

THE 2017 INAUGURATION:

Empowering a Clean Energy Nation

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DOUBLE BOTTOM LINE VENTURE CAPITAL

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EXECUTIVE SUMMARY

The energy industry is at a major junction. We've had our grandfather's electricity system for 100 years, with no major changes or innovations. Now, the energy industry is in an innovation cycle across many sectors, from electricity to transportation to agriculture and beyond. The transformation is akin to what we've experienced in phones, computers, and even music distribution over recent decades. Uniquely, this innovation is fueled not just by economic opportunity, but by environmental imperative as well – energy-related carbon dioxide emissions account for more than 80 percent of U.S. greenhouse gas emissions.¹ From industry icons like First Solar, Tesla, SunPower and SolarCity to exciting upstarts like UtilityAPI, Farmers Business Network, Advanced Microgrid Solutions and Off Grid Electric, our country's entrepreneurs are increasingly focused on creating the 21st century energy sector. With this focus comes not only a flow of capital, but a flood of

job creation. The solar industry alone offers over 200,000 well-paying jobs as of last year, growing at an annual rate of 20 percent compared to 1.74 percent for the rest of American job growth.² The growth rate in cleantech not only exceeds that of other fast-growing tech companies, but also has been populated by a more demographically diverse workforce than that of other energy and technology industries (see Figure 1).³ Despite its promise and remarkable growth rate, the 21st century energy sector is still a budding industry – solar only represents about one percent of U.S. electricity generation and electric vehicles are still less than three percent of U.S. auto sales.⁴ Maintaining U.S. leadership in clean energy and the attendant growth rate in job creation will require America's next president to think holistically about the industry and take a broadly strategic approach to energy policy.

Figure 1

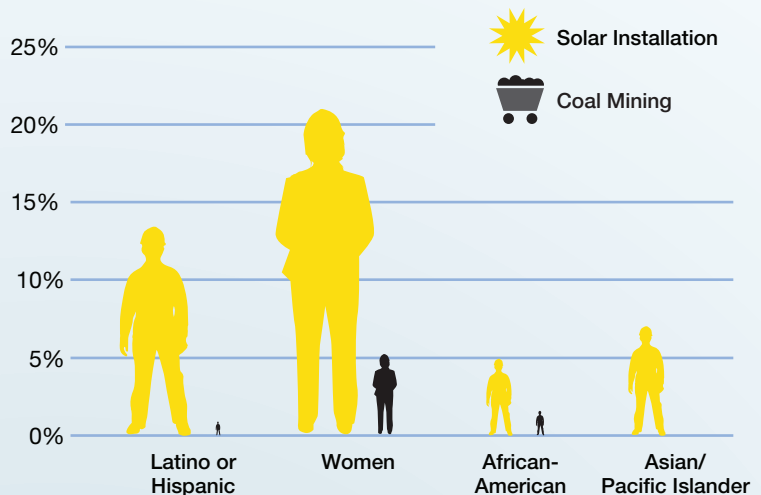
Clean Energy Jobs Promote a More Diverse Workforce

Solar Installation Employs 15,000 More Latinos, nearly 5,000 More African-Americans, 8,000 More Asian/Pacific-Islanders and 21,000 more Women Than The Coal Mining Industry

The U.S. solar industry supports a more demographically diverse workforce compared with traditional energy generation industries. Only 5.2% of the U.S. coal mining industry is female compared to 21.1% of solar installation workers who are women. While there is always room for improvement, solar is more diverse across a range of demographic categories and the solar workforce is becoming increasingly diverse over time.

Not only is the solar sector more diverse than traditional energy generation like coal mining but there are also more solar jobs than coal jobs. The Solar Foundation National Jobs 2015 Census reports that the solar sector employs 140,930 more workers than the coal mining industry.

Comparison of solar and coal workforce



Sources: The Solar Foundation National Jobs Census 2015 Report and the Bureau of Labor Statistics, U.S. Department of Labor.

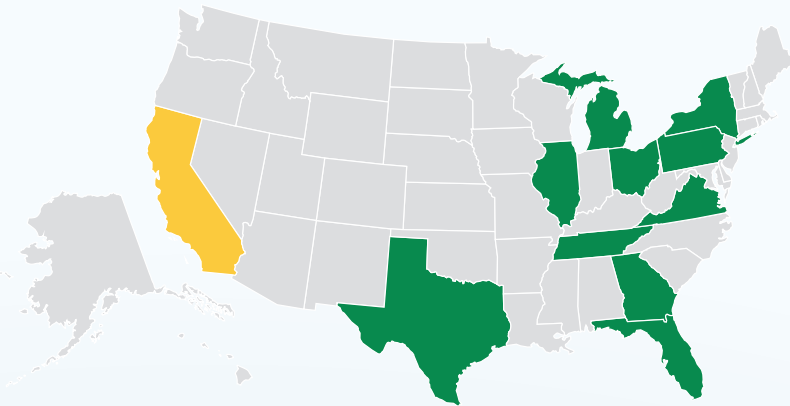
We offer three areas of mutually reinforcing recommendations. The most important achievements the next president can accomplish for clean energy are fostering stakeholder unity behind the shift to renewables, increasing accessibility and viability for investors, and improving nationwide energy literacy.

1. Building a Cleantech Coalition: Consumers create the political climate which, in turn, influences the policies that either support or repress investment into sustainability and renewable energy. The next president should therefore unify the country in support of clean energy

by enacting policies that bring renewables to populations for whom they have previously been out of reach for economic or political reasons. The figure below depicts the potential of one such community – high population states with low penetrations of renewables. In addition, the administration should work closely with the electric utilities to find solutions that allow both incumbent and new business models to thrive. This would allow utilities to move their significant policy influence behind renewables, promote cooperation rather than conflict, and open up new paths to innovation.

Solar States of Mind – Wish They All Could Be California Solar Stats

If the next president’s energy policies can push these ten large states past solar grid parity and help them catch up to California’s level of solar watts per capita, the nation’s solar capacity will **double***, increasing by 34 GW – **enough to power over 6.6 million American homes and generate over \$67 billion in economic activity¹.**



State	Population Size	Grid Parity?	MW of Solar Installed	Current Watts Per Capita (WPC)	Total MW at California WPC (257.7)	Total Solar Opportunity in MW
Texas	27,469,114	Close	479	17	7,078	6,599
Florida	20,271,272	Very Close	206	10	5,223	5,018
New York	19,795,791	Yes	583	29	5,101	4,518
Illinois	12,859,995	Very Close	52	4	3,314	3,262
Pennsylvania	12,802,503	Very Close	204	16	3,299	3,095
Ohio	11,613,423	Medium	108	9	2,992	2,884
Michigan	9,922,576	Close	36	4	2,557	2,521
Georgia	10,214,860	Close	120	12	2,632	2,512
Virginia	8,382,993	Medium	29	3	2,160	2,131
Tennessee	6,600,299	Medium	82	12	1,701	1,618
TOTAL	139,932,826		1,897		36,055	34,158

Sources: US Census Bureau, US Energy Information Administration, Solar Energy Industries Association; Greentech Media “GTM Research: 20 US States at Grid Parity for Residential Solar”

*Based on Q2 2016 SEIA and GTM Research U.S. Solar Market Insight Report figure of 29.3 GW total installed U.S. solar capacity

¹ Estimate of economic activity calculated using nationwide weighted average cost of solar in 2015, derived from GTM Research and Solar Energy Industries Association’s U.S. Solar Market Insights Reports for Q2 2016 and 2015

2. Supercharging our Future – Investment Policies that Build an Onramp to our Clean Energy Economy: Surveys of consumer attitudes toward renewables find that although environmental ramifications are important, it is ultimately the economics of renewable energy that primarily motivate consumer outlook. Consumers in the U.S. and worldwide will not make the switch to clean energy unless increased investment makes it economical to do so. The next administration should therefore refine and build on the existing frameworks of the Investment and Production Tax Credits, the Community Reinvestment Act, and the Capital Gains Tax to incentivize sustainable and clean energy investment. In addition, we recommend the next president address ongoing energy data policy discussions to facilitate investment-garnering innovation throughout the energy industry.

3. Educating the Next Generation of Cleantech Entrepreneurs – Fostering Nationwide Energy Literacy: Finally, by increasing nationwide energy literacy, particularly among the nation’s youth, the next president can encourage continued progress beyond the term of her presidency. We recommend a three-pronged approach to the president’s energy literacy campaign:

- a. The DOE should work with celebrities, from both inside the energy industry and out, to create viral content and establish concrete audience behavior goals. Website visits or purchases of a specific energy-saving device, for instance, would create measurable results and the ability to refine campaign strategy accordingly.
- b. The DOE’s Energy 101 class was a good start, but it can be reimagined to be more effective by working with the College Board to create an AP test designed specifically for energy.
- c. The “solarize” model has been tremendously successful at driving down solar installation costs and increasing penetration by harnessing the competition amongst residential solar installers in a growing number of states. The federal government should direct the DOE to announce a national solarize competition among the states.

By leveraging policy concepts old and new, local and federal, and appealing to all, from wonks to average Jills, our 45th president can drive a low carbon economic boom and preside over a nation that leads from sea to sustainable sea.

An Investor’s Perspective: Policy Recommendations for the Next President



The Clean Jobs Transition Act – Help new industries revitalize coal communities. Stimulate investment in clean jobs and technology

Cash for Clunkers Redux: Solar for Scrap Metal – Offer utilities with aging coal infrastructure a way out through reinvestment in renewables

Overcoming the Deferred Maintenance Overhang – Low income housing managers must invest in long-neglected maintenance ahead of renewables and energy efficiency. Instead of one or the other, help them do both

Community Solar: Roofs not Required – Roof ownership is limited among the low income community. Increase community solar accessibility for low income Americans by decreasing developer cost

Solar States of Mind – Grid Parity is here or fast approaching in many states. Those with large populations offer clean energy businesses a big opportunity. We show the math

Beyond DER Drama: Best Practices from the White House – Extended net metering battles are costly to clean tech, taxpayers, and climate change efforts. Convene stakeholders to write a playbook

Green Button II – Data access is crucial to grid innovation. Make Grid Neutrality a priority

Share the Love: Expand the ITC – Other capital intensive clean technologies should be made ITC eligible – start with storage

Democratizing the Tax Equity Pool – The scarcity of investors makes tax equity financing expensive. Change the ITC and PTC accounting rules to expand the pool

Two Scoops of Solar: ITC meets LIHTC – Translate the success of LIHTC in low-income housing to low-income solar

The Carbonless Gains Tax – Take inspiration from capital gains tax policy. Recognize green activity and incentivize green decisions by giving investors a small tax break

Three-Pronged Energy Literacy Campaign – Americans need to know the energy market in order to lead it. **Celeb Power, High School AP Energy Courses,** and using the power of solarize to “put-solar-on-it” can help get us there

BUILDING A CLEANTECH COALITION

Philosophical support for clean energy has spread to the point of ubiquity across the nation's voters.⁵ Still, physical uptake is far from an even distribution across geographical and socioeconomic spectrums. As communities that have traditionally depended on demand for coal to drive their economies suffer the rise of natural gas, they often incur spikes in unemployment and feelings of resentment toward agendas that promote environmental protection and cleaner sources of energy.⁶ And whether in coal states or sunshine states, lower income Americans have also been left behind in the transition to renewables. Moreover, segmentation of energy policy jurisdiction by state boundaries creates the risk of state policy makers and energy regulators

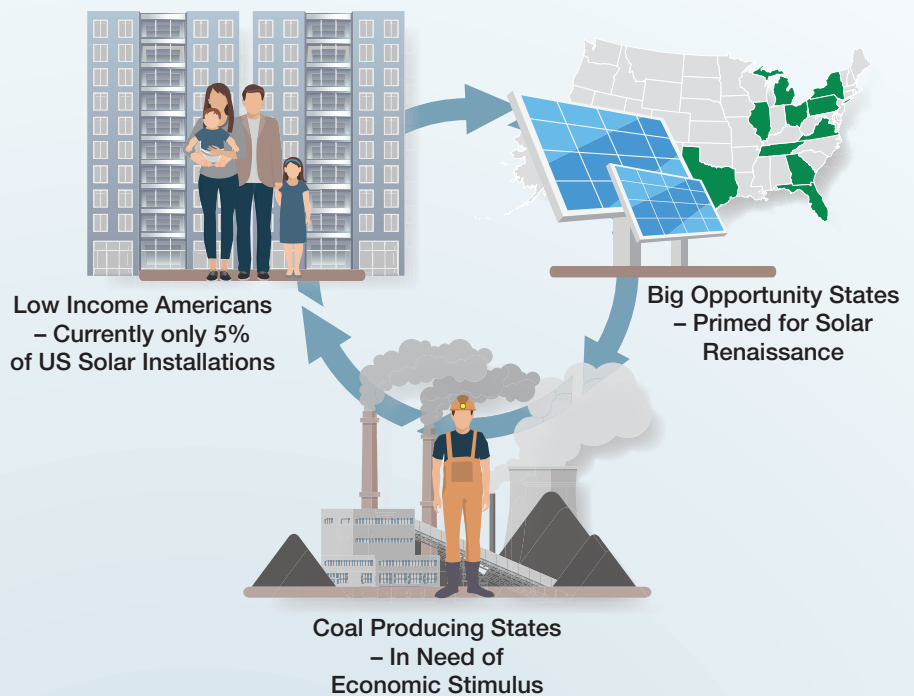
in populous states excluding large segments of the American public from the transition to clean energy. The good news is that these three communities – coal states, low income populations, and large states with unrealized potential for renewables – offer the next presidential administration exceptional opportunities to spread renewables into untapped markets. By doing so, the administration will further strengthen pro-renewables political will power. In concert with seeking to reduce the tensions between utilities and distributed energy resources (DERs), the next president can work with these three key communities – our Clean Energy Trifecta – to create a nationwide coalition of political support.

Figure 2

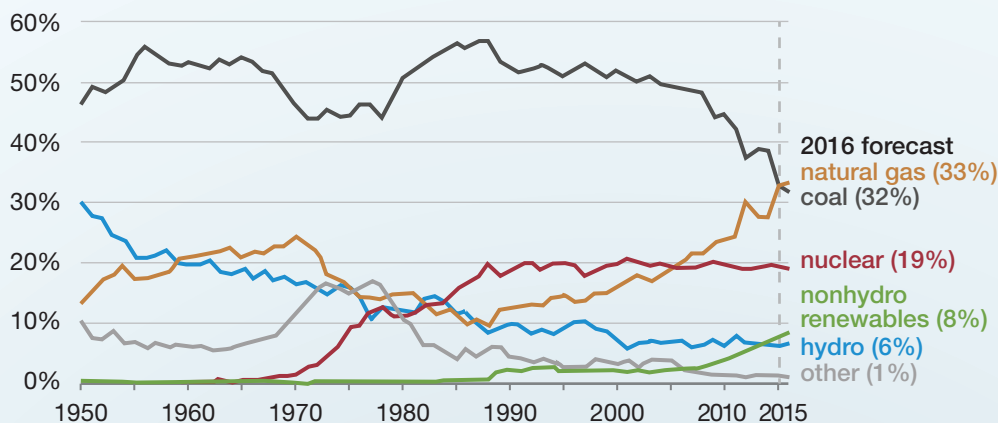
The Clean Energy Trifecta

The next president can focus energy policy on our Clean Energy Trifecta to help lower income Americans save **\$20Bn in energy costs**, begin replacement of the nearly **13,000 coal jobs lost** over the last year, and launch a **19x increase in solar capacity** for high population states

Sources: US Department of Labor Bureau of Labor and Statistics, US Energy Information Administration, and US Census Bureau. Low income data from George Washington Solar Institute research, "Bridging the Solar Income Gap". Solar capacity data from SEIA Market Insight Report 2016 Q2



Natural Gas Surpasses Coal as Leader in U.S. Electricity Generation, and Renewables are on the Rise 75 Years of Energy History



Source: U.S. Energy Information Administration, Monthly Energy Review and Short-Term Energy Outlook (March 2016)

Community #1: Coal 2 Green

The wave of coal bankruptcies sweeping across our nation leaves in its wake thousands of unemployed workers in need of retraining. As Figure 3 notes, coal has been losing a significant share of U.S. electric generation to natural gas, and increasingly renewables, since the late 2000s. Unsurprisingly, the states with the greatest volumes of coal mining – Wyoming, West Virginia, Kentucky, Pennsylvania, and Illinois – have traditionally had low electricity costs and consequently some of the lowest rates of solar adoption per capita.^{7,8} Kentucky and West Virginia have low rates of wind penetration as well.⁹ For example, West Virginia, the second largest coal producing state in the nation, had the fourth lowest retail electricity rate in the country for 2015 and ninth lowest solar watts per capita. With coal losing out to natural gas, however, that dynamic is changing – West Virginia’s average retail electricity rate increased 18 percent between April 2014 and April 2016.^{10,11} Meanwhile, the state has the fourth highest unemployment rate at 6.2 percent.¹² The combination of high unemployment, soon to be obsolete power infrastructure, and rising electricity prices makes coal states a prime target for a presidential administration seeking to redress energy and economic inequality and increase the penetration of renewable energy and other sustainable technologies.

The Clean Jobs Transition Act

The precipitous decline in coal jobs across the United States should be addressed through policies that promote retraining of coal workers into locally viable industries capable of revitalizing sustainable growth in struggling communities. Local demand for solar and wind jobs in these states is not yet high enough to save coal state economies alone. Yet as renewable prices fall while traditional energy prices rise, the solar and wind industries will play an increasingly large role in putting

unemployed coal families back to work. Solar jobs are growing at a 20 percent annual rate and are employing over three times as many workers as coal mining.¹³ The next presidential administration should seek to harness this growth for those suffering the decline of the coal economy by creating funding opportunities for transitioning workers and communities to clean energy. The next steps should push beyond the Obama administration’s 2010 Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) initiative by passing a **Clean Jobs Transition Act**. This act would require coal companies to help struggling communities by sharing in the provision of funding and administration for retraining laid-off workers. The **Clean Jobs Transition Act** would look to the early 2000s for guidance on using high profile energy bankruptcies to create community benefits. In 2001, Pacific Gas and Electric filed for bankruptcy after fallout from the California Energy Crisis caused its debts to begin increasing at a rate of \$300 million per month.¹⁴ While the bankruptcy was a burden on the state’s ratepayers, regulators were able to reframe the proceeding as an opportunity to create funding for state economic recovery. A California Public Utility Commission (CPUC) decision following the bankruptcy required PG&E shareholders to distribute \$30 million over five years to establish the California Clean Energy Fund, or CalCEF, a public benefit fund that invested in clean energy activities and companies. Drawing from the CPUC’s requirement that PG&E create CalCEF, the **Clean Jobs Transition Act** would require coal companies to both fund solar training programs for newly unemployed workers as part of their bankruptcy settlement and provide resources dedicated to assisting with enrollment in such training programs.

The **Clean Jobs Transition Act** would allow the next president to transform the downward spiral of coal bankruptcies into the upward mobility of opportunity by creating additional funding for The Solar Training Network* and other clean energy growth programs.

* Recently, the Obama administration announced the rollout of a DOE Sunshot program called the Solar Training Network that will connect people interested in solar careers industry training and employers. The program is the successor to the Solar Instructor Training Network

(SITN), spearheaded by the Interstate Renewable Energy Council, and will be administered by the Solar Foundation under a limited pool of funding from the DOE – \$2.1 million over two years.

The administration could apply this funding model to create additional, scalable programs for coal worker retraining and employment in other industries as well. The Coalfield Development Corporation's Quality Jobs Initiative offers an instructive model. Coalfield Development Corporation is a West Virginia Community Based Organization that provides well-made and affordable homes, creates reliable jobs, and generates opportunities for increased quality of life for low-income southern West Virginia families impacted by the downturn of the coal industry.

Cash for Clunkers Redux: Solar for Scrap Metal

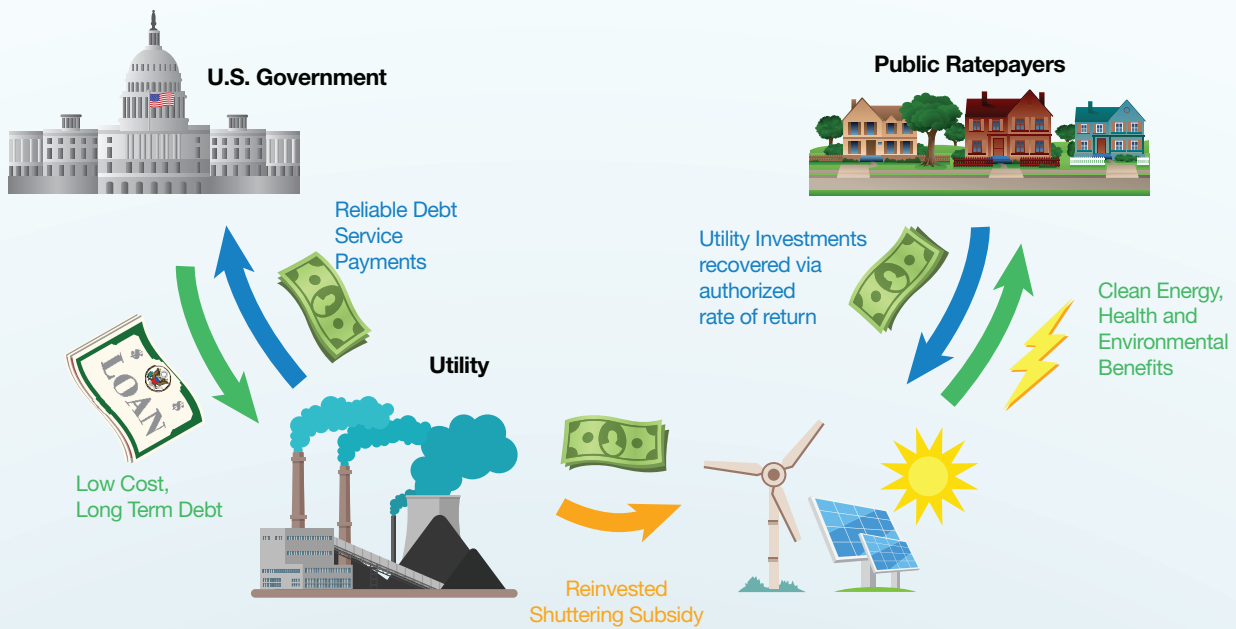
In 2015, POWER awarded \$14.5 million in funding for projects dedicated to improving the health and economies of coal communities. None of this funding, however, directly addressed the extensive costs incurred by utility ratepayers as a result of the closure.¹⁵ Shutting power plants is expensive – the costs of demolition, hauling, safe handling of hazardous substances, and environmental remediation add up. Another program aimed at updating aging technology, Cash for Clunkers, can act as a precedent. Under the

Clean Jobs Transition Act, the next president should launch a similar program for power plants – **Solar for Scrap Metal**. The federal government could subsidize the cost of shuttering a plant with a grant or low cost loan, up to the amount that was reinvested in renewable energy. Provided the cost of capital from the federal government was lower than what traditional debt providers would offer to finance a solar plant, the utilities already under economic and political pressure to close coal plants would see a strong incentive to participate in the Solar for Scrap Metal program. Meanwhile, the federal government could recoup its costs from ratepayers over a longer term than the utility would otherwise, easing the burden of shuttering plants on consumers. Additionally, consumers and the general public would benefit from reduction of coal generation's environmental and health externalities. A 2011 Harvard study found that coal generation placed a \$0.197/kilowatt-hour (kWh) (in 2016 dollars) burden on the public from a combination of land, air quality and human health effects.¹⁶ Shutting one of Kentucky's coal plants that generated 4.9 GWh of power in 2014,¹⁷ for example, would therefore create \$965,300 in annual social benefit. Figure 4 shows a schematic of how this program could work.

Figure 4

Cash for Clunkers Redux: Solar for Scrap Metal

Offer utilities with aging coal infrastructure a way out through reinvestment in renewables. Ratepayers will reap benefits in both health and electricity bills



The EIA's Energy Outlook 2016 projects coal-fired generation to fall by nearly half in the coming two decades. The White house can ease this impact on populations whose energy comes from coal by making a long-term investment in replacing coal plants with renewable generation. In doing so, the White House can provide affected communities with lower energy bills and a healthier environment. **Just replacing the 4.9 GWh of electricity generated annually by one coal plant would create \$965k of public health benefits every year.**

Sources: Health costs of coal from Epstein et al. "Full cost accounting for the life cycle of coal".

Community #2: Reaching Low Income Americans

It's no secret that consumers with lower incomes have been difficult for the clean energy industry to reach at scale. Especially in their early days, solar panels were historically only within the budget of higher income Americans. Yet over the past eight years, developers have introduced financing options like leases, loans and power purchase agreements (PPA)s that dramatically cut or even eliminate the customer's upfront cost of solar installation. At the same time, the all-in cost of residential solar installation fell by 55 percent between 2009 and 2015.¹⁸ These factors combined with the continued existence of the solar Investment Tax Credit have helped funnel billions of private sector dollars into solar development and helped America's middle class become the fastest growing solar customer segment¹⁹ - see Figure 5 below. Still, low income Americans have yet to experience this growth. Some state programs, like the CPUC's Multifamily Affordable Solar Housing (MASH) program, have begun to close the gap but are often fully subscribed long before demand is satiated.²⁰

Defining "lower income" as American households making less than \$40,000 per year, a recent study by the George Washington Solar Institute found dramatic differences in solar adoption rates below and above this threshold. While 40 percent of American households fall

into the "lower income" category, this segment of the population only accounts for about 5 percent of nationwide solar installations.²¹ And while zero-money down options like PPAs and solar leases are helping to erode this discrepancy, personal credit remains a hurdle and there are barriers aside from pure economics that stand between low income Americans and clean energy. Two such barriers we see as prime targets of the next president's policy agenda are the accumulation of deferred maintenance amongst state housing authorities and the high rate of rental housing for low income consumers. Addressing these issues will allow the next presidential administration to make clean energy relevant for the nearly 50 million lower income American households.

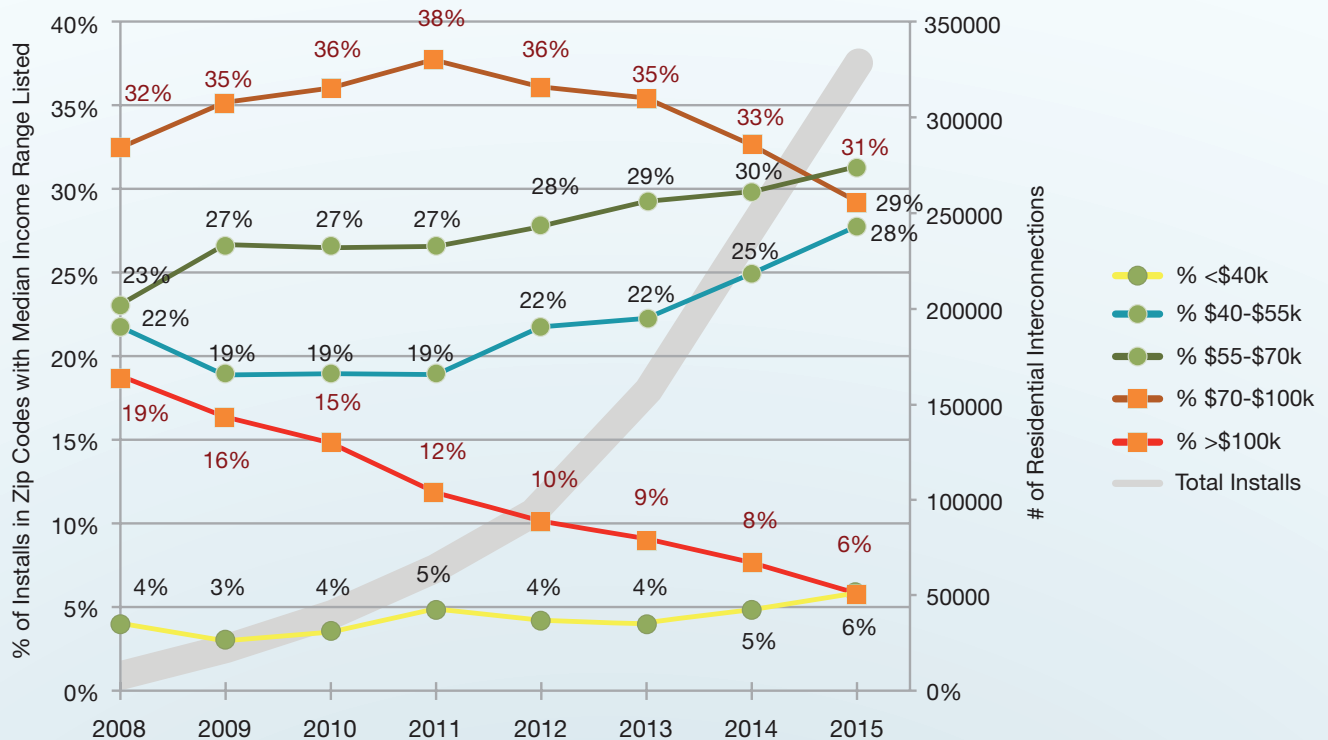
Overcoming the Deferred Maintenance Overhang

Lower income Americans are more likely to live in buildings with deferred maintenance than those with higher incomes.²² This prevents the adoption of clean energy measures in two ways. First, it creates a housing maintenance financial obligation that supersedes investment in renewables. Second, some deferred maintenance issues can physically prevent a homeowner from conducting home energy upgrades. In older homes with asbestos risk, for example, homeowners

Figure 5

Solar to the People: State-wide Residential Solar Breakdown by Median Owner Occupied Household Income

Residential solar is being installed increasingly on middle income homes – in California the \$40-\$55k household income segment has made the greatest strides in market share since 2013



Source: Kevala Analytics "Income Distribution of Rooftop Solar Customers"

are discouraged from making any changes to existing insulation before taking on the added cost of contracting an asbestos abatement professional.²³ Moreover, conducting weatherization improvements before addressing air quality issues arising from deferred maintenance can lead to an unhealthy buildup of combustion gases and volatile organic compounds.²⁴ Unfortunately, deferred maintenance has reached astronomic levels in some state housing authorities. New York City Housing Authority (NYCHA), for example, has 270 buildings over 30 years old and has accumulated \$16 billion in deferred maintenance. NYCHA's operating deficit of \$98 million perpetuates this situation.²⁵

In order to address deferred maintenance and help bring new energy solutions to low income populations living in public

and Section 8 housing, the federal government could establish a dual purpose **Deferred Maintenance Overhang Loan** program for both deferred maintenance and energy efficiency investment. The DOE should create a task force designed to expand existing home energy assessment programs by including the cost of the initial deferred maintenance upgrades required. By providing deferred maintenance costs, the costs of suggested energy efficiency upgrades, and the projected energy savings, the assessments would allow the government to forecast the upfront costs and payback period of each project. The government could then issue **"Dual Purpose Deferred Maintenance and Energy Upgrade Bonds"** with a similar maturity to the forecast payback period. The proceeds of the issue would fund loans to state housing authorities in the amount of the aggregated project costs under their jurisdiction.

Weather or Not: The Case for Supporting Weatherization in Low Income Housing

Consumers with lower incomes cannot avoid the necessity of heating, cooling, and lighting their homes and are thus disproportionately affected by the cost of energy. While middle- and upper-income families typically spend 5% or less of their income on energy, lower-income Americans frequently spend upwards of 10%.

Weatherization measures make economic sense - A recent study of the DOE's Weatherization Assistance Program's cost-effectiveness found a savings to investment ratio of 1.5 for 2008 WAP projects.

Aside from household economics, weatherization measures provide significant health benefits to the inhabitants whose homes receive them. The same study found that for every DOE dollar spent, homeowners and society realized \$2.08 non-energy benefits such as reductions in asthma, thermal stress, and carbon monoxide poisoning

Typical Measures Installed	Energy Savings	Payback Period
Homes weatherized July 1988 to June 1989		
<ul style="list-style-type: none"> • Caulking • Weatherstripping • Replacement Windows • Storm Windows • Attic Insulation 	Single Family – Gas Heat.....	10%
	Single Family – Electric Heat.....	5%
	Mobile Homes.....	10%
		30 years
		21 years
		53 years
Homes weatherized July 1989 to June 1990		
<ul style="list-style-type: none"> • Advanced Air Sealing • Attic Insulation • High-Density Wall Insulation • Heating Safety and Efficiency Improvements 	Single Family – Site Built.....	24%
	Mobile Homes.....	17%
		10 years
		17 years

Sizing our Deferred Maintenance Overhang Loans: The chart above is a sample payback period analysis used by the DOE to provide training for weatherization technicians in Virginia. Such analyses, expanded to the measures required to eliminate deferred maintenance requirements, could be applied to low income housing energy projects and used to calculate the appropriate term for our proposed loans.



Sources: Information on energy budgets from "Energy Burden and the Need for Integrated Low-Income Housing and Energy Policy", by Diana Hernández and Stephen Bird. Weatherization cost effectiveness and health impacts from "Weatherization Works" retrospective evaluation by Oak Ridge National Laboratory. Photo and Weatherization chart credit to the US Department of Energy.

This could also be accomplished via Property Assessed Clean Energy (PACE) financing. The Federal Housing Administration (FHA) has recently announced that they will begin insuring mortgages on properties with PACE liens provided that the PACE liens remain subordinate to the mortgage. The announcement broadens the scope of buildings under which PACE financing can be used. In some cases, PACE financing could stand in for government bonds as a source of funding for state housing deferred maintenance and energy upgrade projects. At the beginning of 2016, California Governor Jerry Brown initiated a multifamily PACE pilot program in partnership with HUD. The pilot program is intended to test the viability of PACE loans for HUD-assisted and HUD-insured multifamily housing. The next administration should follow the results closely and direct HUD to apply the learnings of the California pilot to a national program.²⁶

Community Solar: Roofs not Required

The second barrier to low income renewable energy and energy efficiency adoption lies in the fact that lower income citizens are also less likely to own their roof due to higher rates of renting and living in multifamily housing. 49 percent of lower income households are renters versus just under 22 percent of households with incomes greater than \$40k.²⁷ This makes entering into a solar agreement difficult, but community solar programs offer a solution. Community solar programs allow customers without a suitable location for a solar array to make use of one built elsewhere. Participants either invest in a portion of a solar farm and partake in the profit of selling the energy or enter into a contract with their local utility to purchase renewable energy from a shared solar facility operated by the utility or a third party. Community solar is growing in popularity with 25 states now home to at least one operating project.²⁸ In addition, the DOE SunShot Initiative recently announced its intention to develop a \$5 million Community Solar Challenge. Still, the federal government could lend developers and their low income customers a huge boost by directly lowering the costs of community solar development.

One way to lower costs and boost community solar development would be to **include the land purchase or present value of lease payments under the basis of the Investment Tax Credit** for projects built exclusively for community solar purposes. Landowners are quickly becoming aware of the value of their land for renewable developers and are raising their prices accordingly. Allowing these costs to be tax credit eligible for investors would help bring down project costs, encourage investment and ultimately help improve solar access to low income customers. Another tactic would be to provide the land itself. Secretary Clinton has set a goal of a tenfold increase in renewable energy production on public lands and waters within 10 years.²⁹ This goal could be further refined to target low income customers by **decreasing federal land lease or sale rates for community solar projects** in proportion to the percentage of the solar farm dedicated to serving low income customers. The cost savings achieved would then be passed on to community solar

customers in the form of a lower cost of investment or cheaper utility bill depending on the community solar model.

Community #3: Solar States of Mind

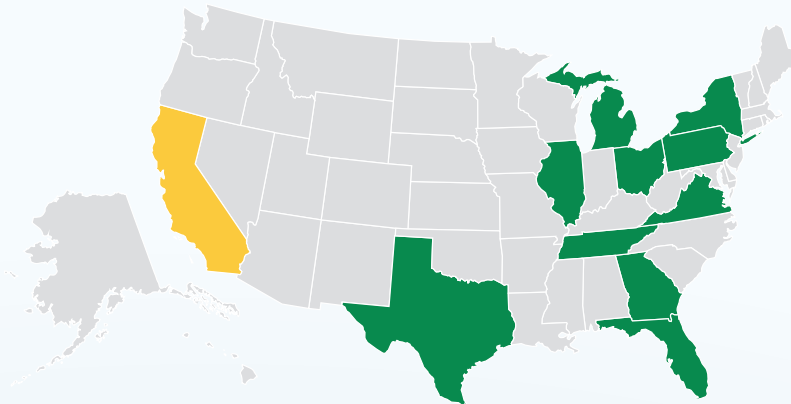
A notable feature of the political landscape as it pertains to renewable energy is the segmentation of policy by state. As renewable technologies that have to interact with the utility grid are largely at the mercy of state policy, state borders can function as massive barriers to adoption. Due to the varying sizes of state populations, state policies that are prohibitive to renewables growth can potentially hold a disproportionate share of the U.S. population captive with traditional energy sources. In the fight for the hearts and minds of U.S. voters, populous states with low deployment are an attractive frontier. To construe large, low renewables penetration states as low-hanging fruit would understate the challenge of inspiring change among state policy makers showing or facing resistance to promoting renewables. Yet, when these large states with low solar penetration are subdivided into those which also happen to be approaching solar grid parity (the point at which an alternative energy source provides power at a levelized cost of energy equal to that of conventional sources of power) and are home to large populations, we have large, juicy, increasingly obtainable fruit.

Wish They All Could Be California Solar Stats

The Energy Information Administration (EIA) Electric Power Monthly report for July 2016 includes a data set on solar capacity by state. Cross-referencing this data with the state population data from the U.S. Census Bureau, we've created a measure of solar penetration in watts per capita (WPC) for all of the 50 states. Layering in Greentech Media's recent study on grid parity and accounting for overall population size, we found a set of populous states with low solar penetration but closing in on or at grid parity – exactly that low hanging fruit mentioned above. We then compared these states to California, the nation's leading state in terms of both total solar capacity installed and solar job creation.³⁰ Though California's sunny weather certainly lends its solar market an advantage, those states at or nearing grid parity have the potential to compete proportionally with the Golden State. Using California's WPC, we calculated the overall opportunity for additional solar capacity constituted by our set of target states and illustrated this opportunity below. Combined, these states represent over 106 million citizens of voting age,³¹ 190 congressional votes and 43 percent of the U.S. population.³² Moreover, two of the top 10 biggest opportunity states – Illinois and Pennsylvania – are also among the top 5 coal-producing states.³³ The data also shows that of the five largest states by population – California, Texas, Florida, New York, and Illinois – only California is in the top 30 percent of states by solar penetration per capita.³⁴ Targeting our set of opportunity states will allow the next presidential administration to address both large populations and those that have suffered the ramifications of a declining coal economy.

Solar States of Mind – Wish They All Could Be California Solar Stats

If the next president's energy policies can push these ten large states past solar grid parity and help them catch up to California's level of solar watts per capita, the nation's solar capacity will **double***, increasing by 34 GW – **enough to power over 6.6 million American homes and generate over \$67 billion in economic activity¹.**



State	Population Size	Grid Parity?	MW of Solar Installed	Current Watts Per Capita (WPC)	Total MW at California WPC (257.7)	Total Solar Opportunity in MW
Texas	27,469,114	Close	479	17	7,078	6,599
Florida	20,271,272	Very Close	206	10	5,223	5,018
New York	19,795,791	Yes	583	29	5,101	4,518
Illinois	12,859,995	Very Close	52	4	3,314	3,262
Pennsylvania	12,802,503	Very Close	204	16	3,299	3,095
Ohio	11,613,423	Medium	108	9	2,992	2,884
Michigan	9,922,576	Close	36	4	2,557	2,521
Georgia	10,214,860	Close	120	12	2,632	2,512
Virginia	8,382,993	Medium	29	3	2,160	2,131
Tennessee	6,600,299	Medium	82	12	1,701	1,618
TOTAL	139,932,826		1,897		36,055	34,158

Sources: US Census Bureau, US Energy Information Administration, Solar Energy Industries Association; Greentech Media "GTM Research: 20 US States at Grid Parity for Residential Solar"

*Based on Q2 2016 SEIA and GTM Research U.S. Solar Market Insight Report figure of 29.3 GW total installed U.S. solar capacity

¹Estimate of economic activity calculated using nationwide weighted average cost of solar in 2015, derived from GTM Research and Solar Energy Industries Association's U.S. Solar Market Insights Reports for Q2 2016 and 2015

An Offer They Can't Refuse: Federal Energy Bonds

Picking certain states for exclusive subsidies would be both unfair and politically unpalatable. However, by targeting states that are just on the verge of grid parity, the next president can optimize the allocation of federal support to nascent solar markets with the most potential for success. The VirginiaSAVES Green Community Program offers an example of how the federal government might accomplish this. VirginiaSAVES provides low cost loans to developers of energy efficiency, renewable energy, and alternative fuels projects by using Virginia's allocation of the Department of Energy's Qualified Energy Conservation Bonds (QECBs). QECBs and the similar Clean Renewable Energy Bonds (CREBS) are a taxable bond structure that allows issuers to reduce their cost of financing. The issuer – a government entity in the case of QECBs – receives a cash rebate from the U.S. Department of Treasury to reduce the size of the net interest payments to bondholders. The rebate has historically reduced VirginiaSAVES interest rates by 2-3% allowing the program to pass this savings along to project developers in the form of low cost loans.^{35,36,37} The federal government should **offer to help other states set up this framework and work with the DOE to issue more QECBs and CREBS** for the capital requirements. By fine tuning

the size of the Treasury's interest rate reduction to the cost of capital required by state developers, the federal government would effectively set a threshold for which states could find such a program economically attractive.

Leadership from the Utilities: Good Bye Battles, Hello Collaboration

Net metering policy is one of the critical components of residential solar economics. It is a common regulatory policy in which residential solar customers are reimbursed by the utility on a \$/kWh basis for the electricity their solar panels generate that isn't immediately used by the home. Net metering has been credited with enabling the nascent distributed solar market to emerge by offering a simple-to-understand compensation mechanism to consumers.³⁸ The policy has also been contentious in some states, especially where utilities admonish the program as an alleged subsidy for rooftop solar providers.³⁹ In fact, state specific net metering battles have dominated solar news publications and taken a major toll on solar jobs, growth and investment over the last year. In Nevada, for example, the state regulator eliminated net metering for both new and existing customers in December 2015. The controversial decision caused SolarCity, Sunrun, Vivint and other

solar developers to suspend their operations in the state. This decision cost over 700 solar installers their jobs and removed the majority of Nevada’s solar growth – see below.^{40, 41, 42}

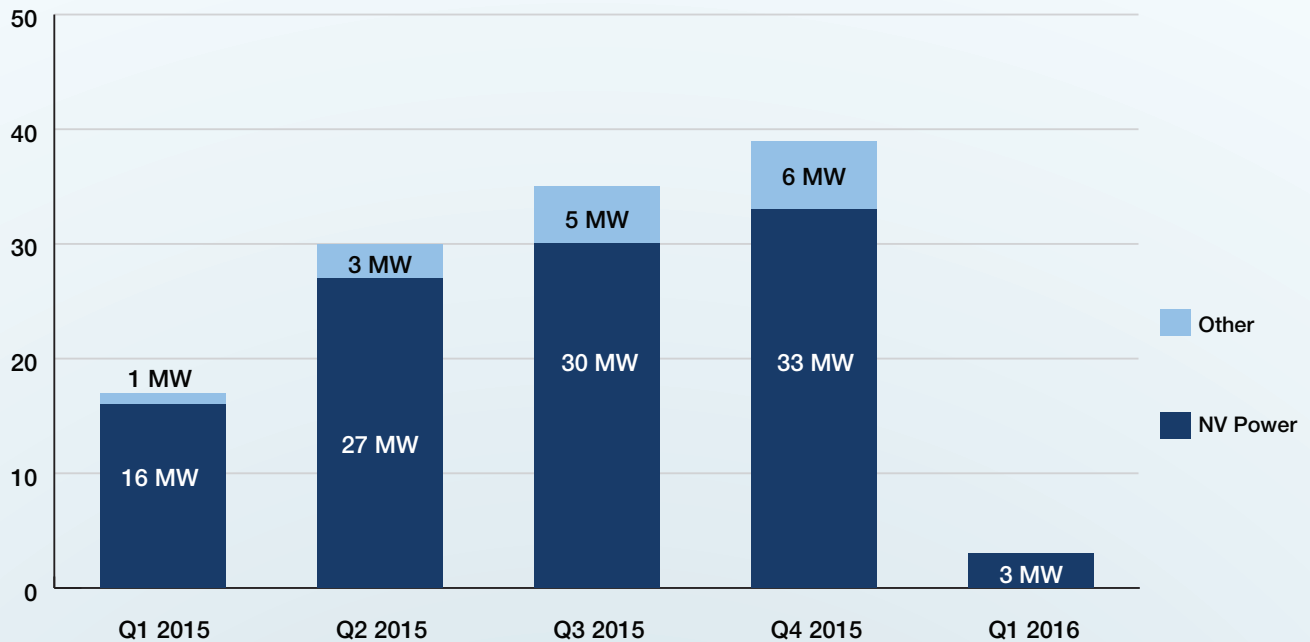
Utilities have a simple motivation for decrying net metering: it reduces their revenue. Utilities argue that in the process of doing so, net metering shifts costs from solar customers to nonsolar customers by reducing the payments coming from solar customers to cover the costs of the grid. This theoretical shift would subsequently result in higher utility bills for nonsolar customers. Yet the truth of the matter is more complicated. First, the assertion that net metering results in a cost shift to nonsolar customers has been heavily disputed by a number of studies. Indeed, a recent report by the nonpartisan Brookings Institute analyzing the major cost effectiveness studies to date found that net metering provides a net benefit to ratepayers. The paper finds that: “In short, while the conclusions vary, a significant body of cost-benefit research conducted by PUCs, consultants, and research organizations provides substantial evidence that net metering is more often than not a net benefit to the grid and all ratepayers.”⁴³ Second, utilities are financially disincentivized from supporting customer-owned distributed energy resources (DERs) that reduce their system operating costs. The traditional

“cost-of-service” utility business model relies on profits from capital investments to infrastructure – new substations, transformer upgrades, centralized generation (depending on the regulatory regime) and the like. Some have argued that utilities which do not provide centralized generation under a “decoupled” regime are not in competition with DERs like rooftop solar.⁴⁴ Counter to this point, recent utility transmission plans have shown that the grid-benefiting attributes of DERs decrease the need for upgrades and therefore decrease utility revenue streams, even in decoupled scenarios.⁴⁵ Utilities cannot be faulted for seeking to avoid slowing revenue growth – they are simply operating within the constraints of an outdated regulatory paradigm – but their incentives must be kept in mind when considering their position on net metering and other grid innovations.

Despite the findings of the Brookings institute in support of net metering, the dispute is far from settled. The debate in Nevada rages on, and as of the end of 2015 more than half of U.S. states were studying or considering changes to their net metering policies.⁴⁶ Nevada aside, there were some recent big successes for the solar industry – the net metering decisions in California, Colorado, Massachusetts, and Arizona, which together accounted for

Figure 7

Not Such a Heavenly Valley: Permits Issued for Nevada Residential PV by Utility Territory
Q1 2015 - Q1 2016 (MW)



Source: Brookings Institute “Rooftop Solar: Net metering is a net benefit” and Bloomberg New Energy Finance, Construction Monitor

67 percent of the new U.S. solar capacity installed last year, were widely hailed as a victories for solar.^{47,48} Yet the fact that these battles are hard fought and can potentially occur on 50 separate stages is enormously expensive to society in terms of legal costs, court costs and the opportunity costs of lost solar installations.

Beyond DER Drama: Best Practices from the White House

We see a role for the next administration to encourage thoughtful progress related to distributed solar policies at the state level, including net metering. In particular, we recommend that the federal government work with the Federal Energy Regulatory Commission (FERC) and the DOE to **create a DER cost-benefit framework and supporting playbook** that lists best practices for quantifying DER cost-benefit categories. State regulators could then turn to the framework and playbook when net metering battles inevitably reach their doorstep, and even mitigate exacerbated and costly conflict by foreseeing those battles and initiating proceedings proactively. Additionally, the DOE and FERC could augment the playbook with a **quantitative public tool** that allows third parties to run their own cost-benefit analyses in order to comment on regulatory proceedings. The data generated

from these analyses could be pooled to create a national database useful for predicting the ramifications of state policy changes. Moreover, as technologies change and analytical methodologies improve, the cost-benefit framework and best practices playbook should be updated. The most near-term example of this is the arrival of “solar + storage” on residential rooftops, which will impact net metering and other utility policies significantly. The framework will need to be adjusted to account for the increasing value of excess solar energy once it can be stored and used flexibly. The DOE and FERC should **convene conferences to seek industry feedback** both at the point of creation and when updating these tools to build consensus and prevent future disagreement at state level proceedings. To do so will require an impartial government agency host, broadly respected voices on energy, and attendance from all of the relevant parties – utilities, renewable energy representatives, public utilities commissioners, environmentalists and consumer advocate groups. It will undoubtedly be difficult to build consensus among such a group. Yet, if the next presidential administration is successful in doing so, it will have removed one of the largest remaining barriers to the clean energy revolution and laid the foundation for a presidency full of clean energy collaborations rather than conflicts.

Aligning with the Future – Grid Reform Models



The misalignment of utility incentives under the current regulatory paradigm will be a barrier to customer choice and DERs until the model is changed. Fortunately, several states are already considering major changes to their regulatory paradigms. We suggest the next president direct the DOE to partner with FERC in analyzing the potential of several of the new models under consideration, and use the results of these analyses to weigh in on ongoing proceedings at the state level.

The CA DRP Model: California’s proposal for reforming the grid seeks to incentivize utility investment into DERs, but does so within the traditional “cost-of-service” utility model. Similar to IDSO, CA utilities would own the grid infrastructure. However, under the CA model the utilities would also still be responsible for planning and procurement of resources. The innovation of the CA Distributed Resources Plan (DRP) proceeding is that it expands the generation technologies under which CA utilities can earn a return on investment. As it stands, when CA utilities make such a choice they receive no return – the expense of DER energy is simply passed through to ratepayers at cost. Under the DRP proceeding, California regulators have proposed to allow utilities a return on investment when they choose to procure energy from DERs rather than centralized generation. With California’s high penetration of renewables, this proceeding takes on considerable significance and will provide valuable insight to regulators in growing solar markets.

The IDSO Model: In the late 1990s, FERC encouraged the voluntary formation of Independent System Operators and Regional Transmission Organizations to manage the country’s long-distance electrical transmission infrastructure in a manner fair and objective to the ratepayer. This was done to avoid the misalignment of incentives between ratepayers and transmission system owners who might be

tempted to operate the grid in a manner that benefited their affiliated power businesses on the electrical generation side of the grid. The IDSO model proposes establishing the same set of independent operators at the distribution level. While utilities would continue to own the distribution system, the planning and operations would be managed by an independent organization. IDSOs would select generation sources on a competitive basis, evaluating DERs and traditional generation sources for the benefit of the grid. If DERs like solar and storage ultimately proved to be more competitive in the IDSO framework, there would be no barrier or disincentive for utilities to invest in them.

The NY REV Model: Under the New York REV (Reforming the Energy Vision) proceeding, the state intends for its utilities to become “distributed system platform providers”. The key to NY REV is that it seeks to incentivize utility investment in DERs by expanding the platforms under which utilities can earn revenue. As noted above, the cost-of-service model requires utilities to forecast revenue requirements, make investments in grid infrastructure, and then recoup their investment via regulator-approved rates. In May, the New York Public Service Commission voted to allow utilities to earn revenue for the use of customer PV, demand management, and energy efficiency measures. Additionally, utilities will be allowed to earn revenue on provision of grid services to DER providers, such as interconnection or financing facilitation. Rather than simply earn a return on identifying costs for upgrades and purchasing them, utilities under NY REV would earn a return on identifying costs and avoiding them (while still providing safe, reliable service). While nascent, this NY REV model bears watching as its early results will surely offer useful lessons for other states.

SUPERCARGING OUR FUTURE – INVESTMENT POLICIES THAT BUILD AN ONRAMP TO OUR CLEAN ENERGY ECONOMY

Investment in cleantech has been accelerating at a remarkable pace. Investors poured a record \$329 billion into global clean energy last year.⁴⁹ Still, in the wake of the landmark agreements reached in Paris at COP 21, the worldwide conversation has turned to the renewable energy “investment gap.” Estimates put the investment in clean energy needed to achieve the goal of limiting global temperature rise to 2 degrees Celsius at between \$12 and \$13 trillion over the next 25 years.⁵⁰ This is approximately \$5 trillion above current projections. Fortunately, there are many opportunities within the U.S. to start closing this gap. National rates of electric vehicle adoption highlight one such opportunity and the potential for increased investment to realize others. In Norway, where average exemptions on aggressive taxes for carbon-fueled cars equated to over \$23k per car in 2014 U.S. dollars, plug-in EVs represented over 22 percent of Norwegian auto sales in 2015.⁵¹ The United States has a long way to go by comparison – with the U.S. federal incentive capped at \$7,500, EVs make up just under 1 percent of American auto sales.^{52,53,54} Consumers in the U.S. and worldwide will not make the switch to clean energy unless increased investment makes it economical to do so. Despite our slower adoption rates, the 373,000 pre-orders for the less expensive Tesla Model 3 in the weeks after its debut provide a clear illustration of U.S. customers’ price sensitivity⁵⁵ when considering an electric vehicle. Without significant venture, equity and debt investments, moving down the cost curve would have been prohibitive for Tesla or any other EV manufacturer. To both proliferate the spread of clean technology and broaden its political support, the next president of the United States must seek to increase cleantech investment wherever possible. Here we present several areas in which the president can directly affect levels of investment through policy change.

Investing in the Energy Amazons of Tomorrow: Data Access is Key

Imagine if Uber was not able to access your locational data through your phone. The drivers would have to call you individually, get your address, plug it into Google Maps themselves, and then drive to find you. There would be missed calls, misheard addresses, and ultimately an inefficient app that created unsafe driving conditions. Imagine if Amazon, not the consumer, chose the seller of any product searched for on its site. Moreover, imagine if Amazon only displayed the sellers it had chosen and never revealed the options it had to choose from or the criteria of its decision. Shopping at Amazon would ultimately offer no advantage over visiting a manufacturer’s

website directly. Amazon would today not be a household name, and consumers would have missed out on the ability to weigh price and quality to source their own goods. Yet this is the landscape we face in the energy sector – the public, and therefore entrepreneurs, do not have access to grid data that is absolutely critical for improving the efficiency of electricity transmission and distribution. Without democratizing access to data we can’t create the Ubers, Amazons or Googles of our future energy industry.

In addition to limiting the ability of entrepreneurs to create new solutions to the problems of an aging utility business model, lack of access to data interferes with the adoption of existing renewable energy. For example, there is a direct cost to renewable energy developers resulting from lack of ability to determine the costs of interconnection. Without reliable estimates of interconnection costs, developers have trouble forecasting project profitability. As a result, investors ascribe to their funds an increased level of risk and therefore cost of capital.⁵⁶ Second, lack of access to models and cost assumptions used in avoided cost calculations^{*} and long-term planning prevents public stakeholders from debating utility decision-making with regards to renewable energy. This limits collaboration and leads to combative decision-making like that seen in Nevada over net metering, which cost over 700 jobs, a steep decline in solar equity values, and an undoubtedly high sum in legal costs borne by ratepayers.

Green Button II: Getting to Grid Neutrality

The federal government can ameliorate these barriers to investment through the extension of a past successful initiative. The White House took a major step toward data standardization and transparency with the Green Button Initiative in 2012. This measure allows utility customers to easily download their usage data for purposes of energy efficiency and management. In many states there are ongoing debates in public utility commissions to make the aforementioned data and investment decision-making frameworks open to the public.⁵⁷ The federal government could launch a **Green Button Phase II** initiative to standardize methods and set a floor for data sharing. In California utilities are proposing rollouts of data sharing apps but have been slower to cooperate with one another or third parties on what the final format of the data will be.⁵⁸ **Green Button Phase II** should be launched ASAP by convening all stakeholders, including data experts like Amazon, Google, Uber and Microsoft, to advise state regulators and encourage utilities to create

* Avoided Cost is calculated as the marginal cost of energy production and delivery. When utilities choose to procure energy from non-traditional sources, such as DERs, they are literally avoiding the cost of incremental energy generation. Hence, regulators often employ an avoided

cost methodology in determining how much DERs and other alternative sources of energy should be paid by the utilities.

data products that can easily be blended into regional or nationwide data sets. Otherwise, disparate data sets will create an enormous challenge for economists, utilities, policy makers and entrepreneurs interested in improving the function of the grid.

Improving on Successful Policies: Updating the Investment and Production Tax Credits

The Solar Investment Tax Credit (ITC) and Wind Production Tax Credit (PTC) have been vital to the growth of the solar and wind industries in the U.S. According to the American Wind Energy Association, the PTC “has helped more than quadruple wind power in the U.S. since 2008.”⁵⁹ Similarly, the Solar Energy Industries Association reports that solar capacity has increased 8,300 percent since 2008, when solar tax credits received a long term extension.⁶⁰ When the most recent ITC extension was passed in late 2015, Greentech Media’s forecast for solar growth in the following five years increased 54 percent.⁶¹ Before the PTC expires in 2020 and the ITC follows suit in 2022, America’s next president should build on their success by expanding the rapid growth we’ve seen in solar and wind to other technologies. Additionally, the ITC and PTC both suffer from a major shortcoming that should be addressed. Their structure has created a limited pool of investors, giving undue strength to suppliers of tax-equity investment. Consequently, solar developers often face a challenging 10 percent or higher cost of capital from tax equity investors.⁶² The federal government could make a number of changes to alleviate this problem.

Share the Love: Expanding the ITC to include Storage

The first and most obvious technology to begin incorporating into the ITC is energy storage. Though energy storage currently qualifies for the ITC if installed with solar PV or wind, the requirements for qualification are complicated and create uncertainty for investors. They include a provision that 75 percent of a storage property’s energy consumption must come from the renewable energy source they are installed with in order for the storage investment to receive the most recent ITC. If the property falls below the 75 percent threshold for even one year of the five-year ITC compliance period, the tax credit becomes subject to claw back by the IRS. If the property meets the 75 percent requirement, the amount of ITC received is pro-rated to the percentage of energy stored from the associated renewable generation between 75 and 100 percent. Inherent variation in the annual generation from weather-dependent renewables therefore creates uncertainty in the amount of storage ITC received under the current policy. Bipartisan legislation to create a more straightforward storage ITC was recently re-introduced in both the House (H.R. 5350) and Senate (S. 3159), and U.S. Representatives Chris Collins (R-NY) and Mark Takano (D-CA) launched an Energy Storage Caucus in late 2015. Initially, the next president should **call on Congress to work the storage ITC legislation through to passage and publicly endorse the Energy Storage Caucus**. Once this legislation is passed the federal government should direct the DOE to examine other capital-intensive renewable technologies and determine their suitability for inclusion under the expanded ITC.

Get Active or Experience a Passive Loss: Democratizing the Tax Equity Pool

Addressing the limited pool of PTC and ITC tax equity investors and attendant high costs of monetization should also be a priority for the next administration. Part of the issue is the difficulty for every day citizens and smaller businesses to take advantage of the tax credits. They



are nonrefundable tax credits, so investors in renewable energy projects can only take advantage of the ITC or PTC up to the amount of their existing tax burden. The existing statutes somewhat alleviate this problem by allowing the credits to be carried forward to future tax burdens, but the credits do not appreciate to account for the lost time value of money. In order to make the ITC and PTC easier to monetize and hence available for investment by the general public, the federal government could change the credits from non-refundable to refundable or allow the credits to accrue interest at the going federal funds rate.

Another change that would help address the limited pool of tax equity investors would be to allow individual investors and closely held corporations to more efficiently claim these tax credits by changing the passive loss and at-risk rules as they apply to renewable investments. Currently, individual investors and closely held corporations are typically prevented from efficiently investing as tax equity partners because the tax benefits are limited by passive loss rules. These rules prevent tax credits and deductions from offsetting most forms of taxable income. The at-risk rules that limit tax credits proportionally based on the amount of investment are another barrier to smaller investors. Relaxing these rules as they apply to renewables could significantly expand the available investor pool. While this rule change would be significant, it is not totally unprecedented. A more limited special exemption to the passive loss limitation already exists for the federal Low Income Housing Tax Credit (LIHTC) program, and has contributed to the program’s success described below. Enacting any of these changes would open renewable energy finance to a more diverse pool of investors, enable novel financing solutions, and drive down the overall cost of projects.

Two Scoops of Solar: ITC meets LIHTC

Low income communities represent one of the biggest untapped opportunities for both renewable energy investors seeking a green return and policy makers seeking to evenly distribute the benefits of renewable energy. As noted earlier, one of the biggest hurdles to solar adoption among low income citizens is that many do not own their own homes and are hence prohibited from making investments in renewable energy. The existing problem can be addressed by the expansion of community solar programs and funding for deferred maintenance, as we advocate above. The federal government also has a tremendous opportunity to prevent this problem for future low income housing developments by incentivizing housing developers and the banks that fund them to go solar from the beginning. The Low Income Housing Tax Credit (LIHTC) has much in common with the Solar ITC. Both are a dollar for dollar, nonrefundable credit against investors' tax appetites, and both include a clawback period during which the infrastructure funded by the credit must remain operational for the credit to be retained. LIHTC was instituted to counteract the diaspora of investors out of rental housing as a result of the Tax Reform Act of 1986. Since a decrease in the creation of new rental housing would have disproportionately affected the low and middle income population, Congress passed LIHTC to incentivize investors with a sizable tax credit for costs incurred in low income housing development. In addition to the tax credit value, LIHTC investments count toward banks' requirements to provide low income communities with credit and lending opportunities under the Community Reinvestment Act. The program

has been so successful that nearly 90 percent of low income rental property investments now incorporate a LIHTC credit.⁶³

While the ITC has proven highly effective at spurring solar development, it could be made more effective for low income customers if paired with the LIHTC program. The White House should work with state housing finance agencies to **ensure that solar projects built on LIHTC-eligible developments are eligible for both the ITC and full LIHTC tax credit.** In this manner, banks that would normally invest in solar projects to monetize the ITC could also take advantage of the LIHTC tax credits, and in doing so gain points on their Community Reinvestment Act (CRA) exams. In a mature market, the addition of LIHTC credits would enable solar developers to achieve a lower cost of capital from the banks providing tax equity investment. LIHTC tax credits captured by the investors and the resultant lower cost of capital realized by developers would ultimately be passed on to the consumers in the form of lower rent. LIHTC laws require that maximum rent is set based upon the Area Median Income (AMI). In order to qualify for the LIHTC credit on solar, the new standard could lower the maximum rent in proportion to the credit received. 50 percent of the LIHTC credit could be shared among each of the units and spread over the length of the 15 year LIHTC clawback period, thereby creating long term savings for low income renters. Meanwhile, developers would have a much stronger incentive to include solar on their low income rental properties and banks would open up more CRA-eligible funds to address this market – See Figure 8 below.

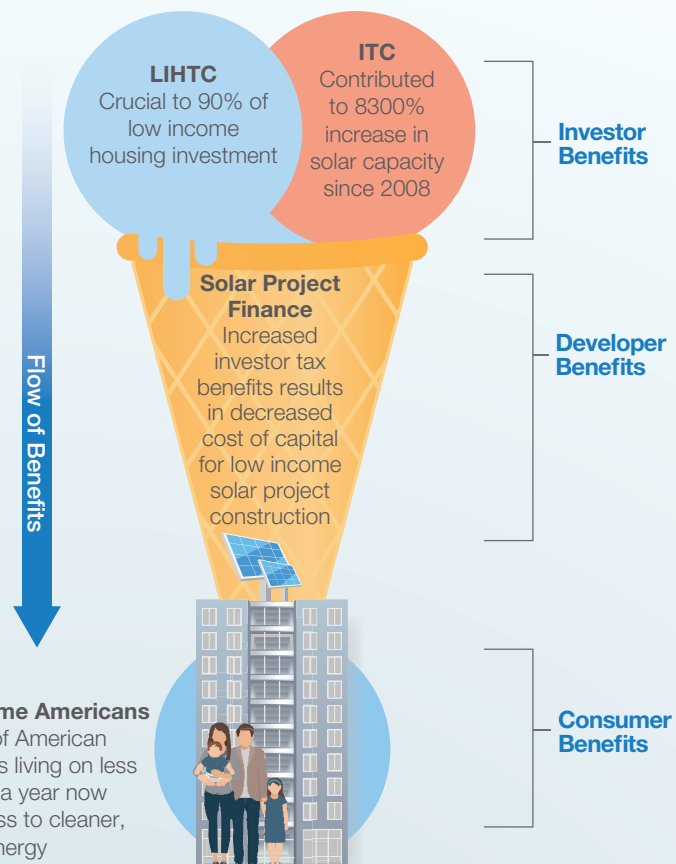
Figure 8

LIHTC & ITC: Two Scoops of Solar

If every existing LIHTC credited apartment unit was in a building where solar was installed, **2.5 million low income renting households** would have access to solar energy. Meeting just 10% of these households' energy needs with solar would create at least **1.8 gigawatts** of nationwide additions to residential solar capacity – **an increase of over 40%.**

Sources:
The New York Times'
"A Tax Credit Worth Preserving"
and George Washington Solar Institute's
"Bridging the Solar Income Gap"

Low Income Americans
The 40% of American households living on less than \$40k a year now have access to cleaner, cheaper energy





The Carbonless Gains Tax

Demand for sustainable investment options is growing. The UN-supported Principles for Responsible Investing Initiative network grew to 1,380 signatories with \$59 trillion in assets under management by the end of 2015.⁶⁴ A 2015 Morgan Stanley survey found that the portion of assets considered sustainable under professional management was up 50 percent from 2012 to 2014.⁶⁵ At DBL Partners, we are firsthand witnesses and beneficiaries of investor appetite for social good, but we want to see DBLs proliferate all over the country. One of the ways the next president can create more DBLs and continue fueling the cleantech investment trend is through creation of the **Carbonless Gains Tax**.

The Capital Gains Tax qualified dividends provision allows investors some relief from taxation. Most regular dividends from U.S. corporations fall under the qualified dividend distinction and as such are taxed at a maximum of 15 percent (for anyone other than those in the highest tax bracket) rather than the ordinary income tax rate. The next president should work with Congress and the IRS on expanding qualified dividend policy to further incentivize investment in green company equities. Under a **Carbonless Gains Tax** policy, dividends would be taxed at a lower rate than the current qualified tax regime. Doing so would effectively increase after-tax dividend yields to investors. Therefore, corporate managers of green companies could

allocate considerably less of their annual earnings *on a pre-tax basis* to dividend payouts and still achieve the same *after-tax* dividend yield to investors. For example, a company that pays out \$100 in dividends to investors who are taxed at a 15 percent rate and one that pays out \$97.70 to investors taxed at 13 percent are both providing investors with \$85 after tax, but the second company now has an extra \$2.30 to invest. To qualify for the green dividend program under a **Carbonless Gains Tax**, the IRS would require corporations to submit an application demonstrating a plan for use of the savings achieved toward qualified green product development, emissions-reducing activities or other corporate sustainability goals.

Alternatively, the administration could focus its efforts on the capital gains tax realized at the point of sale. Currently, the capital gains tax is structured to incentivize investors to hold stocks for a longer duration by taxing the gain on sale of equities held for one year or longer at a lower rate than those sold less than a year after purchase. While short-term gains are taxed at an individual's ordinary income tax rate, long-term capital gains are taxed at 15 percent for single filers with incomes less than \$415k. Similarly, the government could incentivize investment in companies that qualify for **Carbonless Gains Tax** status by making their long-term capital gains rate lower than current rates.* This would serve to increase investor demand for green equities and therefore incentivize companies to make investments to qualify for Carbonless Gains Tax status.

* Empirical studies conducted by the National Bureau of Economic Research in the wake of the Tax Payer Relief Act of 1997, which lowered the top capital gains tax rate from 28% to 20%, showed that investors reacted quickly and materially to changes in the capital gains rate. Since

the resultant changes to equity prices are somewhat unpredictable, policy makers should consider implementing the Carbonless Gains Tax incrementally to gauge market response.

EDUCATING THE NEXT GENERATION OF CLEANTECH ENTREPRENEURS – FOSTERING NATIONWIDE ENERGY LITERACY

The next president will lead a nation increasingly interested in the impact of its energy choices. The majority of millennials favor protection of the environment, even at the risk of the economy.⁶⁶ The next president will have the opportunity to teach young people that they need not choose one or the other but can instead choose both. She or he can give this hopeful new generation the tools to change the economy and the environment for the better. Though we recommend an approach targeted to future generations, the next presidential administration should also launch a nationwide energy literacy campaign to foster broad, cross-generational interest in confronting the challenge of a sustainable energy landscape.

The DOE defines energy literacy as “an understanding of the nature and role of energy in the world and daily lives accompanied by the ability to apply this understanding to answer questions and solve problems.”⁶⁷ Recent studies show American energy literacy to be fairly low, with significant numbers of survey respondents unable to correctly provide an example of a fossil fuel or renewable energy source.⁶⁸ When Americans are uncertain of the climate impacts of wind energy versus natural gas, they cannot be expected to make informed choices about energy at the polls. Recognizing the opportunity to provide decision-making tools, the Department of Energy made great strides in energy literacy as part of its 2011 strategic plan. The Energy Literacy Initiative and the Energy 101 educational framework that grew out of it laid a strong foundation for spreading energy awareness among Americans. Now is the time to build upon these efforts and embed energy as a topic in the national conversation. The next administration should employ a three-pronged approach in pursuit of this goal.

Prong 1 – The Power of Celebrity: The DOE should work with celebrities, from both inside the energy industry and out, to create a modern media awareness campaign. President Obama, for example, was tremendously successful in reaching young people to explain the benefits of the Affordable Care Act by making a guest appearance on Zach Galifianakis’ internet series “Between Two Ferns”. Within a day of the feature posting, traffic on the Affordable Care enrollment website shot up 40 percent.⁶⁹ The DOE could replicate this success by tapping into modern media sources and seeking to create viral content. By tying its content to finite audience behavior goals, like website visits or purchases of a particular energy savings device, the DOE would be able to generate measurable results and refine its campaign accordingly. Using public figures with both technical expertise and celebrity status, such as Richard Branson, Elon Musk or Bill Gates would unite credibility with entertainment. Relaunching a Bill Nye the Science Guy miniseries with a focus on energy would play well with nostalgic millennials. Short, educational energy public service announcements featuring such environmentally conscious celebrities as Leonardo

DiCaprio, Rachel McAdams, Mark Ruffalo or Scarlett Johansen could be very effective in capturing the attention of celebrity-obsessed Americans if broadcast across the right medium.

Prong 2 – Raise them Ready: The Energy 101 class was a good start, but it can be reimagined to be more effective. The current iteration is a guidebook and course framework that has been designed for a collegiate level course. The **DOE should be more ambitious with an energy curriculum – it could be aimed at a larger, younger audience.** A joint program of the Department of Energy and the Department of Education would offer the most logical and comprehensive approach. There are excellent (but disparate) existing programs being managed by various private, nonprofit, and state organizations. However, none match the strength and effectiveness that a federal agency based initiative would bring to K-12 energy education. The initiative should establish a clear, nonpartisan agenda that draws on the latest science and economics available to provide stakeholders (educators, administrators and parents) a gateway to vetted resources for educating our nation’s future innovators, policy makers and investors.

Additionally, we recommend the White House direct the DOE to work with the College Board to **create an Advanced Placement (AP) exam designed specifically for energy.** It should seek to create an objective, holistic understanding of the electrical grid’s past, present, and future while helping students evaluate the merits of various energy sources through the latest and most comprehensive cost-benefit analyses. The course should also use the momentum behind increasing cultural desire to understand the environmental implications of consumer decisions to fully engage students in critical thinking. For example, the high growth rate in demand for organic agricultural goods presents an opportunity to make a meaningful connection between students’ food consumption habits and their energy use.^{70,71} Consumption-conscious students will feel an increased connection to the energy curriculum when presented with facts like “In 2014, greenhouse gas emissions from agriculture accounted for approximately 9 percent of total U.S. greenhouse gas emissions”⁷² and “The U.S. agriculture industry used nearly 800 trillion British thermal units (Btu) of energy in 2012, or about as much primary energy as the entire state of Utah.”⁷³ In further support of such a program, a recent Gallup Poll found a strong inverse relationship between age and prioritization of the environment – 60 percent of 18-29 year old respondents favored protection of the environment at the risk of curbing economic growth compared to only 39 percent of those over 65.⁷⁴ Not surprisingly, AP Environmental Science is one of the fastest growing Advanced Placement courses in popularity.⁷⁵ By reaching teenage students on the cusp of voting age, the administration will be helping the next generation of voters make more informed decisions about energy.

Want to Fix the Climate? Start by Fixing our Food Chain



Climate Relevance

Globally, agricultural production is responsible for nearly 30% of all human-caused greenhouse gas emissions.¹ Moreover, agriculture accounts for approximately 80% of US consumptive water use.

Ongoing Changes

Agriculture is becoming increasingly data driven on the **supply side**. Young “agtech” companies like the Farmers Business Network are helping all farmers aggregate and share their data. Others use drones and satellite imagery to monitor soil and crop health, and moderate irrigation levels. All this innovation equates to a more level playing field for all farmers and more efficient use of resources. On the **demand side**, US organic food sales have shown double digit annual growth rates almost every year since the 1990s, and approached \$37Bn in 2015.² Entrepreneurs are meeting this growth with increasingly advanced solutions to drive down the cost of an organic lifestyle. One such company, Juicero, has pioneered a home, office, and retail-based cold-press juicing machine that minimizes produce waste by using cloud computing to track the freshness of the juice ingredients.

How the Next President Can Address Climate Change, Stimulate Agtech, and Help Meet Organic Demand

1. Align agricultural subsidies with the government’s recommendations for nutritional health. A recently published study in the Journal of American Medicine found a 37% greater risk of obesity in adults who consumed high level of federally subsidized foods compared to those at lower levels.³ Moreover, the large carbon footprint of meat production relative to most crops has been well-documented and many experts call for a more balanced agricultural approach to developing animal and plant-based protein. By realigning subsidies with health cost-benefit analysis, the next president can promote both a healthier America and a healthier climate.

2. Incorporate cost of natural resources into subsidy allocations.

When determining the size of crop-specific subsidies, consider the water and carbon intensity of each crop. Netting out such costs from subsidies will reduce incentives to plant environmentally demanding crops, and level the playing field for farmers interested in planting sustainably.

Sources:

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Prong 3 – Put-Solar-On-It 50 States Challenge: Anyone familiar with the informal competition among state governors for one another’s workforce understands how intense interstate government rivalry can be.⁷⁶ The “solarize” model has been tremendously successful at harnessing the same spirit of competition among residential solar installers in states like Connecticut, where it helped the number of solar installations in 2013–2014 eclipse that of the previous eight years combined (see Figure 9).⁷⁷ Solarize relies upon municipal governments and local relationships to create demand for residential solar, while initiating a competition among local installers to offer the lowest viable \$/watt installation cost in order to have exclusive rights to supply the town’s solarize campaign. The White House should harness this energy by directing the DOE to **announce a National Solarize Contest among the states**. To further incentivize participation, the DOE should offer awards to the states in funding

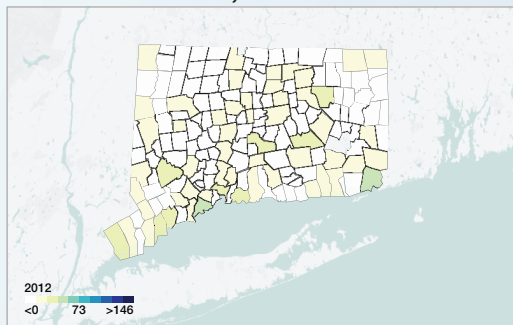
proportional to how much growth each state’s solarize program drove in residential solar adoption per capita. These awards would be earmarked for renewable energy generation, storage, energy efficiency or electric vehicles, thereby creating a pool of funding within each state to continue driving growth beyond the solarize contest. Using the National Renewable Energy Labs (NREL) Solarize Guidebook as a foundation, the DOE could initiate the contest by holding a conference for municipal and state leaders interested in creating solarize programs in their own towns. For those who commit to participating in the national contest, the DOE could then work with NREL to offer a follow-up training session to prepare participating municipalities for the administrative responsibilities of a contest. Standouts on the high school AP Energy tests could even be offered a small stipend to intern as aides to the municipal leaders running the Solarize programs.

The Energy Bill of Rights: Solarize Comes to the Constitution State

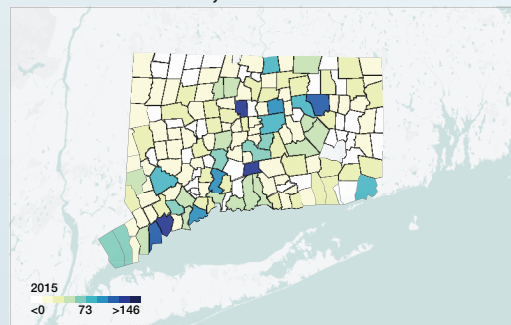
Figure 9

Number of cumulative residential solar installations in Connecticut, segmented by town.⁷⁸ Annual installations increased nearly 500 percent between 2012 and 2015.⁷⁹

BEFORE SOLARIZE, 2012



AFTER SOLARIZE, 2015



Sources: TrendCT and the Connecticut Green Bank “It’s Always Sunny in Connecticut

CONCLUSION

Whoever is sworn in on the 20th of January 2017 will have a mammoth task ahead of her or him. While the world rejoiced upon hearing the news of the Paris Climate Accords, the agreement means little without action. Without action, global temperature increases will exceed 2 degrees Celsius within the century. Without action, sea levels will rise, weather patterns will change, and climate refugees will flood national borders. The next president will have an opportunity like no other. The world will look to the United States for leadership on meeting the challenge of climate change with solutions that build innovation, jobs and economic growth.

With energy-related emissions accounting for 80 percent of U.S. greenhouse gas emissions, the energy industry should be the primary target for a president seeking to reduce our climate impact. Moreover, public interest is on the rise as our youngest generations are increasingly concerned about the environmental ramifications of their energy sources.⁸⁰ Fortunately, solar and wind technology is increasingly cost competitive with conventional generation⁸¹ and

the renewable energy industry is now a significant economic engine running on the fuel of solar job creation.⁸² The energy industry that we have lived with for over 100 years is on the precipice of transformation – the next president just needs to give it an intelligent push.

Nationwide consumer demand, investment and energy literacy – each is entirely critical to the existence of the others. Without energy literacy, consumers will not have the understanding or the interest to adopt new technologies. Without consumer demand, investors will see no potential for returns on cleantech investment. Without investment, prices will remain high, demand will remain low, and interest in energy literacy will wane as new clean technology becomes slower to market. Yet by balancing demand, investment, and energy literacy the next president can realize this moment's potential and empower America to become the leader the world needs it to be – our 21st century clean energy nation.

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