Accelerating U.S. Clean Energy Deployment Through Investment-Grade Policy

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EXECUTIVE SUMMARY

The global transition toward a zero-carbon future requires vast amounts of clean energy—27,000 gigawatts globally, according to a recent study by the International Energy Agency (IEA). While clean energy resources such as solar, wind, offshore wind, and geothermal have seen dramatic growth this last decade, their deployment rates remain insufficient.

In the United States, for example, meeting emissions goals would require growing wind and solar deployment rates three to five times higher than historical maximums and sustaining this for decades as the energy system electrifies to meet net-zero targets.[i]

Because of significant reductions in the cost of clean energy, economics are no longer the prime barrier to expanding clean energy: Solar, onshore and offshore wind, and battery power now cost the same or even less than fossil fuels.

But significant non-financial barriers to wider deployment remain. Clean energy deployment is rife with uncertainties, most of them unnecessary. These uncertainties are constraining clean energy deployment right when it should be accelerating.

The risk factors for clean energy deployment fall into three main groups: technology or performance risk, project development risk, and market uncertainty risk.

Significant advancements in technology have already alleviated the first risk category. Solar and wind energy are now the cheapest sources of power in the world.

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Project development risks encompass a wide range of challenges faced by developers, including siting issues, community opposition, lengthy approval processes and, arguably most importantly, transmission access. All these obstacles can put a project on hold for years—or even stop it entirely.

Current interconnection queues in the U.S., with wait times exceeding five years, highlight the urgent need for reforms that facilitate the swift and cost-effective entry of clean energy projects into the market. On top of that, it is vital to establish efficient mechanisms for selling power in energy markets designed to support clean energy projects.

Smart public policy can help minimize the risks, and fewer risks mean faster, lower-cost deployment. Ultimately, this will drive down costs for both clean energy developers and consumers, while ensuring the U.S. and other countries reach their greenhouse gas goals.

Summary Policy Recommendations

We recommend policymakers prioritize investment-grade policies to minimize risks in clean energy development. These policies should be diverse and address the federal, state, and local levels of authority.

Start with transmission access: it is imperative for Congress and the Federal Energy Regulatory Commission (FERC) to align in creating reliable and simplified interconnection rules. These rules should significantly reduce wait times in the interconnection queue and accord with clean energy goals. On top of managing transmission access, prioritizing investment in and construction of new transmission lines is essential. Specifically, the location of new lines should be carefully considered to expand interregional transmission and be optimized for new project implementation.

Streamlining siting and permitting processes is another critical step for efficient clean energy development. Siting approval delays can bring projects to a complete halt. To address this, Congress and the Bureau of Land Management (BLM) can pre-zone as much land as feasible and encourage land leasing to clean energy development. Early community engagement and establishment of standardized processes can create a more predictable environment. Clarity, in the form of clear standards and uniform systems, will make a world of a difference for developers.

Lastly, when it comes to selling power, market design greatly affects risk levels for clean energy developers. It is essential that public utilities commissions (PUCs) implement clean energy policies allowing for longer-term cost-recovery schedules of at least 10-15 years. This will substantially reduce the risk developers face.

We urge policymakers to implement a robust portfolio of investment-grade policies, as outlined in this report, to achieve affordable, reliable, clean, and safe energy.

Table of Contents

INTRODUCTION

Renewable energy technologies have high initial costs, but then cost very little to operate, since they do not require fuel.[2] Because these technologies are capital intensive, they are also very sensitive to the cost of capital, meaning the interest rates or return rates demanded by those who lend or pay for renewable energy technology. High interest rates, for example, significantly raise the cost of a wind farm.[i]

Return requirements and interest rates, in turn, are driven by risk. Investors properly demand higher returns when they face higher risks. So, if smart public policy can drive down risk, it can drive down cost. And the difference can be dramatic—cutting costs by close to 50 percent in some cases.

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[i] See Travis Hoium, Greentech Media, February 20, 2017. "Let's say, for example, you have a solar project that has predictable, contracted cash flows of $1 million per year for the next 25 years. If the rate of return investors demand is 7 percent, then the project is worth $11.65 million. But if the rate of return rises just one percentage point to 8 percent, the value of the project falls 8.4 percent to $10.67 million. A rise to 9 percent reduces the value by 15.7 percent to $9.82 million." https://www.greentechmedia.com/articles/read/these-two-federal-policy-changes-could-be-way-more-damaging-to-solar#gs.pUq6Z1k

Risk comes in many flavors: Technology can fail; it can be difficult to site a project; construction and grid interconnection may be delayed because of permit issues; and a power plant's profitability is not guaranteed. Smart public policy can mitigate many of these risks without compromising public values. And where risk falls, clean energy becomes cheaper.

This brief explores the ways good policy can drive down risks and costs.

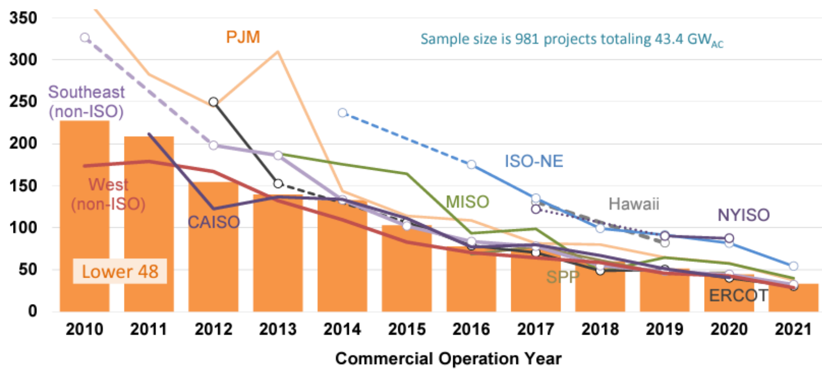

*Figure 1. Utility-scale photovoltaics (PV) generation-weighted average levelized cost of electricity (LCOE) across U.S. regions (2021 $/MWh) *Regions include the seven independent system operators (ISO) and two non-ISO regions. Source: LBNL3*

Types of Risk

Several major types of risk exist in developing large-scale renewable energy: The technology may have performance issues that lead to revenue volatility and cash shortfalls; it may be hard, or slow, or expensive, to deploy; or the market may not offer a reliable and reasonable price for the clean energy produced.

The first of these, technology or performance risk, is substantially boiled out for solar PV and onshore wind, which are now reliable, inexpensive, and underwritten by a wide range of equity investors and project finance lenders. Other technologies are nearing this standard, including grid-battery storage, offshore wind, and demand response. This brief focuses on clean energy projects that have low technology risk but can suffer from development and market uncertainty. We focus on transmission access and congestion in lines leading to long queues, as these issues encompass the largest barriers to development. This brief argues that smart policy can drastically cut these risks, thereby lowering the cost of clean energy.

Project Development Risk

Building a wind or solar farm can be a daunting task. The project developer must handle grid interconnection, siting, permitting, wholesale market rules, finding a buyer, tax rules, and many other factors that can derail the project, or raise its costs. And there is fierce competition in clean energy development, meaning financial margins are thin.

In the U.S., access to the grid is far and away the biggest barrier and risk for a project. Currently, more than 2,000 GW of generation and storage projects (primarily renewable) are in line waiting for permission to interconnect.[4] This is primarily caused by siting, permitting, cost allocation, and other issues associated with adding bulk transmission. Hence, policies to ease transmission build-out and speeding up interconnection approvals are a prerequisite for success.

Transmission Access

Wires are a natural monopoly, so power plants' access to the wires is controlled by monopolistic companies regulated by public authorities. The size of the transmission system affects where and how new power plants can access the market. In some locations, adequate capacity to interconnect a new project exists at a low cost, while projects in other areas could overload the circuits without further upgrades. The grid is like a highway—some projects are being asked to merely build an on-ramp, while others are being asked to add lanes to the highway—an expensive proposition for a single project.

Grid operators are essentially planning the grid through the interconnection process by upgrading one segment at a time, rather than proactively expanding grid capacity to accommodate the least-cost clean power that customers demand. The grid's capacity therefore must be managed and paid for in an equitable way for renewable energy projects to enter the market quickly and at low cost.

Planning, cost allocation, and interconnection policies can enable or inhibit market access for large-scale solar and wind projects. Today's status quo is untenable. Approximately 2,000 GW of wind, solar, hybrid, and storage projects are sitting in interconnection queues, with record-long wait times that exceed five years on average. This level of interest indicates the U.S. clean energy industry is ready to scale quickly and highlights the urgent need for reform.

Complex interconnection processes with opaque requirements inhibit large clean energy projects from quickly interconnecting by introducing uncertainty, raising costs, and dragging out project development. While most U.S. wholesale markets have made progress developing straightforward interconnections and procedures, they can further improve these processes by setting reasonable time limits to complete studies, clustering studies to reduce the cost and speed the study process, and prioritizing projects that have low costs or that are reusing existing interconnection rights.

In July 2023, FERC issued a final rule to reform interconnection of new generation to the grid.[5] Some highlights include a cluster study process in which transmission providers assess multiple projects that meet higher readiness and securities requirements simultaneously instead of conducting individual assessments; a study process that allocates costs fairly among all projects in a given cluster; deadlines and penalties for transmission providers that fail to complete interconnection studies on time; and a requirement that interconnection studies use updated modeling that allows solar plants, wind generators, and batteries to continue providing power and voltage support during grid disturbances.

This interconnection reform will help viable projects reach the head of the line faster, but speed and scale also depend fundamentally on proactive planning and cost allocation reforms ("adding lanes to the highway"), which FERC is tackling in a parallel proceeding.

Who Can Get It Done

Decision-maker	Policy
Congress	**Affirm FERC's authority for transmission cost allocation and planning for public policy impacts to the grid**, including regions outside of ISOs and regional transmission organizations. Give particular attention to state and utility clean electricity goals. Make clear the intention to reduce interconnection queue times and require beneficiary customers to pay their fair share.
FERC	**Require regional planning authorities to develop compatible models** (incorporating state energy resource plans) and pursue transmission where benefits exceed costs. Require states denying a regionally beneficial line to demonstrate certain criteria are met to justify denial.
FERC	**Require regional transmission planning bodies created under FERC Order 1000 to propose to FERC multi-value transmission projects** accounting for state and federal clean energy policies, with federal authority to promulgate a cost allocation methodology where regions fail to act.

New Transmission Lines

Renewable energy production is more consistent and diverse over a large geographic area, making it easier and cheaper to manage. This consistency also better matches system demand, which varies daily and seasonally but which varies less than individual variable renewable power plants. Natural variability, for example from wind sources, is reduced by hooking up large numbers of turbines as illustrated by the graph below, showing output of a group of 15 turbines (top) compared to a group of 215 turbines (bottom). Robust transmission networks help to link diverse renewable resources and demand centers across these geographies, creating new opportunities for renewables to access energy-hungry markets.

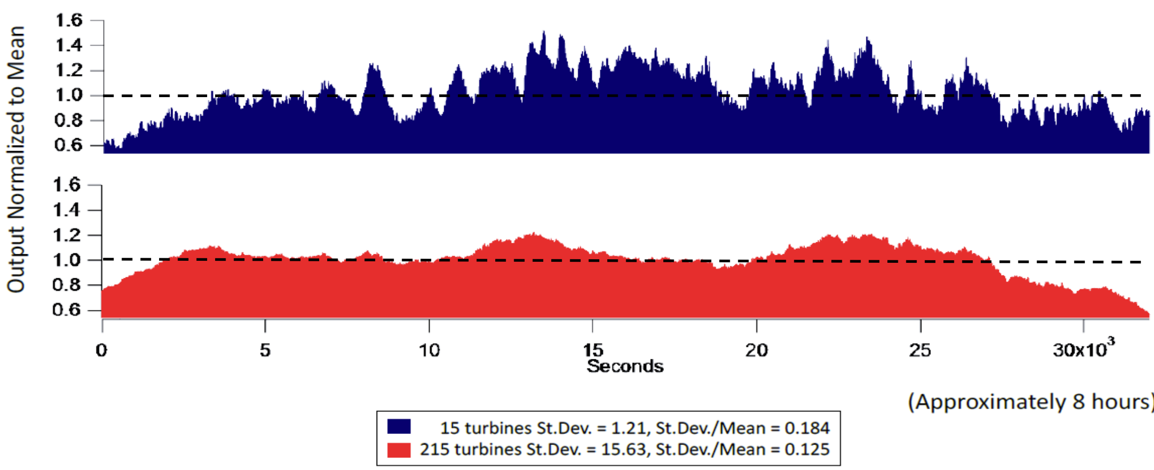

Figure 2. Two wind energy output scenarios. Source: Adapted from Milligan, 20116

These benefits get even stronger across longer distances. For example, wind in Wyoming and California are counter-correlated, creating great opportunities for Wyoming wind to reap high electricity prices in the

California market if transmission access expands, and vice versa.[7] A strong regional transmission network makes these benefits mutual—for example, solar systems in California have a later sunset than those in Arizona or Texas, allowing them to help with late-afternoon summer air conditioning loads in the more eastern states. The Pacific Northwest has vast hydro capacity that could be efficiently used to balance California renewables; the same is true of Quebec and the Eastern U.S. For this reason, a broad, interlinked transmission system is a solution for a high-renewables system, mitigating price risk and other development risks.

As the graphic below from a Lawrence Berkeley National Laboratory report illustrates, there is ample opportunity to expand the transmission network to relieve congestion. The report finds that substantial opportunities exist within and between regional U.S. grids to share power and reduce prices, especially during extreme events. In the Midwest, the report observes particularly high interregional price differences, as wind-heavy regions experience price suppression without adequate transmission to sell wind power outside the region. Strategic transmission capacity allows renewable energy resources to reach new markets and complement one another in a reliable electricity system.

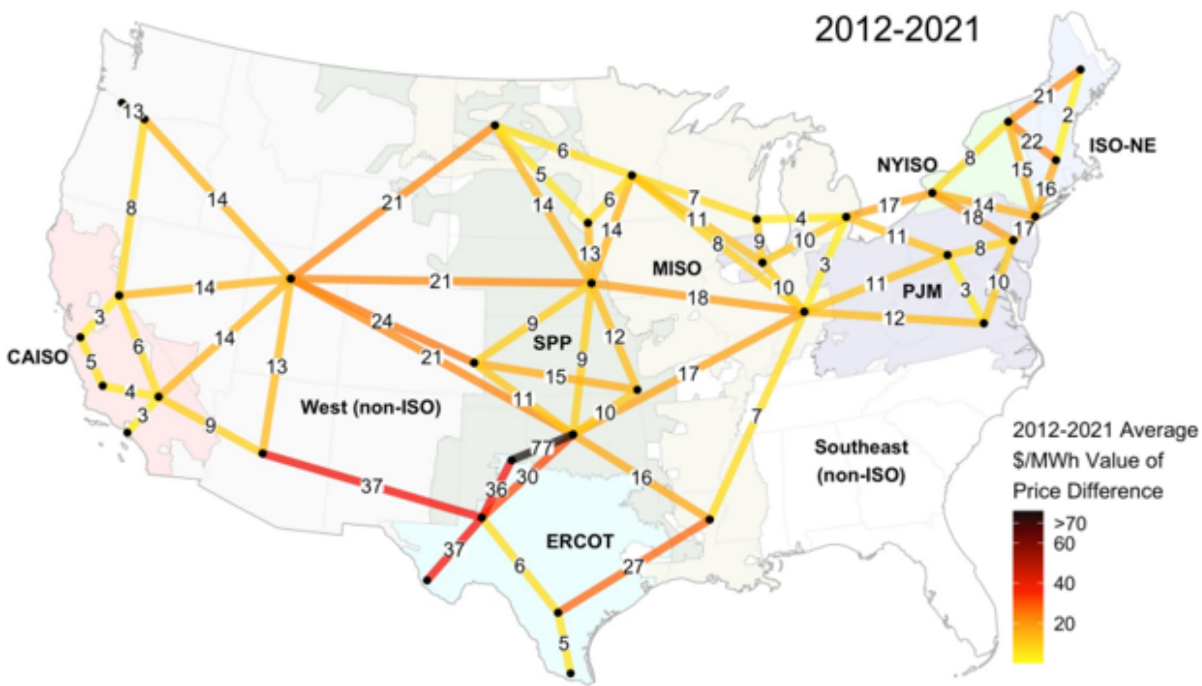

Figure 3. Marginal value of transmission in relieving congestion from 2012 to 2021 (in $/MWh Units). Source: LBNL8

One important strategy to alleviate congestion is to proactively build transmission connecting demand centers to renewable sites. Texas illustrated this beautifully when it established "Competitive Renewable Energy Zones," which were a planned strategy to build a suite of transmission lines connecting the windiest areas of Texas with load centers. These zones continue to pay dividends, as more renewables were installed in Texas in 2022 than in any other state. Installations of solar and wind energy in Texas can be seen in Figure 4 and 5 below, respectively. States like Colorado and New Mexico have created state transmission authorities that will plan and build transmission as a last resort in case the incumbent utilities refuse. The

United Kingdom to use a similar approach to cost-effectively scale its offshore wind industry to meet its goal of 50 GW by 2030.[9]

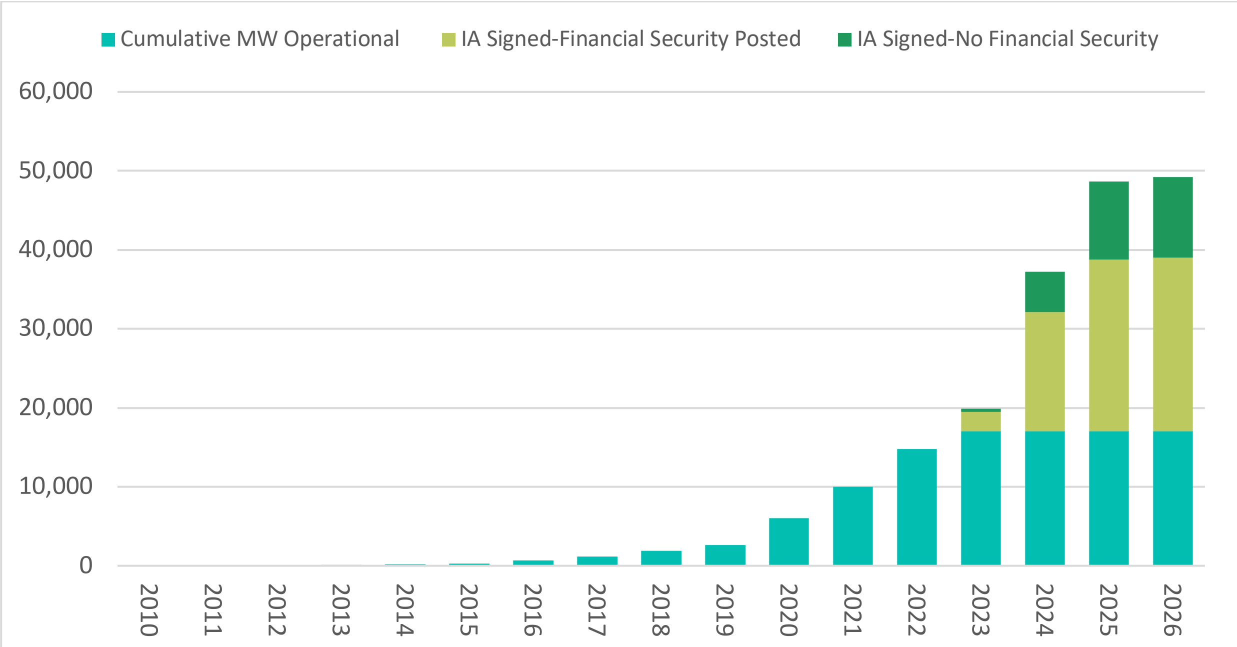

Figure 4. Electric Reliability Council of Texas (ERCOT) solar additions by year, MW (as of June 30, 2023). Source: ERCOT Resource Adequacy, Resource Capacity Trend Charts10

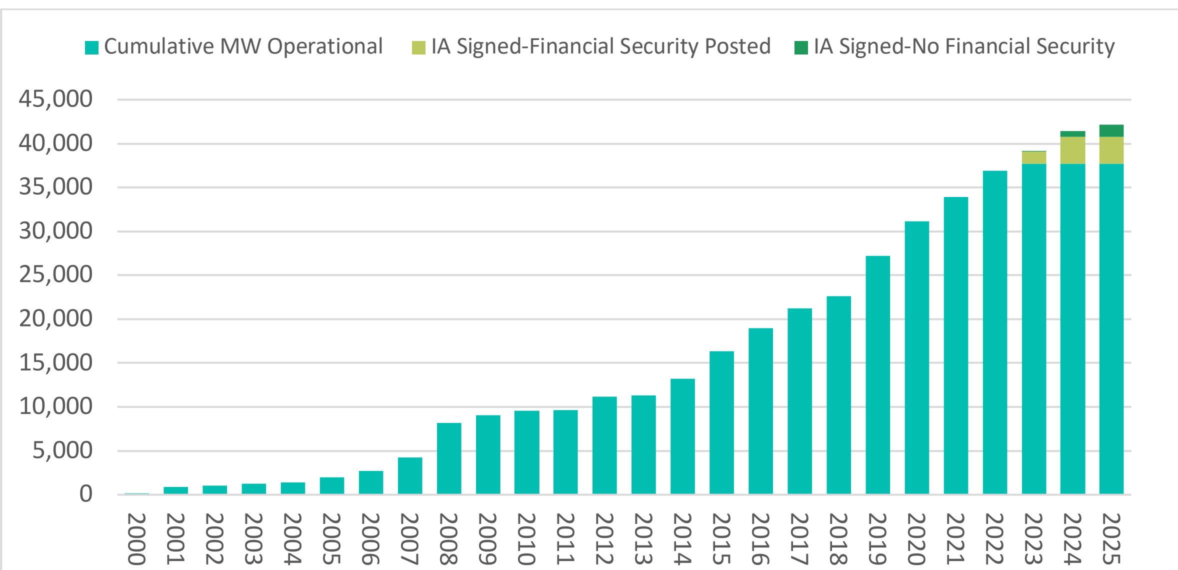

Figure 5. ERCOT wind additions by year, MW (as of June 30, 2023). Source: ERCOT Resource Adequacy, Resource Capacity Trend Chartsvi

Who Can Get It Done

Decision-maker	Policy
State, regional, federal governments	**Increase regional or state transmission authority to plan and pay for transmission infrastructure investments** to expand transmission interconnections within and between states and regions.
States	Like Texas, **establish competitive renewable energy zones**, where transmission line planning can be optimized for new project implementation.

Siting

Pre-zoning lands for development or no development and clearly articulating all relevant permit requirements in one resource could slash both time and uncertainty, and thus risk. This approach could speed both renewable energy project development and transmission line construction. Additionally, it is helpful for zoning authorities to provide developers explicit guidance related to where renewable energy projects are permissible on otherwise zoned land. For example, the state of California has supported solar development by zoning certain lands for agricultural use but approving the lands for solar use so long as the soils are below a specific quality threshold.

Renewable energy developers need to find sites that are amenable for development, and many renewable energy technologies require a fair bit of land. According to the IEA, global wind and solar capacity must grow roughly nine-fold from the current 3 TW to 27 TW by 2050 to reach net-zero emissions.[11] The U.S. will need up to 3,400 GW of land-based renewables by 2050.[i] In terms of land requirements, this translates to an estimated 145 million acres.[12] To put this into perspective, nearly 28 percent, or 640 million acres, of the U.S. is owned by the federal government. The siting risk has many dimensions:

Who owns the land? Is the land public or private? If public, what are the procedures for leasing space? Terms? Duration? Is the land easy to access? Are there environmental considerations? Wetlands? Scenic requirements? Will reclamation or decommissioning be required? How much time is required to get a permit? Is there a transmission line nearby? And so forth. Note that private lands also are subject to public zoning and environmental standards, and most of the considerations apply in both public and private ownership.

Each of these questions raises uncertainty—sometimes a *decade's* worth—that can kill a project. If a developer spends two years trying to get siting questions answered, that means two years with no returns, two years of climbing expenses, two years of expiring tax breaks, and so on. Good policy can drastically cut this uncertainty by pre-zoning land and by setting clear requirements, submission expectations, and timeframes for permits. The more that permits can be administrative, and the less they are discretionary, the better.

For example, a public lands agency like the BLM can, with public input, zone public land as strictly green or red where red lands will never be developed, green zones are suitable for renewable energy development, so long as clear, pre-specified standards are met. The European Commission, for instance, has released a plan for proactively mapping and designating low-conflict renewables sites. The REPowerEU plan proposes that each member country designate "go-to" areas dedicated to renewable energy, subjecting these areas to streamlined permitting requirements as part of a larger response to the Russia-Ukraine crisis.[13][14] Recent work by The Nature Conservancy showed this can work in practice by identifying low-conflict areas in the Western U.S. while still meeting net-zero electricity requirements.[15]

In addition to environmental suitability, which may already be clear to developers, green zones could be used to signal a commitment from regulators that permitting will be fast-tracked or otherwise efficiently processed. This could be applied in cases where regulators already have granular knowledge of a location or have in some way previewed or "pre-permitted" that location. Such a commitment from reviewers would represent a substantial risk reduction for developers.

BLM and other zoning agencies should avoid zoning any areas as "yellow." The local ground conditions for project viability are almost impossible for regulators to map over large areas, and many projects will fall between green and red areas. Almost everything is, de facto, yellow, but an official "yellow" designation is most often used by project opponents to prevent development: "Why are you developing this yellow area when you could be developing a green area?" While well intentioned, "yellow" designations are not useful or efficient for developers.

This is not an argument for relaxed environmental standards—protecting landscapes, habitat, wetlands, streams, watersheds, and species should remain a priority. Instead, green vs. red pre-zoning offers an efficient way to land at the right result. The red-zoned lands would include wilderness study areas, for example. Conversely, a green zone might be an existing oil and gas field, or an interstate highway corridor, or open land that is not critical habitat. Keeping to a green and red system would enable a streamlined review process and would reduce uncertainty on the developers' end. However, this should be coupled with added assurances that federal and BLM policies will make green land available for high-standard renewable energy projects. For example, BLM land highly favors oil and gas projects—75 percent of the best lands are prioritized for oil and gas even when it wouldn't be the most efficient use of the space.[12] Instead, land that is not optimal for oil and gas should not be restricted to fossil fuel leasing, and that land should be reprioritized for solar and wind projects.

Beyond an improved zoning framework, standardized project development process and mitigation criteria should be developed, ideally by a higher jurisdiction like a state. These should include standards for development, use of land, reclamation, and so forth. The standards should be strong enough to protect public amenities and should be unambiguous, so project sponsors understand exactly what is required and how it should be documented. The standards should be formulated via stakeholder processes whereby participating members (state/county commissioners, planning commission members, developers, Tribes, residents, utility representatives) can contribute to and comment on proposed zoning regulations. For example, the state of New York's newly formed Office of Renewable Energy Siting is charged with developing standards to streamline and accelerate the siting of projects with generation capacity greater than 25 MW. Importantly, municipal and local jurisdictions have constrained involvement and can no longer block projects that help the state meet its climate goals.[16] Other states should adopt similar policies.

Having higher jurisdictions set standards is essential, as local-level permitting and opposition can often be a major hurdle and source of ambiguity for renewable energy projects. Local ordinances are highly variable and easily changed; local moratoriums are a common response to rumors of a project; and local officials are often volunteers rather than paid professionals. At the local level, it is much more crucial to build trust with the community itself, which can be a huge challenge given that land development is often seen as a disruption to the peace or status quo. Maine is a good example of how a state-level solar energy decommissioning law created predictability for developers while also instituting rigorous protections for local communities.[17] A requirement to prepare a decommissioning plan and set aside decommissioning funds holds great value, as it provides some assurances to the community that it won't be left high and dry if a project fails or when it ends. As a result, the Maine law also helped foster trust between local communities and developers, who can point to their state permit as binding proof that they will be good stewards of the land, even in towns without a decommissioning ordinance.

Land-use regulations and policies should also be revised with renewable projects in mind. Renewable projects are fundamentally different from other types of projects: They require a lot of land but typically have low impact on the land, compared to a fuel-burning power plant or even a parking lot. Many policies designed for these traditional developments are a poor fit for renewable projects.

For example, stormwater regulations often implement a fee per square foot of impervious surface area. Without being re-written with solar development in mind, the definition of "impervious area" is up for debate: Are solar panels impervious? They don't absorb water, and there could be many acres of them. A fee per square foot could easily kill a project with narrow margins. But solar panels are drilled into the ground with nothing more than ground screws, and the soil underneath them will absorb runoff. A reasonable stormwater regulation would limit impervious area to the cross section of panels' support structures. But unless this is spelled out explicitly, it is up for interpretation and debate with whichever regulatory project manager is reviewing a given permit. States should be prepared for renewable development with definitions appropriate to the technology. Clarifying such rules and policies could go a long way toward cutting down the permit review timeline to get a project successfully sited.

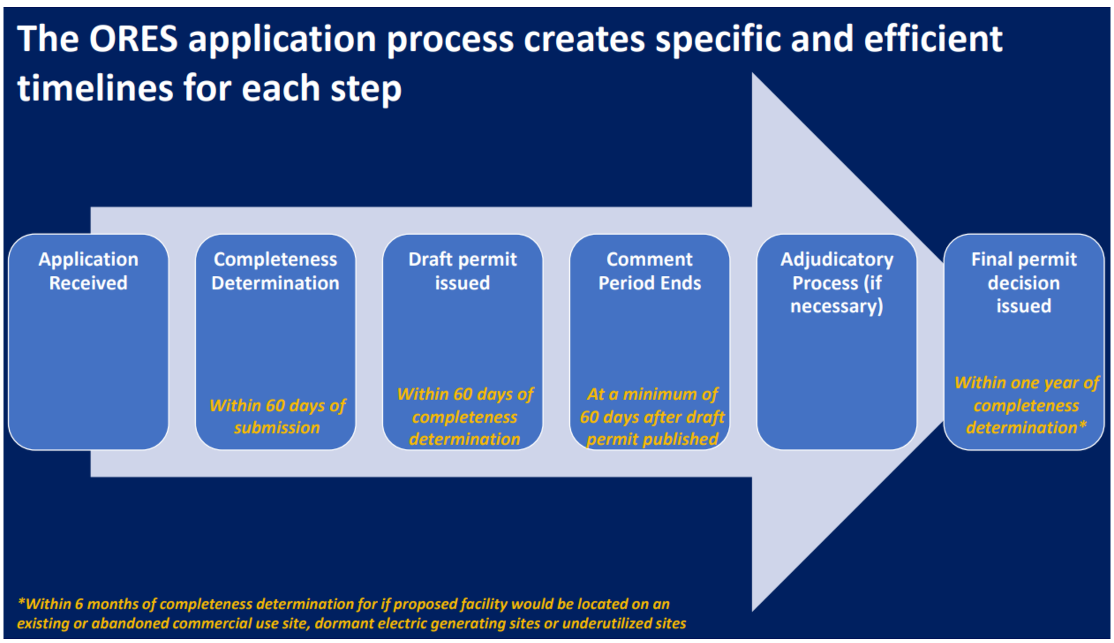

Figure 6. Overview of the New York Office of Renewable Energy Siting (ORES) application process. Source: NYSERDA16

Who Can Get It Done

Decision-maker	Policy
Congress	**Pre-zone as much land as possible** by requiring the Department of Energy and Department of Interior to develop and update national renewable energy zones and publish a national database of land conflicts to facilitate development and responsible siting. Stick to a green vs. red system as much as possible; avoid zoning any areas as yellow.
Congress/BLM	**Enhance BLM guidelines**, including restricting land leasing for oil and gas projects where that use is not ideal (i.e., create priority energy zones), encourage leasing to renewable energy and transmission development, and set an oil-and-gas land siting phase-out date.
State governments	**Pass state-level laws** creating a more predictable siting environment by creating state-wide uniform rules that include strong community consultation and environmental protection processes.

General Permitting

Once a site has been selected and approved, dozens of other permitting requirements arise relating to matters such as access to land, construction standards, fill, inspections, noise, traffic, visibility, dust, and worker protection. These permits are usually required by many different federal, state, county, and city offices, resulting in a paper blizzard that adds years to a project—or at worst threatens to derail a potentially successful project.

Most policies were, of course, created for sound public policy reasons, and not every viable project will meet community and environmental needs. But the system often flounders on two fronts: The initial purpose may be lost, or swamped, by the ultimate policy, and the *sum* of all the policies may become an intolerable or unjustified burden on the project, even if each one has merit.

A jurisdiction with a goal of deploying clean energy can work to clear out this sort of costly clutter by thinking ahead, setting clear standards, and then offering rapid permits for projects that meet those standards with reasonable, self-imposed deadlines. Ideally, faster timelines should apply to developers proposing projects on contaminated or low-grade land. This is not to say that development on contaminated land should be taken lightly, but rather that development should be authorized subject to strong assurances of careful management and planning. For instance, higher jurisdictions can step in to offer funding for legal fees or insurance costs as well as designating a full-time project manager for the land. In the end, huge benefits accrue from transforming blighted land into something usable and beneficial to the community. Creating these avenues for simpler permitting is not a simple process, but it can have profound effects.

The first task is to enumerate the steps required of a projected developer—and to do so across all the agencies that have a say in the matter, including local governments. The work of identifying the current critical path to obtaining permits should be done hand in hand with an experienced developer, who will be more likely than a government official to understand the full picture.

The work should then be grouped by purpose and by jurisdiction, and a clearer, simpler set of requirements produced. The result should:

1. Use common forms wherever possible. If colleges can use a standard application form, there is no reason that states and local agencies can't handle overlapping requirements the same way.
2. Be crystal clear on what is required for a successful permit. The goals of the standards need not be relaxed, and it should not be difficult for developers to understand what it takes to meet the standard. There should be clear timelines, in terms of both submittal by the developer and response by the permitting authority. This will allow the developer to appropriate capital according to when key risks (such as binary or discretionary permit approvals) are mitigated.
3. Reduce or eliminate anything that is not necessary. Ideally, build a master file system so that applicants do not need to fill out redundant information in dozens of places. Where feasible, commit to a paperless workflow process. Drive "counter visits" as close to zero as possible.
4. Set a firm, quick time commitment for approval of any permit application that meets all the requirements, and adequately fund staff permit review. Policies that invite a wave of development (e.g., a net-metering policy) should include funding to appropriately staff the reviewing agencies.
5. Set a firm response time commitment for any issue that arises.

Good policy should be developed and shared among jurisdictions (for example, cities within a county or region) so that standards are replicable across multiple locations, meaning developers do not have to re-invent the wheel in every new jurisdiction they enter. This allows them to cost-effectively deploy resources and import best practices into more areas.

A complementary government program is to appoint an ombudsman who can help developers navigate regulatory and permitting problems across different agencies and jurisdictions.

This set of procedures, if carefully crafted and then published, would inform developers of the precise requirements for the development and permitting of a new solar or wind farm. Developers would have much more clarity on timing, costs, selecting contractors, and so forth, which would help investors understand that certain projects are low risk based on well-defined timelines and steps to approval.

Distributed energy sources also can use a smart permitting process. For example, Germany has made rooftop solar permits fast and reliable, in striking contrast to the U.S. In 2010, U.S. permitting took nearly 23 hours of work per permit and cost $0.24 per watt, whereas German permitting took about 5 hours and cost $0.03/W.[18] Eleven years later, in 2021, the problem remained unsolved; U.S. distributed solar permitting and interconnection costs hovered at $0.24/W.[19]

As the graphic below shows, the steps required to secure a permit for a simple home rooftop solar system in the U.S. are very complex and time consuming, and therefore expensive. As a result, American homeowners pay $10,000 more for a 5 kW system than Australians.[20]

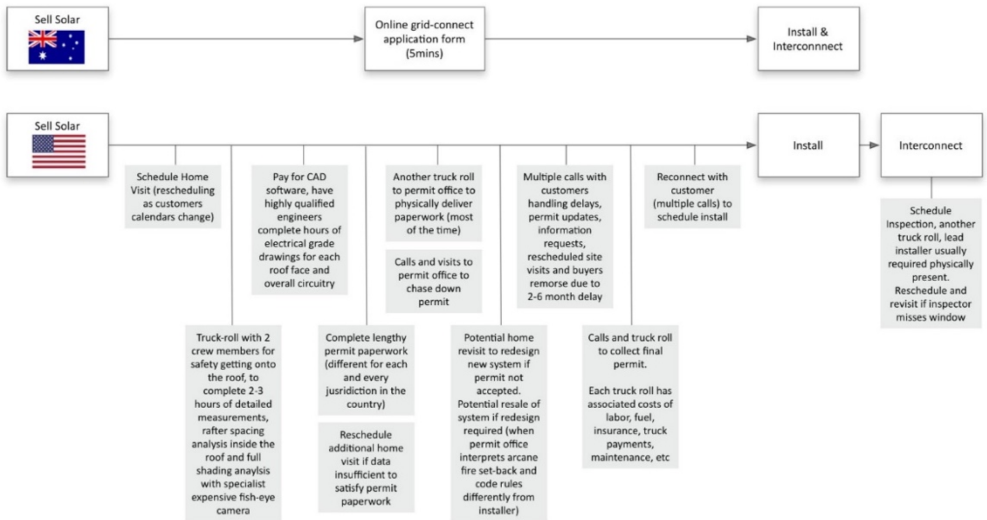

Figure 7. Comparison of rooftop solar permitting work required in Australia and the U.S. Source: GTM20

If the permitting process undermines key public values relating to environmental protection, safety, traffic, views, and so forth, then it cannot succeed. The goal here is to meet those values much more quickly, easily, and affordably.

Who Can Get It Done

Decision-maker	Policy
State legislatures; state energy offices	**Set clear standards** by implementing efficient systems that minimize tedious work and clarify requirements for permits. Include options for rapid permits for projects that meet standards, prioritizing renewable energy projects.

Selling The Power

The third major realm of uncertainty in developing a big renewable energy project is the price of the electricity generated. A long-term, certain price from a reliable purchaser makes it far easier to both invest capital at lower discount rates and raise competitive project financing. More generally, long-term power contracts also allow for non-recourse financing, which allows developers without large balance sheets to compete.

Utility-scale energy supplies have different sales conditions depending on the applicable regulatory system—and there is quite a range. On one end are long-term fixed price contracts for energy procurement. These can be achieved in two ways. Traditional vertically integrated monopolies can build their own power plants—which is cheaper and easier if the guidelines in this brief are followed. Or the utility may be the market-maker, signing long-term power purchase agreements with independent power producers. At the other end of the spectrum lie energy-only markets where electricity is sold in five-minute increments, subject to a day-ahead auction. This price volatility and transparency creates a backdrop against which competitive retailers and power providers negotiate contracts of various terms and durations.

Both market types exist in parallel in the U.S. For example, in California, projects can receive long-term power contracts but also participate in the day-ahead or real-time market with a residual portion of the output that is not contracted. Monopoly utilities can play the same game at no risk by bidding their power into the wholesale market and absorbing gains or losses relative to the real-time cost of power.

The ingredients for smart pricing are:

1. For a vertically integrated monopoly building its own power plants, PUCs should allow a 10- to 20-year cost-recovery schedule—but should open procurement up through a competitive process and require the utility to offer competitive pricing, so consumers do not overpay.
2. For jurisdictions with the utility, or the PUC, as a market-maker, offering solicitations to independent companies to build a new power plant, the PUC should allow 10- to 15-year contracts to bidders.
3. And for day-ahead and real-time energy markets, the system should be structured to encourage long-term bilateral contracts between energy marketers and energy suppliers.

In all cases, public incentives for clean energy should map onto the timescales required for smart development. A renewable portfolio standard can offer price-collaring for renewable energy developers, because they are bidding against like energy supplies. Tax credits should last 10 years or more, and should not be subject to year-on, year-off uncertainty. The Inflation Reduction Act is a terrific step in this direction. And remember cost declines in renewable energy, despite occasional setbacks, are expected to continue over the next few decades.[21]

Who Can Get It Done

Decision-maker	Policy
PUCs	Implement renewable energy policy to **allow for longer-term cost-recovery schedules** of at least 10-15 years to encourage development of renewable energy projects with less risk.

CONCLUSION

The public wants energy that is affordable, reliable, clean, and safe. Today's technology can meet these goals, but only if it is built in a smart policy environment. This document outlines policies that create the enabling conditions for excellent clean energy development—or the converse. Policymakers need to consider the entire cycle of development—the entire panoply of challenges facing developers—if they are to do the best job of reaching all four public goals.

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