 2025 was J$40.83/kWh. Natural gas and petroleum together supplied about 89.9% of net national electricity generation that year [14]. We do not apply this fuel mix to a private power plant. A customer who buys an annual quantity of renewable energy over the public network still needs to show how the proposed facility satisfies the government's rule on drawing power.

4 Financial and operating results

The 1 MW mixed case purchases 176 GPUs and allocates 750 kW to tenant equipment. At mature occupancy it sells 1,156,320 GPU-hours and rents 562.5 kW. A normal year after refresh

generates US$3.47 million in GPU charges, US$1.35 million in basic rent and US$1.01 million in power recovery. Its total operating cost of US$2.87 million includes US$1.69 million for power. The operator spends US$18.80 million initially and another US$4.224 million at each of two refresh dates. A separate supplier incurs US$3.71 million in generation capex and recovers it through service charges.

The point case reaches permanent simple payback in year 12. Its undiscounted 15-year return on initial and replacement capital is 29.75%. At a 10% real cost of capital its NPV is still minus US$6.10 million because much of the surplus arrives late. With other inputs fixed, a mature occupancy of 90.58%, a GPU rate of US$3.84/hour, or basic colocation rent of US$330.10/kW-month separately brings NPV to zero. Jointly increasing the two service prices by about 19.5% is a different way to cross the same threshold.

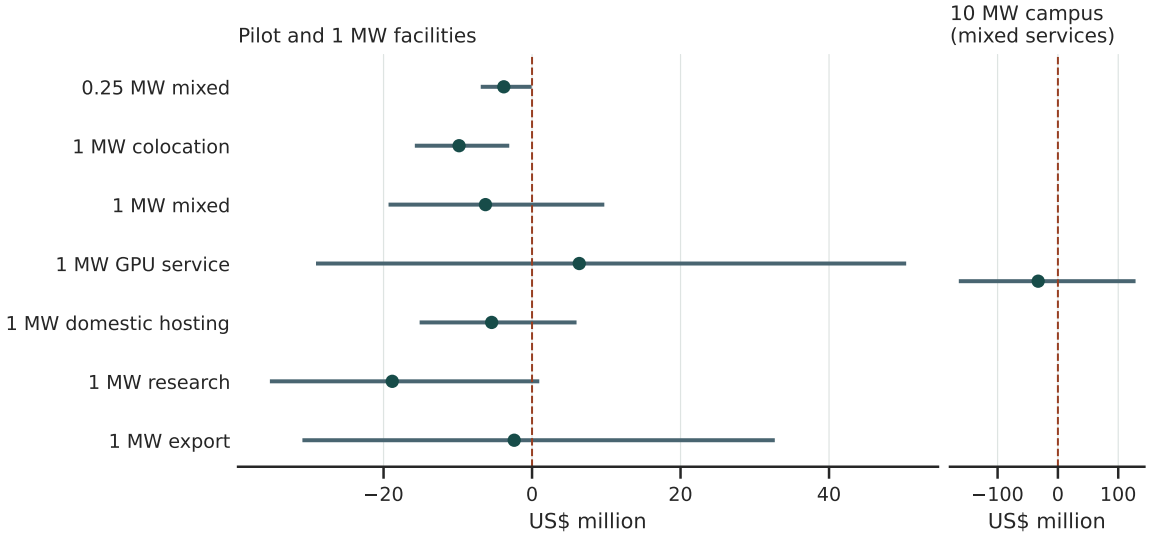


Figure 1: Project NPV across scale and service alternatives. The point marks the median. Bars span the 10th to 90th percentiles under the specified input distributions. The 10 MW case has a separate scale because it commits substantially more capital. Constant US dollars.

Table 1: Normal operating-year receipts and initial operator capital, US$ millions. Initial capital excludes supplier plant. The eight cases include separate age-zero GPU prices of US$2.25 (research) and US$2.60 (export); domestic hosting pays an assumed US$235 basic rent. Remaining cases use the reference unit prices.

Case	GPU share	Occupancy	Capex	Revenue	$P(\text{NPV} > 0)$
0.25 MW mixed	25%	75%	4.84	1.38	9.7%
1 MW colocation	0%	75%	13.52	3.20	3.1%
1 MW mixed	25%	75%	18.80	5.83	30.6%
1 MW GPUs	100%	75%	34.88	14.03	58.0%
10 MW mixed	25%	75%	185.57	58.74	39.5%
1 MW domestic hosting	10%	80%	15.44	4.68	27.2%
1 MW research	60%	65%	26.24	6.52	11.2%
1 MW export	85%	80%	31.52	11.42	46.4%

A capacity seller can shift the cost of tenants' electricity through its contracts, subject to collection, dispute and default risk. It still pays for empty space and idle equipment. A GPU operator assumes those risks and adds the cost of hardware refresh. Research, domestic inference, regional disaster recovery and frontier training have different uptime, bandwidth and volume requirements. Table 2 identifies a procurement test for each service; the simulation prices the physical service units, not the social value of the application.

Table 2: Workload procurement tests before investment.

Workload	Customer output and model unit	Evidence needed to add revenue
Continuity and backup	Reserved tenant kW and an agreed restoration service.	Failover exercise with a recovery point, recovery time and separately routed second site.
Domestic inference	Billed GPU-hours serving an existing application.	Observed peak and off-peak requests, measured latency, cost per completed request and a minimum purchase.
Scientific computing	Billed GPU-hours for climate or other scheduled jobs.	A funded allocation, test-job completion time and a queue that can pause if power is constrained.
Regional or large-scale training	Billed GPU-hours in a cluster; tightly coupled jobs need contiguous capacity.	Named buyer, network and storage benchmark, reserved cluster size and a cancellation payment.

5 Uncertainty, distributional effects and decision

A stronger sales contract can change the result. With 90% occupancy, a US$3.50 GPU-hour, US$225/kW-month in basic rent and 5% lower facility construction cost, point NPV is plus US$6.50 million. A construction overrun of 35% and a one-year delay produce minus US$13.74 million. A combined purchase shortfall, fuel-price rise, cost overrun, heat and flood closure produces minus US$29.58 million.

A separate structural test changes what the investor assumes each refresh will buy. The model discounts a GPU-hour's selling price by 5% per year within a hardware cycle and restores the starting real price when the operator renews the machines. If the price of the same sold GPU-hour instead keeps falling at 5% per year for all 15 years, the all-GPU point NPV falls from plus US$7.02 million to minus US$7.30 million. The mixed case falls from minus US$6.10 million to minus US$9.64 million. Both tests purchase replacement hardware on schedule and preserve operating volume. Hardware performance per dollar could improve, but the investor must show how much of that gain customers will pay for.

For a buyer seeking the mixed case's volume, the service alternative costs US$41.13 million in present value against US$44.53 million to own and operate capacity. The lease assumes power-inclusive rent of US$330/kW-month, US$3/GPU-hour, US$250,000 setup and US$175,000/year for buyer operations. At that rent the GPU bid can rise to US$3.42/hour before the alternatives cost the same. This buyer-side break-even price and the operator's required selling price answer different questions. Current prices, service quality and capacity in Jamaica require bids.

A currency stress assumes half of receipts are fixed in Jamaican dollars. A permanent 20% increase in Jamaican dollars per US dollar from year 3, with no repricing or cost relief, reduces mixed-case NPV to minus US$8.74 million. In a separate financing illustration, 50% debt for ten years at 8% real US-dollar interest requires about US$1.40 million each year. Cash after refresh fails to cover that payment in years 1, 5 and 10. The base model remains pre-tax and unlevered.

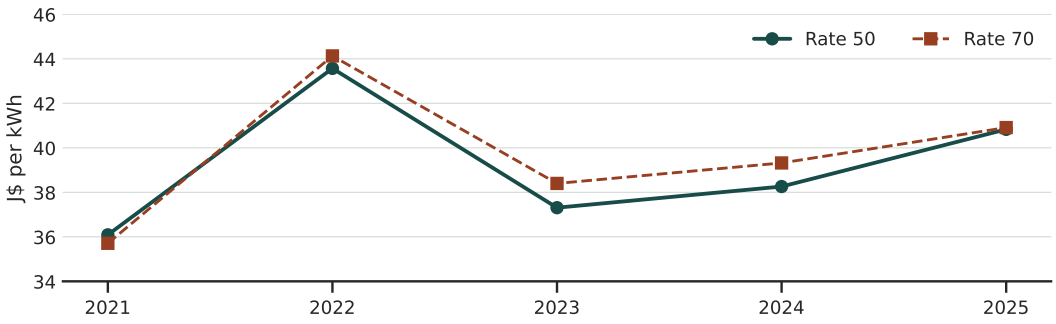


Figure 2: Historic national class-average electricity prices (Jamaican dollars per kWh). The 2025 value is preliminary [14]. Five annual observations provide a limited resampling exercise. They contain no information about the price or reliability of a new islanded power contract.

An operator's surplus is not the public return. Staff salaries are an operating cost to the investor and income to workers. Counting both wages and the operating surplus before wages overstates domestic benefits. Imported servers can increase the asset base while leaving little domestic manufacturing income. A national cost-benefit account would need the wages workers could earn elsewhere, domestic value added by suppliers, the opportunity cost of land and water, taxes net of concessions, and the distribution of outage and pollution costs. These data are unavailable for the proposed investment. We report direct employment and related payments where defined, without applying an economy-wide employment multiplier or claiming a social benefit-cost ratio.

A smaller pilot limits the dollars committed but can lose more per unit of capacity because it carries fixed operating costs. Compare its price with a cancellable lease at a Jamaican operator, a geographically separate recovery site and an offshore service bid. The correct comparator depends on data access, response time and performance requirements. An offshore service that cannot meet those requirements does not deliver the same output. Conversely, a domestic building that shares a fibre route with its backup does not deliver independent recovery. Measure both arrangements against the same service contract.

Before offering public concessions, require customers to disclose committed quantities and remaining contract terms, obtain a firm power-and-water package, price an insured all-in construction offer and rerun the financial distribution. National climate evidence supports testing loss of access, extended resupply delays, heat and flooding [15, 16, 17, 18]. It does not supply a single annual loss rate for a Jamaican data centre. Each prospective location requires its own civil and service surveys. If a workload can use existing capacity at lower life-cycle cost and meet the same service level, the avoided investment is part of the decision.

A Assumptions and reproducibility

The case fixes mature occupancy at 75%, age-zero GPU price at US$3/hour, rent at US$200/kW-month, and construction at US$12 million/IT MW before the site allowance and 6% hardening allowance. An installed GPU costs US$30,000 including its share of the host and network. Refreshes at years 5 and 10 cost 80% of original IT capital. Operating years one, two and three reach 55%, 78% and 92% of mature occupancy. The real discount rate is 10% and the grant is zero. Tax, leverage, terminal proceeds, decommissioning, working capital and delay-period overhead are excluded. The model cannot resolve taxes on imports or foreign-exchange exposure without the currency and timing of signed contracts.

Every scenario uses 10,000 draws with common seed 41926. Let T be the sum of two independent uniform draws minus one. For independent market, build, fuel, heat and labour shocks distributed as T, selling prices scale by $1+0.45T_m+0.15e$ and occupancy by $1+0.37T_m+0.17e$, with

a fresh e at each use. Build and equipment cost scale by $1+0.32T_b+0.12e$ and $1+0.20T_b+0.22e$. Fuel scales by $1 + 0.38T_f + 0.10T_h$; cooling overhead by $1 + 0.28T_h$. The annual disruption probability starts at $0.08(1 + 0.45T_h)$ and increases by 2% of the initial value per year. An event of severity $U \sim \text{Uniform}(0, 1)$ removes $2 + 10U$ days and costs $(0.005 + 0.04U)$ times facility capital plus half of IT capital, with both capital components inside the multiplication. The point case treats that damage as the operator's retained share; any actual insurance, deductibles and recovery delays must be priced separately. The one-year delay probability is $0.18+0.13T_b$. These factors are modelling choices without fitted local occurrence probabilities.

A bootstrap with 400 resamples of the simulated mixed-case outcomes gives a percentile interval of minus US$6.55 million to minus US$5.89 million for the estimated median. This is numerical sampling uncertainty only. The 10th-to-90th percentile range of the project NPV distribution itself runs from minus US$19.33 million to plus US$9.73 million. Two independent seeds each yielded a negative median (minus US$6.35 million and minus US$6.21 million). Separately, resampling five annual national Rate 50 observations gives J$37.01–41.53/kWh for the central 95% of resampled means around an observed mean of J$39.21. Serial dependence, cost shocks and a five-year sample prevent interpretation as a future tariff interval.

The BootLoops Emitall consistency check reproduced 46 reported values at their printed precision and detected three deliberately changed values involving a sign, a month and an outage duration. The test exposed a rounding ambiguity at 7.175 resident positions; we report this as 7.2 for planning. This checks numerical reporting and the test's ability to detect selected errors. It does not validate future prices, job creation or site availability.

Data, authorship and scope

The source bundle includes the model, results, figure code and source register. Both companion papers share these inputs. The authors are affiliated with Maestro AI Labs, an AI-sector organisation. Research software and language-model tools assisted source discovery, drafting, implementation and numerical consistency checks. The numerical experiment concerns project cash flows and resource loads. It does not train or evaluate a predictive language model. This preprint has not undergone external peer review.

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