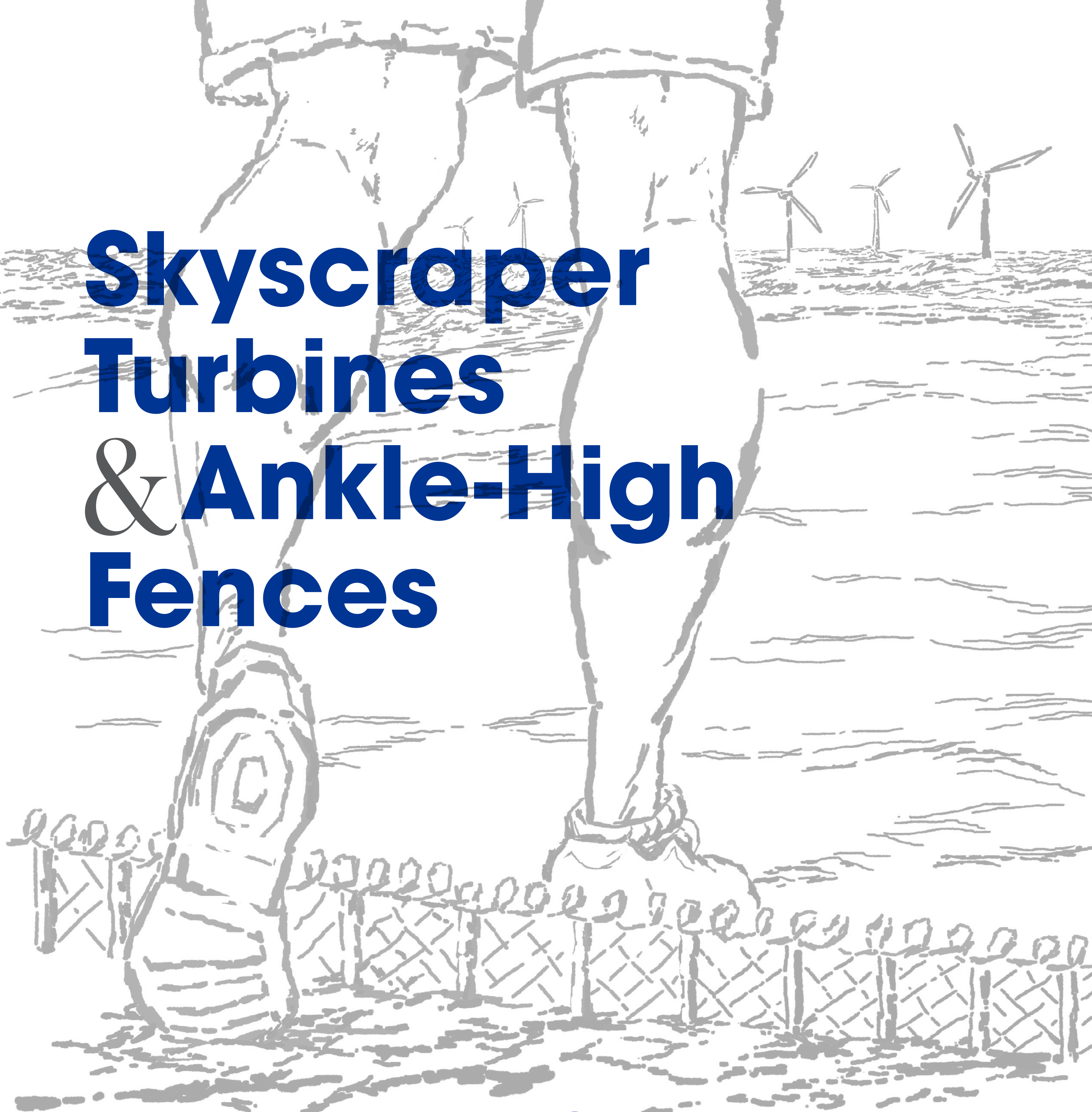

Skyscraper Turbines & Ankle-High Fences

by **James McGinnis**

Managing Director, Head of Renewables

PJ SOLOMON

unrivaled wisdom

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by **James McGinnis,** Managing Director, Head of Renewables, PJ SOLOMON

Change is here...almost.

Civilization is in the early stages of a fundamental transformation in the way we satisfy our growing hunger for energy. It is a breathtaking moment in time for the energy sector, as a resounding global political "consensus" is accelerating, in tipping model fashion, from an unthinking, centuries-old, steadily growing dependence on burning fossil resources to a transformative shift to reliance on energy from the sun and wind.

But "consensus", like good intentions, can only get us so far. Despite $363 billion in global clean energy investment in 2019, in line with the average annual spend since 2014[1], society is not yet close to meeting emissions reductions consistent with the UN's Intergovernmental Panel on Climate Change (IPCC) established targets of 1.5°C. In fact, since 2010, when the United States (the world's second-largest emitter of CO_2 after China) came strikingly close to passing landmark cap-and-trade legislation (the Waxman-Markey bill)[2], annual global emissions of CO_2 have continued to rise, an additional 16%, to an alarming 33.3 gigatons in 2019, just as clean energy investment growth has stalled.[3]

Subsequently, domestic political winds have stymied US leadership on global climate change cooperation, with the Trump Administration's 2017 announced withdrawal from the UN's 2015 Paris Agreement. Under treaty mechanics, this withdrawal would officially take place on November 4, 2020, one day after the next US presidential election.

Why is accelerating this change... So. Damn. Hard?

We Have the Capabilities.

It's hard to know whether an increasingly noisy public debate can help redress decades of political vacillation on climate change from the US and many other nations. In reality, the most forceful drivers of change are not politicians but rather massive, relentless technological and manufacturing breakthroughs in making the energy transition happen. These far-reaching innovations have decimated the costs of installing wind, solar, and accompanying battery storage, while also driving major progress in handling inherent intermittency through smart demand management, resource planning, integrated storage, and better grid design.

As we wrote in December of 2018, there is a larger than ever accumulation of capital (we at PJ SOLOMON have identified over $500 billion in liquid assets ready to be deployed globally) earmarked to pursue these investments, which has driven a significant uptick in activity in renewable power technologies and projects over the last decade. Still, bona fide residual technical uncertainties, a bit of politics, and deeply embedded, highly motivated industrial resistance threaten the path ahead, just as actual investment in the sector sharply lags critical consensus targets developed to slow climate change.

Barriers Remain to Capital Deployment.

Despite record-setting wind and solar capacity installation, persistent areas of friction and systemic challenges remain. What are these barriers – high or low, real or perceived - to investing in renewable power for sophisticated capital providers, and how can they be overcome? As a 35-year veteran M&A specialist and capital provider, I'm particularly focused on identifying those sophisticated investors who are best able to evaluate and accept the risk-reward profile of each type of asset as it travels through its own unique development-construction-operation life-cycle, and matching them with the most promising platforms, those developing game-changing renewable investment opportunities.

No surprise – over the last 35 years, the wind and solar power sectors have matured from a wildly uneconomic experiment to a profitable, competitive dynamo, worthy of massive investment. Keeping pace (with some stumbles), the process of capital formation for these sectors has swerved and adapted, and the financing market continues to make course corrections. It's our view that agile, renewables-savvy investors and financial institutions can actively assist the burgeoning renewable energy sector to adapt, and in the process, step over these barriers.

In short, despite the breathtaking progress that has been made, particularly in the last decade, important challenges remain. As I argue in this paper, some of these challenges are self-imposed constraints or what I like to call "Ankle-High-Fences." The good news: jumping these fences may be much easier than we think.

A Case Study: Offshore Wind Turbines Are Now Colossal Beasts, with Sharply Increased Output at Reduced Costs.

In September 2019, Danish developer Orsted announced that, rather than using one of two leading European manufacturers, Vestas or Siemens Gamesa, for its two US offshore wind projects in NJ and MD, a combined 1,320 MW, it would deploy GE's breakthrough Haliade X wind turbine design. At a rated output capacity per turbine of 12 MW, the Haliade X is the world's newest, largest, and most efficient offshore wind turbine.

To put this once unthinkable turbine size growth spurt into historical context, California's Altamont Pass Wind

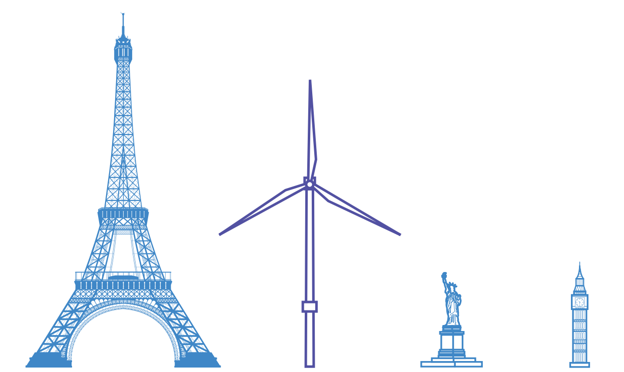
1) Bloomberg New Energy Finance, "Clean Energy Investment Trends, 2019." January 16, 2020

2) The so-called Waxman-Markey legislation (The American Clean Energy and Security Act, H.R. 2454) passed the US House of Representatives on June 9, 2009 and was advanced to the Senate. The legislation would have required high-emitting industries to reduce their CO_2 output to specific targets, ramping down through 2050, with a phase-in of caps between 2012 and 2016. Following the death of Dem. Massachusetts Senator Ted Kennedy in August 2009, and the January 2010 special election of Republican Scott Brown to the vacated seat, which removed the Democrats' 60-seat filibuster-proof majority, the Waxman-Markey bill never moved to the floor of the Senate.

3) International Energy Agency, "Global CO^2 Emissions in 2019", February 11, 2020.

Farm, once the largest in the world, began spinning its blades in 1981 with just under 5,000 100kW Kenetech turbines, each of which had just 0.8% of the capacity of this new GE behemoth. The Haliade X, with a 220-meter rotor and a 260-meter hub-height, is 80% as tall as the Eiffel Tower, 2.7 times higher than Big Ben and nearly three times the height of the Statue of Liberty. More important, it captures an exceptionally massive power load vs. older, smaller technologies, and it does so at dramatically lower total cost.

The Haliade X, the 12 MW unit from GE, with a 220-meter rotor and a height of 853 feet, is 80% the height of the Eiffel Tower, 2.7 times higher than Big Ben and almost three times the height of the Statue of Liberty.



Why So Big? Squares and Cubes.

There are two reasons, each recognizable from high school geometry and physics, as to why being bigger is so dramatically better when it comes to wind turbine efficiency:

1. The cost increase of building larger towers, foundations, blades and rotors for modern turbines is basically linear (i.e., a 100 meter turbine blade requires roughly twice the materials and manufacturing cost as a 50 meter blade), with modest adjustments: downward for manufacturing scale economies, and upward to accommodate upgrades in materials for added strength and durability. Said differently, the incremental cost for any larger turbine vs. its smaller counterpart is a function of the height of a tower and the length of a turbine blade. However, this trade-off in cost for the size increase in the turbine's swept area is exceedingly worthwhile. While the increase in the cost of a larger turbine blade is roughly proportionate to its increase in length, the swept area increase of the blade is a function of the square of the length (Swept Area = π x Radius^2). Accordingly, GE can comfortably claim its Haliade X will deliver more than a 45% jump in energy production from the largest existing installed turbine (a 9.5MW Vestas turbine), and best-in-world cost of delivered energy - under exactly the same wind conditions.

2. What about the impact of better wind conditions? Naturally occurring energy for capture which is engaged in harnessing a propelled mass of air at incrementally higher speeds passing over a turbine's swept area has a *cubed* impact on incremental energy output, holding all else equal (think: cubic meters moving at standard air density). Turbines with greater hub-heights, and better placed (say, at sea), reliably access the higher velocity, steadier wind which naturally occurs at greater altitudes, especially over open ocean, unimpeded by topographical features such as mountains or man-made obstacles. Massive turbines, placed where the wind actually blows its hardest, at soaring hub heights over the ocean, optimize this capture.

Taken together, these two factors which favor maximizing blade size and hub height have driven the turbine supply industry race to largest-available technology, constrained largely by the practical limits of installation logistics. For example, the Haliade X's 107-meter-long blade can, from a practical standpoint, only be installed at sea, as over-ground transport on existing roads (imagine standard 90-degree turns or hill-climbing switchbacks) is practically impossible. Remote, on-site assembly in the future may change that, as developers innovate to deploy larger turbines.

Competition Among Turbine Manufacturers Has Become Intense.

As technology in the design, materials, and installation processes for the construction of wind turbines continuously advances, so does the competitive landscape among global turbine manufacturers. [4]

In recent years, a consolidation and reconfiguration of arguably seven major world-class OEM competitors (Siemens-Gamesa, Vestas, GE, Enercon, Senvion, Suzlon, and Goldwind) has occurred. From 2005 to 2015, all of these players were in reasonable to strong financial health and spending very heavily to compete for market share. The more recent ascension within this bracket of just a few experienced, well-financed, aggressive manufacturers is the natural outcome of a brutal, high-stakes competition for large orders. One fallout: as Siemens, Vestas, and GE turbines flourish, Senvion, which in 2019 became insolvent, has defaulted on numerous turbine supply agreements and recently announced it is considering a sale of certain core European service assets (to Siemens).

Today, well-positioned developers see very aggressive turbine price quotes (and similarly aggressive vendor financing) from each of several competing OEMs on multi-billion-dollar orders for wind projects. Made typically two to three years in advance of in-service dates; these proposals are quoted with meaningful manufacturing cost efficiencies anticipated in advance of reality. As most large wind project awards have now gone to multi-round, sealed-bid competitions or even public auction format, the largest developer-customers who seek an equipment price advantage to compete have induced the OEMs to provide them with the forward expected price decline they need to compete and win. These aggressive OEMs accept most of the risk on their own assumptions on lower future manufacturing costs, and in addition, offer attractive vendor financing and even upfront bid "bonding" costs in some instances.

In short, it has been a turbine buyer's market for large developers in the last few years. Even despite consolidation and shallower cost decline curves, we believe sharp continued volume growth globally will extend this aggressive competitive behavior, to the benefit of large developers.

The Net Effect: Dramatically Lower Cost of Wind Energy, and Lots of It.

For most of the last thirty years, wind developers and financiers have lobbied for and secured a critical jump-start economic boost, the "Feed-In Tariff" (FiT): a subsidized price for power that was designed to bridge a temporary gap in power production costs as between renewables and their incumbent, fossil-fuel-fired competitors.

While still hugely lucrative, in most large markets the FiT has basically served its purpose and is no longer necessary. The US Department of Energy reported that the levelized cost of wind energy from newly deployed onshore turbines in the US has declined from approximately \$650/MWh in 1980 to a national average of \$36/MWh in 2018, a decline of nearly 95%.[5] In our recent experience, we are seeing ERCOT (Texas) and SPP (Great Plains) wind hedge pricing more typically *below \$20/MWh in 2020*.

Instead, in markets where a government incentive or subsidy is necessary to smooth the transition to clean energy, it is now most acutely needed for grid improvements and durability, as well as energy storage.

4) This set of trends and the industry's history was best documented in Ben Blackwell's "Wind Power: The Struggle for Control of a New Global Industry," 2nd Edition, 2018
5) in DOE "2018 Wind Technologies Market Report"

Solar Power: Modules Have Seen Breakthrough Efficiencies and Extraordinary Cost Reductions – and are About to Get Even Cheaper.

Just as increases in the size of wind turbines, along with technology-aided cost improvements in materials and manufacturing techniques, the gains in the cost-effectiveness of solar-powered generation have been enormous. These trends have driven down costs and have resulted in a sharp increase in the demand for and deployment of solar. According to Bloomberg New Energy Finance (BNEF), the rate of new solar installations has grown from 8.3GWs in 2009 to an expected 121GWs in 2020, a decade of 31% in compounded annual growth; it has been an explosion in manufacturing capacity, installations, and widespread adaption.[6]

How did this happen? Ten years ago, as a hedge fund investor in the global energy sector, I traveled with my team several times to visit certain Chinese cities (Baoding, Changzhou, Wuxi, Xuzhou, Tianjin) to learn more about the disruptive nature of competition in China for a bigger share of the global solar panel market.

In our visits to a handful of the best-run, most successful, well-financed and high-growth solar power supply chain companies, we learned that unlike any competitive dynamic we had seen, the leadership of each firm was acutely aware of their limited window to gain a foothold in a rapidly growing sector, and saw their firms' economic survival as a full-out sprint to higher volume and lower unit cost. Competitive advantages were derived from the scale benefits and technology improvements in polycrystalline silicone ("poly-Si") manufacturing (the conversion of metallurgical grade silicon into purified poly-Si ingots, which are then sliced into wafers, the predominant input material for PV solar panel manufacturing).

Poly-Si refinement and ingot slicing is a moderately complex, precision process conducted under large scale, high-heat laboratory conditions. With Korean- and European-sourced manufacturing equipment, domestic Chinese poly-Si competitors, the largest of which by far was GCL Poly, found innovative new ways to find gains in the solar conversion output of their wafers, while simultaneously, and dramatically, driving down costs. To wit, in 2008, on the heels of this government-driven growth spurt in PV wafer assembly capacity in China, global spot prices for polysilicon spiked from $260 to $500 per kilogram; this massive price signal drove two responses: a design-led drop in the manufacturing use of poly-Si per watt of capacity, and a surge in (largely GCL's) technological advances and refinement capacity. Five years later, in 2014, with multiple additional new-entrant competitors to GCL, poly-Si dropped to $21/kg. Today, the average spot price year-to-date in 2020 is $7.10/kg.[7]

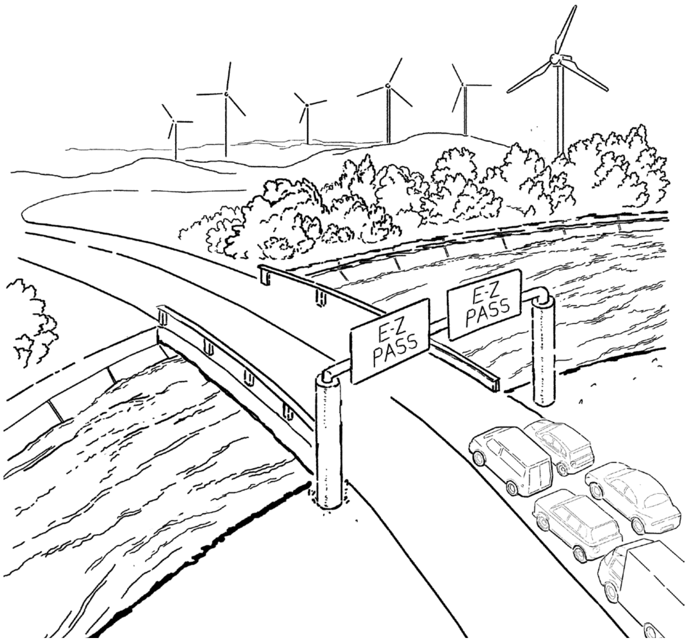
Fast forward to a full decade of continued efficiency gains and cost reductions on polysilicon, wafers, panels, array design, and balance-of-system costs - all over massive volume increases: today's best-located utility-scale solar projects produce the single lowest levelized cost of energy from any source. For example, in November 2019 the Los Angeles Department of Water and Power accepted a 400MW (with accompanying battery storage) winning bid by 8minute Solar Energy in a highly competitive auction with a price of $19.97/MWh – the first utility-scale project to break the 2-cent barrier (per kWh).

Understanding the Barriers to a More Rapid Transition

"Ankle-high fence" (AHF) describes certain widely-adopted human patterns, practices or beliefs which became outmoded or pointless, yet persist out of routine and thus were durable. Colloquially, we would refer to these as being "stuck in our ways," or innocently unreflective. For an individual, being unreflective at times simply doesn't

6) BNEF, "`1Q 2020 Global PV Market Outlook." February 19, 2020.
7) Bernreuter Research, "Ramp-up Delays to Stabilize Polysilicon Price", July 10, 2014, and "PV Insights,- PV Poly Silicon Weekly Spot Price", February 12, 2020.

matter; but if an entire population sticks to an outmoded behavior, the collective impact can be dramatic and lasting.



Ankle-High Fences serve as an impediment to progress.

As a recent example, in 2017, New York City authorities acted to ease traffic congestion by introducing a series of "cashless" tolls at the nine major tolled interborough crossings affecting approximately one million commuters each day. For the next 12 to 18 months following the installation of the tolls, drivers reflexively slowed down in anticipation of the toll-collection traffic they'd always experienced. In other words, out of habit, *drivers drove noticeably more slowly at the crossings simply because they'd always done so*, which meant that much of the congestion persisted, despite the full resolution of the issue. The good news: this specific dimension of NYC driving behavior has steadily evolved, and it's largely resolved by now (...while other issues remain).

The renewable energy sector has experienced a similar set of ankle-high fences. While it's essential for the industry to retain its naturally cautious operational framework that prevents serious anomalies and errors that can impact millions of people, a number of outmoded traffic patterns exist.

Ankle-High Fence #1: Outdated Beliefs.

Just like those NYC drivers slowing for the Phantom Tollbooth, we as professionals in the business, as consumers of energy and as society as a whole, tend to have long-held historical beliefs about renewable projects which are now flat-out wrong (this was described in depth in a prior essay: "A Costly System of Outdated Beliefs"). These outdated beliefs still affect our behavior. In fact, they define our assessment of risk and thus, how we develop, evaluate, structure, finance, and sell projects. As we described, these outdated beliefs include:

1. Renewable energy almost always requires heavy economic subsidies to deliver competitive returns;
2. Due to uncontrollable intermittency, power from wind and solar is (and will be forever) inherently unreliable;
3. Renewable energy is mostly generated in locations physically remote from demand centers and thus require unusually high transmission and grid balancing costs; and
4. Electricity must be consumed as it is produced, because electricity storage, while a promising technology and dropping in cost, is still very costly.

As the prior paper asserts, technological advances, shifting consumption behavior, improved grid stability, and distributed generation growth now mean that none of these beliefs are true all of the time. Most are now irrelevant, simply a relic of the past.

Ankle-High Fence #2: Traditional Non-Recourse Financing Absorbs Too Much Time and Resources.

Non-recourse "project" financing has and will remain a vital tool in sourcing capital for renewable power projects.[8] Developers are driven to efficiently conserve capital and retain liquidity in order to best exploit opportunities in the shortest possible timeframe. Even large entities use partnerships and non-recourse loans to minimize single-asset exposure. Project finance is the perfect solution for these partnerships.

Additionally, every individual land parcel or offshore lease has a unique set of physical characteristics, including exposure to wind and/or solar resources as well as many unique site-specific challenges and opportunities. Thus, every new project seeking standalone financing is implicitly different, which lends itself to the written assurances of third party engineering, environmental, and market experts, as well as a customized financing structure.

How many MBAs and JDs does it take to finance a renewable energy project?

However, while necessary and useful in many cases, traditional project finance is an extraordinarily cumbersome method of raising capital. Particularly when done with large bank or investor groups (often necessary to spread capital risk for big projects), project financings by definition can result in a lowest-common-denominator outcome – on terms, costs and tenor.

Certain unknowns as well as the persistent "outdated beliefs" outlined above have naturally caused the financing of wind and solar projects to be done "off balance sheet", limiting perceived uncontrollable operational and financial risks to the projects' non-recourse creditors. In the off-balance sheet financing context, some widely accepted ground rules have emerged for creating a "financeable" project for non-recourse investors:

1. **Offtake.** Because capital spend is almost entirely front-end loaded, and due to its remote, uncontrollable, intermittent nature, wind and solar power generators must find a customer who will sign a power purchase agreement ("PPA") which covers a significant amount of the power to be generated and the transmission cost until well past the return-of-capital threshold;
2. **Term.** Financing must be arranged with full repayment required materially short of the life of such a contract, which largely requires owner equity cash flows to be postponed to the end of the project's future cash flow horizon;
3. **Cash Reserve.** Such project financing is very tightly structured around a set of cash reserves, operating and financial covenants which have low tolerance for missed deadlines on construction or subpar operating performance, and which can result in large financial penalties and troubled assets which are exceptionally difficult to sell for value; and

8) For an excellent and more comprehensive argument, see: "Why the World Needs Project Finance (and Project Finance Lawyers)" by John Dewar, in Global Legal Group Ltd., Project Finance 2019.

4. **Cash Flow Sweep.** Such project financing also generally requires the amortization of principle with all available project cash flows well into the life of the project, leaving the financing and construction of a portfolio almost without any cash flow benefit to the equity owner for five to seven years after operation begins, which is often a decade after development spend commences.

This durable paradigm of highly structured project finance facilities, while predominant and useful from the historical perspective of untested and subsidy-dependent renewable technologies, has persisted in requiring a relatively inflexible capital-raising framework even for today's much larger, cheaper, and more efficient renewable energy projects. This outdated framework also imposes a slew of near-ritualistic gates on developers, through which a renewable project's sponsors must proceed, only some of which are still useful or correctly applicable.

An example: the 2016 Project Finance International Latin America "Deal of the Year" was the Santiago, Chile-based Aela Energia $435 MM project finance loan which I worked on in my capacity as then-CEO of Mainstream Renewable Capital. This project had a 25-page working group list between two equity sponsors, eight lending banks (in multiple countries), their respective attorneys, and an entourage of civil and environmental engineers, accountants, and market consultants. In the Aela financing, more than one hundred professionals worked, off and on, for more than eighteen months, to structure, conduct due diligence, evaluate, negotiate, confirm, modify, and reconfirm deal terms. All this for a single, 330 MW wind project with a 20-year offtake contract. It took less time and fewer individuals (at far lower wages) to actually build the project than it did to complete the project financing!

Today's global project finance lending market is simply too granular in scale (and often too short in tenor) to handle the estimated $14 trillion needed for the construction of the necessary new fleet of wind farms and solar plants with 30+ years of operating life on the horizon.

The Solution

How can this implicit friction of financing timing lag be alleviated? Given the very large amounts of "dry powder" in the form of bank and investor capital currently targeted for the renewable energy sector (again, in excess of $500 billion), there has been much discussion of a "rotating construction facility" that would be available to large, highly credible, durable ownership/sponsor groups, with a track record of successful delivery of projects. Rather than being tied up for the life of the project, these facilities would be funded during construction and then refinanced after first operation date (or close enough thereto that risk of not reaching full operations is insignificant). The freed-up initial capital could then be redeployed, usually within one year or less, to support a new project's constustion. In essence, this is classic, industrial working capital financing for large scale developers.

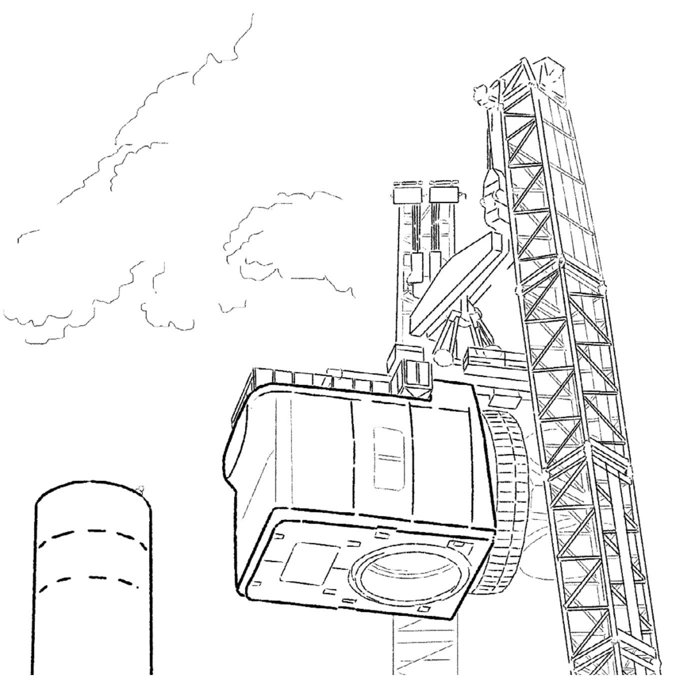
These private facilities, with "soft commitments," are already quietly in effect across a small range of healthy infrastructure funds and other financial sponsors. Widespread adoption is restricted by the fact that essentially every new renewable project is different in cost and risk factors, which makes such a revolving facility very difficult to commit on a blanket-approval basis, much less correctly "price."

The largest developer/owners, which are both top-tier banking customers and exceptionally well understood credits, are also capable of providing liquidity from multiple sources to assure lenders that project completion risks are insignificant. The best-positioned of these large developers have cultivated a club of lenders who are always "on standby" to provide quick turnaround for transactional requirements, even for complex projects, so that the formal "rotating facility" isn't an urgent need. Inevitably, the construction/development revolver product will gain more traction as projects for top-tier developers continue to move at a faster pace, and become more predictable and economically durable.

At its natural extreme, a collective of larger, better capitalized, more agile, expert players has already begun to access low-cost and flexible corporate credit directly, which obviates the need for non-recourse financing or interim financing. Which is directly related to the next point....

Ankle-High Fence #3: Taking the "Right" Risks and Being the Right Size.

In mid-2019, I was asked by an accomplished friend who has spent two decades in energy private equity how he should deploy capital in the wind or solar sectors. He said, "We can't see a way to make money on the renewable energy side of the equation." Returns were too low, he argued, as project risks were eliminated via long-term agreements, and with investors (especially among long-term, risk-averse funds) crowding into "de-risked" operating projects, every asset, it seemed, was "priced for perfection" with bond-like returns unacceptable when compared to what he earns elsewhere in the energy universe.



From "Ludicrous Risk Mode" to "Bountiful Mode".

In contrast, in a very different conversation, a few weeks later, an established European pension investor described to me with pride how his firm had "innovated" the approach of categorizing low-risk, long-term levered equity investments in contracted renewables assets as essentially a fixed income instrument. In other words, he said, "if we think of these investments as bonds, they look cheap."

Needless to say, the latter investor has successfully deployed scads of capital while the former remains "focused," but with a surplus of committed but undeployed capital (not to mention a long list of illiquid energy assets in his portfolio).

Who's right?

The answer, as with many nuanced finance questions is: "It depends."

Like many conventional greenfield infrastructure and energy projects, every renewable energy project moves through a sequence of transformational development phases: from a drawing board concept, to an early financial modeling stage, to landowner outreach, to design and troubleshooting, to offtaker/hedging arrangements, to zoning and environmental approvals, then to near certainty, to binding financial commitment/close, to construction, and then to de-risked, operational status.

Said differently, every project starts on someone's drawing board, at "Ludicrous Risk Mode" (to borrow a Tesla term) and either fails, producing minor tax losses for the owner and, if lucky, occasionally the value of lessons learned; or succeeds, cleansed of risk and uncertainty, transformed to a fuel-free, cash-spewing vehicle with 30+ year range in what we'll coin "Bountiful Mode."

At each stop along the way, as risk is removed, the timeline to Bountiful Mode is reduced, and this compression of time itself boosts present value and lowers the "go-forward" required returns.

Again, much like conventional infra and energy projects, historically the most profitable period for experiencing investment profit is derived from owning the asset (or a portfolio of assets) during its transformation to a de-risked asset, as it jumps down the risk curve and up the value curve. This can result in initially investing at a required risk-adjusted return of 15-20% or more, and ideally selling at a risk-reduced (levered) return of 7-8% or even lower, extracting a sometimes spectacular "development fee" of 4x-6x or more for this death-defying exercise.

But it's not an easy road. The Trip to Bountiful denotes the period extending from:

- the identification of a population center with meaningful, predictable power needs...
- in a country/state with a constructive legal framework and accessible market...
- adjacent to a site with a windy hilltop, offshore ocean bed, or a sunny plateau...
- controlled by a group of willing sellers or lessors...
- which meshes with a rigorous desktop analysis of assumed wind or solar capacity...
- married with economically purchased and transportable energy capture equipment...
- clearly knowing and vetting transmission access rules and costs...
- with a timely process of clearing permitting hurdles and local market requirements...
- onto the advanced development stage (fully contracted, awaiting clearances which are identifiable and likely)...
- and garnering community support...
- to financial close,
- multiple intricate stages of construction, and
- full operation (at which point the project is hopefully already in Bountiful Mode).
- Noting that each project, with plenty of potential critical components, can fail, at any time, for any number of reasons, or for a single reason!

Most renewable energy projects face a labyrinth of risks at outset, and of course only a select few successful projects reach Bountiful Mode at the end of this continuum. Not every fund or institutional investor can assume such a unique and often opaque set of risks; most cannot.

Therein lies the infrastructure fund industry's profit opportunity, and the answer to my friend's conundrum: higher return-seeking investors have tended to migrate toward a portfolio of riskier projects (of the type outlined above), and seek the valuation upside of moving most of these projects through this risk continuum, to the financial close and construction phase.

Upon achievement of that de-risked, Bountiful Mode, the economics of extended ownership of an operating, contracted renewable asset are more efficiently conveyed to a low-risk, long-term, diversified asset holder, such as an insurance company or a pension fund. The transfer of an asset at financial close or "COD", is the "exit" event that crystallizes a risk-taking sponsor's returns; this return, particularly for a relatively short hold period (say, under two years), can be very attractive. This risk continuum is not unique to renewable energy; it is also familiar to conventional power developers, commercial real estate developers, and industrial entrepreneurs, too.

Economically competitive (aka "grid parity") renewable energy is a relatively new reality and is itself an important source of risk mitigation. As cost competitiveness and grid durability continues to improve, customer support expands, regulatory acceptance occurs, and market risk is reduced, there will be less of a need for projects to receive exogenous economic help. Note, however, that regulatory and tax incentives are, of course, extraordinarily valuable and therefore will always be a priority – one need look no further than the hydrocarbon industry to see the myriad of tax incentives and subsidies that abound and endure... a topic for another day.

That drive to a simpler, more economically-driven development model will significantly impact the different types of investors currently most active in and best educated on the nuances of this arena. The investors who are best equipped to handle the complex decision-tree hurdles of tax-driven structured financings in today's renewable energy environment will likely be very different from those best at handling the impending, and different risks of competing head-on-head with fossil-fueled generation assets, and incumbent integrated utilities.

In short: institutional investors collectively have defined a very wide spectrum of appetite for renewable energy risk; it is more important than ever for institutional teams to consider, evaluate, and occasionally refine their unique target range on this spectrum and accordingly, to adapt their firm's unique risk model as markets evolve.

Ankle High Fence #4: Constant Government Intervention Leads to Mixed Signals.

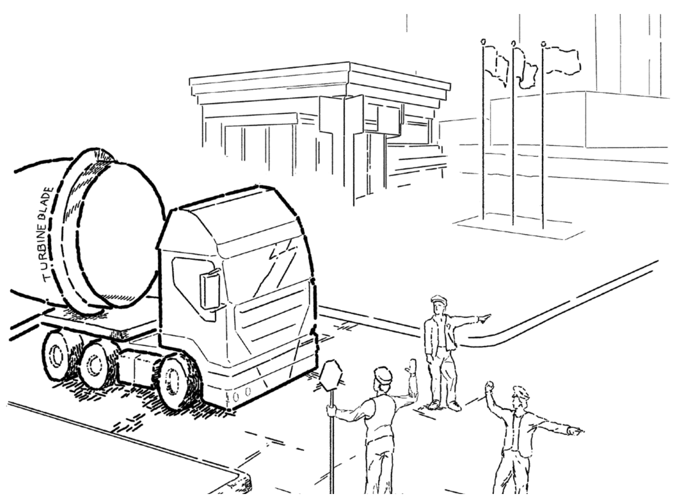
The scatter plot history of renewable energy development policy in the US reveals one single recurring pattern: there is a constant dynamic of complex, overlapping, regionalized, and frenetically shifting incentives and requirements. While each regulatory change may be understandable on its own, the cumulative complexity is, itself, its own Ankle High Fence.

Policy Complexity and Schizophrenia Abound.

Before even considering the labyrinth of policy incentives, developers already evaluate their own complex, multivariate decision trees: which technology is applicable, under which conditions, to be added to which part of the portfolio, and what next step is most time sensitive, and how will each of these decisions affect my funding access and costs, and how will each affect my value at risk? Layer on top of that: which tax strategy is best in light of my return hurdles, and what benefits are at risk, over what time frame, and importantly, how will this change in the near term and beyond?

After many starts and stops, three main US domestic policy incentives are now driving renewable energy towards grid parity: Investment Tax Credits (ITCs), Production Tax Credits (PTCs), and Renewable Portfolio Standards (RPS). While increasingly, corporate purchasing behavior has also increased renewable energy consumption and development initiatives, it is government (federal and state) policy which are the main drivers.

To add to this mix, the US renewable industry's Holy Grail, Federal carbon legislation (this framework would enact laws under which carbon emitters are required to purchase credits in an open market, with proceeds re-



"Which way to the tax credit?"

tained by the U.S. Treasury, as proposed by the 2010 Waxman-Markey bill discussed above) is still just a very-distant possibility. To state the obvious, a carbon tax of some form would shift the burden of societal carbon "costs" to emitters, making clean power suppliers comparatively more cost-effective, and thus eliminating the need for PTCs or ITCs.

In the absence of carbon legislation, over the last three decades, PTCs have instead emerged as the primary policy instrument on a federal basis. Its genesis, the US Energy Policy Act of 1992 which created PTCs of 2.3 cents per kWh for energy produced from wind turbines was designed to "sunset" after ten years. Instead, the PTC has survived, with a magnitude that has varied over time; it has expired and subsequently been renewed four times (with expiries in 1999, 2001, 2003, and 2013). A more permanent-minded "ramp down" bill was passed in 2015, which itself was negotiated in dramatic fashion by environmentalists, legislators, and lobbyists (ironically, bartered in exchange for a 2015 agreement to permit the lifting of the long-standing US, crude oil export ban). The 2015 bill's provisions extended the PTC for five years until 2020.

More recently, in a déjà vu moment from federal budget cycles past, on December 17, 2019, Congressional and White House budget negotiations over the 2020 federal Budget legislation produced some important last minute trades, narrowly avoiding another US federal government shutdown. This 2019 "omnibus" spending bill which ultimately passed had important implications for the U.S. renewable power sector: instead of expiring under the 2015 legislative design, with this last-minute deal, the wind sector's downward-sloping PTC was instead extended and increased; projects which began construction by the end of 2020 qualified for an enhanced 60% of the tax credit. The legislated ramp down also allowed for an ITC for projects which begin construction by the end of 2020 to enjoy 60% of the credit.

A parallel ITC ramp down for the solar industry, namely, from 30% through 2019, to 26% in 2020, 22% in 2021, and 10% (for utility-scale or third party-owned DG only) was left unchanged (for now).

The Tug-of-War Over Incentive Policy Continues.

In February 2020, a group of Senate Democrats urged in a public letter to Senate Finance Committee Chairman Chuck Grassley (R-Iowa) to schedule committee action on energy tax proposals, in an effort to help address climate change. Whether this drives any substantial change in policy remains to be seen. The letter reiterates that

> "despite its crucial policy making role, the Finance Committee did not hold a single hearing on energy tax policy during the 115th Congress and has yet to hold one in the 116th. The sole energy tax-related recommendation of the Committee's temporary policy task forces was ignored in the tax extender legislation passed in December 2019 along with nearly all proposals put forward in members' legislation of this congress."

The PTC and ITC regimes have each been effective in driving development, and have, in turn, created quite large financial/legal ecosystems for the ownership, transfer, and monetization of these credits, since quite often developers themselves have insufficient pre-tax income to offset against sometimes large, immediate tax incentives.

US States Are Taking Over.

While mixed signals and ramp downs will undoubtedly continue from the US federal government, states have emerged as perhaps the most significant drivers of policy. The most common state-based strategy is the use of Renewable Portfolio Standards (RPS) which now are enacted in more than 100 individual programs, across 42 states, carried out by approximately 3,500 utilities and retail electric suppliers. Policy-mandated demand for renewable energy is estimated by BNEF to be 322 TWh, or 9% of total US electricity sales. The RPS tool is growing in importance, too; based on current RPS targets adopted in mandatory state programs, the total will rise by 2030 to 867 TWh, or greater than 14% of power consumption.[9]

Of these 42 states with RPS programs, the most common and effective form of enforcement is the use of Renewable Energy Certificates (RECs) which are required to be purchased by investor-owned utilities (IOUs) and retail electricity providers, and in some states, municipal utilities and electric cooperatives, often at lower standards. There are now 13 states with RPS of 50% or greater, with RPS targets and the number of states both moving higher.

Last Summer's Unexpected BOEM-Shell in US Offshore.

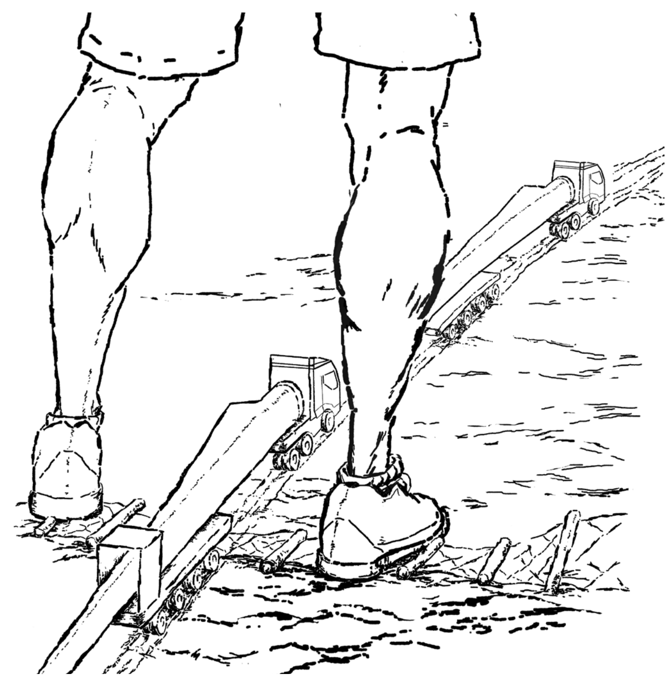
The Federal Bureau of Ocean Energy Management (BOEM), previously named the US Minerals Management Service (MMS), is the federal agency which since 1982 has planned and executed all US offshore oil and gas leases (2,674 leases over 14.2 million acres) and has taken responsibility for the supervision of all offshore leases after they have been issued. Following passage of the US Energy Policy Act of 2005, the MMS (now BOEM) was also given jurisdiction over the research, planning, stakeholder engagement, environmental analysis, and technical review of all leases made available for offshore wind energy.

Nearly fifteen sporadically eventful years later, BOEM was poised in July 2019 to authorize the Construction and Operations Plan (COP) of Vineyard Wind, the first large-scale US offshore project ($2.8 billion, 800 MWs), planned for construction on a BOEM lease in Massachusetts coastal waters awarded to and developed equally by Avangrid Renewables and Copenhagen Infrastructure Partners. Under President Trump's January 2017 Executive Order on Reducing Regulation, and Vineyard Wind's December 2017 COP submission, BOEM officials had until December 2019 to meet the Executive Order's strict two-year deadline for federal environmental reviews and approvals.

It's Not About the Fish, It's About the Fishermen.

And yet, in August 2019, just under two years since their COP submittal, instead of obtaining an expected, momentous approval, Vineyard Wind received public notice that prior to granting Vineyard Wind's approval, BOEM would require a further study, without time limitations, of the "cumulative impacts" of all East Coast offshore projects. It has been reported in subsequent weeks that the primary reason for the delay was from concerns arising from the Department of the Interior's National Marine Fisheries Service, specifically that "the reason behind the [delay] is due to concerns around the project's impact on the local fishing industry. The [NMFS] claims the windfarm's design, as it stands, would encroach on species and commercial fishing operations in the Atlantic waters."[10] This, despite the 84 planned turbines each being nearly a mile apart from one another.

While the angle of the array, or even the spacing of the turbines is not an impossible issue to overcome, it appears increasingly likely (from our sources) that more simply, a series of compensatory payments to commercial fisherman or scallopers may resolve the issue, and



9) BNEF: "US Renewable Portfolio Standard Demand Dataset." June 3, 2019
10) Power Technology: "Vineyard Wind: delayed project reveals bluster in US' offshore wind ambitions." December 4, 2019

point to a Vineyard Wind-commissioned study which found that "estimated the total value of the catch in the area was $471,242 per year."[11]

Which half-million figure, if reasonably discounted (to compensate against reductions of 20%? 30%?), may lend itself to a reasonable commercial agreement amongst the commercial fishermen (and their attorneys) to permit the go-ahead of this $2.8 billion project. The new BOEM timeline: approval decision is expected in December 2020.

Can We Move Past these Ankle High Fences?

Like global energy sourcing, global (and local) energy financing and M&A activity is at a major inflection point. The energy sector is primed to shift from dependence on fossil-burning resources to a better utilization of the sustainable energy of the planet's sun and wind. The capital will follow, in an all-of-the-above mix of traditional and new forms, public and private.

Driving this change is not only a rapidly shifting political and natural climate, but also true technological progress that has caused breathtaking reductions in the costs and resilience of sustainable sources of energy. A significant accumulation of capital and financial professional know-how has followed these breakthroughs and led to a significant uptick in liquidity for a wide variety of renewable energy and energy storage projects.

Still, despite the powerful one-two punch of competitive cost breakthroughs and the surge in renewables-dedicated capital, the potential for barriers and stumbles remains. In our view, developers and investors should recognize a few key foot-faults to avoid:

1. **Thoughtfully timed profit-realizing strategies and accompanying restructuring and M&A tactics are essential** to realizing value as projects mature from high risk, Ludicrous Mode development projects to Bountiful Mode operating projects. *In other words, don't get tripped up by cornering yourself into the wrong risk framework.*
2. As growth accelerates, the increasing scale of projects will encourage the advent of **large global and/or national players, with substantial scale advantages in liquidity, low cost funding, and operating synergies to ensure project certainty.** *Don't get tripped up by thinking too small.*
3. **Small and mid-scale developer entrepreneurs will continue to play a critical role** in developing unique, "one-off" projects, just as the bulk of renewable energy capital deployed will migrate toward size and scale. *Don't forget to identify and engage with the on-the-ground entrepreneurs that create local momentum.*
4. **New, efficient forms of renewable power loan facilities**, with repeatable formulae, more flexible terms, and ever-increasing scale are among the new tools needed to reduce the barriers to the massive growth about to occur. *Don't let financial constraints force bad strategic decisions - there's always a better answer.*
5. **Long-term investors have increasingly sophisticated portfolio construction parameters,** which may signal developer activity towards differentiated risk types, technologies, and/or regions. *Don't avoid project developments with complexity; investors increasingly can confidently evaluate risk.*
6. **Energy development (of all kinds) is still very much a political game.** While dramatically lower renewable costs are a global game-changer, development strategies in this very dynamic environment will be successful only to the extent policymakers permit renewables, with these new lower costs, and associated grid strengthening initiatives, to expand and capture their appropriate market share. *Don't forget that engaging with these gatekeepers at every step remains an essential task.*

11) Commonwealth: Vineyard Wind layout tough issue for regulators" August 12, 2019

About the Author

James McGinnis
Managing Director, Head of Renewables
PJ SOLOMON

James McGinnis joined PJ SOLOMON as a Managing Director in 2018, with client responsibility in the Renewable Energy sector.

Prior to joining PJ SOLOMON, Mr. McGinnis was CEO of Mainstream Renewable Capital, the New York-based financing and investments arm of Mainstream Renewable Power Ltd., a wind and solar company based in Dublin, Ireland with over 8,000 MW's in development, under construction and in operation. He held this position from October 2016 until February 2018. In January 2013, Mr. McGinnis founded, and until, 2016 served as Portfolio Manager of the Halcyon Energy, Power and Infrastructure Capital Fund, L.P. From 2008 to 2012, he was a Managing Director at Harbinger Capital Partners, where he led a team with responsibility for that partnership's public and private energy and power investments and its pan-Asian infrastructure investment portfolio.

From 2005 to 2008, Mr. McGinnis headed the energy private equity investment business of AIG Financial Products Corp. in Wilton, CT, where, among other transactions, he initiated that firm's leading role in the $23 billion leveraged buy-out of Kinder Morgan, Inc. and advised on the creation of, and investment by, AIG-FP in Tenaska Marketing Ventures, Inc.

Before joining AIG-FP, Mr. McGinnis was an investment banker for eighteen years. He was a Managing Director in the investment banking division of Morgan Stanley, where he worked from 1993 to 2005, advising public, private, government and financial sponsor clients on M&A, initial public offerings, privatizations, restructuring and complex capital-raising in the energy and power sectors from New York, Singapore and Australia. From 1989 to 1993, Mr. McGinnis was an investment banker at Goldman, Sachs & Co. in the energy and power group, focused primarily on M&A, restructuring and capital-raising in the US domestic power sector. At the beginning of his career, Mr. McGinnis was an analyst in the M&A Group at PaineWebber, Inc.

Mr. McGinnis serves on the Board of Directors of the Center for Climate and Energy Strategies, which he first joined in 2004 (then the Pew Center on Climate Change), and he has testified before the US Senate Environmental Works Committee on US power sector emissions policy. Mr. McGinnis holds an AB in Government from Harvard College, and a MBA from the Harvard Business School, both with distinction.

About Our Infrastructure, Power & Renewables Group

PJ SOLOMON's Infrastructure, Power & Renewables Group provides private equity, pension and infrastructure funds, corporate and municipal clients in this dynamic space with a full suite of strategic and financial advisory services. We provide innovative and value-added guidance on buy and sell-side mergers and acquisitions, project & leveraged financings, private placements and restructurings by drawing upon our deep industry knowledge, strategic expertise and strong sector relationships.

Based in our New York office, the Group is led by Managing Director Tim Bath, whose more than 18 years of advisory experience includes some of the most high-profile and historic projects across the European and North American infrastructure markets.

The Power Advisory Group is led by Managing Director Jeff Pollard, whose experience in the power sector includes strategic and financial advisory work totalling well in excess of $100 billion. Renewables coverage is led by Managing Director James McGinnis, who has more than 25 years of experience in the sector. Coverage across power & renewables includes conventional generation, hydroelectric facilities, utility scale solar, wind and energy storage.

Tim Bath
Managing Director, Head of Infrastructure

Jeff Pollard
Managing Director, Head of Power

James McGinnis
Managing Director, Head of Renewables

About the Firm

PJ SOLOMON is a leading financial advisory firm with a legacy as one of the first independent investment banks. We advise clients on mergers, acquisitions, divestitures, restructurings, recapitalizations, capital markets solutions and activism defense across a range of sectors.

Our difference is that we offer unmatched industry knowledge in the sectors we cover, providing the most comprehensive strategic solutions tailored to generate long-term shareholder value. Our bankers live and breathe the sectors they advise on globally, providing unparalleled analysis, understanding and access.

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