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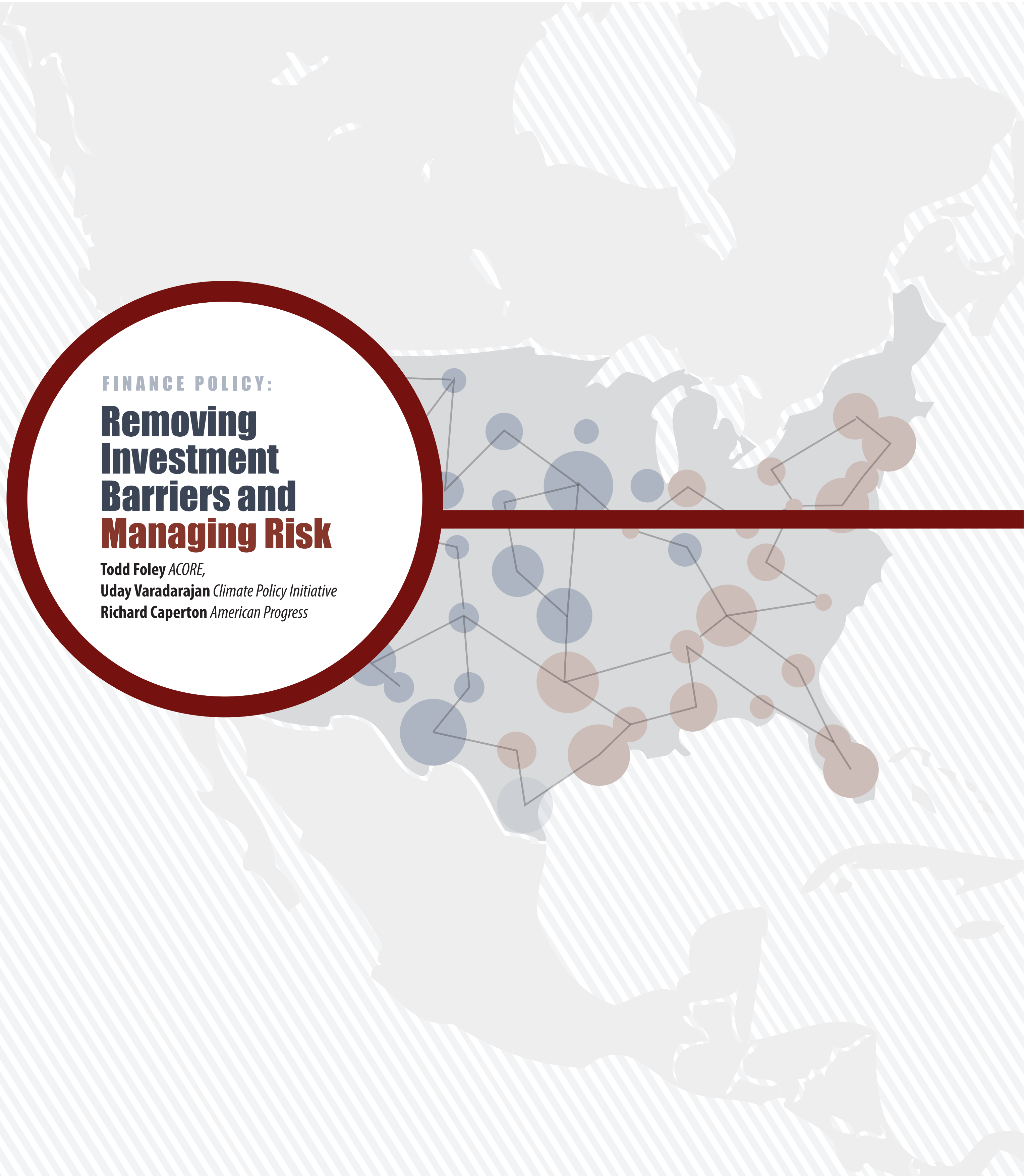
POWER PLAN



FINANCE POLICY:

Removing Investment Barriers and Managing Risk

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EXECUTIVE SUMMARY

Investing in America's clean-energy future will create major new economic opportunities, while reducing pollution and improving the security of our domestic power system. Renewable energy power system costs continue to fall. In the transition to this future, driving down the financing cost for capital-intensive energy infrastructure can go a long way to save consumers additional money.

Financing the clean energy transformation will require modernizing electricity regulation, policy and markets, but it can be done – and done efficiently, minimizing the impact on taxpayers and electricity consumers. The private sector will continue to be the primary source of capital for clean energy investment, but public finance also has an important role to play in driving deployment and adoption of innovative technologies, and in reducing the cost of these technologies. This paper describes the size and nature of the investment opportunities and challenges, the basic principles for minimizing financing costs and the ways in which good policies, regulation and market structures can help the money flow.

Minimizing financing costs will require policy, regulatory and market structures that:

1. **Eliminate barriers to cost-effective financing.** Policy, regulatory or market structures that enable long-term debt and equity financing via liquid and competitive markets can increase the availability and decrease the cost of financing.

2. **Enable investors to realize the full value of the new assets they deploy.** Currently, markets do not value some of the key benefits provided by renewable electricity, most notably, reductions in greenhouse gas emissions and other pollutants. At the same time, today's electricity markets are not designed to reflect the value of technologies such as energy storage and flexible electricity supply or demand, partly because these markets tend to be based on a small set of products that don't fully capture the unique attributes of these technologies. Investors will not finance these assets unless they are confident that markets, policies or regulatory structures are in place that will allow them to get paid for the full range of services they provide.

3. **Focus on efficiently managing electric sector risks.** Moving to a more capital-intensive electricity system means that financing costs play a more prominent role in determining the cost of electricity services. The cost of financing is closely tied to the risks borne by investors, such as policy, technical, market and system-wide risks. This suggests a greater focus on mitigating and managing risks in market, regulatory and policy design.

Policymakers have many options for achieving low-cost financing for the clean energy technologies consumers are demanding: Since markets, regulatory structures, and utility business models vary across the country, there is no one-size-fits-all approach to good policy. Nevertheless, policymakers everywhere have options that can spur cost-effective renewable energy financing locally.

INTRODUCTION

Financing a renewable future will require modernizing electricity regulation, policy and markets, but it can be done – and done efficiently, minimizing the impact on taxpayers and electricity consumers. This paper describes the size and nature of the investment opportunities and challenges, the basic principles for minimizing financing costs and the ways in which good policies, regulation and market structures can help the money flow. This paper addresses:

1. How much additional investment is needed to get to 80 percent renewables?

2. What are the barriers to scaling up investment at a reasonable cost?

3. What are the conditions necessary to enable low-cost financing of the system?

4. How can policy, regulation and market structures help create such a financing environment?

A RENEWABLE FUTURE REQUIRES SUSTAINED HIGHER LEVELS OF INVESTMENT

Achieving an 80 percent renewable electricity future will provide substantial energy security and resiliency, pollution reduction and climate benefits that far outweigh its costs. However, it requires substantial growth of capital investment in the electricity sector. Specifically, the 80 percent renewable futures scenarios considered by *RE Futures* require (in constant 2009 dollars):[1]

- **Adding new renewable generation at two to five times the current rate, $50-160 billion per year:** In recent years, the United States has spent roughly $30-40 billion annually on new generation. This will need to increase dramatically. According to *RE Futures,* we will need to add somewhere between 25 and 70 GW per year annually until 2050, which will likely cost between $50 billion and $160 billion per year.
- **Greatly expanding energy storage capacity, an average of $4-5 billion per year:** According to *RE Futures,* 100-152 GW of new storage will be necessary, compared to the 20GW of pumped hydro storage currently in place. Greater storage is needed in scenarios where flexibility resources are constrained; where there are fewer tools designed to manage variable resources, such as active demand response that adjusts energy demand to match shifts in energy supply and geographically-expanded balancing areas.
- **Expanding transmission capacity over 40 years, $6-9 billion per year:** The cost optimal scenario without significant transmission constraints, 110-190 million MW-miles of new transmission lines (compared to 150-200 million MW-miles of existing lines) and 47,500–80,000 MW of new intertie capacity across the three interconnections are required. [2] These additions require annual investment of roughly $6.4-9 billion per year as compared to $1.8 billion annually in a low-demand baseline scenario. Some of these transmission investments could also be offset by improved grid operations, which would be enabled by the policies proposed in *Renewing Transmission: Planning and Investing in a Re-wired, High Renewables Future*[3]. These estimates do not include continuing investment for maintenance or replacement of existing transmission capacity. In 2010, investor owned utilities invested over $10 billion in all transmission projects including maintenance and replacement.[4]

In total, moving to an 80 percent renewables future will require investing roughly $50-70 billion per year over the next decade, increasing to between $100-200 billion per year as we approach 2050.[5] This is roughly two to five times larger than current levels of investment in new transmission and generation assets in the electricity sector, but still small (0.5-1.5 percent of GDP) relative to the current size of the U.S. economy. Most of the additional investment required is for new renewable generation.

At present, 86 percent of the planned capacity additions as of early 2013 (both renewable and non-renewable) will be built by the private sector, either by shareholder owned utilities or by independent power producers. Though municipal utilities and electric co-operatives play a substantial role as well, the bulk of financing for electric generating capacity sector comes from the private sector. In the case of renewable generation, private investments are enabled in part by federal tax policies such as production and investment tax credits and accelerated depreciation.[6]

BARRIERS TO INVESTMENT

Given the current policy, regulatory and market environment, several challenges hinder investment in renewable generation assets and grid enhancements:

1. **Markets are designed for financing conventional generation and undervalue renewable energy:** They have been designed to enable the financing of conventional generation with very different risks, benefits and cash flow profiles. Currently, markets do not value some of the key benefits provided by renewable electricity, most notably, the reduction in peak power prices, the hedge against volatile fuel pricing and reductions in carbon and other pollution. Federal tax incentives such as the production and investment tax credits have been critical to providing investors some compensation for these benefits, helping them achieve returns commensurate to the risks associated with wind and solar PV deployment.[7, 8] However, as these incentives have historically been temporary and unpredictable, they do not provide the investor certainty needed to support the level of renewable deployment required for an 80 percent renewable future. As a result, sufficient financing will not flow to renewable projects unless renewable costs decline rapidly, key risks borne by investors can be mitigated or investors can realize the full value of the services and benefits provided by renewable energy generation in other ways.

2. **System resources cannot be financed now based on their value in a renewable future:** The significant future system-wide benefits of electricity system resources (such as flexibility resources and energy storage) in 80 percent renewable scenarios will only be realized if we actually do move to more renewables. This creates a chicken and egg problem: we need flexible resources to enable renewables, but flexible resources aren't as valuable without renewables. So, we're trying to finance something today when its value may only be fully realized if we move to a high renewable future. Unless electricity markets, policy or regulation require the consideration of such a high renewable future contingency, investors who must decide whether to invest in grid resources cannot count on getting paid for the services they might

provide. Even if these contingencies are taken into consideration, it is difficult for investors to finance flexibility assets and transmission now on the basis of potential future revenue. For example, the Atlantic Wind Connection is a proposed transmission line that would carry power from offshore wind turbines to cities on the east coast. Offshore wind will be a large part of an 80 percent renewable generation portfolio, but the regional transmission plan only accounts for business-as-usual projections. This line would be much easier to finance and build if planning was based on realistic targets for renewable energy.[9] Current wholesale markets must be expanded and modified to value these flexibility resources.[10]

3. **Low energy demand discourages new investment:** Many of the low demand growth scenarios studied in *RE Futures* require substantial increases in electricity sector investment during a period of little or no growth in demand. Historically, load growth – and the corresponding growth in electric sector revenues – has been well correlated with electricity sector investment.[11] Thus, utilities and other owners of generation assets face the challenge of finding new revenues to support significantly expanding investment in new electricity generation without the expectation of growth in electricity sales.[12] Unless robust markets or other mechanisms are developed to compensate investors for the full suite of services and benefits of the new assets they build, they will not invest in expansion.

4. **Stranded assets may raise financing costs:** The risks to current electricity sector investors associated with an increased potential for stranded assets (such as coal or gas infrastructure and generation assets) in an 80 percent renewable scenario may lead to greater sector-wide capital costs. This could drive away investors who are not willing to bear such risks, and increase financing costs for new generation due to the need to offset portfolio losses associated with those old inflexible assets.

INVESTMENT WILL FLOW AT A REASONABLE COST IF RISKS AND REWARDS ARE BALANCED

Achieving a renewable future that minimizes additional costs to ratepayers and electricity consumers is a high priority for regulators and policymakers. An 80 percent renewable electricity system will likely feature much lower operating costs relative to our current system — due to free "fuel" for wind and solar generation — but the new system will be much more capital-intensive. This means that financing costs will play a more prominent role in determining the price of electricity services to consumers. A handful of specific conditions can stimulate the needed investment while minimizing financing costs.

Rational investors make decisions based on finding the right balance of risk and reward.[13] Projects with higher risk demand higher rewards and projects with lower risk demand lower rewards. Investing in energy is no different. And the cost of financing energy assets – that is, the interest rates lenders require and the earnings that equity investors require – depends on the risks borne by investors. There are three basic strategies for achieving a balance of risks and rewards, which could reduce the cost and increase the availability of financing in an 80 percent renewable future:

1. Eliminate financing barriers – remove financing or other market failures, which reduce available capital and increase its cost for a fixed level of risk.

2. Increase rewards – compensate investors for services their assets provide that are not currently valued by electricity markets.

3. Reduce risks – mitigate or manage risks by allocating them to the actors who can most effectively manage them.

Note that these strategies are more effective when considered holistically – for example, increasing rewards through temporary tax incentives creates additional risk associated with uncertainty regarding the future of the policy, and leads to financing barriers associated with the relatively small market of investors who can use them. The next sections address how each of these strategies can be employed and identify policies that can minimize financing costs.

Eliminate financing barriers

If financial markets are not sufficiently liquid or competitive, investors may demand greater rewards than are commensurate to the risks they bear, resulting in reduced availability and increased cost of financing. For example, at present, financing for renewable generation relies on tax equity – investors who have enough tax liability to make use of federal tax incentives. However, in part due to the lack of political certainty associated with temporary renewable tax incentives, only 20 tax equity investors actively finance renewable projects in the U.S. today. The transactions are generally bilateral agreements that do not have as much transparency on prices or conditions as larger public debt or equity markets. Further, IRS rules require five years of continuous ownership to "vest" the investment tax credit, which restricts the liquidity of these investments.

A direct way to address this issue is to replace tax incentives with taxable cash incentives – this could allow renewable projects to access much larger debt and equity markets. Other mechanisms, such as making renewable energy eligible for master limited partnerships or real estate investment trust treatment, could increase the pool of investors with sufficient need for tax relief and provide liquidity as well – thereby potentially reducing financing costs.

Increase rewards

As we noted above, today's electricity markets do not adequately compensate investors for the value provided by two critical services in a high renewables future – avoided pollution and system-wide grid flexibility services. Addressing market mechanisms for driving investment in grid flexibility services is a primary focus of another paper on market structures in this series, which contains details about the mechanisms that can be employed to value those services.[14] The paper on market design illuminates the mechanisms available to provide sufficient compensation to enable investment in flexibility and energy storage assets. The related financing costs are tied to the impact of the chosen mechanism on the allocation of risks among market participants (discussed below).

At present, compensation for pollution reduction benefits is primarily addressed by federal tax incentives (including production and investment tax credits) and indirectly through state renewable portfolio standards. The tax incentives also compensate investors for bearing risks associated with the scale-up and deployment of a new technology. They have played a critical role in enabling the scale-up of renewable technologies across the country. Along with global technology improvements and economies of scale, they have helped to drive steep cost reductions over the last few years, making wind and solar increasingly competitive. Many investors expect that with sustained policy to drive continued deployment and cost reductions, wind and solar generation will be cost-competitive with traditional fossil fuel resources without federal support by the end of this decade. To provide investors with more certainty and to help achieve the 80 percent future, these tax credits should be extended for a significant length of time, rather than being allowed to expire every few years.

While existing tax credits have been successful, Congress could consider additional modifications to improve their performance reflecting market progress and value to taxpayers. As an example, these credits could be modified to include built-in adjustments, such as to reduce them as technology costs decline. And, Congress should always keep in mind that it may make sense to invest in clean energy via taxable cash grants, and not just by using the tax code. The key is that any changes be made incrementally, so that investors still have certainty.

Another approach to address this issue is the use of policy or regulation to place an effective price on pollution, and in particular, carbon emissions. The impact of such a price on financing costs is dependent upon how the price setting mechanisms impact the risks borne by investors – the more predictable and politically stable a carbon price is, the lower the risks and the lower the financing costs.

Reduce Risks

Effective management and allocation of risks is critical for reducing financing costs. This section reviews the risks most relevant to renewable projects and policies, and then estimates how much policy can bring down financing costs by reducing those risks.

The risks relevant to investment in renewable generation and related assets can be split into four categories – policy, political and social risks; technical and physical risks; market and commercial risks; and outcome risks.[15] For example:

- Policy, political and social risks: Reliance on public resources (for example, tax credits) to make a project financially viable increases investors' perceptions of policy risks.
- Technical and physical risks: Most renewable energy technologies have been deployed recently and do not have decades of performance data, impacting perceptions about technical risks.
- Market and commercial risks: The long investment horizons, high upfront costs and lack of dedicated investors for renewable assets increase the perception of financing and liquidity risks.
- Outcome risks: Tight budgets and the relatively high cost of renewable support policies increase the public sector's uncertainty around sticking to and achieving public targets.

As a general principle, each of these risks should be borne by actors who have:

- Good information about the risk.
- The financial capacity to withstand or hedge the impacts of an adverse event associated with the risk.
- Operational control or authority that enables them to mitigate the outcome of an adverse risk event.

Based on these criteria, the following table maps these risks, the actors best able to manage them and the kinds of policy, regulatory or market structures that can help to mitigate them:

RISKS	DESCRIPTION	SOURCES OF RISK	BEST MANAGED BY	MITIGATED BY
Political, Policy, and Social	Risks associated with project dependence or exposure to government or societal actions	• Reliance on public finance • Investment horizon longer than political cycle • Environmental consequences	Public sector	Stable, long-term policies and regulations with low budgetary impact
Technical and Physical	Technology or site specific risks such construction risk, operation risks, and risks associated with variability in natural resource inputs	• Unproven technology • Lack of performance data • Lack of resource data	Private sector, public-private partnership for innovative technologies	Public support for resource and data collection as well as risk pooling for innovative technologies
Market and Commercial	Economic risks such as price volatility in inputs or outputs, cost, liquidity risks, and counterparty risks	• High up-front costs • Long payback period • Financial complexity	Private sector	Functioning markets for electricity services, related derivatives, private-party contracts
Outcome	Uncertain achievement or costs of public goals such as emissions reductions or economic growth	• Budgetary constraints • Public and political support for goals	Public sector, with project-related outcome risk shared with private sector	Clear, long-term public policy goals

Figure 1. Risks related to renewable projects and policies.

How much can the policies to mitigate these risks reduce financing costs? To address this question, the Climate Policy Initiative modeled the impacts of different policies on the financing costs of a few representative renewable projects in developed nations. Policies generally impact financing costs through seven pathways: duration of revenue support, revenue certainty, risk perception, completion certainty, cost certainty, risk distribution and development risks.[16] The table below discusses these pathways, the risks involved and their relative impacts.

POLICY IMPACT PATHWAY	POTENTIAL IMPACT ON FINANCING COSTS
Duration of Revenue Support (*Market and Commercial Risks*)	Whether support is concentrated in early years or spread over the life of a project determines how a project is financed and thus the cost. For example, increasing the term of a contract or support policy from 10 to 20 years decreases financing costs by 10-15 percent.
Revenue Certainty (*Market and Commercial Risks*)	Exposure to price risks of commodity markets can reduce the amount of debt a project can support and the cost of both debt and equity, potentially increasing financing costs by 5-10 percent.
Risk Perception (*Policy and Technical Risks*)	Higher perceived risks may lead investors to demand higher returns or more security to compensate, increasing financing costs by 2-9 percent.
Completion Certainty (*Policy and Technical Risks*)	The risk of delayed revenues due to late project completion can reduce achievable leverage and may increase financing costs by less than 5 percent.
Cost Certainty (*Policy and Technical Risks*)	The risk of unexpected costs – sometimes policy driven – can also increase the costs of financing by less than 5percent due to the reduced amount of debt providers are willing to commit.
Risk Distribution (*Policy and Technical Risks*)	The ability to and cost of bearing certain risks will vary among investors, suppliers, consumers, and others. By changing which risks (e.g. commodity prices or inflation) are absorbed by which project stakeholder, policy can reduce or increase the financial cost of projects.
Development Risks (*Policy and Technical Risks*)	The cost and success rate of developing a project will affect the attractiveness of the industry. A more attractive industry will have more competition, driving costs down.

Figure 2. Policy Impact Pathways and Potential Impact on Financing Costs.

Policies, regulations and market structures can significantly reduce financing costs by enabling long-term supports or contracts (10-15 percent cost reduction), reducing revenue volatility (5-10 percent cost reduction) and reducing investor perceptions of project risks (2-9 percent cost reductions). The large impact of the first two pathways is due to the fact that they reduce market and commercial risks, thereby enabling the project to increase the amount and term of low-cost long-term financing such as project debt. Reductions in investor perceptions of project risk often involve reducing policy, political and social risks. This can be done by increasing policy certainty, granting pre-approval for siting and interconnection or ensuring that power contracts are not subject to retroactive review by the Public Utilities Commission. Policies can also reduce risk perceptions by reducing technical and physical risks. However, the more direct impact of reducing technical or physical risks is increasing completion and cost certainty and reducing development risks, which have a much smaller impact on financing costs (less than 5 percent cost reduction).

LOW COST FINANCING FOR RENEWABLES IS FEASIBLE

For policymakers, the key is to build a policy environment that effectively addresses the important risks in clean energy development. Broadly speaking, the best policies are those that – in the words of Deutsche Bank – provide "TLC": transparency, longevity and certainty.[17] Put another way, investors just want to know what the rules of the road will be going forward. As an example, incentives are much more valuable if they have long lives, rather than needing to be renewed every year.

There is one policy that would benefit every renewable project: putting a price on carbon. Both the American Enterprise Institute and the Center for American Progress have proposed doing this via a carbon tax. The President called for a price on carbon in his most recent State of the Union address. And a cap-and-trade system passed the House of Representatives with bipartisan support in 2009. Additionally, national renewable and clean energy standards, which have been proposed in Congress, would establish long-term targets and provide important long-term market signals to investors. Any of these policies would go a long way towards making sure that renewable energy's qualities are fully valued in the marketplace.

Beyond a price on carbon, smart policies will match the needs (and risks) of specific investments. The research presented here, the *RE Futures* report, and other papers in this series all come to the same conclusion: no single technology, no single business model and no single market design will dominate the energy future. And, each combination of technology, business model and market design will call for different financing structures, each of which can be enabled by a different set of policy tools.

For example, in an environment where a vertically integrated regulated utility is building large-scale renewables, a significant part of the technological performance risk is borne by ratepayers. If the technology doesn't perform as expected, the utility will likely be able to recoup some of the costs from their consumers, as approved by the relevant state regulator. On the other hand, when an independent power producer builds a renewable project and sells the power to utilities through a wholesale power market, the investor is bearing the technological performance risk. If this risk is large, then it will add a significant amount to the cost of capital for the independent power producer, but it will make a much smaller difference for the regulated utility. This means that policymakers will need to create tools to manage technological performance risk in deregulated markets, in order to drive more financing. They could do this by offering some type of project performance insurance or warranty.

To dig deeper into this, the renewables market can be broken into three categories:

- Utility-scale, regulated. This market covers large-scale power plants owned by the utilities that serve end-users of electricity. These utilities can have several ownership models: investor-owned, cooperatives and municipally-owned.
- Utility-scale, deregulated. This market covers large-scale power plants owned by independent companies that sell the power to the utilities that serve end-users of electricity.
- Distributed generation. This market covers smaller projects located directly on the distribution grid and typically owned (either directly or through a lease or contract) by businesses or homeowners.

Figure 3. Sources of capital and key policies for low-cost financing, by market segment.

MARKET SEGMENT	TYPICAL SOURCES OF CAPITAL	KEY POLICIES TO ENABLE MORE LOW-COST FINANCING
UTILITY-SCALE, REGULATED	**INVESTOR-OWNED UTILITIES** • Public equity. • Corporate debt via capital markets. • Tax incentives. **MUNICIPAL UTILITIES** • Municipal debt. • Tax-advantaged bonds. • Ratepayers. **COOPERATIVE UTILITIES** • Rural Utilities Service. • Tax-advantaged bonds. • Member equity.	**Continue access to public equity markets through beneficial treatment of dividends.** Investors in utility stocks are typically attracted by the dividend yields, which are both stable and tax-advantaged. If dividends were taxed as personal income instead of as capital gains, the cost of raising money via public equity markets would go up. ***Key actor: Congress.*** **Re-authorize Clean Renewable Energy Bonds.** Non-profit municipal and cooperative utilities don't benefit from tax incentives. Clean Renewable Energy Bonds carry tax benefits, so that utilities can sell these bonds at a very low rate and investors benefit from the tax benefit and not just the yield. This program should be re-authorized by Congress. ***Key actor: Congress.*** **Direct Rural Utilities Service (RUS) to focus on renewable energy.** The RUS provides low-cost financing to cooperatives for a variety of purposes, including building new generation. RUS should focus its generation financing on renewable energy. ***Key actor: Congress, President, U.S. Department of Agriculture.***
UTILITY-SCALE, DEREGULATED	• Private equity. • Project finance debt. • Public equity markets. • Tax equity.	**Open up public equity.** Though important to the success of renewable energy development, private equity is both expensive and relatively rare. Independent power producers would benefit from having better access to public markets as well. One way to do this would be by allowing renewables companies to organize as MLPs or REITs, both of which are currently off-limits to clean energy. These instruments are publicly traded and have a tax benefit, since MLPs don't pay corporate taxes and REIT dividends are tax-deductible. ***Key actors: Congress, U.S. Treasury Department.*** **Make incentives available to more investors by transitioning to refundable tax credits or taxable cash grants.** The additional costs of bringing tax equity into a project consume some value of the tax incentives available to a project. The government can get a better "bang for its buck" by instead offering taxable cash or refundable incentives, as described by the Climate Policy Initiative and the Bipartisan Policy Center.[18,19] ***Key actor: Congress.***

MARKET SEGMENT	TYPICAL SOURCES OF CAPITAL	KEY POLICIES TO ENABLE MORE LOW-COST FINANCING
DISTRIBUTED GENERATION	• Private equity. • Project finance debt. • Tax equity. • Cash incentives.	**Clarify net metering rules so that they remain stable for the long term.**[20] Most distributed generation projects rely on net metering as a source of revenue. When net metering rules are open to change over time, the benefit is discounted by investors. States should act now to make sure that net metering policies are financially sustainable far into the future and that any negative impacts from cross-subsidization are avoided. By addressing these challenges early, policymakers can make this revenue stream much more certain. ***Key actors: utilities, state public utility commissions, state legislatures.*** **Allow long-term contracts for distributed generation.** Utilities provide long-term, fixed price power purchase agreements for large-scale renewable generation. They could make distributed generation eligible for similar contracts. Such contracts provide the long-term, certain revenues needed to enable low-cost debt financing of distributed generation. ***Key actors: utilities, state public utility commissions, state legislatures.*** **Allow new financing and ownership structures.** Third-party ownership of distributed generation has enabled rapid deployment by helping consumers avoid upfront costs. Yet, some states have rules that discourage these business models. Policymakers should make sure that every consumer has access to innovative low-cost financing solutions for distributed generation. [21] ***Key actors: state public utility commissions, state legislatures.*** **Move from private capital to public capital.** Just like in the utility-scale deregulated market, these projects would benefit from access to public equity markets and debt securitization. The same recommendations apply here. ***Key actors: Congress, U.S. Treasury Department.*** **Enable securitization of project debt.** The secondary market for project debt is basically non-existent, and securitization could bring this market to life. The government should work with the private sector to encourage standardization of contracts. Any future federal green bank should also work to enable securitization, similar to Fannie Mae's function in the housing market. ***Key actors: U.S. Department of Energy, potential future federal green bank, Congress.*** **Provide low-cost project debt through state green banks.** State green banks can lend money at preferred rates, since states have ready access to low-cost capital. The exact structure of the bank in each state will determine the products they offer, but co-lending and other public/private partnerships are especially promising. State green banks are likely to be relatively small in scale and will want to invest in multiple projects, so they're uniquely well-suited to the distributed generation market. ***Key actor: state legislatures.*** **Use municipal debt to finance projects through commercial Property Assessed Clean Energy.** Cities can lend money to businesses and residents to build clean energy projects, and the borrowers re-pay the loans on their tax bill. This is known as Property Assessed Clean Energy, or PACE. While residential PACE programs have largely been halted due to Federal Housing and Finance Authority (FHFA) policy, commercial PACE does not have the same challenges, and can move forward quickly. Placing debt on the property tax bill adds security and thereby lowers financing cost. ***Key actor: municipal governments, state legislatures.*** **Allow consumers to repay financing for distributed generation on their utility bills.** Utility bill-based repayment of distributed generation financing could lower financing costs through increased security and clarify to consumers the economic benefits of distributed generation investments.

SUMMARY OF RECOMMENDATIONS

DECISION-MAKER	RECOMMENDATION
Congress	Continue access to public equity markets through beneficial treatment of dividends as capital gains.
Congress	Re-authorize Clean Renewable Energy Bonds.
Congress, President, U.S. Department of Agriculture	Direct Rural Utilities Service to focus on renewable energy.
Congress, U.S. Treasury	Transition from private to public equity by making renewable energy eligible for new corporate structures, such as Master Limited Partnerships and Real Estate Investment Trusts.
Congress, U.S. Department of Energy, potential federal green bank	Enable securitization of project debt. Any future federal green bank should also work to enable securitization, similar to Fannie Mae's function in the housing market.
Congress	Make permanent or provide long-term extensions of the critical tax credits, and explore possible revisions to the credits such as taxable cash incentives or refundability.
Public Utilities Commissions (PUCs), state legislatures, utilities	Clarify net metering rules so that they remain stable for the long term.
PUCs, state legislatures, utilities	Allow long-term contracts for distributed generation.
PUCs, state legislatures	Allow new financing and ownership structures, including third-party ownership.
State legislatures	Provide low-cost project debt through state green banks.
Municipal governments, state legislatures	Use municipal debt to finance projects through "Commercial PACE."

CONCLUSION

A high-renewable energy future requires substantially expanded investment in the electricity sector, particularly in renewable generation assets. This will require a much more capital-intensive electricity sector, and result in electricity prices, which are much more sensitive to financing costs (although it will also be less fuel intensive and less sensitive to fossil fuel costs). As a result, policy, market and regulatory structures throughout the country face the challenge of increasing investment while reducing financing costs. There are three key strategies for achieving this goal, and a diverse set of policy, regulatory and market structures, which can be used to pursue them:

1. **Eliminate barriers to accessing liquid and competitive financing markets.** Enabling access to larger, more liquid financing markets – such as through new partnership structures, public debt or securitization – can help increase the pool of potential investors and decrease financing costs.

2. **Enable investors to realize the full value of the new assets they deploy.** A stable price on carbon emissions through one of any number of policy or regulatory mechanisms can help investors in renewable generation monetize the emissions reduction benefits of their assets. Similarly, several options for driving investment in flexibility and energy storage services through appropriate forward markets that reflect the value of those services have been discussed in the market structures paper.[22]

3. **Focus on enabling electricity sector stakeholders to efficiently manage risks.** Policy, regulatory and market structures that enable long-term, stable revenues and reduce investor perceptions of risk can substantially reduce financing costs. For example, a stable, increasing carbon price or a renewable electricity standard that uses long-term power purchase agreements or Renewable Energy Credit contracts can enable low-cost financing of renewable generation.

By taking the important steps laid out in this paper, policy, market and regulatory structures throughout the country can adapt to drive sufficient low-cost financing to make a high share of renewables a reality. This is a national imperative: shifting to a renewable future will reduce pollution, enhance our economy, and free us from reliance on finite fossil fuel resources.

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1 Edison Electric Institute, 2012. "2011 Financial Review: Annual Report of the U.S. Shareholder-Owned Electric Utility Industry." <http://www.eei.org/whatwedo/DataAnalysis/IndusFinanAnalysis/finreview/Documents/FinancialReview.pdf>

2 Note that NREL considered a scenario with significant constraints on new transmission, including disallowing any new interties or transmission corridors, tripling the cost of new lines and doubling their losses. In this case, less than 30 million MW-miles of new lines were required, but at triple the cost, leading to investment requirements comparable to the low-end of the range. The transmission constraint increased electricity system costs by about 5 percent relative to the 80 percent scenario without it. The America's Power Plan report by Jimison and White discusses in greater detail how the current grid can be optimized to enable reliable operation when faced with such constraints.

3 See America's Power Plan report by Jimison and White.

4 Edison Electric Institute, 2012.

5 On the path to an 80 percent renewable scenario, conventional generation will be relied upon less for the energy it provides and more for its ability to provide operational flexibility to the grid. As a result, there will be a significant decline in the need for inflexible conventional generation. This is likely to include disinvestment in assets, which are not fully depreciated. The exact amount and type of stranded assets will depend on the pathway we take to get to 80 percent renewables. For example, analysis from the Center for American Progress has found that we can likely avoid any uneconomic retirements of natural gas capacity, but only if we just build power plants that are currently in the planning stage and if we retire plants on their 45th birthday, starting in 2023.

6 American Public Power Association, 2013. "APPA Report on New Generating Capacity: 2013 Update." <http://www.publicpower.org/files/PDFs/New_plants_analysis_2013.pdf>

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8 Federal tax incentives covered roughly half the gap between the cost of wind and solar PV generation in 2010 and expected revenues at market electricity prices. At 2013 costs, wind is nearly competitive with federal incentives alone.

9 Wald, Matthew L., 2013. "1st Par of Offshore Wind Power Line Moves Ahead." The New York Times. <http://www.nytimes.com/2013/01/15/business/energy-environment/an-offshore-wind-power-line-moves-ahead.html?_r=2&>

10 See America's Power Plan report by Hogan.

11 Edison Electric Institute, 2012.

12 See America's Power Plan report by Lehr.

13 There are non-risk/reward factors that influence decisions, of course. A company with a history of building nuclear power plants and a team of nuclear engineers is likely to invest more in nuclear power, just based on familiarity. Our assumption is that these soft biases against renewable energy will be overwhelmed by the national commitment required to get to 80 percent renewables.

14 See America's Power Plan report by Hogan.

15 Frisari, Gianleo, et al, 2013. "Risk Gaps: A Map of Risk Mitigation Instruments for Clean Investments." Climate Policy Initiative. <http://climatepolicyinitiative.org/wp-content/uploads/2013/01/Risk-Gaps-A-Map-of-Risk-Mitigation-Instruments-for-Clean-Investments.pdf>

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17 DB Climate Change Advisors, 2009. "Paying for Renewable Energy: TLC at the Right Price." Deutsche Bank Group. <http://www.dbcca.com/dbcca/EN/_media/Paying_for_Renewable_Energy_TLC_at_the_Right_Price.pdf>

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19 Mackler, Sasha, 2011. "Reassessing Renewable Energy Subsidies." Bipartisan Policy Center. <http://bipartisanpolicy.org/sites/default/files/BPC_RE%20Issue%20Brief_3-22.pdf>

20 See America's Power Plan report by Wiedman and Beach.

21 See America's Power Plan report by Wiedman and Beach.

22 See America's Power Plan report by Hogan.

APPENDIX A. ACRONYMS

APPA	America's Public Power Association
FHFA	Federal Housing and Finance Authority
GDP	Gross Domestic Product
GW	Gigawatt
MW-miles	Megawatt- miles
MLP	Master Limited Partnership
NREL	National Renewable Energy Laboratory
PACE	Property Assessed Clean Energy
PUC	Public Utilities Commission
PV	Photovoltaic
RE Futures	Renewable Electricity Futures study
REIT	Real Estate Investment Trust
RUS	Rural Utilities Service