JLM Energy – EcoYield Report

Hybridising Solar Energy and GPU Infrastructure: A Comparative Feasibility Study of AI Compute Leasing in Leeds and Dubai

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Abstract

This report investigates the integration of solar photovoltaic (PV) systems with high-performance GPU compute infrastructure for artificial intelligence (AI) leasing applications. Using Leeds (UK) and Dubai (UAE) as case studies, the analysis evaluates how local energy prices, solar resources, and infrastructure conditions influence the financial viability of such hybrid projects. A detailed methodology combining solar yield modelling, GPU utilisation assumptions, and supplier-verified cost inputs is applied to generate internal rate of return (IRR) projections. The findings indicate that while Dubai benefits from superior irradiance and scale potential, the relatively low cost of electricity reduces the marginal financial benefit of solar integration. In contrast, Leeds exhibits stronger relative returns due to higher grid electricity costs, despite lower solar yields. The literature review contextualises these results within broader trends in GPU leasing markets, renewable energy deployment, and geographic considerations for data centre siting. Overall, the study highlights both the opportunities and limitations of GPU-solar hybridisation, demonstrating that local market conditions and rapidly evolving compute demand are critical determinants of project performance.

Contents

Abbreviations	
AI	Artificial Intelligence
ESG	Environmental, Social and Governance
GPU	Graphics Processing Unit
IRR	Internal Rate of Return
LLM	Large Language Model
LP	Liquidity Provider
ML	Machine Learning
PV	Photovoltaic
RWA	Real World Asset

1. Introduction

AI has been in development since the 1940s, with the Bombe machine developed by Alan Turing to break the Enigma in WWII argued to be the first AI-driven machine[1]. In 2024, the AI market was valued at USD 279.22 billion and is project to reach USD 1,811.75 billion by 2030[2]. The recent rapid acceleration of artificial intelligence (AI) has led to unprecedented demand for high-performance computing infrastructure, particularly graphics processing units (GPUs), with NVIDIA as the leading manufacturer[3]. These systems underpin the training and deployment of large-scale machine learning models but are also characterised by significant energy consumption, with European Central Bank estimating consumption at around 20 TWh consumption for early 2025[4]. As energy prices rise and sustainability concerns intensify, the integration of renewable energy into compute infrastructure is becoming both an environmental necessity and a commercial opportunity[5].

Solar photovoltaics (PV) represent one of the most scalable and rapidly deployed renewable energy sources, with 2.2 TW installed globally[6], offering the potential to offset the carbon footprint of energy-intensive GPU clusters. However, the intermittent nature of solar generation presents challenges for compute environments that require consistent uptime and performance guarantees[7]. Hybridisation strategies (combining solar energy with grid supply, storage, and intelligent load management) offer a pathway to balance reliability with sustainability[8].

This report investigates the hybridisation of GPU infrastructure with solar energy to support an emerging business model: leasing GPUs to companies that require AI compute capacity[9]. Two contrasting sites are examined: Leeds, in the United Kingdom, and Dubai, in the United Arab Emirates representing differing climatic, regulatory, and market conditions. By comparing the technical, economic, and policy contexts of these locations, the study aims to assess the feasibility and competitiveness of solar-hybrid GPU operations.

The findings contribute to ongoing discussions around sustainable digital infrastructure, offering insights for investors, policymakers, and technology providers seeking to align AI growth with net-zero commitments.

2. EcoYield – Company Overview

EcoYield is an emerging investment platform that combines renewable energy infrastructure with high-performance computing resources, primarily Graphics Processing Units (GPUs) used for artificial intelligence workloads. The company operates at the intersection of two rapidly expanding sectors: the growth of digital infrastructure to meet demand for AI compute, and the global transition toward renewable energy systems. Its stated objective is to democratise access to infrastructure that has traditionally been dominated by hyperscale operators and institutional investors, by offering smaller-scale investors opportunities to participate in projects through tokenised financial instruments.

2.1. Business Model and Premise

EcoYield's core business model is based on generating returns from two distinct but complementary revenue streams. First, GPUs are leased to clients who require large-scale compute capacity for AI and related digital applications. Second, renewable energy assets (principally solar photovoltaic (PV) systems, with the potential integration of battery storage) provide a source of electricity to power these GPUs. This hybrid model reduces exposure to volatile energy markets while aligning with sustainability targets.

To facilitate investor participation, EcoYield uses tokenisation. Financial stakes in infrastructure projects are represented on blockchain ledgers, allowing investments to be fractionalised and tradable. Investors can access liquidity provider (LP) tokens, which represent a share in project revenues. The platform also issues a governance token, through which stakeholders can vote on project selection, reinvestment strategies, and other operational matters. This structure reflects broader trends in the tokenisation of real-world assets (RWAs) and the application of decentralised finance mechanisms to infrastructure finance.

2.2. Strategic Positioning

EcoYield positions itself within three converging global trends. First, demand for AI compute is rising sharply, with GPUs in short supply and leasing models emerging as a pragmatic way to meet demand without requiring all clients to own hardware. Second, renewable energy deployment continues to accelerate, with investors seeking opportunities that combine attractive financial returns with measurable sustainability outcomes. Third, tokenisation of infrastructure projects reflects a wider movement to increase transparency, accessibility, and inclusivity in investment. EcoYield leverages these dynamics by offering a hybrid product that addresses both yield generation and environmental, social, and governance (ESG) considerations.

2.3. Strengths and Challenges

The company's approach has several notable strengths. The combination of energy and compute revenues diversifies cashflows and reduces reliance on a single market. The use of blockchain governance and impact tracking enhances transparency and may appeal to investors prioritising ESG alignment. Furthermore, EcoYield's stated ambition to open infrastructure investment to smaller-scale participants reflects a novel attempt to democratise what is often a closed asset class.

However, challenges remain. GPU leasing markets are highly dynamic, with potential risks arising from technological obsolescence, competition, or fluctuating demand for AI compute. Regulatory uncertainty in both the energy and digital finance sectors may also affect project viability, particularly where policies around renewable tariffs, tokenised securities, or cross-border capital flows evolve. Finally, while tokenisation offers advantages in liquidity and transparency, it also introduces complexity for governance, investor protection, and compliance with diverse jurisdictional frameworks.

3. Literature Review

3.1. GPU Compute Demand and Leasing

Over the past decade, demand for high-performance computing has expanded dramatically, driven largely by advances in artificial intelligence (AI), machine learning (ML), and high-performance data analytics. GPUs, originally designed for graphics rendering, have become the de facto standard for AI workloads due to their highly parallelised architecture[10]. Training state-of-the-art models, such as large language models (LLMs), requires thousands of GPUs operating continuously for weeks or months[11]. Industry forecasts suggest that demand for AI-related compute will continue to grow at an exponential rate, outpacing improvements in hardware efficiency[12].

Despite the clear need for GPU resources, barriers to entry remain high. Purchasing GPU clusters requires substantial capital expenditure, compounded by long lead times and supply chain constraints[13]. Operating such infrastructure also incurs significant ongoing costs, including energy, cooling, space, and specialised technical staff[14]. For many organisations, particularly start-ups and research institutions, outright ownership of large-scale GPU clusters is financially prohibitive[15].

In response, GPU leasing has emerged as a flexible alternative. Providers offer access to GPU clusters on a rental basis, either through public cloud services (e.g., Amazon Web Services, Microsoft Azure, Google Cloud)[16] or through specialised GPU-as-a-service (GPUaaS) operators[17]. Leasing models allow companies to scale compute resources dynamically, paying only for what they use. This approach reduces upfront costs, improves accessibility, and aligns expenditure with revenue generation[18].

The GPU leasing market is highly competitive and rapidly evolving. Large cloud hyperscalers dominate in terms of scale and accessibility but are often criticised for high pricing and limited customisation[19]. In parallel, smaller operators have entered the market, offering more flexible leasing terms, bespoke configurations, or energy-efficient infrastructure. Recent trends include the development of decentralised GPU marketplaces[20], where idle compute capacity is pooled and leased via blockchain-based platforms.

The leasing model intensifies the need for reliable and sustainable power. Since providers operate GPU clusters at scale, energy costs form one of their largest operating expenses. Integrating renewable energy sources, such as solar, into GPU infrastructure can reduce exposure to volatile electricity markets, lower operational costs, and align with the sustainability objectives of end users[21]. Clients in industries such as healthcare, finance, and research are increasingly sensitive to the carbon footprint of their digital operations[22], making renewable-backed leasing a potential differentiator in the market.

3.2. Solar Energy and Hybridisation Technologies

Solar photovoltaic (PV) technology has become one of the most widely adopted forms of renewable energy, with falling costs, improving efficiency, and scalability across diverse geographies[23]. Utility-scale solar farms and distributed rooftop systems now contribute significantly to electricity generation worldwide, generating over 2,000 TWh[24]. For energy-intensive computing applications, solar offers a pathway to reduce reliance on carbon-intensive grid electricity and to stabilise long-term operating costs by insulating operators from market volatility[25].

Despite its advantages, solar generation is inherently intermittent, varying by time of day, weather, and season. For GPU clusters that require stable, high-availability power, this variability poses a significant challenge. Downtime or performance throttling due to energy shortfalls is unacceptable in most AI workloads, which often run continuously for extended periods[26]. Therefore, hybridisation strategies are essential to ensure reliability while still capturing the benefits of renewable integration.

Hybrid systems typically combine solar PV with grid supply and energy storage. The grid acts as a baseload backup, guaranteeing continuous operation, while batteries or other storage technologies provide short-term balancing and smoothing of solar variability[27]. Advances in lithium-ion storage[28], coupled with declining costs, have made battery integration increasingly viable for data-centre-like applications. In regions with high solar potential, such as Dubai, hybrid systems can significantly reduce grid dependence; in lower-yield regions like Leeds, they can still contribute to decarbonisation and cost savings, though with lower generation per unit area[29].

Beyond physical infrastructure, hybridisation also relies on intelligent energy management systems[30]. Smart controllers can dynamically allocate loads between solar, storage, and grid power to optimise both cost and carbon footprint. Some operators explore demand response mechanisms, where non-critical compute tasks are scheduled during periods of renewable abundance, further aligning consumption with green generation[31]. This approach is particularly relevant for GPU workloads with flexible scheduling requirements, such as model training.

In addition to batteries, other hybridisation pathways are under active exploration. These include pairing solar with hydrogen production and fuel cells[32], integrating thermal storage for cooling systems[33], and deploying modular microgrids tailored for compute facilities[34]. As technology matures, these hybrid solutions could enable GPU operators to achieve near-carbon-neutral operations while maintaining the uptime guarantees demanded by customers.

For GPU leasing providers, hybrid solar systems offer both an operational and market advantage. By reducing energy costs, operators can improve profit margins and offer competitive pricing. By demonstrating renewable integration, they can attract sustainability-conscious clients and differentiate themselves in a crowded marketplace[35]. Hybridisation thus represents not only an engineering solution but also a strategic enabler for the long-term viability of GPU leasing businesses.

3.3. Location Specific Considerations

The suitability of hybrid GPU-solar infrastructure is highly dependent on geography, as local environmental and infrastructural conditions directly affect both technical performance and economic viability[36]. One of the most critical variables is the availability of solar resource. Regions with high solar irradiance, such as the Middle East, North Africa, the southwestern United States, and Australia, can achieve photovoltaic (PV) capacity factors of 20 to 30 per cent[37], enabling a significant proportion of compute demand to be supplied directly from solar installations. By contrast, regions in Northern Europe or parts of East Asia typically achieve capacity factors of 10 to 15 per cent[37], reducing the contribution of solar energy and increasing the reliance on grid power or storage systems. Seasonal variation is particularly acute in temperate latitudes, where summer generation may be three to four times higher than in winter[38], presenting additional challenges for maintaining consistent supply to high-availability GPU clusters.

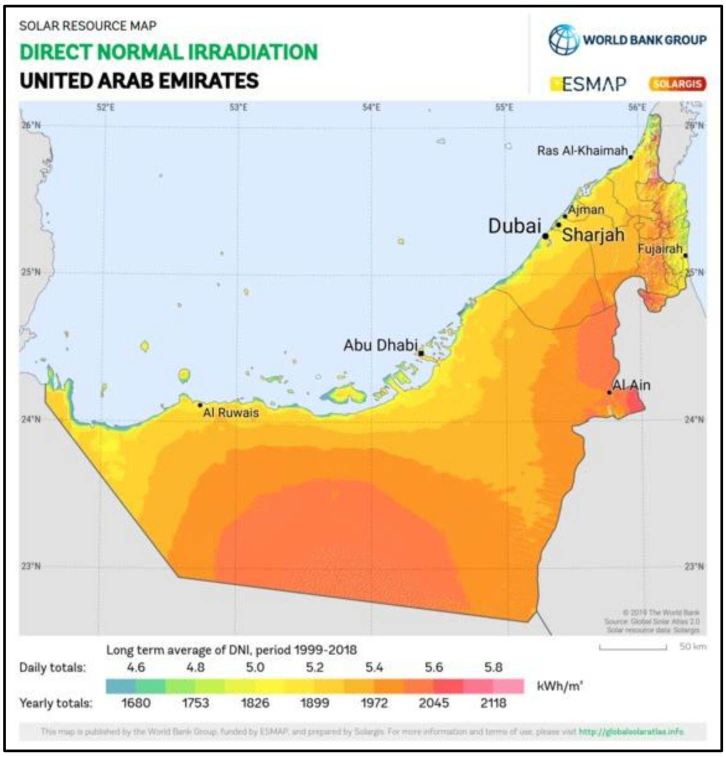

Figure 1 - Direct normal irradiance map in the UAE[39].

Climate also exerts a substantial influence on hybridisation strategies. Hotter regions offer abundant solar energy but face efficiency losses in both PV modules and computing infrastructure[40]. PV modules typically experience output reductions of 0.4 to 0.5 per cent for every degree Celsius above 25°C[41], and GPU clusters in such climates require significantly more cooling to maintain operational stability. In the Gulf region, for instance, cooling can account for 30 to 40 per cent of total facility energy consumption[42]. Cooler climates, such as Northern Europe or the Nordic countries, impose lower cooling demands[43], reducing overall energy intensity even though solar yields are weaker. Some operators in these regions exploit natural advantages by siting facilities in cold environments, sometimes even using immersion cooling or free-air cooling to minimise operational overheads[44].

The characteristics of the local electricity grid are equally important. In regions with stable and largely decarbonised grids, such as the Nordics where hydro and wind dominate, the marginal benefit of integrating solar tends to be economic rather than environmental[45]. Conversely, in areas where grids are heavily dependent on fossil fuels, such as parts of Asia and the Middle East, solar integration can produce substantial reductions in carbon intensity, making GPU leasing models more attractive to clients concerned with sustainability[46]. Grid reliability also determines the scale of storage required. In markets with frequent outages or instability, hybrid systems may need to be designed with larger battery capacities or even full microgrid functionality to guarantee the uptime expected in commercial GPU leasing agreements[47].

Electricity pricing and market exposure further influence project feasibility. Energy constitutes between 46 to 60 per cent of total operating expenditure in data centres, making it a decisive factor in project economics[48]. High-cost electricity markets, such as the United Kingdom, Germany, or Japan, strengthen the incentive to integrate solar as a hedge against price volatility[49]. In contrast, markets with relatively low electricity costs, such as the U.S. Midwest or the Gulf states, offer less immediate financial benefit, though renewable integration in such contexts may provide reputational and regulatory advantages, particularly for corporate customers with strong environmental, social, and governance (ESG) commitments[50].

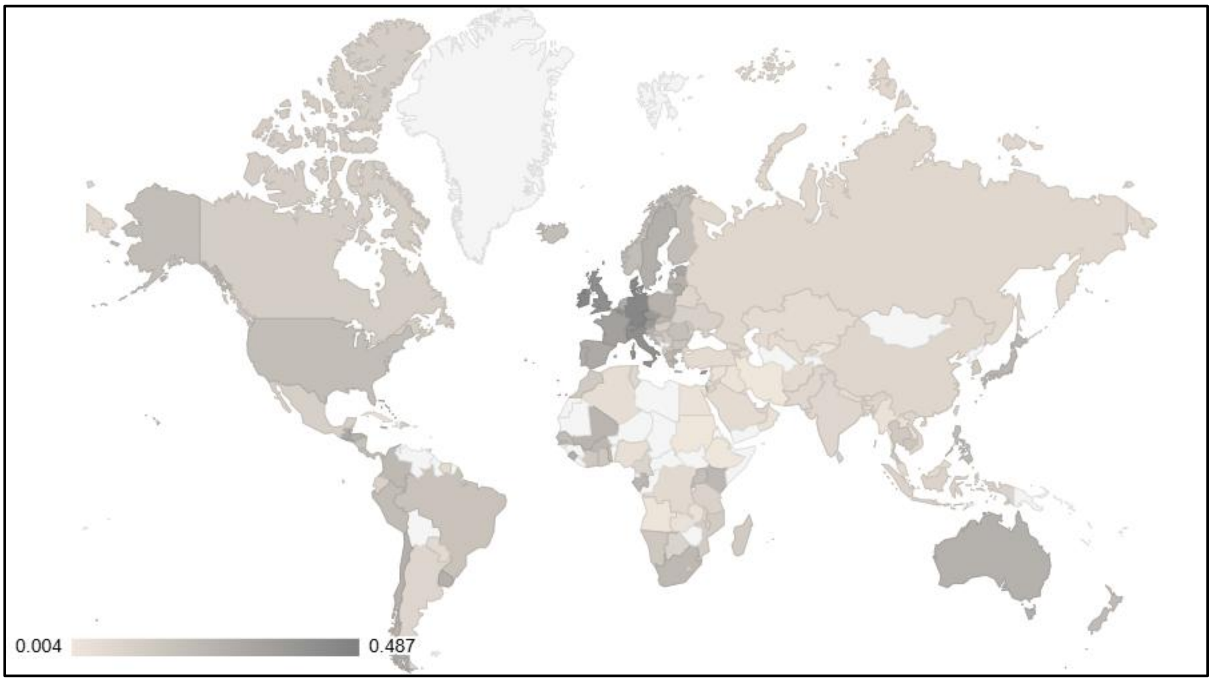

Figure 2 - Domestic electricity rates per country in USD[51].

Policy and regulatory frameworks also play a decisive role in shaping the viability of GPU-solar hybrid projects. Jurisdictions that offer renewable subsidies, carbon pricing mechanisms, or tax incentives for green data centres create more favourable investment conditions. Some governments have explicitly prioritised the alignment of digital infrastructure with renewable energy goals, as seen in Singapore's Green Data Centre Roadmap[52] and the UAE's Energy Strategy 2050[53]. Land availability and permitting also matter while urban environments often constrain large-scale solar development[54], they may support rooftop or community solar schemes, whereas rural or desert regions allow for expansive ground-mounted arrays.

Finally, connectivity and latency considerations cannot be overlooked in the context of GPU leasing models. Clients typically require low-latency access to GPU clusters, which makes locations with robust international fibre connections and strong network infrastructure (such as London, Frankfurt, Singapore, or Dubai) particularly attractive[55]. Remote regions with abundant renewable energy, such as Iceland or Quebec, can deliver exceptionally low-carbon GPU services, but their geographic distance from key markets can be a disadvantage for latency-sensitive workloads[56].

Taken together, these factors suggest that the optimal siting of GPU-solar hybrid projects involves a balance of high solar potential, manageable climate-related energy overheads, stable and supportive electricity markets, favourable regulatory environments, and strong network connectivity. No single location meets all these criteria perfectly, which means that project developers must align technological configurations (such as the sizing of PV arrays, storage systems, and cooling technologies) with the specific geographical and market conditions of each site.

4. GPU Leasing Rates and Market Dynamics

The cost of leasing high-performance graphics processing units (GPUs) for artificial intelligence (AI) workloads remains highly variable across providers and regions, reflecting both the immaturity of the market and persistent supply-demand imbalances. Unlike conventional cloud compute services, GPU leasing lacks standardisation, with prices strongly influenced by hardware specifications, contractual arrangements, and the availability of infrastructure.

Recent market data illustrate this heterogeneity. For example, Genesis Cloud offers NVIDIA H100 HGX instances at approximately US$2.19 per hour on an on-demand basis, but prices fall to US$1.60 per hour when users commit to long-term reservations of twelve months or more[57]. Comparable on-demand rates are reported by Hyperstack, which lists H100 SXM GPUs at around US$2.40 per hour[58]. In decentralised marketplaces, prices can be lower still: Akash Supercloud lists H100 units from US$1.46 per hour and A100 units from US$0.78 per hour[59].

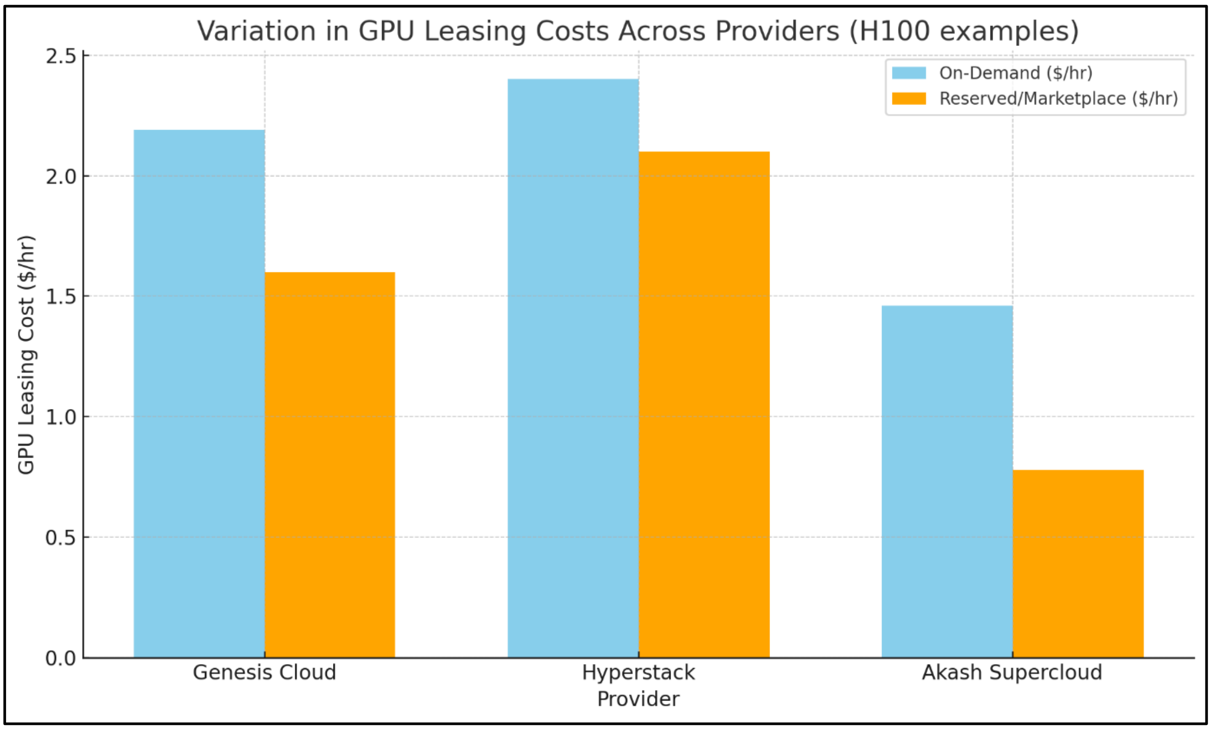

Figure 3 - Variation in GPU leasing costs across providers.

Three factors appear particularly significant in shaping effective leasing costs. First, contractual structure is central: on-demand arrangements carry premiums for flexibility, while reserved contracts typically reduce hourly costs by 20–30 per cent[57]. Second, hardware configuration influences pricing, with premium models such as SXM (NVLink/NVSwitch-enabled) units commanding higher rates than PCIe alternatives[58]. Third, geographical and infrastructural context also matters, since underlying electricity costs, cooling requirements, and network quality all contribute to cost structures passed on to end users[60].

Taken together, the literature suggests that GPU leasing rates are both dynamic and context specific. For hybrid GPU-solar projects, this variability has important implications: financial projections must account not only for current leasing rates but also for their sensitivity to global supply cycles, hardware innovation, and regional cost structures.

5. Case Studies

5.1. The Icarus White Paper

The ICARUS initiative[61] represents one of the earliest academic demonstrations of solar-powered GPU computing. The project deployed a containerised computing centre running on a 7.5 kWp photovoltaic array supported by an 8 kWh battery bank. The facility hosted clusters of NVIDIA Jetson Tegra K1 GPUs, designed for low-power, high-throughput applications. While modest in capacity compared to commercial data centres, ICARUS illustrates the technical feasibility of off-grid GPU workloads and provides valuable data on the relationship between compute load and renewable energy availability.

5.2. YTL Green Data Centre Park, Malaysia

The YTL Green Data Centre Park in Johor, Malaysia,[62] provides an example of renewable integration at hyperscale. The facility, developed in partnership with NVIDIA, combines on-site solar generation with conventional grid supply to support advanced AI computing workloads. Situated in a region with high solar irradiance and growing digital demand, the project highlights how large-scale data centres can be aligned with national energy transition objectives while meeting international client requirements for low-carbon digital services.

5.3. Redwood Materials' GPU and Battery Integration

Redwood Materials[63], a U.S.-based company, has pioneered the integration of GPU clusters with second-life energy storage systems[64]. Its facility runs approximately 2,000 GPUs supported by a 63 MWh battery installation composed of repurposed electric vehicle cells, complemented by on-site solar generation. This approach demonstrates how renewable energy and large-scale storage can be combined to ensure resilience for energy-intensive AI computing. Importantly, the project illustrates a circular economy model, using recycled batteries to reduce both cost and embodied carbon.

Figure 4 - Redwood Material's GPU site[65].

5.4. Intelligent Energy Governance for Solar Data Centres

Recent academic work has explored the role of advanced optimisation techniques in balancing renewable energy supply and compute demand. The study Toward Intelligent Energy Governance in Solar-Powered Data Centers[66] models how predictive algorithms and demand scheduling can reduce operational risk in GPU-intensive facilities reliant on solar power. It finds that hybrid configurations integrating solar, storage, and intelligent workload management can maintain uptime levels expected in commercial agreements, even in variable renewable contexts.

6. Methodology

6.1. Goal and Scope Definition

The goal of this analysis is to assess the financial viability of hybrid GPU-solar projects by calculating the internal rate of return (IRR) under different geographic and market conditions. Dubai and Leeds were chosen as representative pilot projects, reflecting contrasting contexts of high solar availability and low electricity prices versus moderate solar resources and higher tariffs.

The scope covers project-level cash flows, including capital expenditure on PV, GPUs, and supporting infrastructure; operating expenditure such as energy, cooling, and maintenance; and revenues generated through GPU leasing. The analysis is limited to project economics over the expected asset lifetime and excludes wider macroeconomic and policy risks. Sensitivity testing is applied to key assumptions, including GPU utilisation, energy pricing, and solar performance, to reflect uncertainty in real-world deployment.

6.2. Leeds

Table 1 - Leeds AI compute and solar parameters.

Project Element	Parameter	Value
Solar	Solar Installation Cost	$131,625
	Solar PV Array Size	150 kW
	Annual Generation	120,900 kWh
	Self-Consumption	41.80%
	SEG Rate	7p/kWh
GPU	Total GPU Cost	$250,000
	Number of GPUs	10
	Individual GPU Power Draw	1.5 kW
	GPU Leasing Rate	$2.50
	Utilisation	80%
	Salvage Rate	50%
	Ancillaries Cost	$25,000
	Setup Cost	$25,000
Financial	Electricity Rate	$0.34/kWh
	Discount Rate	6%
	Energy Inflation	5%
	Leasing Rate Index	5%

The first part completed for this project was a solar design. The site in Leeds is made predominantly of trapezoidal roofs at relatively sharp angles of ~30-40°. This angle range is ideal for solar installations at this latitude, resulting in the maximum generation throughout the year. Most of the panels are east or west facing (90° or -90° azimuth) which is useful for keeping a consistent generation throughout the day. The capacity factor of this current design is 9.2%. This design was completed using PVSyst due to its detailed generation, shading and loss calculations. Half-hourly (HH) electricity consumption data for the site was created based on the 1.5 kW per GPU power draw. Due to this consumption, the proportion of the produced energy consumed by the site is 99.25%. The cashflow from the solar PV can then be calculated by multiplying the self-consumed generation by the electricity rate, and the exported generation by the SEG rate. SEG agreements typically last for ~10 years, with the rate for export likely, but not guaranteed, to increase in the next agreement.

The GPU units also generate a revenue based on the amount that they are leased out for to be used for AI computing. The GPU revenue was calculated though the following calculation:

$$(Hours\ in\ a\ year\ \times Utilisation) \times Leasing\ Rate \times Number\ of\ GPU\ Units$$

This then results in the positive cashflow from the GPU units. However, there are many associated operational costs with running data centres, the main one in this case being the electricity cost. To calculate this, the previously created HH electricity consumption dataset was multiplied by the electricity rate. Additionally, there is also the operation and maintenance (O&M) cost for both the solar and GPU units which is typically around 2% of the overall capital expenditure (CAPEX).

6.3. Dubai

Table 2 - Dubai AI compute and solar parameters.

Project Element	Parameter	Value
Solar	Solar Installation Cost	$652,800
	Solar PV Array Size	800 kW
	Annual Generation	1,508,000 kWh
	Self-Consumption	68.80%
	SEG Rate	$0.12/kWh
GPU	Total GPU Cost	$2,500,000
	Number of GPUs	100
	Individual GPU Power Draw	1.5 kW
	GPU Leasing Rate	$2.50
	Utilisation	80%
	Salvage Rate	50%
	Ancillaries Cost	$500,000
	Setup Cost	$25,000
Financial	Electricity Rate	$0.08/kWh
	Discount Rate	6%
	Energy Inflation	5%
	Leasing Rate Index	5%

The Dubai model follows a very similar approach to the Leeds model, as it is a very similar concept. However, there were differences in how the solar design was approached. The Leeds project is a rooftop installation, whereas the Dubai site is a ground-mount. Ground-mounted systems have the benefit of being able to choose the angle and azimuth of the solar panels. For Dubai, it is optimal to orientate the panels to be south facing at an angle of ~24°. In addition to this, the capacity factor of the system is 21.5% due to the higher irradiance in Dubai compared to the UK.

7. Results and Discussion

7.1. Discussion

In comparing the two projects, an important consideration is the relationship between GPU leasing revenue and energy costs. Both Leeds and Dubai models assume a similar GPU leasing rate ($2.50/hour) and utilisation (80%), which makes GPU operations the dominant driver of positive cashflow in each case. However, the cost structure varies significantly between the two geographies. In Leeds, the higher grid electricity rate ($0.34/kWh) substantially increases operating expenditure, but this also magnifies the financial benefit of on-site solar self-consumption, which offsets nearly all the generated PV electricity. In contrast, the Dubai project benefits from far cheaper electricity ($0.08/kWh), which lowers total operational costs but reduces the relative value of solar integration. As a result, despite Dubai's much larger solar capacity (800 kW vs. 150 kW) and superior irradiance (capacity factor 21.5% vs. 9.2%), the marginal savings from solar are less impactful in financial terms.

Another key factor is system scale. The Dubai project deploys ten times as many GPUs as the Leeds site, which increases gross revenues substantially but also requires a much higher initial capital outlay ($2.5 million for GPUs and $652,800 for solar). When combined with additional costs such as land leasing for the ground-mounted solar array, the capital intensity of the Dubai model places downward pressure on financial yield (IRR). The Leeds project, by contrast, benefits from lower initial costs and the use of existing rooftop space, avoiding land lease expenses and making its cashflow profile more favourable despite smaller absolute revenues.

Finally, consideration should be given to long-term uncertainty. Both models apply assumed escalation rates (5% energy inflation and 5% leasing rate indexation), but the sensitivity of results to these assumptions differs by geography. In Leeds, where electricity represents a higher share of operating costs, future increases in tariffs would enhance the relative value of solar generation and improve IRR further. In Dubai, however, the effect of energy price inflation is muted due to the lower baseline tariff, meaning project yield depends more heavily on GPU utilisation and sustained leasing rates. Both projects are sensitive to changes in the utilisation of the GPUs, with higher utilisation leading to improved yields.

Taken together, these findings suggest that while Dubai offers a technically optimal solar resource and scale advantages, the higher relative electricity cost in Leeds makes solar hybridisation more financially impactful in that context. This highlights the importance of local energy economics, site characteristics, and capital structuring in shaping the financial performance of GPU-solar hybrid projects.

7.2. Limitations

Although the financial modelling provides a structured comparison between the Leeds and Dubai projects, several limitations remain. A central constraint is the reliance on fixed assumptions for GPU utilisation (80%), leasing rate growth (5%), and energy price inflation (5%). These parameters are inherently uncertain, and deviations could materially affect project yields. For example, downward pressure on GPU leasing rates due to market saturation, or shifts in energy markets, could alter the balance of revenues and costs.

In addition, while the models include capital expenditure, energy consumption, cooling requirements, and routine maintenance, they do not fully capture the breadth of operational risks. Elements such as network connectivity charges, cybersecurity costs, or unplanned outages are not explicitly modelled, yet could have meaningful financial implications, particularly in regions with less resilient infrastructure.

Policy and regulatory factors also represent an area of uncertainty. The export tariffs for solar electricity (SEG rates) are modelled as constant, yet these rates are subject to review and renegotiation, which could affect future cashflows. Furthermore, wider policy developments (such as carbon pricing, renewable incentives, or restrictions on data centre energy use) may shift the investment landscape in ways not reflected in this analysis.

Finally, the assessment is limited to project-level financial performance and does not incorporate macroeconomic or geopolitical risks. Currency fluctuations, interest rate movements, and the global trajectory of AI compute demand all introduce uncertainties that lie outside the scope of this study.

8. Conclusions

8.1. Conclusions

This project has explored the integration of solar energy and GPU compute leasing as a hybrid model for sustainable digital infrastructure, drawing on both academic literature and financial modelling applied to case studies in Leeds and Dubai. The literature review highlighted several key drivers for such projects: the rapidly growing demand for AI compute capacity, the high energy intensity of GPU clusters, and the increasing pressure for operators to align digital infrastructure with renewable energy sources. It also underlined the importance of geography, with solar resource availability, grid carbon intensity, cooling requirements, and network connectivity shaping both the technical and financial viability of hybrid deployments.

The methodology combined detailed solar design modelling, half-hourly load simulations, and supplier-verified cost inputs with financial analysis to evaluate internal rates of return (IRR) under different market conditions. By accounting for self-consumption levels, export tariffs, GPU utilisation, and operating costs, the modelling provided a structured comparison of project economics between two distinct geographies.

The results showed that, while Dubai benefits from superior solar irradiance and larger system scale, the relatively low cost of electricity reduces the financial value of solar integration. Conversely, in Leeds the high unit cost of grid electricity makes self-consumed solar generation far more valuable, leading to a higher relative yield despite the smaller system size and lower irradiance. This finding reinforces insights from the literature: the attractiveness of hybrid GPU-solar projects is not determined solely by technical resource potential, but by the intersection of energy prices, site characteristics, and capital structure.

Several broader conclusions can be drawn. First, hybridising GPU compute and solar power is financially viable in both contexts, but the drivers of value differ: in high-cost electricity markets, solar acts primarily as a hedge against operating expenditure, while in low-cost environments it contributes more to sustainability positioning than to financial return. Second, the success of such projects depends heavily on assumptions around GPU demand and utilisation. While this study accounted for realistic operational profiles, the rapid evolution of the AI compute market means that revenues may vary significantly in practice. Finally, the methodology demonstrates the value of combining detailed technical modelling with scenario-based financial analysis, allowing for nuanced comparisons across geographies.

Overall, the project illustrates that GPU-solar hybridisation represents a promising but still nascent model of sustainable infrastructure. Its success will depend not only on technology costs and solar yields but also on energy market conditions, regulatory frameworks, and the trajectory of demand for leased compute. As the sector matures, future work should expand on this foundation by testing alternative financing structures, incorporating lifecycle sustainability assessments, and exploring the scalability of the model across a wider range of global markets.

8.2. Suggestions for Further Research

Building on the findings of this study, EcoYield intends to pursue several strands of further research. A priority will be to examine GPU leasing markets in greater depth, with particular attention to the impacts of hardware obsolescence and the emergence of alternative accelerators such as TPUs. This will allow us to refine long-term revenue projections and reduce uncertainty around utilisation assumptions.

We also plan to investigate alternative financing structures, including power purchase agreements, green bonds, and joint-venture models, to assess how these could improve investment returns and mitigate risk. Parallel to this, we aim to expand our modelling to include lifecycle sustainability metrics, quantifying the embodied carbon of GPUs and PV modules and evaluating the role of battery storage in reducing reliance on grid imports.

Finally, we will extend our geographic scope beyond Leeds and Dubai to consider additional regions such as the Nordics, North America, and Southeast Asia. This will enable a more comprehensive assessment of how local energy markets, policy environments, and infrastructure conditions shape the viability of GPU-solar hybrid projects.

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