Energy Transition and Real Assets: The Gulf Infrastructure Opportunity

Why the Gulf, the world capital of hydrocarbons, is becoming a leading destination for transition and real-asset infrastructure capital, and how to invest in it

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June 2026

ABSTRACT

The Gulf, long the world's capital of hydrocarbons, is becoming one of its most active destinations for energy-transition and real-asset infrastructure capital, building solar at some of the lowest costs on earth, investing in green hydrogen, grids, water and clean transport, and doing so with the scale, capital and policy commitment that the transition requires. This paper makes the case for transition and real-asset infrastructure investment in the Gulf and sets out how an international investor should approach it. Drawing on the literature on infrastructure and real-asset returns, on the economics of the energy transition, and on contracted cash flows and policy risk, it advances five propositions concerning the Gulf transition opportunity. Using a stylised, clearly-labelled framework, it maps the opportunity set, the return and risk across segments, the cost-competitiveness of Gulf solar, the sources of capital, the contract structures that make projects financeable, and the linkage between the transition and the digital-infrastructure buildout. The analysis finds that the Gulf offers a large, diverse and well-supported transition opportunity; that contracted, low-risk segments such as solar and grids offer infrastructure-like returns while growth segments such as hydrogen offer higher returns for higher risk; that the quality of the offtake and the strength of policy support are the dominant determinants of return; that the transition and the AI data-centre buildout reinforce each other through the demand for clean power; and that an investor should match its strategy to its risk appetite and the contract and policy support available. The paper provides an opportunity framework, an investment checklist and a glossary, and discusses the limitations and avenues for further research.

JEL Classification: Q42, Q48, G31, L94, O13

Keywords: energy transition, real assets, infrastructure, solar, green hydrogen, contracted cash flows, GCC, sustainable finance

1. INTRODUCTION

It is one of the more striking developments in global infrastructure that the Gulf, the region most identified with hydrocarbons, has become one of the world's most active builders of energy-transition infrastructure. The same sun that made the region's deserts forbidding now makes its solar power among the cheapest on earth; the same capital and ambition that built its hydrocarbon industry are now directed at green hydrogen, grids, water, clean transport and the wider apparatus of a lower-carbon economy. This is partly strategic, a diversification beyond oil and a bid for leadership in the industries of the energy transition, and partly economic, because in a region of exceptional solar resource the transition is increasingly the cheaper path. For an international

investor, the result is a large, diverse and unusually well-supported set of transition and real-asset infrastructure opportunities in a region with the capital, policy commitment and natural endowment to pursue them at scale.

This paper makes the case for transition and real-asset infrastructure investment in the Gulf and sets out how an international investor should approach it. It is written for the infrastructure investor, the real-asset allocator and the institution weighing exposure to the energy transition, who must judge where in the Gulf transition opportunity to invest, at what risk, and on what terms. Its purpose is to map the opportunity, to set out the return and risk across its segments, to identify what determines success, the offtake and the policy support, and to show how an investor should match its strategy to its appetite and to the contracts and support available. The central message is that the Gulf offers a genuine, large and well-supported transition opportunity, that its contracted segments offer infrastructure-like returns while its growth segments offer more for more risk, and that the offtake and policy support, as in the digital-infrastructure cluster, are the dominant determinants of return.

The paper sits alongside the digital-infrastructure cluster, with which the transition is deeply linked: the AI data-centre buildout examined in the companion papers is one of the largest new sources of clean-power demand, and the transition infrastructure examined here is part of what will power it. The two themes reinforce each other, and an investor in one should understand the other, which is why this paper closes the cluster by situating the transition opportunity alongside the digital-infrastructure one and drawing out their linkage. The Gulf is building both the clean power and the computing that will use it, and the capital opportunities in each are connected.

The Gulf context is, for the transition, unusually favourable. The solar resource is among the world's best, making solar power exceptionally cheap; the capital, sovereign and private, is abundant and committed to the transition as a strategic priority; the policy support is strong and stable, with national strategies and net-zero commitments backing the buildout; and the demand for clean power, from industry, desalination, buildings and now data centres, is large and growing. These features make the Gulf a market where transition infrastructure can be built cheaply, funded readily and supported durably, which is a rare combination, and they underpin the case the paper makes.

The paper makes three contributions. First, it maps the Gulf transition opportunity set and the return and risk across its segments. Second, it shows the cost-competitiveness of Gulf solar, the sources of capital, and the contract structures that make projects financeable. Third, it draws out the linkage between the transition and the digital-infrastructure buildout and compares the strategies available to an investor. Throughout, the figures are modelled and clearly labelled; they illustrate the opportunity rather than forecasting outcomes, and they are not forecasts.

It is worth confronting at the outset the apparent paradox that draws sceptics: why would the world's great hydrocarbon producers lead an energy transition that, taken to its conclusion, reduces the demand for their principal export? The answer is precisely why the Gulf transition is credible rather than performative. The region's leaders have concluded that the transition is coming regardless of their preference, that their solar resource gives them a genuine cost advantage in the new energy economy, and that diversifying their economies and capturing leadership in transition industries is the prudent long-term strategy for sovereign wealth that must outlast the oil era. The transition is thus aligned with the Gulf's long-term economic self-interest,

not opposed to it, which is why it is backed by serious capital and stable policy rather than by rhetoric. For the investor, this alignment of the transition with the region's strategic interest is the deepest reason to trust the durability of the policy support and the seriousness of the commitment, and it distinguishes the Gulf transition from those that depend on subsidy against the grain of local economic interest.

The remainder of the paper is structured as follows. Section 2 reviews the literature on infrastructure and real-asset returns, on the economics of the energy transition, and on contracted cash flows and policy risk, and develops five propositions. Section 3 describes the data and the stylised methodology. Section 4 presents and discusses the results, covering the opportunity set, the return and risk across segments, the cost-competitiveness of solar, the capital sources, the contract structures, and the transition-digital linkage. Section 5 reports robustness. Section 6 sets out implementation considerations. Section 7 offers concluding comments, including limitations and directions for further research. A statement of disclosures, the references and appendices follow.

2. LITERATURE REVIEW AND PROPOSITIONS

The analysis draws on three strands: the literature on infrastructure and real-asset returns; the economics of the energy transition; and contracted cash flows and policy risk. This section reviews each and develops the propositions the analysis examines.

The real-asset literature also documents the inflation-hedging property of many infrastructure cash flows, which is relevant to the transition investor in an inflationary environment. Contracts such as PPAs and regulated returns often include escalation linked to inflation, so the real value of the cash flow is preserved as prices rise, which protects the investor against the erosion that fixed-nominal cash flows suffer. For a long-horizon investor concerned about inflation, this property makes contracted transition real assets attractive beyond their headline return, because they preserve purchasing power in a way that nominal bonds do not. The investor should therefore value the inflation linkage in a transition asset's contract as part of its return, and should prefer structures that include it, particularly in an environment where inflation is a concern. This inflation-hedging dimension is one of the features that makes contracted infrastructure attractive to the institutional capital that funds the transition, and it adds to the case for the contracted segments beyond their stability and yield.

2.1 Infrastructure and Real-Asset Returns

A literature on infrastructure and real-asset investment establishes that such assets offer long-duration, often contracted cash flows with a degree of inflation linkage and low correlation to other assets, attractive to long-horizon investors (Weisdorf, 2007; Andonov, Kräussl and Rauh, 2021). The consistent finding is that the return and risk of an infrastructure asset depend heavily on whether its cash flow is contracted or merchant, regulated or market-exposed, with contracted, regulated assets offering lower, bond-like returns and merchant assets higher, more variable ones. For transition infrastructure, this means the return depends on the contract structure as much as the technology, and that an investor can access the theme at different risk levels by choosing contracted or merchant exposure. This underpins the first and second propositions, on the opportunity set and the return-risk spectrum.

The infrastructure-returns literature also clarifies why transition real assets appeal to a particular kind of investor, the long-horizon institution seeking stable, inflation-linked, low-correlation cash

flows. Contracted renewable generation and regulated grids produce exactly this profile: long-duration cash flows, often with some inflation linkage, uncorrelated with equity markets and backed by the structural demand for power. For pension funds, insurers and sovereign funds with long liabilities to match, these characteristics are valuable in themselves, beyond the transition's strategic appeal, which is why such investors have become major providers of transition capital. The implication for the Gulf is that its contracted transition assets can attract this deep pool of long-horizon institutional capital, which both funds the buildout and provides an exit market for developers, and that an investor in Gulf transition infrastructure participates in an asset class with genuine institutional demand. This institutional appeal of contracted transition real assets is part of what makes the opportunity financeable and liquid at the contracted, mature end, and it connects the Gulf opportunity to the global pool of infrastructure capital.

2.2 The Economics of the Energy Transition

A second literature examines the economics of the energy transition, the falling cost of renewable technologies, the role of solar and storage, and the emergence of new segments such as green hydrogen (IRENA, 2023; IEA, 2024). The findings relevant here are that the levelised cost of solar has fallen dramatically and continues to fall, that in high-irradiance regions solar is now the cheapest source of new power, and that newer segments such as green hydrogen are earlier in their cost curves and carry more technology and market risk. The literature establishes that the Gulf's solar resource gives it a structural cost advantage in the cheapest, most mature transition segment, while the growth segments offer higher returns for the higher risk of less-proven economics. This underpins the second and third propositions, on the return-risk spectrum and the cost-competitiveness of solar.

The policy-risk literature also distinguishes between policy support that lowers cost, such as cheap financing or streamlined permitting, and policy support that provides revenue, such as subsidies or feed-in tariffs, because the two carry different risks. Revenue-providing support is the more fragile, because a government can reduce a subsidy it pays more easily than it can reverse a structural cost advantage, so an asset whose returns depend on revenue support bears more policy risk than one supported by lower costs or competitive economics. For the Gulf, the most resilient transition investments are those, above all solar, whose returns rest on a genuine cost advantage and contracted revenue rather than on revenue subsidy, because they are robust to a withdrawal of support. The investor should therefore distinguish, in assessing policy support, between the durable kind that lowers cost or eases delivery and the fragile kind that provides revenue, and should prefer assets whose returns do not depend on the fragile kind. This distinction refines the analysis of policy support and points, once again, to the commercially-competitive solar core as the most resilient part of the opportunity.

2.3 Contracted Cash Flows and Policy Risk

A third strand concerns the role of contracted cash flows, power purchase agreements and regulated returns, and of policy support in determining the financeability and return of transition infrastructure (Yescombe, 2014; Steffen, 2018). The findings are that a long, strong offtake or a stable regulated framework makes a project financeable and lowers its cost of capital, while merchant exposure and policy uncertainty raise the risk and the required return; and that policy support, subsidies, mandates, strategic priority, is a material driver of transition-asset returns and a source of risk where it is unstable. The literature establishes that the offtake and the policy support together determine the return and risk of a transition asset. This underpins the third

proposition, on offtake and policy as the dominant determinants, and informs the fifth, on matching strategy to the support available.

2.4 Synthesis and Propositions

Taken together, these literatures imply that the opportunity spans contracted and merchant, mature and growth segments, that solar is the cheap mature core, and that offtake and policy support determine return and risk. From this the paper develops five propositions:

Proposition 1. The Gulf offers a large, diverse and well-supported transition opportunity set, spanning solar, hydrogen, grids, water and clean transport, backed by capital, policy and a world-class solar resource.

Proposition 2. Return and risk vary across segments: contracted solar and grids offer infrastructure-like returns, while growth segments such as green hydrogen offer higher returns for higher technology and market risk.

Proposition 3. The quality of the offtake and the strength and stability of policy support are the dominant determinants of a transition asset's return and financeability.

Proposition 4. The energy transition and the AI data-centre buildout reinforce each other through the demand for clean power; the two themes are linked, and an investor in one should understand the other.

Proposition 5. An investor should match its strategy, contracted-core, balanced, or growth, to its risk appetite and to the contract and policy support available, rather than reaching for growth-segment returns without the capability or support to bear their risk.

3. DATA AND METHODOLOGY

This study is analytical, using a transparent, stylised framework whose assumptions are stated explicitly rather than estimated from a proprietary dataset, which suits a question about the shape of an emerging opportunity. The figures are modelled and clearly labelled; they illustrate the opportunity an investor can apply to its own strategy, and they are not forecasts.

3.1 The Opportunity Framework

The framework has three components: a mapping of the opportunity set and the return and risk across its segments; a cost-and-capital analysis covering the cost-competitiveness of Gulf solar, the sources of capital, and the contract structures that make projects financeable; and a linkage analysis connecting the transition to the digital-infrastructure buildout. Together these address where, how and on what terms an investor should pursue the Gulf transition opportunity.

3.1a What the Framework Does and Does Not Do

It is important to be clear about the framework's scope. It is a tool for reasoning about the shape of the Gulf transition opportunity, the segments, the return-risk spectrum, the cost of solar, the role of offtake and policy, and the digital linkage, and how an investor should approach it; it is not a project-level model, and it does not value any specific asset or predict any segment's returns. The figures should be read as illustrations of the opportunity, the way segments differ in risk, the way solar has become cheap, the way offtake drives financeability, rather than as numerical predictions. The detailed assessment of a specific transition project, its technology, its offtake, its policy support, requires specialist diligence beyond this framework; what the

framework offers is the structure within which to situate that diligence, so that the investor approaches the opportunity with a clear view of where the return and risk lie.

The framework is deliberately strategic because the transition is a fast-moving field in which specific costs, returns and policies change quickly, while the structural relationships, that solar is the cheap mature core, that growth segments carry more risk, that offtake and policy drive returns, are durable. An investor should take from the framework these durable relationships and populate them with current, project-specific data at the time of its decision, rather than relying on any figure here as a current reading. This is the appropriate use of a strategic framework in a rapidly-evolving field: as a durable way of organising the opportunity, refreshed with live data at the point of action, and it guards against both the staleness of specific figures and the loss of the structural insights that outlast them.

3.2 Assumptions and Their Justification

The stylised inputs, the segment shares, returns and risks, the solar cost trajectory, and the financeability of contract structures, are calibrations informed by the infrastructure and transition literature (IRENA, 2023; Steffen, 2018); they are indicative rather than precise estimates and are recorded in Appendix A. The return, offtake and policy assumptions are treated as the central uncertain inputs and are tested in Section 5. The base-case assumptions are set out in Table 1.

Table 1. Base-Case Assumptions for the Opportunity Framework

Parameter	Assumption
Largest segment	Solar and storage
Contracted solar / grid return	~8-9%
Green hydrogen return	~16% (higher risk)
Gulf solar cost	Among lowest globally; still falling
Dominant return determinant	Offtake quality and policy support
Capital sources	Sovereign, infra equity, green bonds/sukuk, bank, DFI
Transition-digital linkage	Strong, via clean-power demand
Policy support	Strong and stable; a strategic priority

Indicative, forward-looking assumptions used to illustrate the opportunity; not forecasts. See Appendix A.

4. RESULTS AND DISCUSSION

This section presents the framework in the order of the propositions: the opportunity set (Proposition 1); the return and risk across segments and the cost of solar (Propositions 2 and 3); the capital sources and contract structures; the transition-digital linkage (Proposition 4); and the comparison of strategies (Proposition 5).

4.0a Why the Gulf Transition Is Credible

Before mapping the opportunity, it is worth addressing the credibility of a hydrocarbon region leading an energy transition, because an investor's confidence in the whole opportunity depends on it. The Gulf transition is credible for reasons of economics, not only declaration: the region

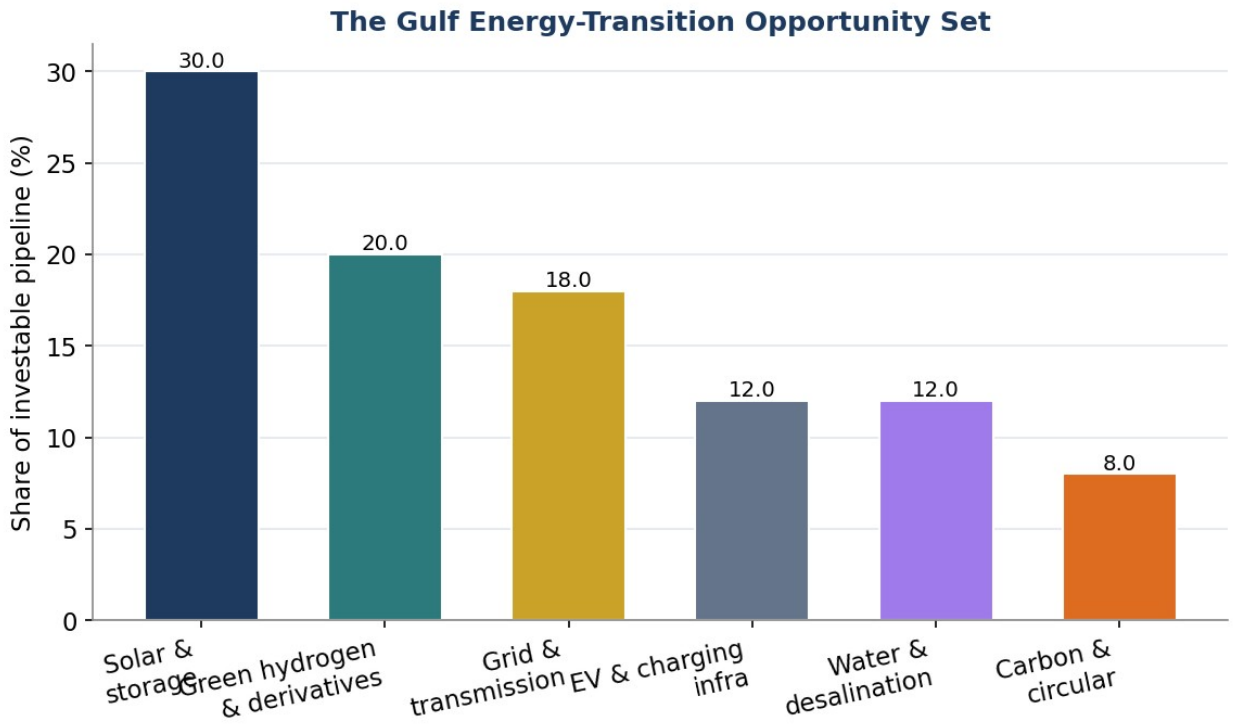
has the world's best solar resource, giving it a genuine cost advantage in renewable power; it has the capital, sovereign and private, to fund the buildout at scale without waiting for external finance; it has the policy stability of states that plan over long horizons and have made the transition a strategic priority; and it has the strategic motive of diversifying economies and sovereign wealth beyond an oil era its leaders know is finite. These are structural reasons rather than rhetoric, and they distinguish the Gulf transition from those that rest on subsidy against the grain of local interest. An investor can therefore treat the Gulf transition as a serious, durable programme backed by economics and strategy, which is the foundation for the confidence the rest of the analysis assumes.

This credibility matters practically because it underpins the stability of the policy support and the seriousness of the demand that make transition investments financeable. A transition driven by genuine economic advantage and long-term strategy is less likely to be reversed than one driven by transient political enthusiasm, so the policy support an investor relies on is more durable, and the demand for clean power, from the region's own industry, desalination, buildings and data centres, is real rather than mandated into existence. The investor's confidence in the offtake and policy support that the analysis identifies as the dominant return determinants therefore rests, ultimately, on the credibility of the transition itself, and the Gulf's economic and strategic foundations for the transition are what make that confidence warranted. Establishing this credibility is the necessary first step in the case, because without it the offtakes and policy support on which the returns depend would themselves be in doubt.

4.1 The Opportunity Set

The opportunity begins with its breadth. Figure 1 maps the Gulf transition opportunity set.

Figure 1. The Gulf Energy-Transition Opportunity Set



Indicative; solar and storage lead, followed by green hydrogen, grids, clean transport, water and the circular economy.

The figure supports Proposition 1. The Gulf transition opportunity spans a broad set of segments: solar and storage, the largest and most mature, where the region's resource gives it a structural

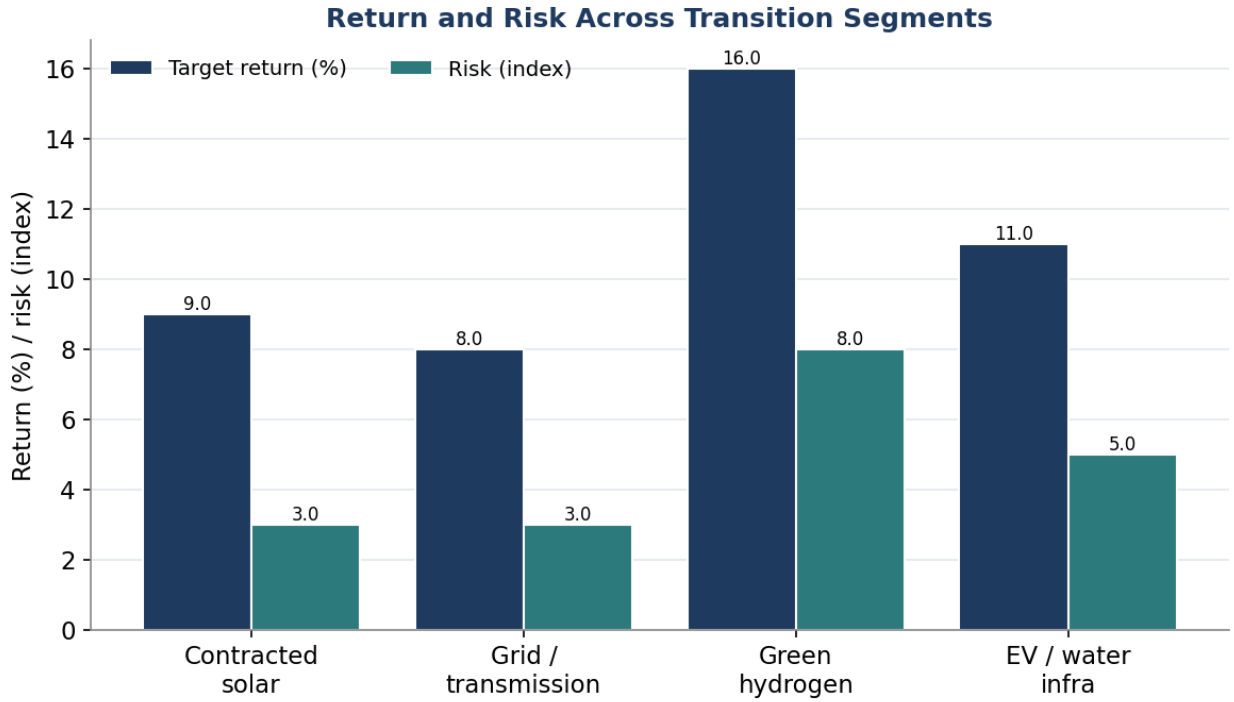
cost advantage; green hydrogen and its derivatives, a growth segment in which the Gulf is investing to become a leading exporter; grids and transmission, the backbone that integrates renewable power; electric-vehicle and charging infrastructure; water and desalination, critical in an arid region and increasingly powered by renewables; and the carbon and circular economy. The breadth matters because it lets an investor build a diversified transition exposure across segments of differing risk and maturity, and because it means the opportunity is a durable, multi-segment market rather than a single trade. The diversity also reflects the seriousness of the Gulf's commitment: the region is building not one piece of the transition but its whole apparatus, which supports a standing capability rather than an opportunistic foray. The opportunity is large, diverse and backed by capital, policy and resource, which is the first part of the case.

A practical implication of the return-risk spectrum is that the transition theme can play different roles in different investors' portfolios. For a long-horizon institution seeking stable income, the contracted solar and grid segments are a core infrastructure holding, valued for their durable cash flows; for an investor seeking growth and able to bear risk, the emerging segments are a higher-risk, higher-return allocation; and for a balanced investor, the theme offers both within one diversified exposure. This means an investor should locate the transition within its broader portfolio according to the role it wants the theme to play, choosing the segments that fit that role, rather than treating the transition as a single allocation. The same theme can be a stable income core or a growth allocation depending on the segments chosen, which is the flexibility the spectrum provides, and the investor should exploit it by selecting the part of the spectrum that serves its portfolio rather than buying the theme undifferentiated. This portfolio-role thinking is part of approaching the transition deliberately rather than as an undifferentiated bet on a fashionable theme.

4.2 Return and Risk Across Segments

The segments differ in return and risk. Figure 2 sets out the spectrum.

Figure 2. Return and Risk Across Transition Segments



Indicative; contracted solar and grids offer lower-risk infrastructure returns, hydrogen higher returns for higher risk.

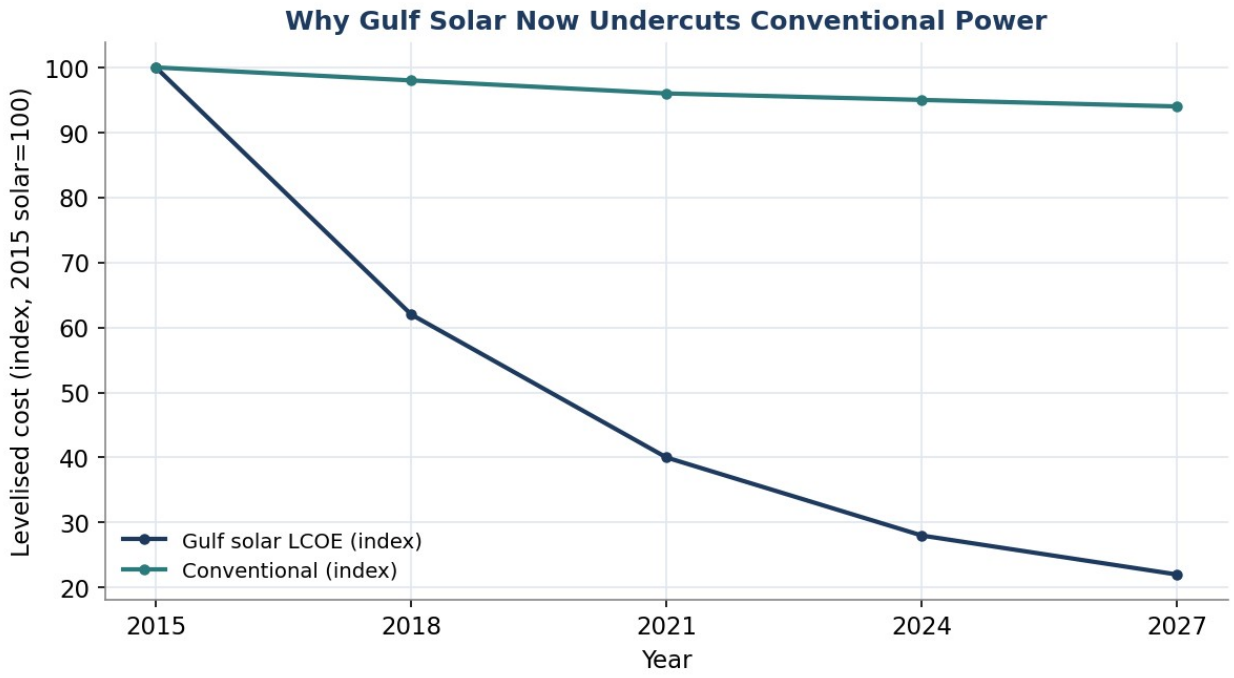
The figure supports Proposition 2. Contracted solar and grid or transmission assets offer infrastructure-like returns at low risk, because their cash flows are contracted or regulated and their technology mature; green hydrogen offers a higher return but at materially higher risk, because its economics are less proven, its markets less developed and its technology still maturing; and electric-vehicle and water infrastructure sit in between. The spectrum lets an investor choose its risk-return position within the transition theme, just as the entry-point and capital-stack choices did in the digital-infrastructure cluster: contracted solar for stable infrastructure income, hydrogen for growth with risk, a blend for a balanced exposure. The practical lesson is that the transition is not a single risk-return proposition but a spectrum, and an investor should choose the segments that match its appetite and capability rather than treating the theme as uniform. An investor seeking stable income should weight the contracted, mature segments; one seeking and able to bear growth risk can add the emerging segments; and the choice should be deliberate, because the segments differ as much in risk as the headline theme unites them.

It is worth noting the role of storage in extending the value of the solar cost advantage, because solar alone is intermittent and storage is what makes it firm. The falling cost of battery storage allows solar generation to be shifted to when it is needed, including the evening and night, converting intermittent solar into a firmer, more valuable supply that can serve a continuous load such as a data centre or a desalination plant. As storage costs fall alongside solar, the combination of cheap solar and affordable storage increasingly provides firm, low-cost clean power, which is what the most valuable offtakes require. The investor should therefore consider solar and storage together rather than solar alone, because the storage is what converts the cheap intermittent resource into the firm supply that commands the strong offtakes and serves the demanding loads. The co-evolution of cheap solar and cheap storage is extending the Gulf’s power-cost advantage from intermittent into firm clean power, which widens the range of demand it can serve and strengthens the whole transition opportunity.

4.3 Why Gulf Solar Undercuts Conventional Power

The mature core of the opportunity rests on solar economics. Figure 3 shows the cost trajectory.

Figure 3. Why Gulf Solar Now Undercuts Conventional Power



Indicative; the levelised cost of Gulf solar has fallen far below conventional power and continues to decline.

The figure supports Proposition 3 in the dimension of cost. The levelised cost of Gulf solar has fallen dramatically over the past decade, far faster than conventional power, and in a region of exceptional irradiance it now sits well below the cost of conventional generation and continues to decline. This cost-competitiveness is the foundation of the mature transition opportunity: solar in the Gulf is not a subsidised, higher-cost alternative but the cheapest source of new power, which means it can be built profitably on commercial terms, with or without subsidy, and can undercut conventional power for the large and growing demand. For the investor, this means the core of the transition opportunity, contracted solar, rests on a genuine cost advantage rather than on policy support alone, which makes it more durable and less exposed to policy reversal than transition investment in higher-cost regions. The Gulf's solar economics are a structural advantage that anchors the opportunity in commercial reality, and they are why the region can build transition infrastructure cheaply enough to attract commercial capital at infrastructure returns.

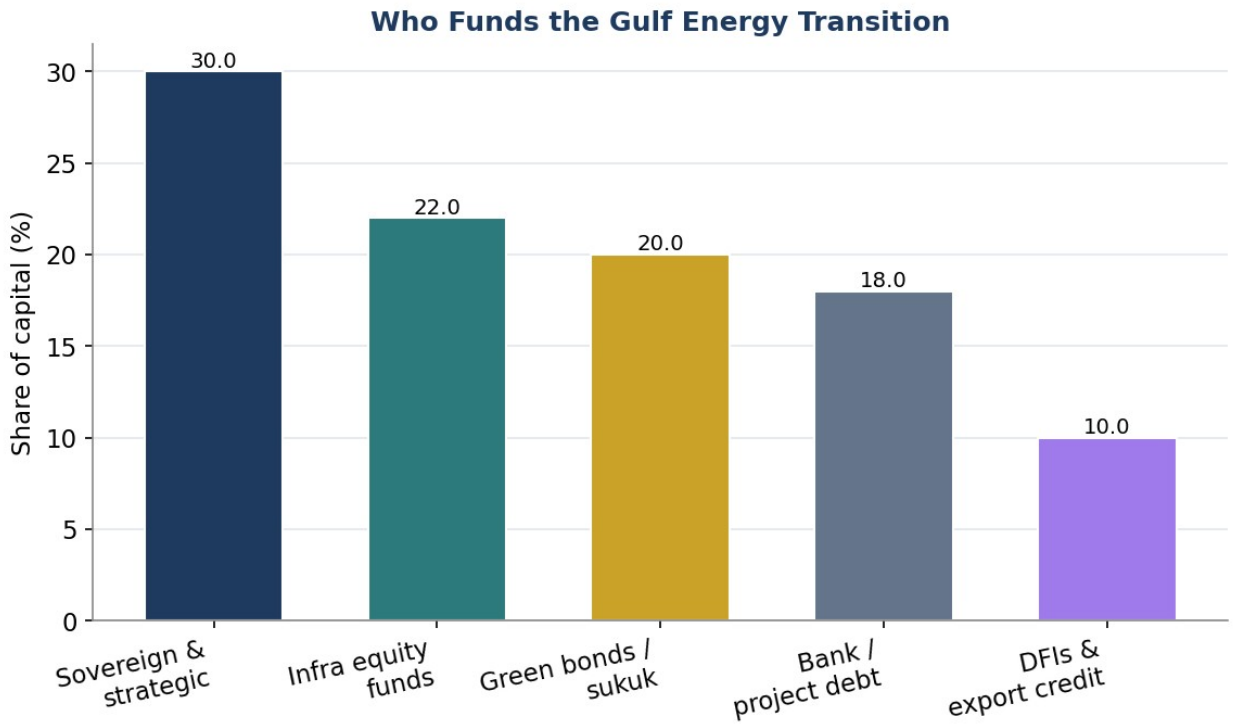
A practical point about the cost-competitiveness of solar is that it changes the nature of the policy dependence over time, in a direction favourable to the investor. In the early years of the transition, renewable investment depended heavily on subsidy to be viable, so its returns were policy-dependent and policy-fragile; as the cost of solar has fallen below conventional power, the dependence has shifted from subsidy for viability to support for speed and scale, and the underlying economics now stand on their own. This means a Gulf solar investment today rests on a commercial cost advantage that does not require subsidy to be profitable, even if policy support accelerates the buildout, which makes it far more resilient to policy change than early transition investment was. The investor benefits from entering the transition at a point where its mature core has crossed into commercial competitiveness, so that the returns rest on economics rather than on policy, while the policy support that remains accelerates rather than underpins the opportunity. This maturation of the solar economics is one of the most important developments for the transition investor, and it is why the analysis treats solar as the resilient core.

A point worth adding about the capital sources is the role of the Gulf's sovereign wealth in anchoring and de-risking the transition for other investors. The region's sovereign funds and government-linked entities are not only large providers of capital but anchor investors whose participation signals commitment and reduces the perceived risk for international co-investors. When a sovereign fund commits to a transition project or programme, it both provides capital and lends its alignment and long horizon, which can make an international investor more comfortable participating alongside it. This anchoring role is a distinctive feature of the Gulf transition, where the alignment of sovereign capital with the policy priority creates opportunities for international investors to co-invest with committed, well-aligned partners. The investor should therefore consider not only accessing the sovereign-linked capital pools but partnering with them, using the sovereign anchor as both a source of capital and a signal of the commitment that de-risks the opportunity. This sovereign anchoring is part of why the Gulf transition is so well-supported and why international capital can participate with confidence.

4.4 Who Funds the Transition

The transition draws on diverse capital. Figure 4 shows the sources.

Figure 4. Who Funds the Gulf Energy Transition



Indicative; sovereign and strategic capital leads, alongside infra equity, green bonds and sukuk, bank debt and DFIs.

The figure shows the depth and diversity of the capital funding the Gulf transition. Sovereign and strategic capital leads, reflecting the transition's status as a national priority; infrastructure equity funds provide commercial equity; green bonds and Islamic green sukuk provide a growing pool of debt aligned to the transition; bank and project debt fund the contracted assets; and development finance institutions and export credit support the larger and earlier-stage projects. The diversity matters for the investor in two ways. It means transition projects can be funded readily, from a deep and varied pool, which eases the assembly of the capital stack; and it means an international investor can participate alongside committed local and sovereign capital, sharing risk and aligning with the policy priority. The availability of green-labelled debt, bonds and

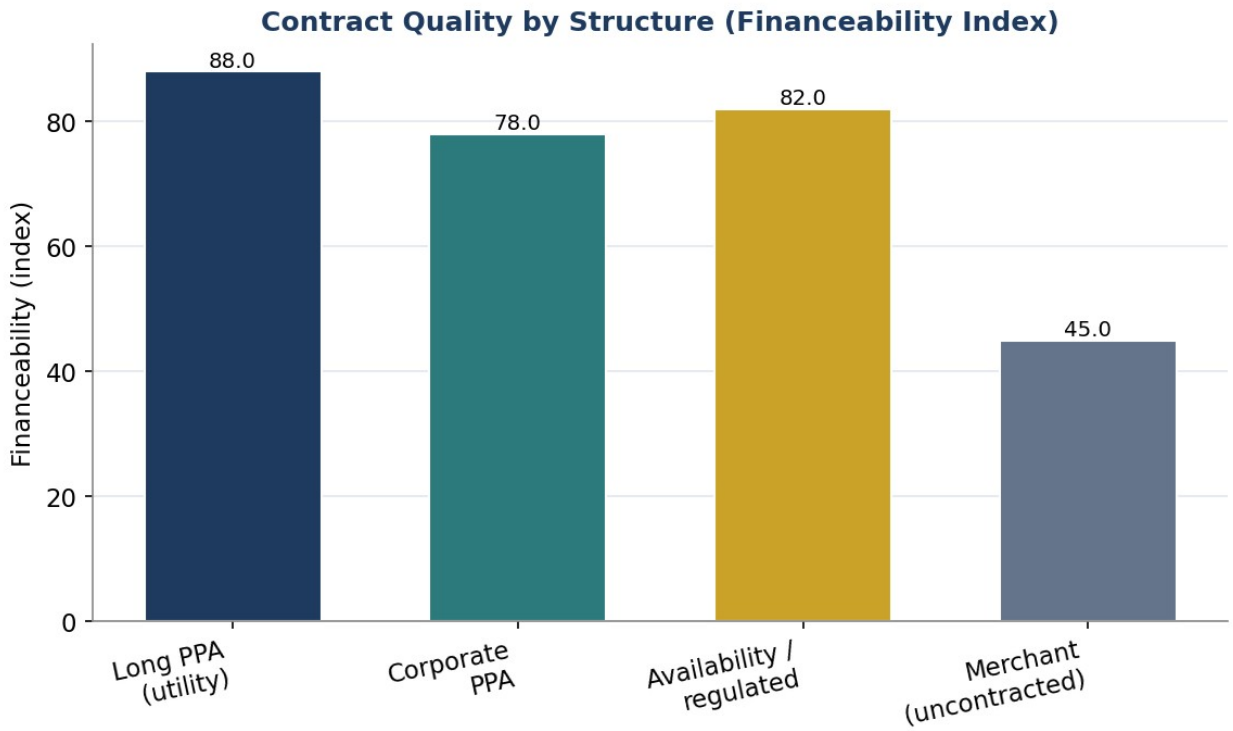
sukuk, is a particular feature, lowering the cost of capital for qualifying projects and connecting the Gulf transition to the global pool of sustainability-focused capital. The depth of funding is part of what makes the Gulf transition opportunity financeable at scale.

A practical consideration in contracting is the creditworthiness of the offtaker, which determines how much protection the contract actually provides. A long PPA is only as good as the entity obliged to pay under it, so a PPA with a strong, creditworthy utility or corporate offtaker provides genuine security, while one with a weak counterparty provides less than its length suggests. In the Gulf, many of the strongest offtakers are sovereign-linked utilities and large corporates whose creditworthiness must be assessed directly, and the investor should weigh the offtaker's credit as carefully as the contract's terms, just as a data-centre lender weighs the tenant covenant. A strong contract with a weak offtaker is a weaker position than it appears, and the investor should secure both a strong contract and a creditworthy counterparty, treating the offtaker's credit as integral to the offtake's value. This assessment of the offtaker mirrors the tenant-covenant analysis of the digital-infrastructure cluster, and it reflects the common principle that a contracted cash flow is worth what the counterparty can and will pay.

4.5 Contract Structures and Financeability

Financeability rests on the contract structure. Figure 5 shows the pattern.

Figure 5. Contract Quality by Structure (Financeability Index)



Indicative; long utility and corporate PPAs and regulated structures are highly financeable; merchant exposure far less.

The figure supports Proposition 3 in the dimension of offtake. A transition asset with a long power purchase agreement from a creditworthy utility, or a corporate PPA from a strong offtaker, or a regulated or availability-based return, is highly financeable, because its cash flow is contracted and secure; a merchant asset, selling power into the market without a contract, is far less financeable and carries the market risk of volatile prices. The contract structure thus determines, as in the digital-infrastructure cluster, the financeability and the cost of capital: a contracted asset supports cheap debt and a low return requirement, a merchant one does not. The

practical guidance is to favour contracted structures, securing a long, strong PPA or a regulated return, which converts a transition project into a financeable, infrastructure-like asset, and to treat merchant exposure as a higher-risk position requiring more equity and a higher return. The offtake, here the PPA or regulated framework, is the master lever on the transition asset's economics, exactly as the tenant lease was for the data centre, and securing it is the foundation of a sound transition investment.

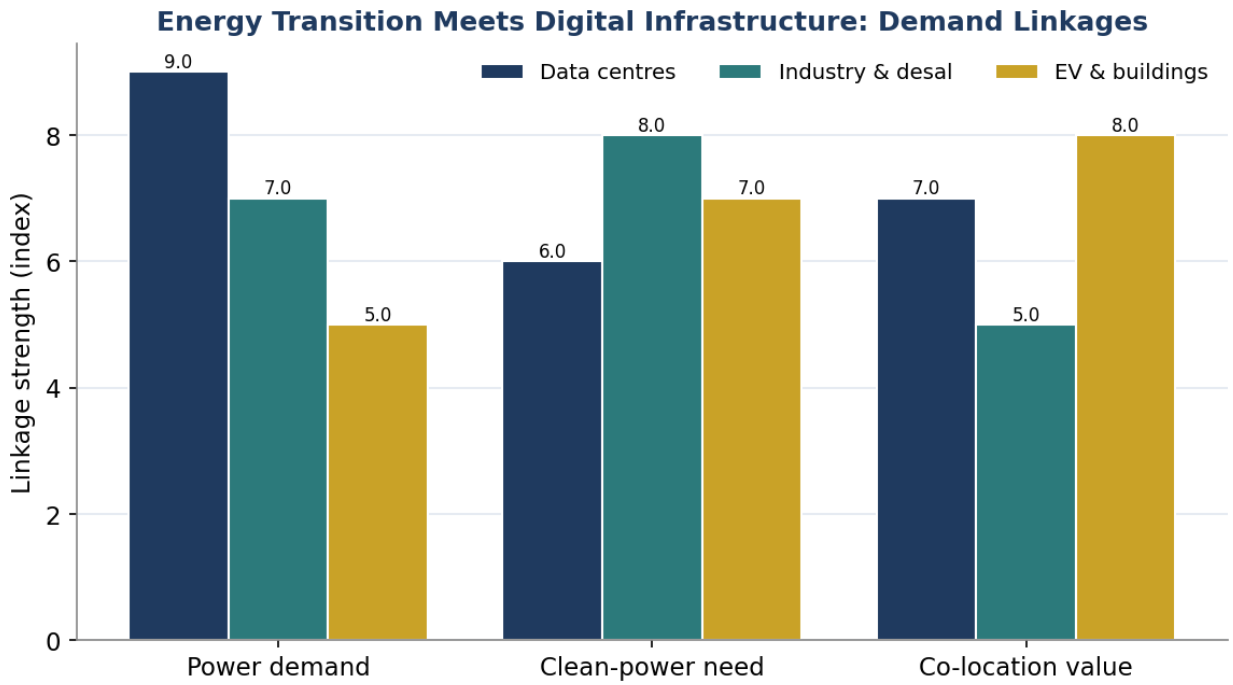
It is worth drawing out a specific structuring opportunity that the transition-digital linkage creates: the co-located or directly-contracted clean-power-and-data-centre project. Because data-centre tenants increasingly require clean power and because the Gulf can supply it cheaply, a project that pairs solar generation with a data-centre load, whether physically co-located or linked by a direct contract, combines the two themes into a single, doubly-contracted asset, the clean power sold to the data centre, the data-centre capacity let to a tenant. Such a structure can be highly attractive, securing the offtake for the power from the data centre and the offtake for the computing from the tenant, and aligning the clean-power supply with the demand that values it most. The investor that understands both themes can identify and structure these combined opportunities, which a single-theme investor would miss, and they are among the most compelling expressions of the transition-digital linkage. This is a concrete reason an investor in either theme should understand the other, and it is one of the practical payoffs of treating the cluster as a connected whole rather than as separate themes.

It is worth situating the linkage within the broader pattern of demand electrification that drives the transition, because data centres are one instance of a wider phenomenon. Across the economy, activities that once used fossil fuels directly, transport, heating, industry, are electrifying, and the resulting electricity demand must be met increasingly by clean generation if the transition is to achieve its aims. Data centres are a particularly large and fast-growing instance of this electrification, but they sit within a general shift that also includes electric transport, electrified industry and the desalination that an arid region requires, all of which create demand for the clean power the transition supplies. For the investor, this means the demand underpinning transition generation is broad and growing across many sources, not dependent on data centres alone, which makes it resilient even if any single source, including AI computing, grows more slowly than expected. The breadth of the electrification demand is part of what makes the transition generation opportunity durable, and it complements the specific data-centre linkage by showing that the demand for clean power rests on a wide and structural shift rather than on a single theme.

4.6 The Transition-Digital Linkage

The transition connects to the digital-infrastructure buildout. Figure 6 shows the linkage.

Figure 6. Energy Transition Meets Digital Infrastructure: Demand Linkages

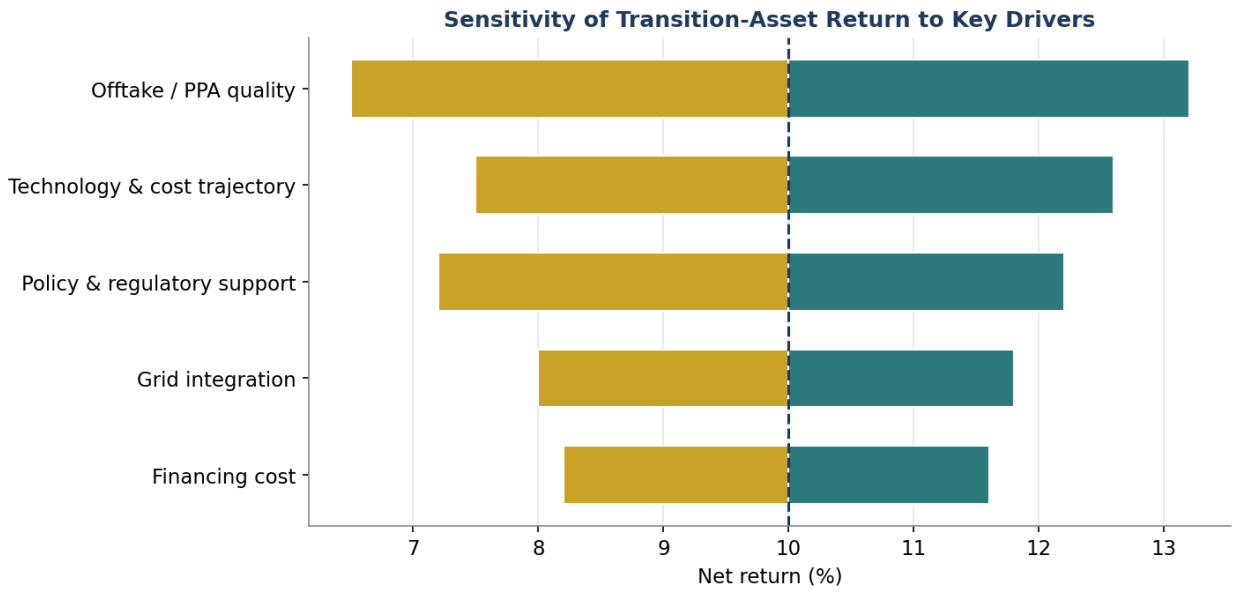


Indicative; data centres, industry, desalination and transport all create demand for the clean power the transition supplies.

The figure supports Proposition 4. The energy transition and the digital-infrastructure buildout are linked through the demand for clean power: data centres, the subject of the companion cluster, are one of the largest and fastest-growing new sources of clean-power demand, and the hyperscale tenants that anchor their offtakes increasingly require renewable power; industry and desalination, large Gulf power consumers, are electrifying and seeking clean supply; and clean transport and buildings add further demand. The transition infrastructure examined in this paper is part of what will meet this demand, and the digital and industrial demand is part of what makes the transition investment viable, so the two themes reinforce each other. For the investor, the linkage has practical consequences: a solar project with a data-centre offtake combines the transition and digital themes in one contracted asset; the clean-power requirement of data-centre tenants creates demand for exactly the renewable generation the transition builds; and an investor in either theme benefits from understanding the other. The two buildouts, clean power and computing, are connected, and the Gulf is building both, which is part of why the transition opportunity is so well-supported on the demand side. This linkage closes the cluster by joining its two halves.

Figure 7 places the sensitivity of the transition-asset return to the key drivers in a single view.

Figure 7. Sensitivity of Transition-Asset Return to Key Drivers

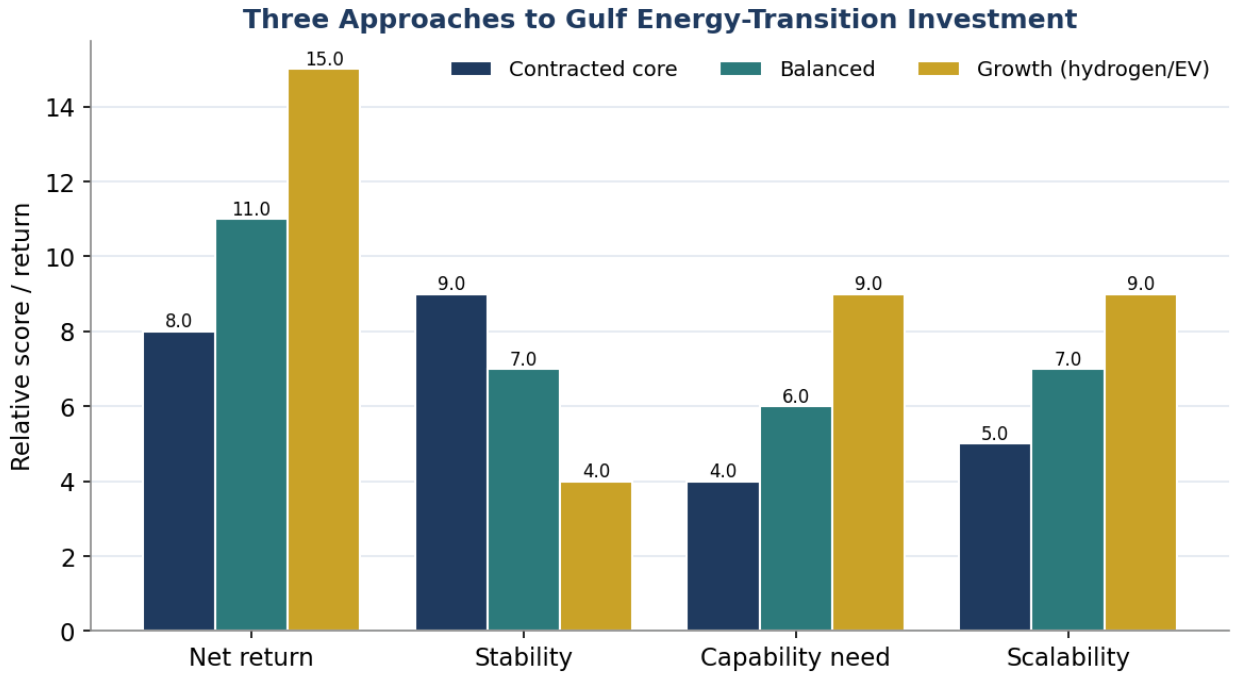


Indicative; offtake quality and policy support dominate, ahead of technology cost, grid integration and financing.

The sensitivity analysis confirms the hierarchy. The quality of the offtake and the strength of policy support have the largest effect on the transition-asset return, ahead of the technology and cost trajectory, the grid integration and the financing cost. This ordering reinforces Proposition 3: the return turns chiefly on whether the asset has a strong contracted cash flow and stable policy support, which together secure its revenue, and only secondarily on the technology and financing. The investor should therefore concentrate on securing a strong offtake and on assessing the stability of the policy support, because these determine the return more than the finer technical or financial details.

Figure 8 compares three transition strategies on a common set of measures.

Figure 8. Three Approaches to Gulf Energy-Transition Investment



Indicative; a balanced strategy trades return against stability, capability and scalability between the contracted and growth extremes.

The comparison supports Proposition 5. A contracted-core strategy, investing in solar and grids with long PPAs or regulated returns, offers stable, infrastructure-like returns with low capability requirements, suiting an investor seeking transition exposure with income and stability. A growth strategy, weighting green hydrogen and clean transport, offers higher returns and scalability but demands more capability and bears more technology, market and policy risk. A balanced strategy, anchored in contracted solar and grids with a measured allocation to growth segments, captures stable income with some growth upside at a manageable risk and capability level. For most investors the balanced or contracted-core strategy is the one the analysis recommends, with the growth strategy reserved for those with the capability and risk appetite to bear the emerging segments' risks. The framework's contribution is to make the trade-offs explicit so the investor chooses deliberately, matching its transition strategy to its appetite, capability and the contract and policy support available.

4.7 A Worked Illustration of a Balanced Transition Portfolio

To make the framework concrete, consider an international infrastructure investor building a Gulf transition exposure. It anchors the portfolio in contracted solar, large-scale projects with long utility or corporate PPAs at the region's low solar cost, which provide stable, infrastructure-like income on a genuine cost advantage. It adds regulated grid and transmission exposure for further stable, contracted return, and a measured allocation to a green-hydrogen or clean-transport project for growth, sized as the higher-risk part of the portfolio. It funds the contracted assets with green-labelled debt where available, partners with a sovereign or local developer for access and alignment, and favours projects whose returns rest on cost advantage and contract rather than on revenue subsidy. The result is a diversified transition portfolio anchored in stable, commercially-competitive contracted income, with measured growth upside, funded efficiently and aligned with the region's strategic priority, which is the balanced strategy the framework recommends for most investors.

The illustration shows the framework guiding the construction of the exposure. The investor did not chase the highest-return growth segments nor confine itself to the lowest-return contracted ones; it built a portfolio matched to its appetite, anchored in the resilient solar core and adding growth in measure. It prioritised the offtake and the cost advantage, assessed the policy support and preferred the durable kind, and accessed the right capital and partners. Another investor, seeking pure stable income, might hold only the contracted segments; one seeking growth, more of the emerging ones; but each should choose deliberately according to its appetite and the support available. The framework does not prescribe a single portfolio; it ensures the portfolio follows from the investor's objectives and the opportunity's structure, which is the deliberate approach the analysis counsels.

4.8 Bringing the Transition Analysis Together

The elements of the framework, the opportunity set, the return-risk spectrum, the cost of solar, the capital sources, the contract structures, and the digital linkage, form a single connected view of the Gulf transition opportunity. The opportunity set establishes the breadth; the spectrum and the cost of solar establish where the return and risk lie; the capital and contract analyses establish how projects are funded and made financeable; and the digital linkage establishes the demand that supports the whole. An investor that attends to one and neglects the others sees only part of

the opportunity: the breadth without the risk differences, or the returns without the contract and policy that secure them, or the supply without the demand that the digital buildout provides. The value of the connected view is that it lets the investor approach the transition as a structured opportunity with a clear map of its segments, risks, financing and demand, rather than as a fashionable theme to be bought undifferentiated. This integrated view is the contribution of the framework, and it closes the digital-infrastructure cluster by joining the clean-power supply to the computing demand that the earlier papers examined.

5. ROBUSTNESS AND SCENARIO ANALYSIS

Because the framework is stylised, its value lies in whether its conclusions hold under different assumptions. This section varies the central inputs.

5.0a Reading the Scenarios as a Set

The scenarios that follow, weaker policy support, slower growth segments, and a merchant position, stress different parts of the transition opportunity, but they share a common antidote worth stating before they are taken in turn: a contracted, commercially-competitive core. An asset anchored in contracted solar at the Gulf's low cost, with a long PPA, is resilient to weaker policy because its economics stand alone, to slower growth segments because it is not one of them, and to merchant price risk because its revenue is contracted. The growth segments and merchant positions bear the risks the scenarios stress, while the contracted core is protected across all three. The unifying lesson is that the resilience of the transition exposure comes from anchoring it in the contracted, commercially-competitive segments and treating the growth and merchant positions as the higher-risk additions they are. An investor whose exposure is anchored this way is robust across the scenarios; one whose exposure is concentrated in the growth or merchant positions is exposed in all of them, which is why the analysis favours the contracted-core or balanced strategy over the growth-heavy one for most investors.

5.1 Weaker Policy Support

If policy support for the transition weakens, through reduced subsidies, slower mandates, or shifting priorities, the returns of policy-dependent segments fall and their risk rises. The conclusion is conditioned rather than overturned: the segments resting on a genuine cost advantage, above all Gulf solar, are the most resilient to policy change, because they are competitive on commercial terms and do not depend on subsidy, while the growth segments that rely more on policy support are the most exposed. The robustness implication is that an investor wary of policy risk should weight the commercially-competitive, contracted segments, where the return rests on cost and contract rather than on policy, and should treat policy-dependent growth segments as the riskier part of the opportunity. The Gulf's solar cost advantage is the anchor that makes the core of the opportunity robust to policy change.

5.2 Slower Hydrogen and Growth Segments

If the growth segments, green hydrogen above all, develop more slowly than hoped, their returns disappoint and their risk is realised, as is common for early-stage technologies. The conclusion is reinforced: the growth segments offer higher returns precisely because they carry the risk of slower development, and an investor should size its exposure to them accordingly, treating them as the venture-like part of a transition portfolio rather than its core. The robustness analysis underscores the case for anchoring in the contracted, mature segments and adding growth

exposure in measure, so that a disappointment in the growth segments does not impair the whole portfolio. The balanced strategy is robust to a growth-segment disappointment in a way that a growth-heavy strategy is not.

A final scenario worth considering is a favourable one, in which the transition accelerates, the growth segments mature faster than expected, and clean-power demand, including from data centres, exceeds projections. In this case the whole opportunity expands, the growth segments reward their risk, and contracted assets enjoy strong demand for their power. The disposition the analysis counsels even in this favourable case is consistent with its counsel for the adverse ones: capture the upside, but do not retrospectively conclude that the contracted core was too cautious and that the portfolio should have been concentrated in the growth segments. A favourable outcome does not retro-justify a riskier strategy, because the growth segments could equally have disappointed, and the next period may bring the adverse scenario the contracted core protects against. The discipline in good outcomes is to enjoy the expanded opportunity while maintaining the anchoring in the resilient core that would have protected the portfolio had the outcome been adverse, which is the same balanced posture the analysis recommends throughout, applied to the favourable case.

5.4 When to Favour the Contracted Core

A candid analysis should be explicit about when an investor should confine itself to the contracted core and avoid the growth segments altogether. An investor without the capability to assess emerging technology and market risk, without the risk appetite for venture-like outcomes, or with capital that cannot tolerate the variability the growth segments carry, should hold only the contracted solar and grid segments, where the returns rest on mature technology, cost advantage and contracted cash flow. For such an investor, reaching into green hydrogen or other emerging segments in pursuit of their higher returns would be importing risk it cannot manage, just as reaching for greenfield development without development capability would be in the digital cluster. The contracted core offers a sound, infrastructure-like transition exposure that does not require the capability the growth segments demand, and an investor matched only to that core should hold it without apology, accepting the lower return as the price of the stability and the lower capability requirement. Recognising this limit honestly is part of using the framework well: the transition offers something for every investor, but not every segment for every investor, and the match of segment to capability is as important here as the match of entry point to capability was in the digital cluster.

The same discipline cautions against the temptation, strong in a fashionable theme, to chase the most novel and talked-about segments because they are novel and talked-about. The green-hydrogen and frontier transition segments attract attention and capital partly for their narrative appeal, and an investor can be drawn to them by the enthusiasm surrounding them rather than by a sober assessment of their risk-adjusted returns and its own capability to bear them. The disciplined investor resists this pull, allocating to the growth segments only in measure and only where it can genuinely assess and bear their risk, and anchoring its exposure in the less glamorous but more reliable contracted core. The novelty of a segment is not a reason to invest in it, and the maturity of solar is not a reason to neglect it; the disciplined allocation follows the risk-adjusted returns and the investor’s capability, not the narrative, which is the same discipline the whole series has urged across its themes.

5.3 A Merchant or Uncontracted Position

The most exposed position is a merchant transition asset selling power without a contract, whose return depends on volatile market prices. Under a scenario of low power prices, the merchant asset's return falls sharply, while a contracted asset is protected by its PPA. The robustness conclusion is that contracted structures are the defence against price and market risk, and that an investor should favour them, treating merchant exposure as a higher-risk position requiring more equity, a higher return and a tolerance for price volatility. This mirrors the digital-infrastructure cluster's emphasis on offtake: the contracted cash flow is the protection, and the uncontracted position bears the risk the contract would have shed. The analysis's preference for contracted structures is what makes the transition exposure resilient across price scenarios.

6. IMPLEMENTATION CONSIDERATIONS

Translating the framework into practice involves choosing the segment and strategy, securing the offtake, assessing policy support, and accessing the right capital and partners.

A foundational sequencing point, consistent with the cluster, is that the investor should establish the segment, the offtake and the policy support before committing capital, because these determine whether a transition investment is sound. A project without a secured offtake, in a segment whose economics or policy support are uncertain, is not yet a sound investment however attractive the theme, and the investor should resolve these questions, securing the contract, confirming the economics, assessing the policy, before committing rather than after. This sequencing, the substance before the commitment, mirrors the discipline of the other papers in the cluster, the offtake before the financing, the power before the project, and it guards against the enthusiasm that a compelling theme can generate. The transition is a genuine and significant opportunity, but it rewards the investor that approaches it with the same discipline it would apply to any infrastructure investment, securing the contracted cash flow and assessing the support before deploying capital, rather than the investor that commits to the theme and seeks the substance afterward.

6.1 Choosing the Segment and Strategy

The first decision is which segments to invest in and with what strategy, matched to the investor's risk appetite and capability. An investor seeking stable income should anchor in contracted solar and grids; one seeking growth and able to bear its risk can add hydrogen and clean transport; most should adopt a balanced strategy anchored in the contracted, mature segments with measured growth exposure. The decision should be explicit and follow from the investor's objectives, because the segments differ sharply in risk, and an investor that drifts into the growth segments without the capability or appetite for their risk will find the technology and market risk it underestimated. Choosing the segment and strategy deliberately is the foundation of a sound transition exposure.

A practical refinement on securing the offtake is to match the offtaker to the asset's strategic logic, because the strongest offtakes often come from buyers with their own reason to want the specific clean power. A data-centre operator requiring renewable power for its tenants, an industrial user electrifying its processes, or a utility meeting a clean-power mandate each has a strategic reason to contract for clean generation, and an offtake grounded in such a strategic need is both stronger and more durable than one driven only by price. The investor should therefore seek offtakers whose own strategy aligns with the asset, because their commitment is deeper and

their willingness to contract long is greater, which produces the strong, long offtake the analysis prizes. This strategic matching of offtaker to asset is a refinement of the offtake discipline, and it connects again to the digital linkage, since the data-centre operators are among the offtakers with the strongest strategic need for the clean power the transition supplies.

6.2 Securing the Offtake

Because the offtake is the master lever on the return and financeability, the investor should prioritise securing a strong, long PPA or a regulated return for its projects, since that converts a transition project into a financeable, infrastructure-like asset. A solar project with a long utility or corporate PPA, or a grid asset with a regulated return, is financeable at a low cost of capital; a merchant project is not. The investor should therefore pursue the contracted structure as the foundation of the investment, and should treat the offtake, here the PPA or regulated framework, with the same priority the digital-infrastructure cluster gave the tenant lease. Securing the offtake is the structuring decision that most determines the return.

A further dimension of policy assessment is the regulatory and permitting environment, which affects the deliverability of a project as much as its returns. A supportive permitting regime, clear rules for grid connection, and stable regulation of power markets allow a project to be built and operated efficiently, while a slow or uncertain regulatory environment can delay and impair it regardless of the headline policy support. The investor should therefore assess not only the high-level policy commitment but the practical regulatory and permitting environment for its specific segment and jurisdiction, because the deliverability of the project depends on it. The Gulf's regulatory environments for the transition are generally supportive and improving, reflecting the strategic priority, but they vary across jurisdictions and segments, and the investor should assess the specific environment its project faces rather than assuming the high-level commitment translates uniformly into smooth delivery. This practical regulatory assessment complements the high-level policy assessment, and together they determine both the returns and the deliverability of a transition investment.

6.3 Assessing Policy Support

Because policy support is a dominant determinant and a source of risk, the investor should assess its strength and stability for each segment and jurisdiction, favouring segments and places where the support is strong, stable and backed by genuine commitment rather than dependent on shifting subsidy. The Gulf's policy support is strong and stable, backed by national strategies and strategic priority, which is favourable, but the investor should still assess the specific support a project relies on and prefer projects whose returns rest on a genuine cost advantage, above all solar, rather than on policy alone, so that a policy shift does not undermine the investment. Assessing and, where possible, not over-relying on policy support is part of managing the transition risk.

A further implementation discipline is to align the investment with the recognised standards and taxonomies of sustainable finance, because doing so both lowers the cost of capital and widens the pool of available capital. Green bonds and sukuk, and the institutional capital allocated to sustainability, require that projects meet recognised environmental standards and reporting requirements, and a project structured to meet these standards can access this cheaper, deeper capital, while one that does not is confined to conventional funding. The investor should therefore structure its transition projects to meet the relevant green standards and to provide the reporting

that sustainability-focused capital requires, treating compliance with these standards not as a cost but as a route to cheaper, more abundant capital. This alignment with sustainable-finance standards is part of accessing the capital that funds the transition efficiently, and it connects the Gulf opportunity to the large and growing global pool of capital committed to environmental outcomes, which is one of the distinctive features of financing the transition relative to conventional infrastructure.

6.4 Accessing Capital and Partners

The investor should access the deep and diverse pool of capital funding the Gulf transition, sovereign, infrastructure equity, green bonds and sukuk, bank debt and development finance, matching each to its projects, and should consider partnering with committed local and sovereign capital, which shares risk and aligns with the policy priority. Partnering with experienced local developers and sovereign co-investors gives an international investor access, local capability and alignment, much as in the digital-infrastructure cluster, and the availability of green-labelled debt lowers the cost of capital for qualifying projects. Accessing the right capital and partners is part of assembling a sound transition investment, and the Gulf's depth of committed capital makes it possible.

7. CONCLUDING COMMENTS

The Gulf, the world's capital of hydrocarbons, has become one of its most active destinations for energy-transition and real-asset infrastructure capital, building the cheapest solar on earth and investing across the apparatus of a lower-carbon economy with the scale, capital and commitment the transition requires. This paper has made the case for transition and real-asset investment in the Gulf and set out how an international investor should approach it.

The evidence and analysis support five conclusions. First, the Gulf offers a large, diverse and well-supported transition opportunity. Second, return and risk vary across segments, contracted solar and grids offering infrastructure returns, growth segments such as hydrogen offering more for more risk. Third, the quality of the offtake and the strength of policy support are the dominant determinants of return. Fourth, the transition and the AI data-centre buildout reinforce each other through the demand for clean power. Fifth, the investor should match its strategy to its appetite and to the contract and policy support available.

Before turning to the limitations, it is worth situating this paper as the close of the digital-infrastructure cluster and a bridge to the wider real-asset opportunity. The cluster examined the AI data-centre buildout, its strategy, its underwriting, its bottlenecks and its capital stack, and identified clean power as one of its dominant requirements; this paper examines the energy transition that will supply that power, and shows that the two themes reinforce each other. Together they describe a Gulf that is building both the clean energy and the computing infrastructure of the coming decades, and capital opportunities in each that are linked through the demand for clean power. For an investor, the two themes are best understood together: an investor in data centres should understand the clean-power supply its tenants require, and an investor in the transition should understand the digital and industrial demand that supports it. This paper closes the cluster by making that linkage explicit and by situating the transition opportunity as both significant in itself and connected to the digital buildout the earlier papers examined.

These conclusions are subject to limitations that also mark out the avenues for further work. The framework is stylised and illustrative, and actual segment returns, costs and policy support will

differ; the value is in the structure, not the specific numbers. The analysis treats the Gulf at a regional level, whereas the segments, policy frameworks and resources differ across jurisdictions, which further work could examine. The growth segments, hydrogen above all, are early in their development, and their economics and risks will become clearer over time, which further work should track. And the analysis treats the transition opportunity alongside the digital-infrastructure cluster, with which it is linked; a complete treatment would integrate the two more fully. These are extensions rather than corrections: the central message, that the Gulf offers a genuine, large and well-supported transition opportunity, that its contracted segments offer infrastructure returns while its growth segments offer more for more risk, that offtake and policy support determine the return, and that the transition and the digital buildout reinforce each other, is robust. An international investor that chooses its segment and strategy deliberately, secures the offtake, assesses the policy support and accesses the right capital and partners can invest in the Gulf energy transition at a risk-return profile of its choosing, participating in one of the most significant and well-supported infrastructure opportunities of the era, in a region building both the clean power and the computing that will define the coming decades.

DISCLOSURES

This paper is provided for general information and educational purposes only. It does not constitute investment, financial, legal, tax or other professional advice, nor an offer or solicitation to buy or sell any security or to pursue any investment strategy. The figures and scenarios are stylised, forward-looking illustrations used to convey the opportunity; they are not forecasts, do not represent the past or expected performance of any actual asset or fund, and should not be relied upon as such. Energy-transition investment carries technology, market, policy and construction risks that can result in loss, and growth segments such as green hydrogen are early-stage and higher-risk. The author is an independent researcher; the views are his own and do not represent those of any institution. Readers should obtain professional advice tailored to their circumstances before making any decision.

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APPENDIX A. BASE-CASE ASSUMPTIONS

The table below records the stylised assumptions used in the framework. They are indicative, forward-looking calibrations chosen to illustrate the opportunity, informed by the infrastructure and transition literature; they are not forecasts and not estimates from a proprietary dataset.

Table A1. Full Base-Case Assumptions

Parameter	Base case	Rationale
Largest segment	Solar and storage	Mature, cost-advantaged in the Gulf
Contracted solar / grid return	~8-9%	Infrastructure-like, contracted
Green hydrogen return	~16%	Growth segment, higher risk
Gulf solar cost	Among lowest globally	World-class irradiance
Return determinant	Offtake and policy	Dominant drivers
Capital sources	Sovereign, infra, green debt, bank, DFI	Deep, diverse pool
Transition-digital linkage	Strong	Clean-power demand
Policy support	Strong, stable	Strategic priority

Indicative assumptions; see Section 3.

APPENDIX B. ENERGY-TRANSITION INVESTMENT CHECKLIST

The following checklist distils the framework into the questions an investor should answer when investing in Gulf energy-transition and real-asset infrastructure.

1. Have we chosen our segment and strategy, contracted-core, balanced or growth, to match our risk appetite and capability?Is the project anchored in a commercially-competitive segment, above all solar, rather than dependent on subsidy?Have we secured a strong, long PPA or a regulated return, rather than accepting merchant price exposure?Have we assessed the strength and stability of the policy support the project relies on?Do the returns rest on a genuine cost advantage and contract, not on policy support alone?For growth segments such as hydrogen, have we sized the exposure as the venture-like part of the portfolio?Have we accessed the right capital, sovereign, infra equity, green bonds and sukuk, bank, DFI, for each project?Have we considered partnering with committed local and sovereign capital for access

and alignment?Have we used green-labelled debt where it lowers the cost of capital for qualifying projects?Have we considered the linkage to digital-infrastructure demand, e.g. data-centre offtakes for clean power?Have we stress-tested the investment against weaker policy support, slower growth segments and low power prices?Is our exposure diversified across segments rather than concentrated in one?

APPENDIX C. GLOSSARY OF KEY TERMS

The following glossary defines the principal technical terms used in this paper for readers who may be less familiar with energy-transition and real-asset investment.

Energy transition. The shift from fossil-fuel to lower-carbon and renewable energy, and the infrastructure that enables it.

Real assets. Tangible, often long-duration assets such as infrastructure and property, valued for their cash flows and inflation linkage.

Levelised cost of energy (LCOE). The average cost of energy per unit over the life of a generating asset, used to compare sources.

Solar PV. Photovoltaic solar power, the Gulf's cheapest and most mature transition segment, given its high irradiance.

Storage. Battery or other energy storage that firms intermittent renewable power, improving its value and reliability.

Green hydrogen. Hydrogen produced from renewable power, a growth transition segment earlier in its cost curve and higher in risk.

Power purchase agreement (PPA). A long-term contract to buy power at agreed terms, the offtake that makes a generating asset financeable.

Corporate PPA. A PPA in which a corporate buyer, rather than a utility, contracts to purchase the power.

Merchant. Selling power into the market without a contract, bearing the price risk; a higher-risk position.

Regulated return. A return set by a regulatory framework, as for grids and transmission, providing stable, contracted-like cash flow.

Offtake. The contract, here the PPA or regulated framework, that secures the revenue of a transition asset.

Policy support. Subsidies, mandates and strategic priority that support transition investment; a return driver and a source of risk.

Green bond / sukuk. Debt instruments whose proceeds fund environmentally-beneficial projects, lowering the cost of capital for qualifying assets.

Development finance institution (DFI). A public or multilateral institution that finances development and infrastructure, often early-stage transition projects.

Grid / transmission. The infrastructure that carries and distributes power, integrating renewable generation; a regulated, infrastructure-like segment.

Desalination. The production of fresh water from seawater, energy-intensive and increasingly powered by renewables in the Gulf.

Contracted cash flow. Revenue secured by a contract such as a PPA, which makes an asset financeable and lowers its cost of capital.

Irradiance. The intensity of solar energy at a location; the Gulf's high irradiance underpins its solar cost advantage.

Net zero. A commitment to balance emissions produced with emissions removed, driving transition policy and investment.

Co-location. Siting demand, such as a data centre, alongside clean generation, linking the transition and digital themes.

Real-asset return. The return on a tangible infrastructure asset, depending on whether its cash flow is contracted or merchant.

Transition risk. The risk arising from the shift to a lower-carbon economy, including policy, technology and market risk.