Nevada Green Bank Study

Reported to the Nevada Interim Legislative Committee on Energy
Directed by SB 360 of the 2015 Session of the
Nevada State Legislature

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Prepared by the Coalition for Green Capital
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About the Coalition for Green Capital

The Coalition for Green Capital (CGC), a 501(c)(3) non-profit, is the nation's leading advocate, expert and consultant on the topic of Green Banks – public or quasi-public clean energy financing authorities. CGC works directly with state governments and other key partners to identify ways for public capital could stimulate private investment in mature clean energy technologies and accelerate the growth of clean energy markets. CGC often works with government to help create the institution, assessing various legal options to institutional creation and financial options for green bank capitalization. CGC also works with states to implement innovative clean energy finance and market development mechanisms through existing public institutions. CGC typically offers this support pro bono, as states are often eager to understand and implement these financing concepts, but do not have the know-how, institutional capacity, or funding to do the necessary work themselves. CGC produced this Study for the State of Nevada with the generous support of the Energy Foundation.

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Executive Summary

Based on the analysis in this Study, Nevada's clean energy economy would benefit from a Green Bank. Green Banks are innovative finance structures designed to attract private clean energy investment so as to increase the total amount of investment in clean energy markets. A Nevada Green Bank has the potential to animate markets, bring jobs back to Nevada and increase clean energy and contractors businesses. A Nevada Green Bank would be uniquely positioned to achieve this. A Green Bank can lower energy costs for Nevadans (which face the highest electricity prices in the region) and reduce energy imports/cash outflows. Currently 90% of the state's energy is imported. A Green Bank would capitalize on Nevada's natural competitive advantage in clean energy. And the jobs that are created by investing in distributed generation and efficiency cannot be outsourced.

Historical Support for Clean Energy is Waning

Nevada has a clear desire to support clean energy. Governor Sandoval identified clean energy as a targeted sector for a diversified state economy in his 2012 economic development plan. The state was an early adopter of a renewable portfolio standard, and SB-123 is greatly reducing dependence on coal. More recently Governor Sandoval signed the Governors' Accord for a New Energy Future with 16 other governors, and he created the New Energy Task Force to advance new clean energy solutions.

However, there are declining subsidies and revenue streams for clean energy programs. Net-metering, renewable energy rebates and demand side management funds are being phased down. The current system of support for clean energy deployment is falling. There is a clear need for clean energy policy to address this gap between economic aspirations and program support. A Green Bank is uniquely suited to fill this gap and support clean energy market growth in a cost-effective manner.

Nevada's Clean Energy Economic Potential

Nevada's economically viable renewable energy potential is immense, and requires many billions of dollars of investment to fully realize the opportunity. The solar opportunity in Nevada is unrivaled, and distributed technologies, like rooftop solar and efficiency represent a $3.5 billion investment opportunity, at least. These figures are drawn from the analyses of leading government and non-profit entities. Energy efficiency investment today, though, is low, because of the upfront cost and very short payback requirements. Investment in distributed solar has slowed. Without a tailored solution, investment opportunities and energy savings are left on the table. Markets are left underserved, potential jobs aren't created, and new business aren't drawn to the state.

Nevada Green Bank Solution

A Nevada Green bank would serve as a dedicated institution that sends a clear market signal of state commitment to clean energy growth. Through increased public-private investment and greater demand, the Green Bank can bring clean energy jobs back and grow the market in a sustainable way without booms and busts. Green Banks focus exclusively on delivering solutions to customers and businesses that make energy cleaner *and* cheaper. Green Bank institutions are working in other states around the U.S. and the world, driving over $20 billion of clean energy investment globally. And they all preserve public capital, by offering loans rather than grants. A Nevada Green Bank can address both the financing obstacles and market development challenges through a portfolio of solutions.

The best structure for a Nevada Green Bank is a non-profit corporation, created by government. This could be done either through the existing statutory authority of the GOE, or through comprehensive legislation. Under either path, the Green Bank would be governed by a Board of Directors, composed of Nevada officials and local leaders, to give proper oversight. To ensure alignment of the Green Bank with the state's policy objectives, some Directors should be appointed by Government, and other Directors should be ex-officio. For instance, the Director of the GOE should be a board member. The Green Bank could receive its public capital from a number of existing or new funding sources, which are outlined in detail in this chapter. This includes general budget appropriation, re-direction of new or previously-cancelled DSM funds, and the existing Renewable Energy Fund. The Green Bank should also have bonding authority so it can sell loans, recapitalize its balance sheet and increase its lending capacity.

A Nevada Green Bank should focus on priority markets. These include whole-home upgrades, whole-building upgrades for the commercial sector, low-to-moderate income households, solar + storage applications, and electrified transportation. The Green Bank can, over time, develop financing and market development solutions to address each market sector. They are outlined in detail in this Study, and include using tools like credit enhancements, direct lending, PACE, innovative auction-licensing mechanisms, and alternative underwriting criteria. All of this financing activity will need to be paired with greater market transparency and consumer protection mechanisms. By offering these solutions in concert with private lenders, contractors, and existing government/utility programs, the Green Bank can grow the clean energy economy of Nevada while lowering energy costs.

Green Bank investments would increase the state GDP, create new businesses, lower energy costs, and create new jobs. The Connecticut Green Bank, serving a market similar in size to Nevada, has generated almost a $1 billion of total clean energy investment in five years of activity. A Nevada Green Bank, hypothetically capitalized with $50 million in public funds, could potentially create $240 million of total lending capacity for underserved markets with an initial portfolio allocation to three products. And the Connecticut Green Bank has created over 10,000 jobs, providing a template for potential Nevada impact.

Nevada's Clean Energy Future

Without a comprehensive, market-oriented approach to growing distributed generation and energy efficiency markets, low market growth is anticipated. Nevada will be in danger of losing its leadership position on clean energy. A Green Bank is just such a comprehensive tool. This means:

- Building a bridge to more private investment. Its objective is to grow the private market and increase private sector participation. And the job is done when the Green Bank can "walk away" from target markets, as other Green Banks have done;
- Harmonizing programs across the state, ensuring alignment and ease of use for customers;
- Acting as central source credible information; and
- Acting as bridge between small distributed projects and large capital providers with money on the sidelines due to lack of track record and scale in target markets.

The time is ripe for new, market-oriented approaches that drive private sector engagement. The Green Bank concept is relatively new, but others have gone before and are succeeding. So Nevada can draw upon their lessons and adapt the model the state's needs. This is an opportunity for Nevada to affirm its position as a clean energy leader, pioneer new solutions, and increase jobs and investment.

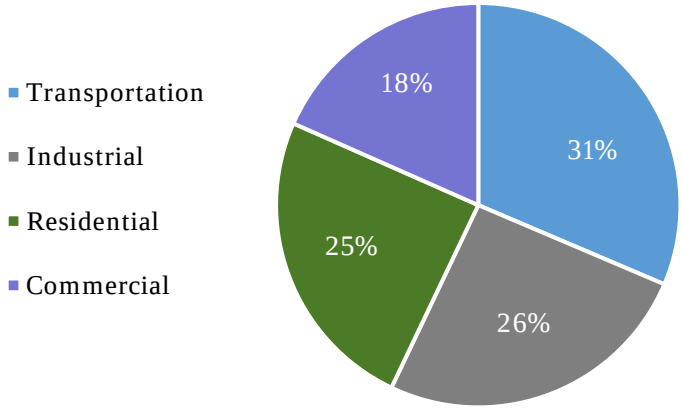
Chapter 1 – Current Nevada Programs & Policies

Nevada has demonstrated a clear commitment to clean energy in recent years. Programs at NV Energy and the Governor's Office of Energy (GOE), and forward-thinking legislation passed by the Nevada state legislature have all helped support clean energy in Nevada. Despite these laudable efforts, Nevada continues to get most of its energy from fossil fuel sources, the vast majority of which are imported from out of state. These fossil fuel energy sources leave Nevada consumers exposed to variable prices in the natural gas and oil markets, and potentially exposed to the economic risk of stranded assets if policies significantly restrict carbon-based fuels in the future.

Nevada Energy Landscape

Nevada's building and industrial sectors collectively use 69% of all energy in the state. Transportation is the single largest energy user in Nevada at 31%. Nevada's largest industry continues to be Tourism and Entertainment. And the state's largest employers are in the hospitality industry. Despite the dominance of the tourism industry in Nevada, the economy is increasingly diverse and home to a wide range of small businesses and industries. Any clean energy policy in Nevada is well-positioned to help lower energy costs in the tourism sector and the many Nevadans that work in it. Energy solutions are also needed for the other private businesses large and small, as well as non-profits, school, municipalities and hospitals.

Figure 1: Energy Use in NV by Sector[1]



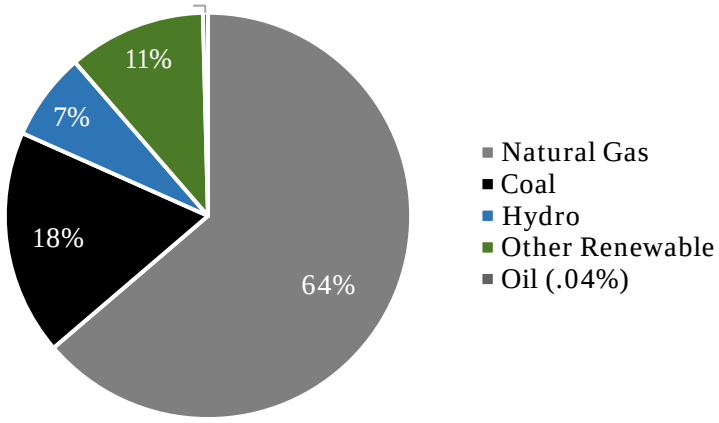
Nevada's large vertically integrated utility, NV Energy, supplies the majority of electricity in the state. The remaining electricity is supplied by electricity cooperatives in the rural areas of the state. Electricity generation in Nevada is dominated by fossil fuels, primarily natural gas and coal fired power plants. Over 64% of electricity generation in Nevada comes from natural gas fired power plants.[2] Coal makes up 18%

[1] EIA 2013

[2] 2015 State of Nevada Energy Report, Governor's Office of Energy
http://energy.nv.gov/uploadedFiles/energynvgov/content/About/GOE_2015_EnergyReport_Feb%2024.pdf

of the electricity mix, but this figure is falling as coal plants are retired as a result of a 2013 state law (SB123) which requires phasing out most coal-fired power plants by 2019[3].

Figure 2: Electricity Generation in NV by Source[4]

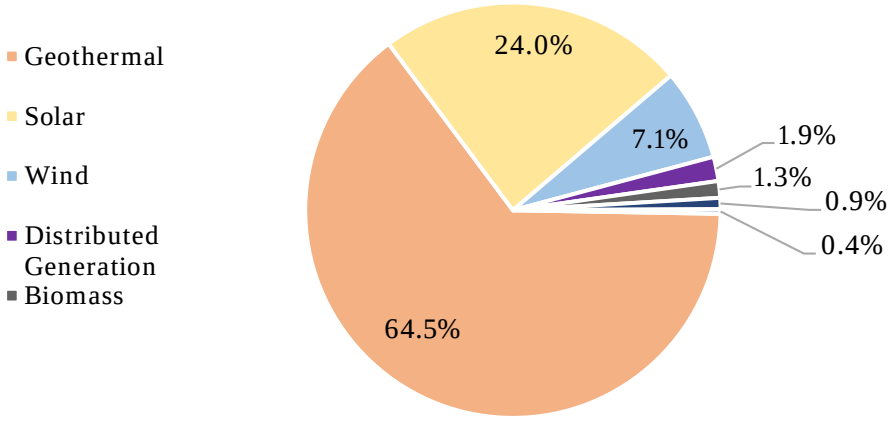


Most of Nevada's renewable energy comes from large hydropower generation, and the Hoover Dam is the third largest electricity source in the state.[5] Approximately 18% of Nevada's electricity mix comes from hydroelectric power stations and other renewable energy sources. The Hoover Dam, the single largest supplier of renewable energy, has declined in output over the last several years; kWh fell from a high of 4 billion to 3.2 billion in 2009 and have been slipping in recent years.[6] Future water scarcity and competing demands on water from the Colorado River basin feeding Lake Mead may further diminish output at the Hoover Dam, decreasing the amount of low-cost and low-carbon electricity available to the state.

Geothermal continues to be a large contributor of renewable energy to Nevada's grid, and Nevada has the second largest amount of geothermal generation in the US after California. In 2014, nearly 65% of non-hydro renewable generation came from geothermal sources in the state. Wind and solar, particularly utility scale, are growing sources of renewable energy in the state.[7]

[3] EIA 2016
[4] 2015 State of Nevada Energy Report, Governor's Office of Energy
http://energy.nv.gov/uploadedFiles/energynvgov/content/About/GOE_2015_EnergyReport_Feb%2024.pdf
[5] EIA 2016
[6] "Receding Lake Mead poses challenges to Hoover Dam's power output" Rod Kuckro, E&E Publishing, June 2014
http://www.eenews.net/stories/1060002129
[7] EIA 2016

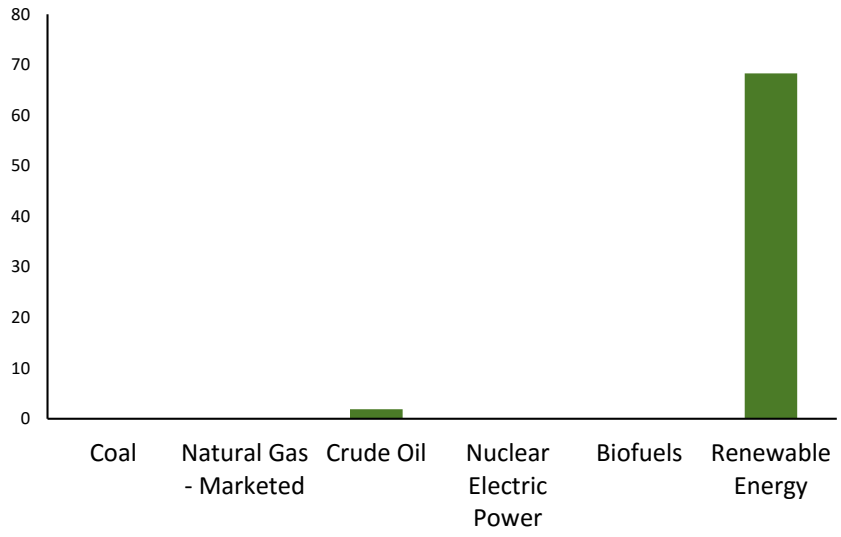
Figure 3: Renewable Electricity Generation in NV, excluding large hydro, 2014



Domestic Energy Production

Nevada is a state with abundant renewable energy resources. The market potential for economically-viable clean energy technologies such as solar, wind, geothermal and energy efficiency is explained in greater detail in Chapter 2 of this Study. Though the current penetration of clean energy technologies is well below its economic potential, much effort has been made to take advantage of the clean energy resources available in the state. In terms of local production, over 97% of the energy Nevada produces within its borders comes from renewable sources.

Figure 4: Energy Resources Produced in Nevada, 2013 (trillion BTU)

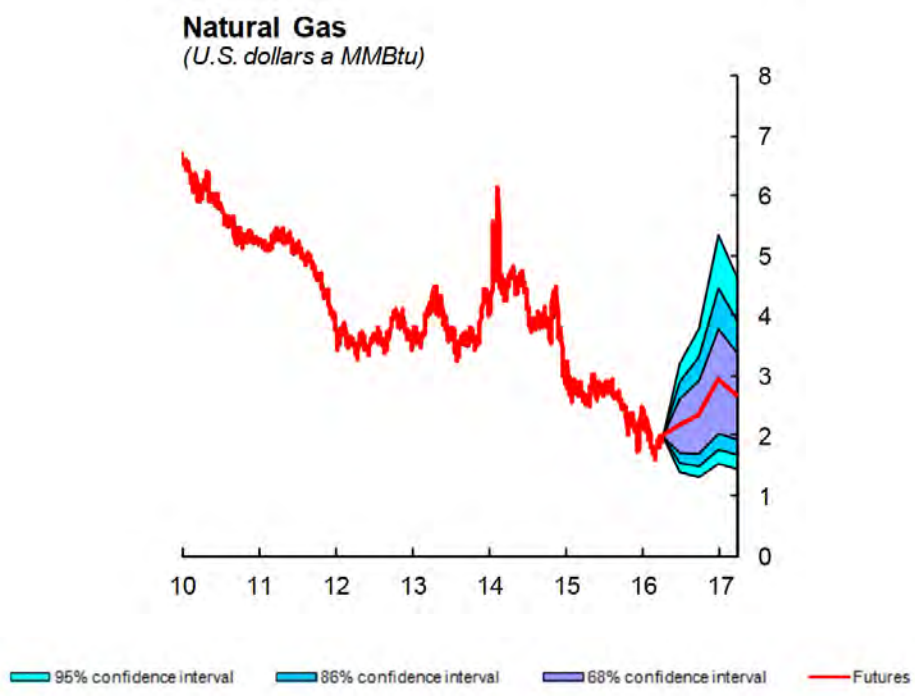


Imported Energy

Nevada is highly dependent on imported energy: over 85% of energy consumed in Nevada is imported; the remaining 15% is from local renewable sources. Nevada contains almost no local coal, oil or natural gas resources, and all of its gas and coal-fired power plants rely on fuels imported from out of state. As more natural gas fired electricity is brought into Nevada's electricity grid, due to SB-123 and shifting

market conditions, Nevadans are increasingly exposed to price volatility in the natural gas markets. Gas prices are at low levels, and consumers are currently experiencing low electricity prices. If gas prices rise above their historically low levels these higher costs will be passed on dollar-for-dollar to consumers.[8] NV Energy, the state's largest electric utility, does not engage in long-term natural gas contracts or hedging, so the exposure to potentially rising gas prices is borne by customers.[9]

Figure 5: Future Prices of Natural Gas[10]



Electricity Prices

Electricity Prices in Nevada over the last decade have seen modest increases, with a compound annual growth rate of 3.3% per year over the period from 2000-2014 (the period for which statewide data is available)[11]. Electricity prices fell slightly in 2015, in part due to low natural gas prices.

Electricity prices in Nevada are near the US average. Electricity rates for residential customers are near the US median (ranked 24th), but are slightly higher than other neighboring states in the Mountain West[12].

[8] "Understand Your Bill" NV Energy 2016 https://www.nvenergy.com/home/customercare/understandyourbill.cfm
[9] Nevada Power, Integrated Resource Plan, 2015
http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2015-7/3640.pdf
[10] IMF Commodity Price Outlook & Risks, April 2016.
https://www.imf.org/external/np/res/commod/pdf/cpor/2016/cpor0416.pdf
[11] EIA Data 2014
[12] Ibid.

Figure 6: NV Average Retail Electricity Price 2000-2014[13]

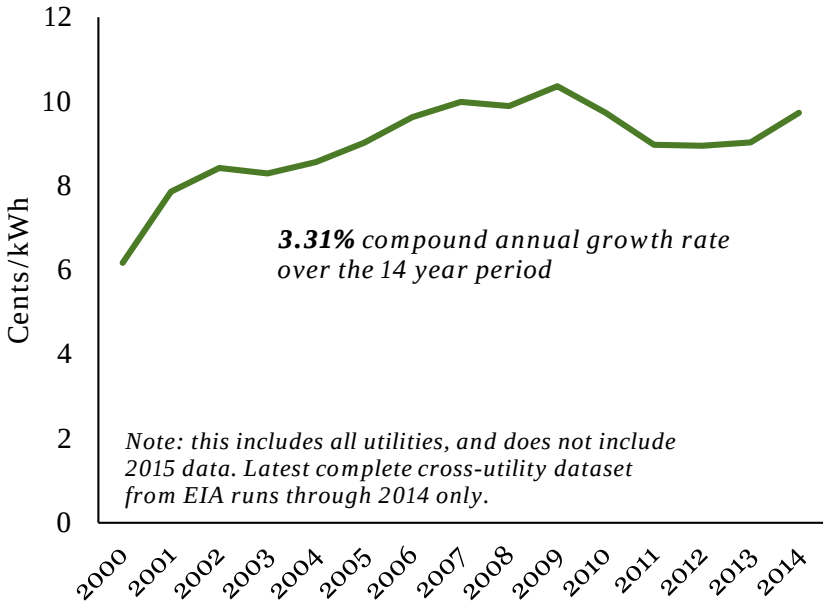


Table 1: Average Residential Electricity Prices in 2014

Average Residential Electricity Price 2014	
State	Cents/kWh
NV	12.93
NM	12.28
CO	12.18
AZ	11.90
UT	10.65
OR	10.47
ID	9.72

Natural Gas

Nevada imports nearly all natural gas consumed in the state for the purposes of electricity generation, building heating, and industrial purposes. Approximately two-thirds of natural gas consumed in the state is used for electricity generation. Half of the remaining gas is used for residential heating.[14] Only a small portion of Nevada geography is covered by a natural gas utility. NV Energy provides natural gas to Reno,

[13] ibid

[14] EIA State Profile, "Nevada – Profile Analysis," updated November 19, 2015. http://www.eia.gov/state/analysis.cfm?sid=NV

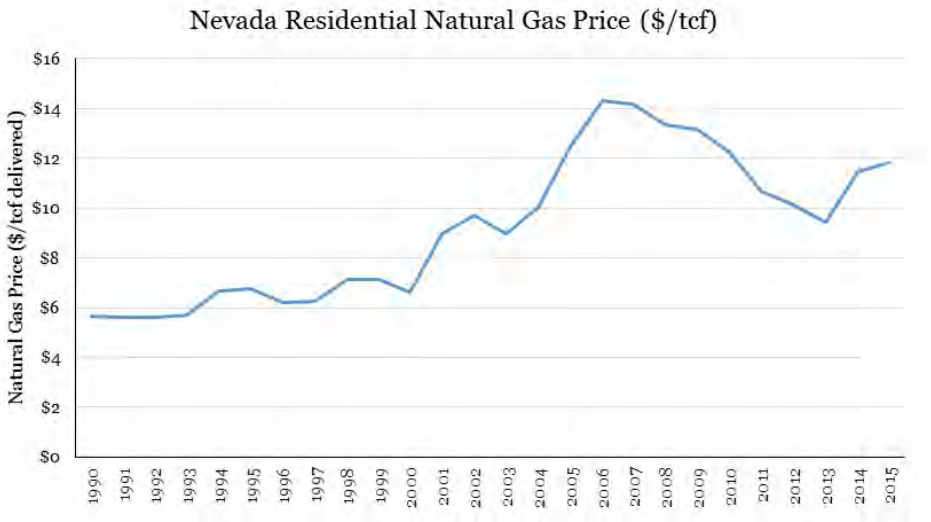
and Southwest gas covers the Las Vegas area in southern Nevada and the area around Carson City in northern Nevada.[15]

Natural gas use in Nevada is very seasonal, with large spikes in use in colder months as residents, particularly of Northern Nevada, use natural gas to heat their homes.[16] Though utilities cover only a limited geographic area, natural gas is the most common fuel used for home heating in Nevada. Three in five homes in Nevada are heated using natural gas. Almost all other homes use electric heating. Nevada's residential natural gas prices are the 16th highest in the country, at $10.84/thousand cubic feet. These prices are nearly double what they were in 2000.

Table 2: Energy Source Used for Home Heating (share of Households)[17]

Home Heating Fuel Source	
Source	Share
Natural Gas	59.9%
Electricity	34.4%
Liquefied Petroleum Gases	2.7%
Fuel Oil	0.7%
Other/None	2.5%

Figure 7: Historical Residential Natural Gas Price in Nevada[18]



[15] http://puc.nv.gov/Utilities/Utility_Service_Area_Maps/
[16] http://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_SNV_m.htm
[17] EIA State Profile, "Nevada – Profile Data," updated June 16, 2016. http://www.eia.gov/state/data.cfm?sid=NV
[18] https://www.eia.gov/dnav/ng/hist/n3010nv3A.htm

A History of Leadership

In recent years, Nevada has shown leadership in clean energy on several fronts. The 2007-2009 Recession hit Nevada particularly hard, and left the housing market and many related industries struggling. Shortly after being elected in 2010, Governor Brian Sandoval signed into law AB-449, moving the state's economic department to the cabinet level, and giving it a new name: the Governor's Office of Economic Development (GOED). GOED worked with the Brookings Institution to conduct research on policies to develop the state's economic potential. Brookings released the report "Unify, Regionalize, Diversify: An Economic Development Agenda for Nevada" in 2011, a report which helped shape the Governor's economic planning process for the state. The report called for a diversification of the Nevada economy to build resiliency. Noting the "excellent natural and physical" local energy resources, and the relatively high energy prices for the region, the report named clean energy, including energy efficiency, as one of the seven pillars of a new diversified Nevada economy.[19]

Since identifying clean energy as a priority, Governor Sandoval has championed clean energy solutions in several ways. The GOED has provided tax incentives to clean energy companies to locate operations Nevada, including SolarCity and the Tesla Gigafactory, which broke ground in 2014. The GOE also runs multiple successful programs, further detailed below.

In February 2016, Nevada signed on to the "Governors' Accord for a New Energy Future" a 19-state accord that outlines clean energy priorities for state governors including modern infrastructure, clean transport options, energy policy changes to speed the clean energy transition. The document serves as a touchstone that helps guide Governor Sandoval's energy policy.[20]

The Governor also recently re-convened the New Energy Industry Task Force, in part to address stakeholder questions about the net energy metering (NEM) decision from the Public Utility Commission of Nevada (PUCN). The PUCN decision, from December 2015, calls for distributed solar customers to receive declining rates for selling excess power back to the grid, prompting several large solar companies to scale back operations in the state. The Governor's executive order dated February 23, 2016 called on the Task Force, chaired by Angela Dykema, Director of the Governor's office of energy, to produce recommendations for bill draft requests that support the clean energy market in Nevada, specifically highlighting clean energy sources, grid modernization, and distributed generation as priorities.

The first Task Force meeting was convened on March 22, 2016 and Governor Sandoval's Chief Strategy Officer, Dale Erquiaga addressed the Task Force, outlining its goals and saying "Governor Sandoval and his administration, the State of Nevada are committed to clean and renewable energy in this state. Rightly or wrongly… our state's reputation in clean and renewable energy has been damaged. And so we'd like your advice on how we move beyond that and how we speak to the world markets about this state and its

[19] Brookings Institution Report, "An Economic Development Agenda for Nevada," November 2011. http://www.brookings.edu/~/media/research/files/papers/2011/11/14-nevada-economy/1114_nevada_economy.pdf

[20] Dale Erquiaga, New Energy Industry Task Force, meeting minutes 3/22/2016 http://energy.nv.gov/uploadedFiles/energynvgov/content/Programs/NEITF_3-22-2016_Draft_Minutes.pdf

commitment and what opportunity there is here [in Nevada]."[21] The Task Force will provide final recommendations on September 30, 2016.

Existing Policies and Programs that drive clean energy deployment

The GOE is the primary vehicle for state-sponsored programs supporting clean energy in Nevada. In the period from 2009-2016, those grant and loan programs totaled approximately $467 million.[22]

The GOE runs the Renewable Energy Tax Abatement Program, which provides partial tax breaks for both sales and uses taxes paid in Nevada by qualifying clean energy producing facilities such as Tungsten (geothermal) Boulder Solar, and Playa Solar 1 and 2. These tax abatements (grants from the state's general fund) have helped producers such as Ormat, First Solar and others build new large scale clean energy projects in Nevada. These state grants have also helped NV Energy secure more affordable assets and Power Purchase Agreement (PPA) prices as they add more large-scale solar to comply with SB-123, the state's coal phase out law passed in 2013.

Table 3: Renewable Energy Tax Abatement Projects 2015

Plant Name	Company	Type	Electricity Offtaker	Tax Rebate (millions)
Nellis Solar	NV Energy	Solar	NV Energy Owned	$6.8
Copper Mountain Solar 4	Sempra Energy Company	Solar	Southern Cal Edison	$22.1
Playa Solar 2	First Solar	Solar	NV Energy	$24.0
Nevada Valley Solar Solutions 2	Bombard	Solar	Valley Electric Authority	$4.9
Don Campbell	Ormat	Geothermal	NV Energy	$10.2
Total				**$68.0**

GOE also runs a revolving loan program for renewable energy or efficiency projects. Loan size ranges from $100,000 to $1 million with terms of 15 years and interest rates of 3% or less. The loan program was funded by an initial American Reinvestment and Recovery Act (ARRA) grant in 2009 of $8.2 million. Since 2009, the original $8.2 million in funding has revolved and increased to more than $17.4 million, primarily due to moving unspent ARRA funds from other programs into the loan program.[23]

Mostly serving the commercial and industrial market, the Performance Contract Audit Assistance Program (PCAAP), offered by the GOE, funds financial grade audits for building owners interested in pursuing an energy savings performance contract with an Energy Service Company (ESCO). ESCOs typically provide energy efficiency upgrades for large facilities, and finance deals in such a way that energy cost savings exceed loan repayment. That is, they are cash flow positive from the outset. ESCOs are effective at addressing certain markets, particular large, credit rated facilities, but do not typically operate in the small- to medium-sized commercial building market. More details are provided in Chapter 3. GOE

[21] Ibid
[22] Ibid
[23] 2015 State of Nevada Energy Report, Governor's Office of Energy
http://energy.nv.gov/uploadedFiles/energynvgov/content/About/GOE_2015_EnergyReport_Feb%2024.pdf

operates a similar program for public facilities in Nevada, funded by a $715,000 grant from the federal department of energy.

The Green Building Tax Abatement Program, administered by the GOE, offers tax incentives of 25% to 35% deducted from property taxes for eligible buildings that achieve certification to Leadership in Energy and Environmental Design (LEED) standards.

GOE also runs the Direct Energy Assistance Loan (DEAL) program, an innovative loan program which provides 0% interest loans of up to $6,000 for energy upgrades for state employees. The program is offered only to homeowners, and offers a simple and streamlined structure where loan repayment is deducted automatically from state employees' payroll, with a maximum term of 60 months.

The GOE runs multiple other clean energy programs including training on new energy codes, a joint program with NV Energy to install new electric vehicle charging stations along route 95, and a successful energy efficiency audit and rebate program for senior citizens called Home Energy Retrofit Opportunities for Seniors (H.E.R.O.S.).

RPS and SB-123

Nevada first adopted its Renewable Portfolio Standard (RPS) in 1997. The current RPS requires 25% of electricity delivered in Nevada to come from a renewable source by 2025. NV Energy is ahead of schedule in compliance with the RPS due to early action on renewables and carrying over of credits from previous compliance periods.

Senate Bill 123, passed in 2013, requires coal fired power generation to be phased out. The law will result in several large coal facilities' retirement or elimination in the coming years.

Table 4: Coal Retirements under SB-123

Name	Fuel	Capacity (MW)	Year Eliminated	Method
Reid Gardner 1,2,3	Coal	300	2014	Retirement
Reid Gardner 4	Coal	257	2017	Retirement
Navajo	Coal	255	2019	Divest ownership
Total		**812**		

The majority of new generation to replace coal fired capacity will come from natural gas, followed by renewable sources. NV Energy is one track to hit its coal phase-out targets as required by law. Some of the associated costs (e.g. plant decommissioning) have been included in current NV Energy rates, but acquisition of certain new renewable energy plants is not reflected in current rates.[24]

[24] PUCN presentation to legislative committee on energy November 21, 2015 https://www.leg.state.nv.us/interim/78th2015/Committee/StatCom/Energy/Other/20-November-2015/4AgendaItemVSB123PUCNNov2015Final2.pdf

Table 5: NV Energy owned power stations replacing coal

Plant Name	Fuel	Capacity	Total Cost (millions)
LV Cogen	Nat. Gas	274 MW	$148.9
Sun Peak	Nat. Gas	210 MW	$18
Nellis Solar 2	Solar	15 MW	$54.5
Total		**511**	**$221.4**

Table 6: Power Purchase Agreements replacing coal

Plant Name	Fuel	PPA price	Notes
Boulder Solar	Solar	$46/MWh	fixed price
Playa Solar 2	Solar	$49/MWh	levelized

NV Energy RenewableGenerations

In addition to its portfolio of large scale renewable projects, NV Energy runs a rebate program to incentivize distributed renewable energy projects in its service territory. The RenewableGenerations program was created by the 2003 state legislature and is collected from ratepayers through rates. The program funds solar (PV and thermal energy), wind and hydroelectric facilities. Wind and hydro facilities may be up to 500kW in size, and solar systems may be a maximum of 25kW. The program consists of both performance based incentives (per kWh produced) and up-front cost incentives, depending on technology type, location and size. Since 2003, RenewableGenerations has been instrumental in developing the distributed renewable energy market in Nevada. The program has issued incentives for over $257 million in its 13 year history. Funding for the program is drawing to a close as less than 13% of the $295 million total outlay remains, and rebates have decreased on a per project basis as the incentive levels have stepped down.

Table 7: Remaining NV Energy RenewableGenerations funds for distributed generation

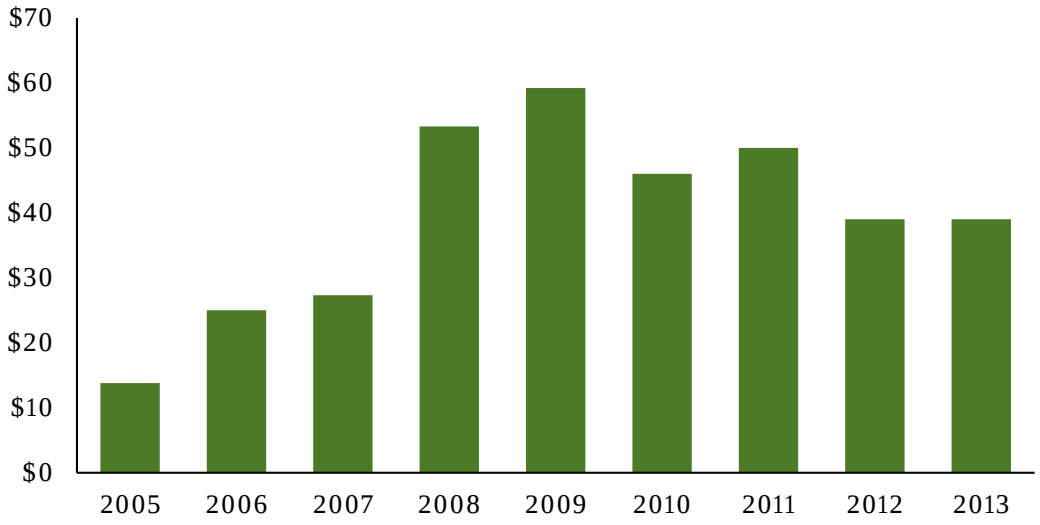
NV Energy Renewable rebates 2003-2015 (million $)	
Initial Program Funding	$295.3
Amount Spent/Committed	$257.1
Remaining Funding	**$38.2**

Energy Efficiency Programs at NV Energy

NV Energy runs a demand side management (DSM) program that provides rebates for energy efficiency upgrades at homes and businesses. SW Gas runs a similar but smaller program for upgrades that save on natural gas use, and sometime struggles to get all of its allotted rebate dollars spent, particularly in rural parts of Nevada. Eligible technologies under NV Energy's program have included lighting, cooling and heating systems and others. Statewide annual spending on these program is in the range of $50 million. NV Energy collects money for these rebate programs through NV Energy customers' monthly bills and earns a rate of return on the money it collects. In December of 2015, NV Energy requested $56 million for

its annual DSM budget and the PUCN approved $41 million, eliminating previous year programs for pool pumps, LED lighting and refrigerator recycling.

Figure 8: Nevada Power + Sierra Annual DSM Approximate Budgets (millions)[25]



Federal Funds

Federal funds for clean energy in Nevada are available for a variety of purposes. Several federal grant programs, such as the State Energy Program (SEP) formula grant, are managed by the GOE. Local Nevada offices of the USDA also manage federal funds such as USDA's Rural Energy for America Program (REAP). The REAP program offers grants and loan guarantees for rural clean energy projects including wind, solar, energy efficiency and biomass.

Of the USDA dollars available from the federal government, Nevada uses less assistance than is available based on its size. Nevada received grant or loan incentives for 45 projects from 2003 to 2014, and in quantity of projects Nevada ranks 48th despite being 35th in population size and having a sizable rural population. 98.5% of Nevada's REAP dollars went to one large ($105 million) loan guarantee for a jet fuel biorefinery project. For reference, New Mexico and Arizona each used available federal incentive dollars to fund around 90 medium-sized (less than $10 million) projects, totaling approximately $14 million per state. Excluding the jet fuel project, Nevada utilized only $1.5 million in federal funds over the same ten year period.[26] Given Nevada's size and rural population, it may be possible to utilize more federal REAP dollars for medium-sized distributed wind, solar and hydro projects if more support was available to channel incentives to rural projects.

[25] : NV Energy PUCN Dockets and Southwest Energy Efficiency Project (SWEEP)
[26] USDA Energy Investment Map, 2016 http://www.usda.gov/energy/maps/maps/Investment.htm

Chapter 2 – Nevada's Clean Energy Market Potential

Nevada has some of the highest potential for clean energy in the United States and has grown to one of the nation's largest clean energy markets in recent years. Despite having 35th largest population and 7th largest land area, Nevada has among of the largest amounts of installed capacity of solar and geothermal in the US. This is due to Nevada's fortunate geography, which contains some of the best renewable energy resources in the country including solar, geothermal, wind and hydro. While Nevada has virtually no fossil fuels reserves, the state enjoys a large economic potential for solar, only a fraction of which have been exploited. Nevada also has a high potential for energy efficiency upgrades at its residential and commercial facilities, all of which can produce immediate cost-savings for building owners and occupants.

"Nevada is home to some of the most abundant and accessible sources of clean energy in the world, including solar, wind and geothermal sources of energy" ***-Governor Brian Sandoval***[27]

This chapter outlines the current levels of clean energy installations, and estimates the economically-viable clean energy potential in Nevada on an energy and dollar investment basis. This study seeks to highlight the potential size of the clean energy market by focusing on the most feasible market segments. That is, technical potential (also known as total addressable market or TAM) is occasionally referenced, but the focus is on the Serviceable Addressable Market (SAM) -- the segment of the market that can be served economically, feasibly and using existing technologies. Different technical analyses often produce varying results, depending on methodologies used. The estimates in this Chapter are based on some of these existing technical analysis. The point of the market review is not to precisely calculate or identify one single figure for clean energy potential, or to indicate a recommended fuel mix. Rather, the objective is to provide a reasonable estimate of the economically-viable clean energy potential, so that policymakers and market participants understand the opportunity and investment need.

This assessment relies on various technical analyses performed by researchers at leading institutions. This includes the National Renewable Energy Laboratory (NREL), the Department of Energy (DOE), the US Geological Survey (USGS), the Southwest Energy Efficiency Project (SWEEP), the American Wind Energy Association (AWEA), the Solar Energy Industries Association (SEIA), RCG Economics, the American Council for an Energy Efficient Economy (ACEEE), and the Massachusetts Institute of Technology (MIT).

[27] Executive Order 2016-4, http://gov.nv.gov/News-and-Media/Executive-Orders/2016/EO_-2016-04-New-Energy-Task-Force/

Table 8: High & Low Scenario Addressable Market by Technology

Selected Technologies		Potential Energy Capacity		Investment Need (millions)	
		High Scenario	Low Scenario	High Scenario	Low Scenario
Solar	Utility	352.8 GW	5.7 GW	$511,600	$8,200
	Distributed	0.3 GW	0.3 GW	$1,000	$1,000
Geothermal		4.242 GW	1.391 GW	$10,605	$3,478
Wind		6.329 GW	1.526 GW	$2,609	$10,822
Electric Efficiency		7,040 GWh		$2,590	
TOTAL		N/A	N/A	**$528,404**	**$26,090**

Energy Efficiency

Nevada's commercial and residential energy efficiency potential is large, both in terms of dollar savings potential, and percentage savings relative to other states. A market potential study performed by SWEEP shows that Nevada can economically reduce electricity usage by over 20% by investing in efficiency upgrades using existing technology. This represents an investment opportunity of $2.59 billion in Nevada. Investing in these efficiency upgrades would result in annual energy savings of over 7,040 GWh worth over $5.97 billion. Nevada has some of the highest potential for energy savings in the region. Nevada has the second highest potential for energy savings as a percentage of sales – 22% – and the highest potential for savings in peak demand, of any state in the Southwest. Investing in energy efficiency upgrades would also allow Nevada to reap the highest net benefits in Gross State Product (GSP) by year 2020 of any state in the Southwest, totaling $284 million per year[28].

Table 9: Nevada Energy Efficiency Needs[29]

	Annual Investment (millions)					NPV of Total Investment
	Year 1	Year 5	Year 10	Year 15	Year 20	
Residential	$17	$96	$169	$128	$45	
Commercial	$64	$178	$295	$223	$78	
Total	**$81**	**$274**	**$464**	**$351**	**$123**	**$2,590**

[28] $20 Billion Dollar Bonanza, SWEEP, October 2012 http://www.swenergy.org/Data/Sites/1/media/documents/publications/20BBonanza/20B_Bonanza-COMPLETE_REPORT-Web.pdf

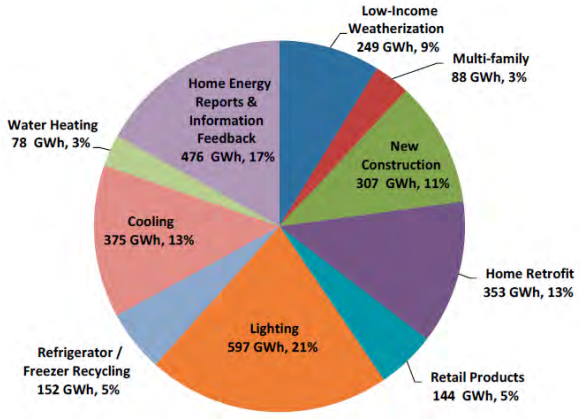
[29] ibid

Table 10: Nevada potential for energy efficiency savings, based on high efficiency scenario[30]

State	Potential Annual Electricity Savings, 2020 (kWh)	Projected Electricity Sales, 2020 (kWh)	Potential Savings as a % of Sales, 2020
New Mexico	5,110	21,370	23.9%
Nevada	7,040	31,321	22.5%
Colorado	11,495	51,538	22.3%
Arizona	16,713	78,111	21.4%
Utah	6,234	30,757	20.3%
Wyoming	3,238	20,771	15.6%

The Energy Efficiency potential in Nevada is large, and the market potential is split somewhat evenly between commercial buildings (60%) and residential buildings (40%). The commercial building sector can benefit from a variety of interventions, including increased used of combined heat and power, direct installs for small businesses and comprehensive custom energy retrofits.

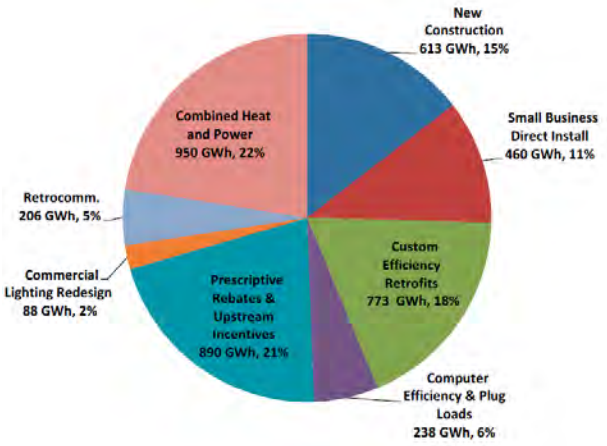
Figure 9: Nevada Electric Efficiency Potential in Residential Buildings[31]



Much of the residential potential can be met with simple, well established interventions such as lighting and cooling upgrades, home energy reports, and whole home energy retrofits. Most of these more comprehensive approaches produce deep savings, but have upfront costs that make payback periods beyond three years, making financing options critical for increasing adoption to realize these savings. A study performed by MIT on energy efficiency potential in Las Vegas found that medium and small scale commercial buildings have a particularly difficulty time arranging financing and often do not have the cash on hand to make comprehensive energy upgrades.[32]

[30] Ibid
[31] Ibid
[32] MIT, "Las Vegas Energy Efficiency Market Transformation Strategy" December 2013.

Figure 10: Nevada Electric Efficiency Potential in Residential Buildings[33]

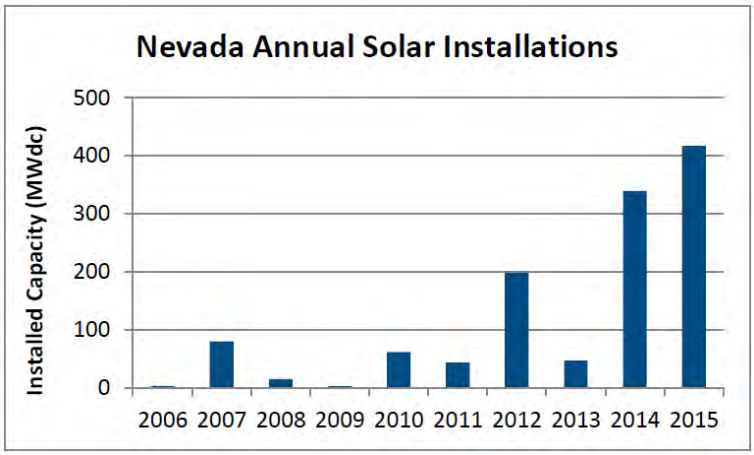


RCG Economics, a Nevada-based research firm, performed a top-down study on energy efficiency potential in Nevada. The study arrived at roughly similar figures as the SWEEP analysis for technical potential.[34] Applying reductions of total estimates for conservativeness to arrive at SAM figures, approximately $2.25 billion of investment opportunity is identified in Nevada's energy efficiency market.

Solar PV Market

Nevada has the 5th most installed solar capacity in the nation through 2015, with 1,240 MW. And in 2015 annual installations were the third most in the nation, with 417 MW. Nearly 200 MW of solar were installed in the fourth quarter alone in 2015.[35] Total 2015 deployment represents roughly $800 million of investment. 2015 capacity additions were almost entirely in the utility-scale sector – 316 MW of utility scale, 95 MW of residential, and 6 MW of commercial solar were installed in 2015.

Table 11: Nevada Annual Solar Installations 2006 - 2015[36]



[33] Ibid

[34] RCG Economics, "EnergyFit Nevada Financing Option Analysis: CD Secured Option & PACE Project," Prepared for HomeFree Nevada, Inc., June 2013.

[35] SEIA, "Solar Spotlight: Nevada," March 4, 2016.

[36] SEIA, "Solar Spotlight: Nevada," March 4, 2016.

Utility-scale solar installations dominate the overall solar market. NV Energy draws power from 10 Nevada-based projects. Most of these projects rely on solar PV, though concentrated solar power (CSP) technology is also used. The Crescent Dunes Project has 110 MW capacity using CSP technology.

The large number of utility-scale projects, and rapid solar deployment overall, is driven by immense natural resource. Nevada's solar resource and resulting power potential is almost unmatched in the country. According to NREL, Nevada's technical potential from solar is 11th most in the country, but its *economic* potential is second to only Texas. What makes Nevada unique is that nearly all of its technical potential for solar power is economically viable. This is due to the state's large desert area and concentrated population centers.

Table 12: NREL Solar Technical & Economic Potential By State[37]

State	Technical Potential (TWh/yr)	Economic Potential (TWh/yr)	% of Technical Potential
Texas	41,309	17,066	41%
New Mexico	17,561	3,368	19%
Kansas	13,637	0	0%
Arizona	13,580	2,720	20%
Nebraska	10,614	0	0%
Oklahoma	10,280	208	2%
Montana	10,174	0	0%
South Dakota	10,001	0	0%
Colorado	9,998	28	0%
Minnesota	9,565	0	0%
Nevada	9,494	7,705	81%
California	9,192	92	1%

Depending on the market and policy assumptions of various scenarios produced by NREL, the SAM for solar PV ranges from 60 GW up to 3,532 GW. Though there is no reason to doubt the accuracy of these figures, they are so large that this Study makes an assumption for conservativeness, only taking 10% of those figures to be the actual size for the purpose of this study. This means that utility-scale solar potential ranges from 5.7 GW to 352.8 GW, and the distributed potential is 0.3 GW.[38] With an assumed utility scale install cost of $1.45/w, this translates to a utility investment potential of between $8.2 billion and $511 billion. And on the distributed side, the investment potential is $1.0, assuming an install cost of $3.0/watt.

[37] NREL, "Estimating Renewable Energy Economic Potential in the United States: Methodology & Initial Results," July 2015; SEIA/GTM Market Watch.

[38] This 10% assumption is particularly conservative for the distributed market. Also, the distributed solar potential across all NREL scenarios is the same. Which is why there is no range.

Table 13: Summary of Solar Power Potential

	Utility Solar	Distributed Solar	Total
Technical Potential (GW)	4,348	9.1	4,357
Economic Potential-High (GW)	3,528	3.4	3,532
Economic Potential-Low (GW)	56.6	3.4	60
Market Potential-High (GW)	352.8	0.3	353.2
Market Potential-Low (GW)	5.7	0.3	6
Investment Need-High (billions)	**$511.6**	**$1.0**	**$512.6**
Investment Need-Low (billions)	**$8.2**	**$1.0**	**$9.2**

These high investment figures reflect the immense solar natural resource in Nevada. It is also worth noting that this potential capacity and generation far outstrips what Nevada, itself, consumes in-state. In 2014 Nevada used 35 TWh of electricity; the economic potential for utility scale solar 7,705 TWh per year, or more than 200x the in-state need. Therefore tapping this resource would necessary enable Nevada to export solar power to other states.

Wind Power Market

To date, Nevada has only one utility scale wind project installed. The 152 MW Spring Valley Wind Project was installed in 2012.[39] However, technical analysis and economic conditions suggest far greater potential is untapped. This Study estimates that the economic potential for wind power in Nevada is between 1.5 GW and 6.3 GW. This translates to between $2.6 and $10.8 billion of capital investments. To date, only $290 million of investment has occurred to construct the Spring Valley Wind Project.[40] These estimates are based on analyses produced by the Department of Energy and NREL.

Table 14: Summary of Wind Market Potential in Nevada

Source	Potential Capacity (GW)	Estimated Investment Need (millions)
DOE Wind Vision (@80M)	1.526	$2,609
NREL – Low	6.329	$10,822
NREL - High	20.349	$34,796

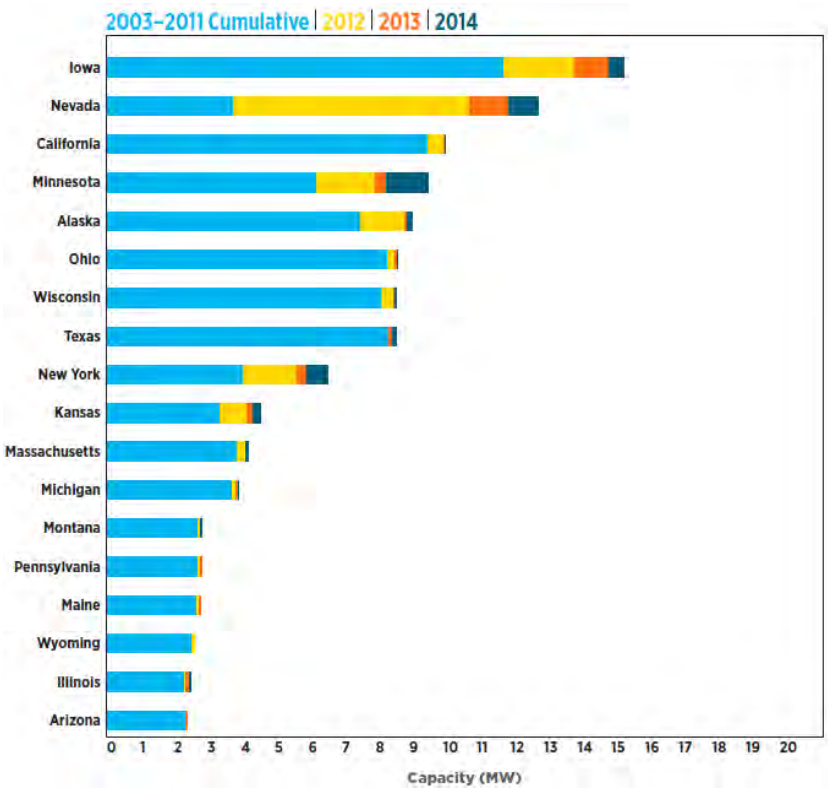
[39] https://www.nvenergy.com/renewablesenvironment/renewables/wind.cfm

[40] AWEA State Fact Sheet – "Nevada Wind Energy." http://awea.files.cms-plus.com/FileDownloads/pdfs/Nevada.pdf

NREL produced a technical analysis of the total wind power potential available in Nevada, and found that 24.5 GW of wind are technically feasible. Under various economic scenarios, they found that this technical potential translated to anywhere from 6.3 to 20.3 GW of economically viable wind potential.[41] In addition to this NREL study, the DOE produced its own analysis of economical wind potential, specifically at 80M turbine height. This study found the wind potential to be 1.5 GW.[42] Therefore this Study uses the DOE figure and the lower NREL figure as the low and high bounds of market potential. This Study assumes an installation cost of $1,710/kw, based on data from the Lawrence Berkeley National Lab.[43]

In addition to utility scale wind potential, Nevada has taken a leadership position in the distributed wind market. Nevada has installed the second most small, or distributed, wind power of any state in the U.S. As of 2014, this capacity was over 13 MW.[44] This market has been supported by the WindGenerations cash rebate program, run by NV Energy.

Figure 11: Small Wind Capacity by State through 2014



Realizing the full wind potential requires both upfront investment and the growth of a robust industry of project development. Though utility scale wind projects typically are able to find reasonably priced capital

[41] NREL, "Estimating Renewable Energy Economic Potential in the United States: Methodology & Initial Results," July 2015.

[42] AWEA State Fact Sheet – "Nevada Wind Energy." http://awea.files.cms-plus.com/FileDownloads/pdfs/Nevada.pdf

[43] http://newscenter.lbl.gov/2015/08/10/study-finds-that-the-price-of-wind-energy-in-the-united-states-is-at-an-all-time-low-averaging-under-2-5%C2%A2kwh/.

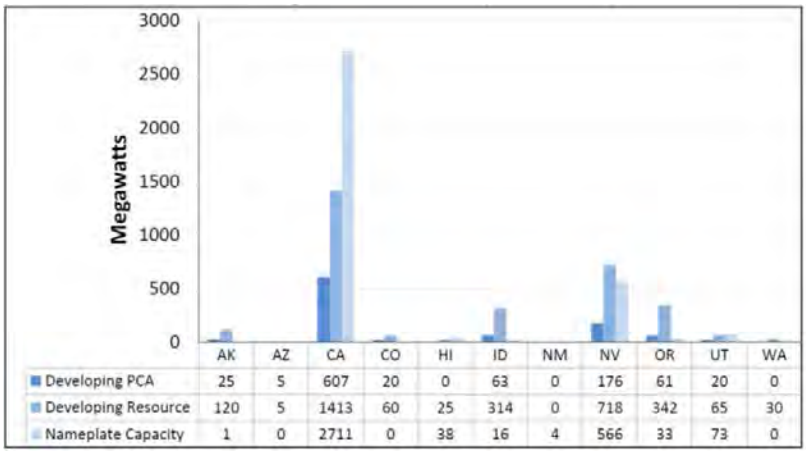
[44] U.S. DOE 2014 Distributed Wind Market Report,

in the private markets, there may be a role for government to support the growth of an in-state wind industry and create clearer lines of sight for easy project development.

Geothermal Market

Nevada has installed the second-most geothermal power generation of any state in the country, and still has vast resource potential. Through 2014 over 600 MW of generation capacity from geothermal had been installed in the state. This represents 16 fields producing 2.74 million MWH of power, or approximately 7.5% of the electricity consumed in the state. Some of these projects were built over 30 years ago and are now coming to the end of their expected project lifespan. There are also more geothermal projects in development in Nevada than in any other state.

Figure 12: Geothermal Capacity by State as of April 2014[45]



Nevada's potential for more geothermal generation is significant. According to the U.S. Geological Survey (USGS), Nevada's "identified" resources are the second most in the nation, behind only California. But the state's potential under "enhanced geothermal systems is actually by the largest in the nation.

Table 15: Geothermal Power Potential By State[46]

[45] Shevenell, Lisa, "Nevada Geothermal Update – 30 Years of Power Production," Geothermal Resources Council Bulletin, July/August 2015.

[46] US Geological Survey, "Assessment of Moderate- and High-Temperature Geothermal Resources of the United States," Fact Sheet 2008-3082, U.S. Department of the Interior, 2008.

		Identified Resources (MWe)				Undiscovered Resources (MWe)				Enhanced Geothermal Systems (MWe)			
State	N	F95	F50	Mean	F5	F95	F50	Mean	F5	F95	F50	Mean	F5
Alaska	53	236	606	677	1,359	537	1,428	1,788	4,256	NA	NA	NA	NA
Arizona	2	4	20	26	70	238	775	1,043	2,751	33,000	52,900	54,700	82,200
California	45	2,422	5,140	5,404	9,282	3,256	9,532	11,340	25,439	32,300	47,100	48,100	67,600
Colorado	4	8	11	30	67	252	821	1,105	2,913	34,100	51,300	52,600	75,300
Hawaii	1	84	169	181	320	822	2,027	2,435	5,438	NA	NA	NA	NA
Idaho	36	81	283	333	760	427	1,391	1,872	4,937	47,500	66,700	67,900	92,300
Montana	7	15	51	59	130	176	573	771	2,033	9,000	16,100	16,900	27,500
Nevada	56	515	1,216	1,391	2,551	996	3,243	4,364	11,507	71,800	101,300	102,800	139,500
New Mexico	7	53	153	170	343	339	1,103	1,484	3,913	35,600	54,400	55,700	80,100
Oregon	29	163	485	540	1107	432	1,406	1,893	4,991	43,600	61,500	62,400	84,500
Utah	6	82	171	184	321	334	1,088	1,464	3,860	32,600	46,500	47,200	64,300
Washington	1	7	20	23	47	68	223	300	790	3,900	6,300	6,500	9,800
Wyoming	1	5	31	39	100	40	129	174	458	1,700	2,900	3,000	4,800
Total	248	3,675	8,356	9,057	16,457	7,917	23,739	30,033	73,286	345,100	507,000	517,800	727,900

In addition to the USGS market assessment, NREL also calculated the technical potential for geothermal generation, and the economic potential under various scenarios.

Table 16: Summary of Geothermal Power Potential in Nevada

Source	Potential Type	Capacity (MW)	Estimated Investment Need (millions)
USGS	Conventional, identified	1,391	$3,478
NREL	Economic Potential – Low	3,841	$9,601
NREL	Economic Potential – High	4,242	$10,605
USGS	Conventional, undiscovered	4,364	$10,910
USGS	Unconventional	102,800	$257,000

These assessments point to a multibillion market potential. For the purposes of this Study, the lower bound of potential is assumed to be the USGS's identified resources. And the upper bound is the NREL "high" scenario. This indicates that the economic market potential for geothermal generation is between 1.4 and 4.2 GW of capacity, representing between $3.5 and $10.6 billion of investment opportunity.[47]

Takeaways

Taken together, the entire clean energy market SAM could be as high as half a trillion dollars, driven by enormous utility scale solar potential. Distributed solutions are a smaller share of overall SAM, but still far greater than current investment capacity. The market size of distributed solar for residential and commercial is estimated to be $1 billion. The building energy efficiency opportunity is estimated to be over $2 billion of cost-effective investment opportunities. The Las Vegas energy study performed by MIT, as well as numerous stakeholder interviews indicate that distributed generation and energy efficiency tend to be more difficult to finance, and investment is well below market potential. Recognizing the large unmet potential for distributed solutions (primarily solar and efficiency), if a Nevada Green Bank were to focus on this market, the investment opportunity would be approximately $3.5 billion of investment.

[47] Assumes $2,500/kw install cost. *See* http://energy.gov/eere/geothermal/geothermal-faqs.

Chapter 3 – The Green Bank Model

Introduction to Green Banks

A Green Bank is a public or quasi-public institution that finances the deployment of renewable energy, energy efficiency, and other clean energy and green infrastructure projects in partnership with private lenders. Green Banks are capitalized with public funds, which are then used to offer loans, leases, credit enhancements and other financing services to close gaps in the private capital markets for clean energy projects. Green Banks typically invest in the project deployment of mature, commercially viable technologies – not in early stage tech or in clean energy companies. The goal of a Green Bank is to accelerate the deployment of clean energy by removing the upfront cost of adoption, leveraging greater private investment in clean energy, and increasing the efficiency of public dollars. Through Green Banks, consumers and businesses can install clean energy technologies with little to no upfront cost while reducing energy costs and states can meet their public policy objectives to increase the amount of renewable energy generated and consumed in their jurisdiction. And because public dollars are used for financing, rather than grants, all public dollars are preserved through loan repayment.

Green Banks and public clean energy financing programs are increasingly common across the U.S., as governments recognize the importance of financing in addition to traditional grant models. Historically, many governments have supported the adoption of mature clean energy technologies by offering incentives, rebates, tax credits and other forms of subsidies. These programs have been generally effective in improving the economics of clean energy installation (primarily for renewables) and stimulating demand among consumers.

However, rebate programs have two primary shortcomings that financing can address. The first is that rebates traditionally only cover a small portion of a project's cost. If a rebate covers $2,000 of a $15,000 efficiency project, for example, then the customer still must find $13,000 in cash. This requirement for upfront, out-of-pocket cash is a barrier to adoption. The second problem with rebates is that they are expensive, as they are expenditures of taxpayer dollars. To bring clean energy markets to meaningful scale using rebates would require more public expenditure than is available or politically viable. Therefore new program solutions are needed that address upfront costs for consumers and the expense of public capital.

Barriers to Private Financing

Ideally, private lenders would step in to this market today to cover the remaining upfront cost of clean energy adoption beyond what is covered by rebates. However, there are capital market inefficiencies and inherent challenges to financing clean energy that have resulted in inadequate investment by private lenders. And those private lenders that do offer capital typically charge interest rates that are relatively high and terms that are short. This erodes the economics of a clean energy project, which ideally will be cash flow positive from day one. Under a cash flow positive project, the borrower is able to, on net, save money every month without paying any upfront costs. This kind of cash flow structure is only possible with loan terms that match the expected lifetime of the projects savings, and with rates that are commensurate with the risk.

Private financing gaps exist for several reasons.

- Short Track Record – Clean energy technologies are fairly new, so there is little data for lenders to turn to on project performance. Without data, banks are left with high amounts of uncertainty over how well different types of projects perform and how often borrowers repay their loans.

- Small Projects – Many clean energy projects are small in scale, which means they are not as cost-effective for lenders. Building efficiency and rooftop solar projects are relatively small investments that are geographically disperse, with varying credit among project off-takers. These types of investments are relatively expensive to underwrite for a private lender.
- Lack of Capital Market Liquidity - If a commercial bank provides an energy efficiency loan, it is unknown to the bank if it will be able to sell that loan to another lender or if it will have to hold that loan on its balance sheet, tying up capital. Mortgage and auto lenders don't have this difficulty, because there are highly liquid secondary markets for home and car loans. These kinds of secondary markets are just now forming for clean energy technologies.
- Organizational Behavior - In order to begin lending into a new market, a bank has to hire new staff, learn about the risks and processes of a new market, and determine a precise "box" of what kind of project and credit they are willing to lend to. This process takes time, commitment and money, all of which will only come with a greater understanding of market potential and risks.

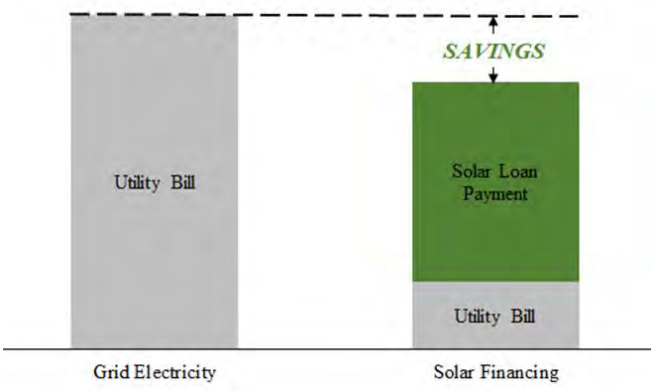
Green Bank Benefits

Green Banks present numerous possible benefits in the markets they address. These benefits include:

- Elimination of Upfront Cost – By offering 100% financing, in partnership with private lenders, Green Banks can eliminate the greatest barrier to consumer and business adoption of clean energy technologies.

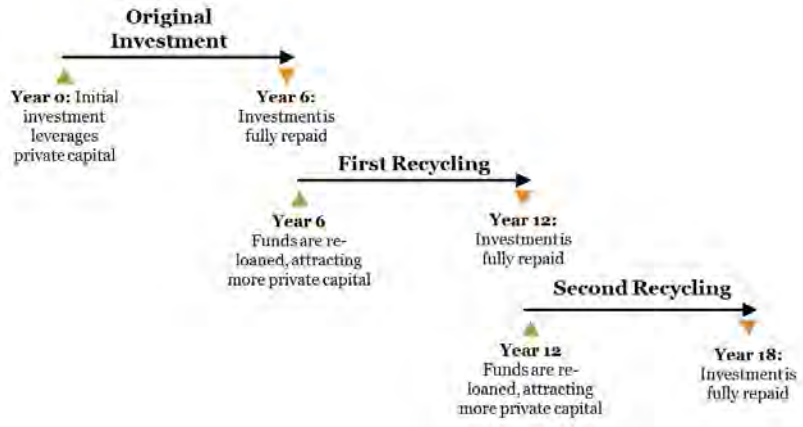
- Lower Energy Costs – Green Banks allow consumers to adopt clean energy and lower their energy costs. By improving the terms of financing Green Banks can lower the price of solar electricity. And total energy demand is reduced through efficiency. The result is total lower energy costs, with upfront payment.

Figure 13: Reduced Energy Costs through Green Bank Financing



- Preservation of Public Capital – Green Banks use public capital, but to provide loans and financing, not grants. Therefore taxpayer and/or ratepayer dollars are preserved through loan repayments. Green Banks are designed to earn enough interest to break even (cover their operating expenses), so that the pool of original public funds put into a Green Bank never erodes. Public dollars can be recycled and re-loaned into the future.

Figure 14: Hypothetical Green Bank Capital Recycling Model[48]



- Private Sector Leverage – Green Bank dollars get more "bang for the buck" because they are deployed in ways that leverage greater private investment than traditional programs. Green Banks achieve two forms of leverage. First, a Green Bank may provide only a portion of the project cost, while the private investor covers the majority of costs. This is the "upfront leverage," and can be as great as 10 private dollars per public dollars. But, in addition, because Green Bank dollars are recycled, that same public dollar will be recycled and leverage more private capital repeatedly.

- Economic & Job Growth – The increased investment sparked by a Green Bank increases GDP and creates jobs. More clean energy adoption means more installers and contractors need to be hired to actually install the renewable or energy efficiency technology. The renewable energy sector is already enormous driving employment across the country, with solar employment growing at a rate 20 times faster than the national rate of job growth.[49]

- Market Standardization – Green Banks can help introduce standardized financing practices and documentation into the clean energy market. Increased standardization is critical for bringing markets to scale and increasing private investment. Standardized financing means less expensive underwriting and the easier build out of secondary markets.

- Market Transparency –Green Banks can be a centralized source of market information that increases consumer and business understanding of clean energy opportunities. A Green Bank website can be a hub of information on market basics, help consumers understand different programs, learn about installers and receive estimates of their own potential savings

- Program Coordination – Green Banks can also play an important role of coordinating public clean energy programs that operate across different agencies. Often public programs to support clean energy deployment are operating by different public or quasi-public agencies. To ensure those

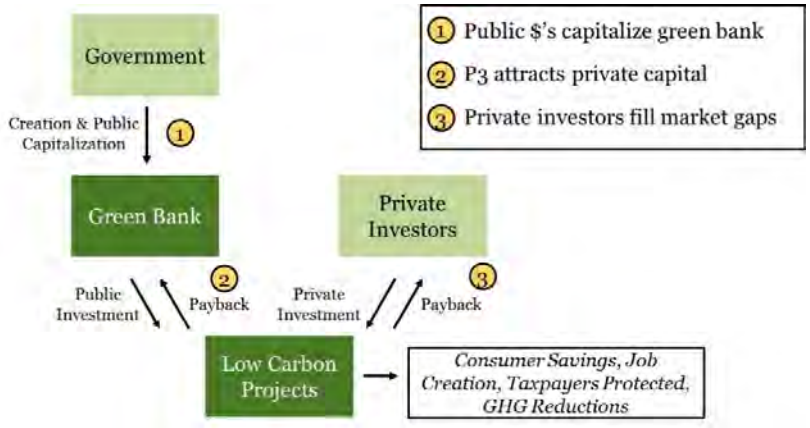
[48] "New York State Green Bank Business Development Plan," Booz & Co., September 3, 2013.
[49] "National Solar Jobs Census 2014 | The Solar Foundation." Accessed May 10, 2016. http://www.thesolarfoundation.org/national-solar-jobs-census-2014/.

programs operate at maximum efficiency and create a single point of contact for customers, it can be beneficial if one agency is tabbed to coordinate and align programs across agencies.

Green Bank Organization

A Green Bank is effectively a public fund used to offer financing and support the growth of clean energy capital markets. The Green Bank institution that manages the fund is typically directly part of government, contracted by government, or is a quasi-public entity. The Green Bank fund is traditionally capitalized with public dollars (though other alternative capital sources can be considered).

Figure 15: Green Bank Basic Flow Chart



The Green Bank, through government direction and internal governance, determines how the capital should be invested in the region or state in order to grow clean energy markets and attract private investment. Green Banks invest in partnership with private lenders in projects. Lenders may range from local credit unions and community banks to large institutional investors. For instance, a Green Bank that seeks to encourage lending for single-family home energy efficiency retrofits may partner with local lenders who know that community. But if a Green Bank wants to build a warehouse facility to originate loans itself, it may seek out an institutional investor to help seed that warehouse. To date the most successful Green Banks or similar clean energy financing programs are ones that actively seek out private lending partners. Less robust public financing programs that rely on private lenders to enter the market without encouragement and engagement (financial or otherwise) are often left with minimal activity.

The structure and ratio of public to private capital are determined through programmatic design and individual project conditions. Green Bank management works closely with private lenders to understand their needs and hesitations to entering the clean energy project finance market. That way financing products can be designed that specifically address obstacles and allow private investors to move into the market. Green Banks look to use as little capital as is needed to draw in private investment at scale.

Target Markets

Green Banks finance the deployment of mature, clean energy technologies that can support loan repayments. This includes renewable technologies like solar PV, wind, geothermal, fuel cells and bio-energy. This also includes a wide range of energy efficiency technologies. Green Banks could also finance the deployment of micro-grids, energy storage, clean transportation infrastructure and smart-grid

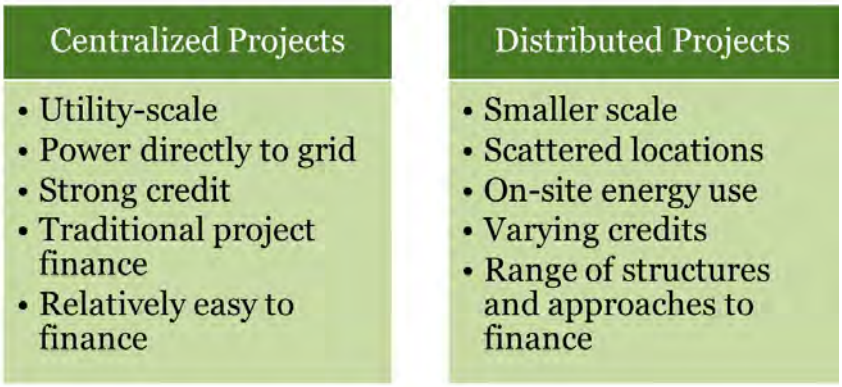
technologies.[50] In each case, the Green Bank would be investing in a project installation of the technology itself, not the technical development of that technology by a company.

Green Banks focus on deployment of mature technologies because they have a low risk profile and can naturally generate the cash flow needed to pay off a loan. For instance, an energy efficiency project can typically save more money than is owed on a monthly loan repayment. Therefore, underwriting that project is relatively easy since the creditworthiness and income of the borrower is not the only basis for assessing loan risk. By focusing on low-risk deployment projects, Green Banks can ensure that public capital is preserved, enabling revolving lending practices.

Among the list of mature renewable energy and energy efficiency technologies identified, it is up to each Green Bank to determine the technologies that are most suitable for its market For instance, a Green Bank may determine that there is a significant wind resource in its geography, but find that wind projects are able to find ample capital at reasonable rates through traditional private capital markets. Therefore wind would not need Green Bank support.

Typically, the technology applications that are well capitalized by private investors are large, utility-scale renewable energy projects like wind and solar. These rarely require Green Bank support. Instead, Green Banks have focused on two categories of projects. One area of focus is on distributed energy projects. This includes roof-top solar and other on-site generation, as well as energy efficiency. The second focus of Green Banks has been on utility-fed, medium-scale renewables projects with less common technologies like anaerobic digesters, bio-energy projects, and fuel cell parks.

Figure 16: Challenges of Financing Distributed Energy Projects



Distributed energy projects have become a primary focus of Green Banks because these projects tend to have the greatest difficulty finding reasonably priced private capital. As described above, the relatively

[50] A Green Bank could theoretically also invest in water or other green infrastructure projects. However, Green Banks are perceived to be (and in reality are) low-risk lending authorities because the projects they invest in, by their very nature, generate the cash needed to repay the loan. Other forms of green infrastructure investing may not necessarily have this quality. For example, an energy efficiency loan will produce savings greater than the loan repayment as a result of the technology itself. Therefore the project relies on no external cash stream or legal enforcement mechanism to generate cash for the loan repayment. A loan to reduce water consumption may save enough on water bills to generate cash sufficient for the loan. But other green infrastructure lending, like public drainage projects, would rely on other enforcement mechanisms to collect the cash for repayment.

small and disperse nature of building upgrades and small renewable energy installations is unappealing for private lenders. Therefore Green Banks can play a big role stimulating investments in these projects and creating more robust markets.

There are a few distributed clean energy markets that have access to reasonably priced private capital. Homeowners with high-credit scores and well-directed roofs can get financing for roof-top solar through a third-party installer like SolarCity. And large industrial companies with high credit-ratings from major rating agencies can finance a building upgrade through an energy service company (ESCO). Otherwise, projects in nearly all distributed energy markets, across technologies and sectors, may struggle to find capital through private markets.

Green Bank Financing Techniques

Green Banks can offer a wide range of types of financing to leverage private capital, but they can broadly be bucketed into three categories.

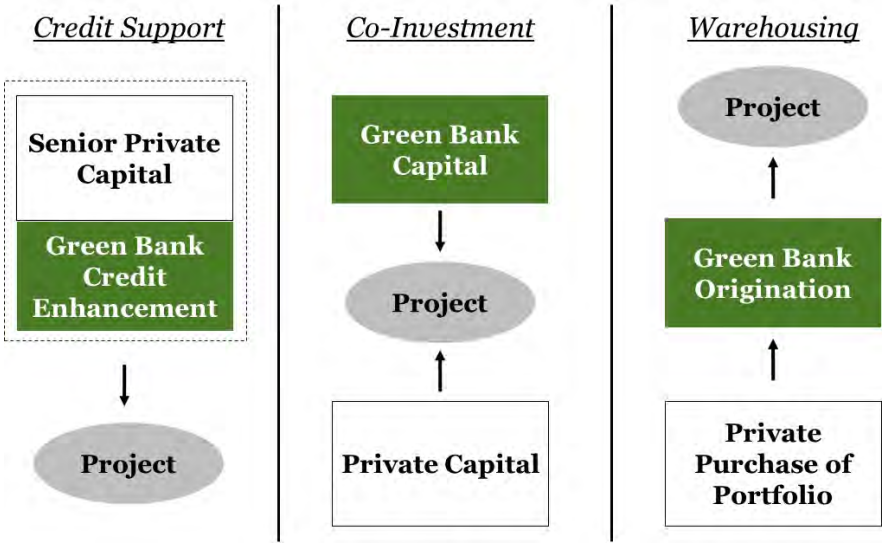
Credit Enhancements

A credit enhancement is typically a pool of Green Bank capital set aside to cover potential losses on loans made by private lenders. This technique is suitable for a market where private lenders are interested in entering the market but are hesitant due to perceived risks. Or it can be used improve the terms of private capital available. Under a loan loss reserve structure, a Green Bank will put aside capital to cover a certain portion of a lender's losses, up to a capped amount of dollars. A reserve can be in the first loss or second loss position in relation to the lender. This structure provides a lender assurance that some portion of potential losses would be covered, while also giving the lender incentive to assess risk appropriately because most losses are still borne by the lender. These kinds of investments can achieve high leverage ratios, stimulating many dollars of private investment per public dollar of investment.

Direct Co-Investment

Co-investment involves direct Green Bank investment in a clean energy project alongside a private investor. Unlike credit enhancements, where public dollars are not actually invested in the project technology, co-investment can take multiple forms and structures of actual project investment. A Green Bank may provide senior debt, subordinated debt, or equity in a project, which is then paired with multiple potential forms of private investment. The leverage achieved on these co-investments depends the precise product structure, and by its nature requires the presence of a private lender willing to at least make some level of investment in a project.

Figure 17: Green Bank Financing Techniques



Warehousing & Securitization

In the event no private lender is willing to underwrite loans, even with a credit enhancement, it may be suitable for a Green Bank to underwrite 100% of a loan itself. This situation may arise if the technology is perceived as too risky or new, if the market segment is viewed as having poor credit, or if the investments themselves are not cost-effective to underwrite for a private lender. This final challenge is a significant barrier to private investment in small and geographically disperse projects like residential or small business energy efficiency projects. However, if a pool of these kinds of loans were bundled together to diversify risk and achieve scale, the projects then become far more attractive to lenders. A Green Bank can accomplish this by underwriting loans directly and warehousing them until scale is reached. At this point the Green Bank can sell the loans to private investors. This can be done either through a private placement of the whole loans, a private securitization, or a public securitization. This technique is critical to allowing small clean energy projects to access the low-cost capital that can be found in publicly traded debt markets that are tapped through securitization.

Related Financing Mechanisms

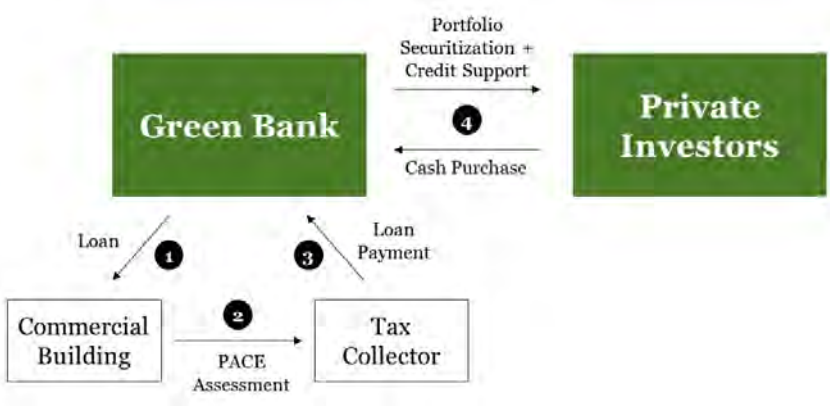
In addition to using Green Bank capital to finance projects, Green Banks can also help implement innovative new financing structure. These include Property Assessed Clean Energy Financing (PACE) or on-bill repayment (OBR). In both cases, Green Banks can play the role of program administrator, deal originator, program marketer, or capital provider. The precise role played by a Green Bank in each market depends on the existing laws, statutes and programs in place.

Property Assessed Clean Energy (PACE)

PACE financing is a structure through which a building owner repays an energy upgrade loan through property taxes via a new lien on the building. PACE liens typically sit senior to all other non-tax liens on a building, including the mortgage, significantly reducing repayment risk. In any state that has passed legislation and any municipality that then allows PACE, technically a PACE loan can be made by any lender. The lender would provide capital implement energy efficiency, for instance, and then the tax-collecting agency would place a new lien on the building equal to the loan repayment. That repayment is collected by the taxing agency and remitted to the lender. Though simple in concept this is difficult to execute and

administer. A Green Bank could step in to provide support through both administration and capital. Loan capital could kick-start a market (as was done in Connecticut). A Green Bank could also offer a credit enhancement to entice private lenders into the PACE market.

Figure 18: Simplified PACE Structure with Green Bank Lending



On-bill Repayment & Financing

On-bill financing or repayment (OBR), like PACE, is a financing structure designed to increase the likelihood of loan repayment. With OBR, an energy upgrade loan is repaid on the borrower's utility bill. This creates greater security for the lender because historically utility bills have a very high rate of repayment. OBR also addresses the "split incentive" between building owners and tenants. By attaching a loan to a utility meter, rather than the customer, a tenant can reap the benefits of efficiency, repay only the portion of the loan that is due while still a tenant, and then hand the remaining payments to the next tenant who continues to benefit from the efficiency. This has the power to open up many new markets for efficiency financing that otherwise would be unsuitable. A Green Bank could act as a program administrator and/or a lender for on-bill programs. (Note: On-bill financing typically refers to programs where the utility itself uses its own capital to issue the loans. On-bill repayment refers to the programs that allow non-utility lenders to issue loans, where the utility merely acts as a collection platform.) A Green Bank could create, administer and finance an OBR program, working in partnership with implementing utilities.

Generating Demand for Clean Energy Products

In addition to animating investment in clean energy, Green Banks also stimulate demand for clean energy products. Adoption of clean energy technology, despite the fact that these investments pay for themselves through savings. The lack of financing to pay for upfront cost plays a major role in the slow uptake. But demand is also slow because clean energy lacks a robust, transparent and efficient market.

When compared to the ease of purchasing consumer goods, as one would on Amazon for instance, the clean energy purchase process is immensely complex with little information available to consumers. In addition, clean energy technologies are yet to be intrinsically desired the way homes and cars are. Therefore any Green Bank financing has to be offered in a way that stimulates demand and facilitates the creation of efficient market structures.

This has resulted in the common refrain that, "capital isn't the problem – it's the demand." This is a reference to the notion that plenty of capital is available and ready to enter the market, but the lack of

consumer demand is the reason that markets are not growing quickly enough. The reality, though, is more complex, as offering capital for clean energy financing is not a binary condition. A bank or a government program may ostensibly make capital available, but because there is no robust market for clean energy technologies, the multitude of activities and parties needed to bridge the distance between supply of capital and demand for technologies does not exist.

This series of activities needed to connect capital supply to customer demand includes marketing; dedicated origination channels; partnerships with contractors; contractor training on how to sell their services with financing; coordination of financing and services with other subsidies; coordination of multiple contractors on multi-measure projects; and many others. In addition to this list of activities, often the capital made available for financing is not well-suited for the purposes of clean energy investing. For instance, a loan may be offered with a short-term that prevents deep retrofits; at an interest rate that prevents a project from being cash flow positive; with a loan size that prevents deep retrofit projects; with the inability to cover 100% of the cost, but with no assistance to find other lenders to cover remaining costs; and with credit restrictions that shut-out a majority of the market.

Green Banks can play a critical role in stimulating demand by both offering suitable financing *and* delivering products to customers through turn-key program design. A Green Bank cannot be built on the flawed clean energy financing premise that, "if you build it, they will come." Rather a Green Bank can design financing programs in coordination with delivery mechanisms, access to information, and consumer marketing techniques to overcome past demand shortages. Whether the Green Bank itself is directly engaging in this market creation activity or doing so in partnership with multiple private partners will depend on precise product and organizational design. But no matter the design, a Green Bank should strive to ensure customers are presented with simple offers that are cash flow positive.

Green Bank Examples

To date, five states operate Green Banks in the United States. Nearly a dozen other states are also at some stage of Green Bank exploration or development. There is also one official county Green Bank, and at least four countries outside the U.S. have national Green Banks. Each of these Green Banks has a slightly different model and approach, tailored to suit the institutional landscape, legal requirements and market objectives of that jurisdiction. Some Green Banks are directly part of government, while others are quasi-public. All Green Banks are tied by a common set of principles, which include:

- Offering financing, rather than grants
- Leveraging public capital to increase private investment
- Recycling and recapitalizing funds to redeploy dollars and maximize investment

Table 17: Summary of Green Bank Institutions

Institution	Eligible Technology	Key Products	Source of Funds	Initial Capital	Structure/Oversight	Staff
Connecticut Green Bank	• Solar, fuel-cell, geothermal, biomass • Energy efficiency	• C-PACE • Smart-E loan • Solar Lease II • Solar Loan	• Utility bill surcharge • RGGI funds	~$35M per year	• Independent quasi-public • Board of Directors, appt by Governor & Legislature	33
Hawaii Green Infrastructure Authority	• Solar (primary focus) • Energy efficiency	• Solar leases for LMI and non-profit sector, paired with on-bill recovery	• Bond issuance backed by ratepayer fee	$150 M	• Independent quasi-public • PUC oversight	2
New York Green Bank	• Renewable energy • Energy efficiency • Clean transportation	• Issued RFP for private sector financial intermediaries	• Utility bill surcharge • RGGI funds	$218.5 M	• PSC oversight • Division within state energy office (NYSERDA)	12
California CLEEN Center	• Efficiency (first priority) • Renewable generation	• MUSH market efficiency • Commercial market efficiency	• Pre-existing bonding authority of the state IBank	~$40M	• Division of CA Infrastructure Bank • Board of Directors, appt by Governor	~5
Rhode Island Infrastructure Bank	• Renewables • Efficiency • Grid and demand-side upgrades	• Commercial & Residential PACE Program • Efficient Buildings Fund for muni's	• RGGI • ARRA • Ratepayers • QECBs • Bonding authority	~$7 M	• Independent quasi-public • Board of Directors, appt by Governor	12
Montgomery County Green Bank	• Renewables • Energy efficiency • Grid and demand-side upgrades	• TBD	• Settlement from utility merger negotiation	$20 M (TBD)	• Independent non-profit • Board of Directors, partial Council approval	TBD

In addition to these domestic Green Banks, the United Kingdom, Australia, Japan and Malaysia all operate national Green Banks. The UK Green Investment Bank and the Australian Clean Energy Finance Corporation (CEFC) are particularly noteworthy for their scale. They have each already invested billions of dollars, leveraging many multiples of that in private investment.

Connecticut Green Bank

The Connecticut Green Bank was created in 2011 as the first state Green Bank in the U.S. Originally named the Connecticut Clean Energy Finance & Investment Authority, it was created through bi-partisan legislation that was initiated by newly elected Governor Dannel Malloy.[51] The new Green Bank institution was born out of the existing grant-making institution, the Connecticut Clean Energy Fund. The Fund was repurposed and turned into a deployment financing entity. The Green Bank was created as a quasi-public

[51] PA 11-80, the public act creating the Connecticut Green Bank, passed the House by a vote of 139-8 and the Senate 36-0.

agency, with a board of directors that are a mix of government officials and independent directors. The government officials include the state Treasurer, the Commissioner of the Department of Energy and Environmental Protection, and the Commissioner of the Department of Economic and Community Development. The board is charged with setting Green Bank Strategy, approving Green Bank products and initiatives, and approving loans.

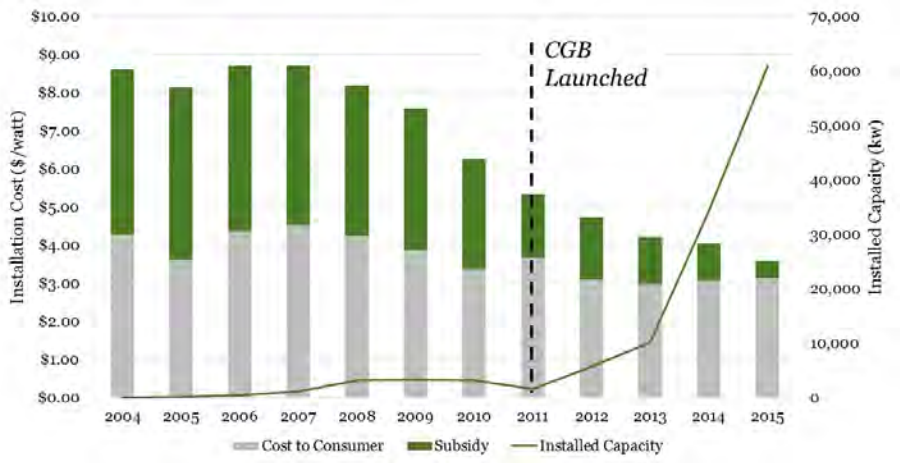
The Connecticut Green Bank is capitalized by two sources, both of which were identified in the legislation. The first is a systems benefit charge that collects roughly $20 to $25 million dollars per year. This was an existing system benefits charge, already in place in the state prior to the creation of the Green Bank. Previously the entire ratepayer collection went towards state-managed grant programs. The re-allocation of those funds to the Green Bank represents only a portion of the total collection, with the remaining funds still going toward grants. This re-allocation of funds was driven by a desire to maximize private leverage from public funds and get the greatest "bang for the buck" for each public dollar. The second source of Green Bank funds are the state's proceeds from the sale of emission allowances through the Regional Greenhouse Gas Initiative (RGGI) Program. In total, this adds to a total annual infusion in the Green Bank of approximately $30 million per year.

In addition, the Connecticut Green Bank is authorized to issue its own bonds based on its own balance sheet. The Bank also has limited ability to issue bonds that are supported by a state bond reserve fund. This is not equivalent to full faith and credit, but does enable borrowing at lower rates based on the state's credit rating. The Bank has not yet issued bonds of this type to increase its lending capacity.

By statute, the Bank must manage the wind down of the state's residential rooftop solar rebate program. Though this grant-making role is distinct from the Bank's broad financing mission, the ability to manage the ramp down of grant levels and then increase financing under a single coordinated strategy has proven highly effective for market growth. As seen in the chart below, as the Bank lowered grants consistently through multiple steps, the increased availability of financing drove unprecedented market growth.[52]

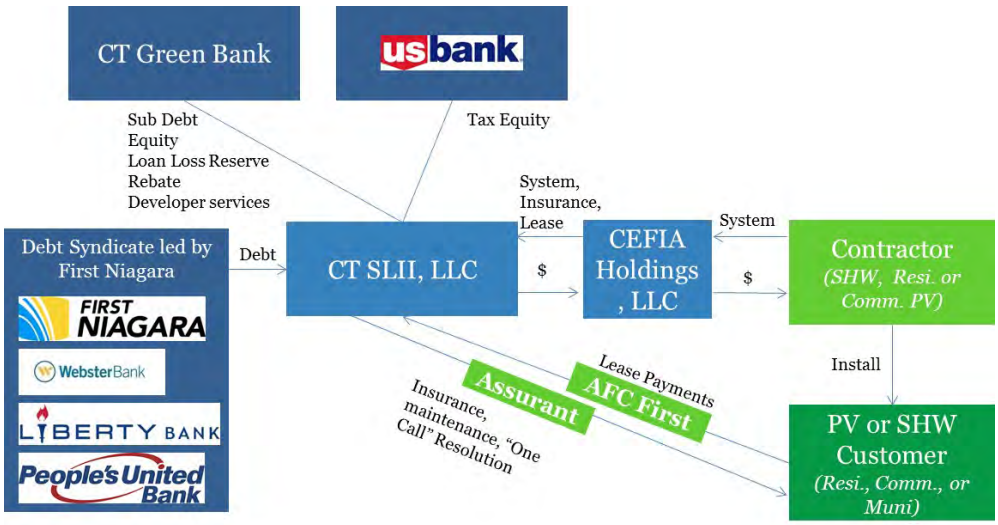
[52] In fact, the chart shows that the net cost of solar faced by the consumer, after the rebate, has actually remained fairly constant in CT over the last decade. This is because the decline in the gross cost of installation was absorbed by the state in the form of reduced rebates. Therefore the spike in market adoption is attributable to new financing tools that allowed consumers to adopt solar without paying that remaining net cost of installation upfront.

Figure 19: CT Residential Solar Market Installation Costs, Rebates, and Capacity[53]



Connecticut offered three different financing solutions for the residential market to support solar installation. The first was a unique, state-sponsored solar tax-equity lease fund that could be used by any installer in the state. CT Solar Lease 2 was a public-private partnership structure that brought $50 million of lease financing to the market, with a 5-to-1 private:public leverage ratio. This kind of tax-equity fund enables homeowners to put solar on their roof at no money down, and pay a low monthly price by taking advantage of federal tax benefits for solar.[54] This financing tool was deployed through local installers, who otherwise would have been unable to offer financing to consumers.

Figure 20: CT Solar Lease 2 Financing Structure[55]



[53] Connecticut Green Bank, 2015.

[54] A tax equity investor effectively invests cash in exchange for the federal Investment Tax Credit and the accelerated depreciation tax benefits enjoyed by solar. This tax value only comes through a tax-equity based structure, and allows consumers to pay a lower price for the solar power than they would if they owned the solar themselves.

[55] "CEFIA's Residential Solar Financing Products," Bert Hunter, Green Bank Academy, February 6, 2014, http://greenbankacademy.com/agenda-materials/.

In addition to the Solar Lease, the Green Bank created the CT Solar Loan product for consumers who wanted to directly own their own solar panels but did not have the cash on hand for the installation. Through this structure, the Green Bank seeded a loan fund with a $5 million investment. Sungage, upon proving the market viability and demand for solar loans, was quickly able to raise $100 million of private capital from Digital Federal Credit Union to replace the Green Bank capital once it was expended. In only a year and with only $5 million of public capital invested, the Green Bank effectively demonstrated the value of solar investment to a private lender, crowding-in capital as desired.

The final residential solar product offered, that can support solar, efficiency or other technologies, is the Smart-E Loan. The Green Bank provides a standard-offer loan loss reserve to multiple local lenders to support their loans into the residential market. These banks were either offering capital at high rates and short terms, or not making loans into the space at any terms. And those that were willing to lend into this market were not actively building deal flow with contractor partnerships or other methods. In exchange for receiving the benefit of the Green Bank's loan loss reserve, the banks agree to offer capital at specific terms and rates that don't exceed a certain cap. These terms compensate banks appropriately for risk, but ensure that projects can be cash flow positive for borrowers.

In addition to managing the wind-down of the solar grant program, the Green Bank's enabling legislation also directed the Green Bank to administer a state-wide PACE program. Through Commercial PACE, CT offers whole-building commercial energy retrofits. The whole-building approach to energy upgrades has long been viewed as the most effective way to significantly curtail energy consumption, but the projects are hard to execute and finance. They include multiple energy efficiency technologies and can also include roof-top solar when appropriate.[56] The Connecticut Green Bank is able to finance these projects through its Commercial Property Assessed Clean Energy, or C-PACE, program.

PACE is legally authorized in over 30 states, but Connecticut is one of only a two states to achieve significant scale with the program. Unlike in most states where each local government is charged with creating their own program, the Connecticut Green Bank is tasked with administering the program across the entire state. Through central administration the Green Bank implements programmatic consistency and standardization, critical elements for private investment. And the Green Bank also ensures that every loan offered can be paid back entirely through the savings generated by the project, as stipulated in the state's legislation. The Green Bank uses a standardized technical underwriting method to ensure that every project has a savings-to-investment ratio ("SIR") greater than 1 (as required by enabling legislation).

Connecticut initially struggled to find interested lenders. However, the Connecticut Green Bank was able to kick-start the market by originating and underwriting PACE loans using its own public dollars. By taking the first step when private lenders would not, the Green Bank was able to build scale by aggregating projects. After building a portfolio large enough to attract private investment, the Green Bank sold 80% of the PACE loan portfolio through an auction, drawing in $24 millions of private investment.[57] This was the first commercial efficiency securitization in the country, attracting specialized and institutional investors to participate in the market. Without Green Bank investment and coordination, the market would have remained dormant as it has in many other states.

[56] To date, roughly 50% of projects are PV only, 25% are EE only, and 25% are both PV and EE.

[57] Lombardi, Nick. "In a 'Watershed' Deal, Securitization Comes to Commercial Efficiency," May 19, 2014. http://www.greentechmedia.com/articles/read/the-first-known-commercial-efficiency-securitization.

Now that the Green Bank has demonstrated the mechanics and potential of PACE, private investors are preparing to enter the market at far greater scale. To satisfy the growing pipeline of projects, the Green Bank is raising an external warehouse of at least $100 million in private capital that will be used to originate loans. After only one portfolio sale, the Green Bank has demonstrated market opportunity to draw institutional investors eager to originate the loans, reducing the need for public investment.

After five years of operation, the Connecticut Green Bank is now a mature financial institution that has sparked remarkable growth in the state's clean energy markets. In FY2015, the Green Bank sparked $365 million in total clean energy investment in the state, while achieving a private:public leverage ratio exceeding 5-to-1. This stands in sharp contrast to the market condition prior the Green Bank's creation. In the eleven years of operation of the prior Clean Energy Fund, a total of $350 million was invested during that whole time period. And of that total, approximately half of the funds were public dollars, and nearly all were in the form of grants.

Figure 21: Connecticut Green Bank v. Connecticut Grant-Making Authority[58]

	FY 2000 – FY 2011 (CCEF)	FY 2012 – FY 2014 (CGB)	FY 2015 (CGB)
Model	Subsidy	Financing	Financing
Years	11	3	1
Energy (MW)	43.1	65.3	62.6
Investment ($MM)	$350	$350	$365
Leverage Ratio	1:1	5:1	5-10:1
Investment % Loans	9%	57%	77%

New York Green Bank

New York Governor Andrew Cuomo announced his plan to form the New York Green Bank in January 2013 during his State of the State address. His plan was to build a $1 billion financing institution to fill financing gaps in the New York clean energy capital market. It was determined from the outset of the process that new legislation would not be needed to create the financing entity. The state's energy office, NYSERDA, had all the legal authorities a Green Bank would need to provide financing. Therefore it was determined that the New York Green Bank (NYGB) entity would be a division within NYSERDA.

Separately, the Governor decided that the best source of funding for the NYGB would be similar to those chosen in Connecticut. The NYGB would be capitalized by redirecting a portion of the ratepayer surcharge funds collected annually to support grant programs. The NYGB would also receive a one-time infusion of state's RGGI proceeds. The allocation of the RGGI proceeds could be made through administrative action, but redirecting the ratepayer funds to the NYGB required approval by the Public Service Commission (PSC). NYSERDA produced a detailed business plan and explanation of the importance of financing to support its petition to the PSC.[59] This led to PSC approval of NYGB funding in December 2013, initially

[58] Connecticut Green Bank, 2015.
[59] "New York State Green Bank Business Development Plan," Booz & Co., September 3, 2013.

allocating $165.6 million in ratepayer dollars.[60] Combined with the annual $45 million in RGGI proceeds, this brought the NYGB's initial capitalization to $210 million.[61]

The NYGB operates as a wholesale clean energy finance lender (as opposed to Connecticut, which operates more as a retail lender). Rather than design specific financing products and programs, the NYGB is looking to the market to learn what financing is needed. In February 2014, the NYGB issued an open-ended RFP seeking applicants for funding that could demonstrate that they could not find private funding elsewhere, and that NYGB deal participation would produce "market transformation."

The first set of NYGB investments were announced in the fall of 2015.[62] $49 million of public capital was used to leverage $178 million in private capital. Three deals were announced addressing different market segments. $25 million in debt was provided to a NY-based solar installer to support a solar leasing warehouse. $4 million in construction financing was provided to a distributed wind installer to support over 160 distributed wind installations in rural New York through a lease structure. And $20 million in credit enhancing capital was provided to enroll the state in the multi-state Warehouse for Energy Efficiency Loans program, which provides home energy upgrade financing.

Hawaii Green Infrastructure Authority

Hawaii's Green Bank institution is called the Green Infrastructure Authority (GIA), which was created through legislation. The GIA was placed within the state's Department of Businesses, Economic Development and Tourism (DBEDT), which operates the state's energy office. The GIA is minimally staffed, relying on third-party contractors to administer its financing program. The GIA's first program, approved by the public utility commission in 2014, is the Green Energy Market Securitization (GEMS) program. GEMS provides solar lease financing to underserved market segments, particularly LMI households.

Hawaii has experienced a residential solar boom as the cost of solar has fallen and is highly competitive with expensive grid electricity in the state. However, solar adoption and the associated economic benefits were concentrated among high-income households. 27% of households earning $90,000 or more had solar, but only 6% of households with less than $60,000 in income had solar. This was a clear gap in private financing markets that had serious economic welfare consequences. GEMS is designed to fill that gap, leveraging public capital in an innovative way.

The GEMS program is funded with an existing and redirected ratepayer surcharge. Ratepayer dollars are collected by GIA through the utility. Rather than wait for the collections to reach scale, the GIA issued a $150 million bond that will be paid off with the future ratepayer collections. Because bond repayment is linked to utility collections, and not individual lease repayments, the bond received a AA-rating and a 2.99% taxable-rate. These funds are then combined with private tax-equity capital to create a solar lease fund. To further reduce the rate lessees will be charged, the solar leases will be repaid through on-bill repayment mechanisms that were established in parallel to the GIA's creation. The lease repayments will go back into the GIA fund, and can be revolved. By combining multiple elements of strong clean energy

[60] "Order Establishing New York Green Bank and Providing Initial Capitalization," Case 13-M-0412, New York Public Service Commission, December 19, 2013.

[61] "Governor Andrew Cuomo Announces NY Green Bank Open for Business," Press Release, New York Green Bank, February 11 2014.

[62] "Governor Cuomo Announces Three New York Green Bank Transactions to Improve Access to Clean Energy and Reduce Greenhouse Gas Emissions," Press Release, October 21, 2015.

financing policy (public-private leases, leveraging ratepayer funds, and on-bill repayment), Hawaii was able to build a program that is low-risk and open to a broad segment of the population.

California CLEEN Center

In the fall of 2014, the California Infrastructure and Economic Development Bank (IBank) announced the creation of the new California Lending for Energy and Environments Needs (CLEEN) Center. The CLEEN Center will act as a Green Bank to initially support municipal and commercial building efficiency upgrades, before expanding to finance broader clean energy markets. For much of 2014, a bill to create a new stand-alone California Green Bank advanced through the state legislature. As a result of negotiations between Governor Brown and the bill's lead sponsor, it was decided that the existing state IBank would house the new Green Bank entity.

As described in the business plan, the objective of the CLEEN Center's programs is to "drive down the cost of EE projects and retrofits, leverage existing public programs, encourage private investment and earn investment returns for the IBank and partner with market intermediaries."[63] This statement encompasses the broad set of objectives typically held by a Green Bank. The CLEEN Center's first two programs will be the Statewide Energy Efficiency Program (SWEEP) and the Commercial & Industrial Energy Efficiency Programs (CEEP). The programs will fill market gaps where viable efficiency projects are unable to access reasonable financing, specifically targeting the municipal, university, school and hospital (MUSH) market, as well as the Commercial & Industrial (C&I) market. The CLEEN Center is also designing a specialized LED street lighting program that will enable municipalities to swap out old street lights for LEDs while remaining cash flow positive throughout the term of the loan. Through each of these programs, the CLEEN Center will offer senior or subordinated debt, or credit enhancements to support private investment.

The funding source for the CLEEN Center is the IBank's existing pool of cash raised by issuing bonds. The CLEEN Center sits under the existing Infrastructure State Revolving Loan Fund (ISRF). This is the IBank's largest program and is entirely funded through IBank bond issuances. Bonds are issued to recapitalize this program nearly every year, and at a very large scale. For instance, in May 2015 the IBank closed on an ISRF 2015A Series bond in the amount of $125 million, at 3% interest rate (rated at AAA). Presently, the IBank has roughly $200 million in cash assets available for lending, most of it for the ISRF program that includes the CLEEN Center. Finally, the IBank does have equity on hand (cash that does not have to be used to repay bond holders.) The IBank will use those equity dollars to create loan loss reserves and other credit enhancements to enable more private investment.

Rhode Island Infrastructure Bank

When Rhode Island Governor Gina Raimondo assumed office in January 2015, she very quickly followed through on her campaign promise to create a Rhode Island Green Bank. Rhode Island had an existing set of state and utility-run rebate programs, and had attempted to build a residential PACE program. A new Green Bank, though, would increase financing across new clean energy markets, and importantly drive investment in infrastructure and job grow.

Rhode Island determined that the best path to creating its Green Bank required legislation. And rather than build an entirely new institution, the Green Bank would be built upon an existing entity with a track record of success. The state's Clean Water Financing Authority (CWFA), which had financed water projects

[63] "Business Plan," California Infrastructure and Economic Development Bank, Clean Energy Finance Center, February 17, 2015, p. 5.

in the state for many decades, was tapped to become the Green Bank. The CWFA would be given expanded authorities to address clean energy markets, and be renamed as the new Rhode Island Infrastructure Bank (RIIB). This new organizational structure was passed into law in June 2015 as part the Governor's fiscal year budget legislation.

The RIIB was assigned responsibility for two specific financing programs in the legislation. RIIB has responsibility for designing, administering and possibly financing both commercial and residential PACE in the state. RIIB chose to follow the Connecticut model with a single, state-wide PACE administrative authority. Though the RIIB hopes that private investors will originate and underwrite PACE loans, the RIIB is able to provide credit enhancements to those lenders should it be necessary. The RIIB was also tasked with designing and implementing an Efficient Buildings Fund (EBF), which will finance energy upgrades for municipal buildings in the state. RIIB was given general authority to design the optimal financing structure to serve this market, which has been broadly underserved. This program was given priority because reducing energy bills in public buildings will reduce government budgets at a time when the state needs to maximize the value of all public dollars.

RIIB activities are funded through a combination of RGGI proceeds, system benefit charges, remaining federal ARRA funds, and a small amount of re-directed operating funds. The RIIB also has the authority to issue state qualified clean energy bonds (QECBs). In sum, these funds are intended to both serve as an equity portion of a broader bond issuance, as well as support a larger agency operation. The bond issuance, the proceeds of which will finance the EBF program, is estimated to raise $20 million. RIIB, like the CWFA before it, is a quasi-public agency with a board of directors, where the chairman is appointed by the Governor.

Montgomery County Green Bank

In June 2015, Montgomery County, MD became the first county in the U.S. to create an official Green Bank. The Green Bank was created through County Council legislation, which was passed unanimously. The Green Bank has been given a broad mandate and set of tools to fill financing gaps and accelerate the growth of the county's clean energy markets. The county, which had already begun to create its own PACE program, saw a Green Bank as critical to meeting its own clean energy goals and opening access to all customers. The county is currently administering a public working group process that will more precisely inform the operations and focus of the Green Bank.

Montgomery County's Green Bank was created using a fairly unique structure. The county did not want to directly operate the Green Bank itself within the government, but was also unable to establish a separate quasi-public without state-level legislation. So instead of directly creating the Green Bank, the legislation precisely defines a mission and set of functions to be performed by a purpose-built 501(c)(3) non-profit that would be the county's Green Bank. The county Council would designate the non-profit entity as the county's Green Bank for a specified term, during which time it would operate under the governance and legal definitions of the Green Bank as written in legislation. This structure has similarities to both a quasi-public structure and an external, third-party administered structure. The primary initial source for the bank is intended to be approximately $20 million of funds the county was to receive from Exelon as a result of their merger with the local utility, Pepco.

Chapter 4 – Nevada Clean Energy Market Gaps & Needs

This study relied heavily on conversations with market stakeholders to identify any market gaps and needs in Nevada's clean energy sector. The authors interviewed – in person or via phone – more than 50 people/organizations working on clean energy in Nevada. Interviews were conducted with project developers, contractors, bankers, realtors, policymakers, NGOs, utility representatives and regulators. Conversations focused on understanding the current energy landscape, and the process for identifying, financing and developing clean energy projects. Discussions also centered on identifying gaps, opportunities and underserved market segments.

Table 18: Nevada Stakeholder Interviews on Clean Energy Market

Market Interviews for SB-360 Green Bank Study	
Utility Representatives and Regulators	12
Policymakers, Government and NGOs	24
Clean energy project developers and installers	7
Banking, real estate, small business interests	8
Total	**51**

Key Nevada Energy Questions

- How does NV continue to grow its distributed solar market?
- How does NV continue to make its energy sources even cleaner while keeping costs low?
- What are the market segments in greatest need for energy efficiency upgrades, and how does NV address them?
- How does NV replace gasoline cars with electric vehicles?

Market-Specific Findings

As identified in Chapter 2, the serviceable addressable market for solar and energy efficiency in Nevada is large and uptake is well below its potential. Stakeholder interviews focused on these markets in particular, in an effort to understand why investment levels are below their potential, and what markets gaps and failures might be preventing growth. Discussions focused on real and perceived market risks, investment priorities for homes and businesses, and the existing landscape for Nevadans looking to save money from clean energy upgrades. Questions focused on market segments and solutions that give Nevadans more energy choice, cleaner options, and lower costs for consumers. Through the interview process, Nevada stakeholders identified several key markets segments that are underdeveloped and have difficulty implementing clean energy projects. These markets include:

- Whole Home Energy Efficiency Upgrades
- Low to moderate income residential
- Renter and multifamily residential
- Residential solar + storage
- Energy Efficiency retrofits at medium to small sized commercial and industrial
- Electric Vehicles and charging stations

Stakeholders also identified several markets that have an easier time implementing and financing clean energy projects: high income residential solar (depending on level of self-consumption and NEM rates); utility-scale solar and geothermal; large, credit-rated class A office buildings and hotels; and select local government owned facilities and schools with access to grants and low-cost financing options. The sections below are based on interviews with Nevada stakeholders.

Whole Home Residential

The residential energy efficiency market is one of the largest markets for clean energy solutions in Nevada. Various technologies are available to help Nevada homeowners (currently paying the highest electricity prices in the Mountain West) save money and energy. Stakeholders in Nevada noted that energy efficiency is often not a top priority for homeowners.

Efficiency upgrades tend to happen on a one-off basis, rather than on a whole home basis. Energy efficiency upgrades are typically "reactive"—that is, homeowners only upgrade to more efficient technology when an old system breaks. When contractors are fixing aging or broken home essentials (e.g. an air conditioning system) this is often the best time to perform a comprehensive home upgrade. For example, a home may be able to replace some windows and add sealant and attic insulation at the same time they replace an aging A/C system, therefore allowing the homeowner to buy a smaller and more efficient A/C unit. Such a comprehensive whole home system can often save homeowners money, but may require a larger upfront investment. Paying this upfront cost in cash is often a challenge, as homeowners typically have other competing demands for the money, or don't wish to pay out of their savings. Financing options are limited for Nevadans that wish to finance a whole home upgrade, even if that upgrade will save them money over time. Limited programs are available from local banks, and the primary option is an unsecured loan with high interest rates. Contractors are also often unfamiliar with the variety of rebates, incentives and financing options available and how they can work together. This leaves many homeowners simply replacing broken equipment and not making proactive whole home upgrades that can help them "right size" their systems and save money over time.

On the finance side, lenders do little lending in this space because the per-project size of a loan is small, and many banks have limited experience in the energy efficiency sector. Loan size is an important factor, as many private lender are uninterested in offering tailored products with low rates for what might be a portfolio of loans that is very small. The return on investment from a small group of loans is simply not high enough to cover the staff time and underwriting costs of offering a tailored product for energy efficiency. This leads to loan options with high interest rates and little uptake. The few tailored and affordable energy efficiency loan products that are being offered in Nevada receive little uptake, as many contractors are unfamiliar with them and do not market them to their customers.

Low to Moderate Income Residential

Residential energy customers in the low to moderate (LMI) income bracket often have the most difficulty undertaking money-saving clean energy upgrades. LMI households are often unable to benefit from distributed solar systems on their homes due to high up-front costs, lack of attractive financing options, or because they do not own their homes. Higher income Nevadans may qualify for loan and lease products from local and national solar development companies, but these products are often unavailable to residents with lower credit scores, or aren't targeted to LMI communities. Without the upfront capital to pay for a solar system out of pocket, and lacking access to affordable financing options, LMI Nevadans are mostly left behind in the development of rooftop solar.

Energy efficiency upgrades typically save utility customers money in the long run, but also have large upfront costs that are prohibitive for many residents. LMI households are those typically in greatest need for a cost-saving efficiency upgrade, as the energy burden increases as household income declines. LMI Nevadans may not have the cash available to make an energy efficiency upgrade, and financing options such as unsecured loans from a bank or credit card debt is typically only available at high interest rates that make upgrades unattractive. Many Nevadans are therefore locked into high monthly bills despite the potential for energy efficiency.

> *"With the NV Energy **rebates declining**, access to **finance is becoming more important** than ever." – Nevada Stakeholder (Project Developer)*

Several utility-run programs seek to address the LMI market, such as bill assistance for low income residents, state and federal assistance programs, and high bill complaint services with energy audits to identify low-cost solutions such as cracked attic windows and thermostat settings. Some incentives are available to residents to help lower the cost of purchasing more capital intensive new equipment. However, rebates typically cover a portion of the upfront cost of a new technology. If the remaining technology cost is still above an individual's savings, they are left with few options to pursue deeper energy upgrades. This leaves many LMI households underserved. Financing options for Nevadans are limited to programs such as the GOEs's DEAL program, a turnkey financing option for state employees only. Lack of options for more comprehensive energy upgrades is a particular problem for LMI Nevadans, as low income residents typically pay a higher percentage of their salary on energy bills. Additionally, long-working hours and multiple jobs can make it difficult to navigate and successfully take advantage of the rebate programs available from various state sources.

> *"Getting **financing at attractive rates is tough** as the state still **struggles to come out of the recession**." – Nevada stakeholder (Non-profit/NGO)*

Rental and Multifamily Residential

Rental and multifamily residential markets face similar challenges to making energy improvements, such as low credit or lack of credit history. Additionally, these markets suffer from a split incentive problem where tenants typically pay energy bills while building owners are responsible for building maintenance and upgrades. This leaves little incentive for building owners to make comprehensive energy upgrades to their properties. Large building owners also deal with many issues beyond just energy – plumbing fixes, cosmetic upgrades, fire safety, to name a few. This can often mean that energy upgrades are a low priority, and tenants are left paying high energy bills month to month.

Multifamily residences also lack the ability to install distributed solar options on their rooftops, as apartments typically lack sufficient roof space. Community solar – where residents can opt-in to help pay for a nearby solar farm in exchange for compensation on their individual utility bill – is one approach to address this challenge. Community solar options in Nevada are limited, but may become more available in the future. One example is a proposed utility-led program that allows customers to participate in solar farms and receive a production credit on their bill. The program was not designed to lower monthly bills

for participating customers, however, removing one of the primary incentives for Nevadans looking for clean energy solutions.[64]

Residential Solar and Solar + Storage Markets

Residential rooftop solar policies have recently undergone several changes. Declining incentives from NV Energy's RenewableGenerations program, along with declining NEM rates, have made the payback period longer for many rooftop solar projects. Several large national solar development companies have closed operations in the state, and Nevada solar developers interviewed said that they are now focusing on properties that can do more self-consumption, and are scaling back operations in the residential market. When Governor Sandoval reconvened the New Energy Industry Task Force in February 2016, he cited distributed solar as a priority to support. Sandoval's chief strategy office, Dale Erquiaga, noted the Task Force was directed to develop solutions that "encourage development of clean energy sources and integrate renewable energy technologies into Nevada's energy sector; foster the creation of a modern, resilient, and cost effective energy grid; and support distributed generation and storage, with a specific focus on rooftop solar and net metering."[65]

Another on-going challenge to the residential solar market is lack of impartial market information. Several stakeholders expressed concerns that many solar development companies – both local and national – proliferated in Nevada rather quickly, and consumers were often confused by the choices available. There were reports of salespeople making claims and offering products (loan, lease, PPA, escalator, fixed price, etc.) that were hard to understand or verify. When potential customers were presented with options from salespeople – often door to door – there were complaints that customers lacked a place to turn for unbiased information to compare options.

Many stakeholders interviewed expressed enthusiasm for solar + storage solutions for residential customers in Nevada. With Nevada's Gigafactory slated to officially open in July 2016, the future of Nevada's economy is tied in part to the success of battery storage options. With economies of scale and technological advance, battery prices are expected to continue declining. If NEM rates continue to make increased self-consumption (selling less back to the gird) more attractive, then distributed solar + storage will be an increasingly viable alternative.

> *"As solar, EV and battery prices decline,* ***we can imagine a distributed energy future*** *that takes advantage of our local resources; EVs and batteries in the garage, solar feeding peak A/C demands at load centers, and a smart two-way system that supplies electricity where it is most needed." – Nevada stakeholder (Government/Policy/Regulatory)*

However, solar + storage presents similar challenges to other home energy upgrades. Battery and solar PV technology costs have dropped significantly in recent years, but adding a battery to an already large capital outlay for a solar system, adds greatly to the upfront cost of a system. Customers may see long term savings with a combined solar + storage option, but financing the upfront cost is compounded when

[64] "NV Energy proposes new community solar subscription program" Reno Gazette Journal, Sept 2015 http://www.rgj.com/story/money/business/2015/09/11/nv-energy-proposes-new-community-solar-subscription-program/72088562/

[65] Dale Erquiaga, New Energy Industry Task Force meeting, March 22, 2016 http://energy.nv.gov/uploadedFiles/energynvgov/content/Programs/NEITF_3-22-2016_Draft_Minutes.pdf

considering a combined system. Absent a tailored financing solution to match monthly bills savings to debt repayment over a sufficiently long term, Nevadans without large personal savings or access to affordable financing will continue to be left out of the market.

Commercial Building Market

The commercial building market in Nevada is comprised of a wide range of property types from large hotels and casinos to small commercial buildings, hospitals, universities and research centers. Nevada's climate also varies widely, from the hot desert climates of southern Nevada to the higher elevations of Northern Nevada with longer and colder winters. The building stock is newer than many states, but the potential for cost savings through efficiency upgrades are high relative to other states in the southwest (See Chapter 2 for details).

The potential for energy cost savings from energy efficiency is significant in Nevada's commercial building sector. Many large local businesses are taking advantage of the available cost savings though deep energy retrofits and approaches like continuous commissioning. While large energy efficiency projects usually produce very predictable savings over the life of the new equipment, they also come with high upfront costs. Certain segments of commercial building owners – such as large offices and hotels – are able to pay the upfront cost using their own balance sheet, and have the in-house technical and financial expertise to complete projects.

If large commercial customers do not want to finance energy upgrades themselves, they can often take advantage of Energy Savings Performance Contracts (ESPCs) from Energy Service Companies (ESCOs). ESCOs provide financial-grade energy audits and install new technologies with effectively guaranteed savings. That is, the ESCO arranges the upfront financing, and gets paid back thought monthly bill savings that are projected based on technical assessments by the ESCO's engineers. ESPCs are typically available to large customers that are credit rated, such as class A office buildings and hotels. This is because ESPCs rely on high-credit counterparties as part of their underwriting criteria, and ESCOs have significant costs on a per-building level (modelling, engineering, financial analysis) so contracts must be large enough to justify pursuing a retrofit.

While ESPCs and in-house financing are viable options for large credit-rated buildings to realize their energy saving potential, there are many small and medium commercial buildings that are unable to secure such financing. Nevada contractors interviewed for the study identified many challenges of pursuing projects at medium- and small-scale facilities. For instance, businesses may lack the in-house energy and financial expertise to pursue deeper energy retrofits with higher upfront costs. Many businesses also simply do not have the available capital in a given year to pursue an energy upgrade. If a building owner or business does have capital available in a given year, medium sized enterprises, small businesses, hospitals and nonprofits often have many competing demands for capital (e.g. new staff, new carpets, new MRI machines). Demand for these near-term essentials can lead to putting off investments in energy savings, even if it is clear that such investments will save the business money over time.

Small to medium sized commercial buildings are also typically left out of the ESCO market, and they lack the sufficient credit history and size to work with established ESCOs. ESCOs working in Nevada also raises concerns that businesses sometime take advantage of free energy audits from ESCOs, but may pursue only one small upgrade (out of numerous upgrades identified) and self-finance, rather than with the ESCO.

This leaves money on the table, as many deeper efficiency projects aren't completed, and also makes ESCOs hesitant operate outside of tried-and-true markets with large customers.

> *"There are many smaller casinos that can't or won't do retrofits, because the interest rates are too high."*

> *"Many commercial building operators are **unaware of the Sure Bet [Commercial Services] rebates**. And if they need financing, that just adds to the complexity as often they don't have the expertise in house" – Nevada Stakeholder (Project Developer)*

Another limiting factor in the commercial market is lack of information. Commercial building owners and operators may lack sufficient expertise to make informed investment decisions regarding projects with long payback periods. Additionally, several stakeholders interviewed indicated that many small and medium commercial building operators are unaware of the various financial incentives available to customers under NV Energy's Commercial Services program. Various incentives are available from the state and NV Energy, and small to medium commercial building owners are often poorly equipped to take advantage of all incentives and pair them with financing to achieve deep energy retrofits at their facilities. Program rules vary and different incentives are available to different types of businesses (e.g. for profit vs. non-profit) adding to the complexity for building owners as well as contractors looking to do more comprehensive projects.

Commercial buildings are well suited to benefit from on-site solar generation. Many Nevada businesses have significant operations – and correspondingly high air conditioning and lighting loads – during the day, when solar PV is at its peak. Rooftop solar is a viable option for many businesses, but solar still comes with a large upfront cost followed by predictable monthly savings over the lifetime of the panels (typically 20+ years). This large upfront cost can be difficult to finance for small to medium commercial facilities, and suffers from similar financing gaps that come with energy efficiency upgrades.

> *"For commercial building owners, **one of the biggest impediments to doing upgrades is information** about the payback of technologies and how to finance them" – Nevada Stakeholder (Non-profit/NGO)*

Nevada stakeholders noted that the effect of the 2007-2009 recession are still being felt in Nevada, and lending to commercial property upgrades is still slow in the wake of the economic downturn. Lenders can be wary of investments in projects with few comparable and with lack of credit history of the counterparty. Nevada has a high level of expertise and a large labor force of contractors, real estate and finance professionals. Many stakeholders identified the large opportunity that would be presented by further developing and harmonizing these sectors, to take advantage of the large clean energy and energy efficiency potential in the state.

Takeaways

There are several clean energy markets where financing and deal flow have typically run smoothly in Nevada, namely utility-scale solar, upper-income residential solar, and large credited rated commercial energy efficiency. This leaves out many large and critical markets that together represent an enormous market opportunity for investment. As outlined in Chapter 2, the market potential for commercial energy efficiency for commercial and residential energy efficiency alone is over $2.5 billion, with saving far out-

weighing up-front investment cost. The distributed solar market is similarly large – around $1 billion – and is currently underserved. Residential electricity prices in Nevada are above neighboring states in the Southwest, and customers' bills are tied to variable prices in natural gas markets, leaving customers few options to take proactive control of their energy costs.

Investments in clean energy solutions can save consumers money on their monthly bills, but financing must be designed to facilitate those savings. The markets outlined above need targeted solutions to achieve their large savings potential. Home energy upgrades can save consumers money, but few financing options are available, leaving much of the market unaddressed. The residential solar market suffers from a lack of clear information, as well as options for Nevada residents outside of upper income brackets. Similarly, the small to medium commercial building market suffers from lack of information; lack of in-house expertise; lack of in-house capital along with competing priorities; and lack of access to external turnkey finance products like ESPCs. These leaves the majority of Nevada homes and businesses unable to take advantage of clean energy solutions that can save them money. Without a coordinated effort to address these markets – targeting market failures on both the supply and demand side – the majority of homeowners and small to medium businesses will continue to leave money on the table.

Chapter 5 – Nevada Green Bank Recommendations

This Chapter outlines the specific recommendations for how Nevada could establish a Green Bank to address the clean energy market gaps and barriers observed during this Study. This chapter addresses the following questions:

- What would be the best legal structure for a Nevada Green Bank?
- Where would money come from to capitalize the Green Bank?
- Once created, how would Nevada operate and staff the Green Bank?
- What should the Nevada Green Bank do to address clean energy market inefficiencies?

This Chapter answers each of these questions in order, to provide a guide that Nevada policymakers could follow for Green Bank creation and implementation.

Summary of Recommendations

This study finds that a Nevada Green Bank can drive private investment and economic development in the clean energy sector in Nevada, and do so in a cost-effective manner. There are a number of barriers to adoption of clean energy and gaps in the financing landscape that make it challenging for those who would benefit from cleaner and cheaper energy to acquire the technology due to upfront costs. Market participants are also not properly informed about the programs available and the benefits that can be accrued from clean energy solutions. A Green Bank can address both the financing obstacles and market development challenges through a portfolio of solutions. Green Banks around the U.S and around the world have proven that limited public funds can drive private sector activity, which in turn creates jobs and lowers energy costs for consumers and businesses.

The best structure for a Nevada Green Bank is a non-profit corporation, created by government. This could be done either through the existing statutory authority of the GOE, or through comprehensive legislation. Under either path, the Green Bank would be governed by a Board of Directors, composed of Nevada officials and local leaders, to give proper oversight. To ensure alignment of the Green Bank with the state's policy objectives, some Directors should be appointed by Government, and other Directors should be ex-officio. For instance, the Director of the GOE should be a board member. The Green Bank could receive its public capital from a number of existing or new funding sources, which are outlined in detail in this chapter. This includes general budget appropriation, re-direction of new or previously-cancelled DSM funds, and the existing Renewable Energy Fund. The Green Bank should also have bonding authority, so that it may sell its loans, recapitalize its balance and increase its lending capacity in a budget-neutral way.

A Nevada Green Bank should focus on priority markets. These include whole-home upgrades, whole-building upgrades for the commercial sector, low-to-moderate income households, solar + storage applications, and electrified transportation. The Green Bank can, over time, develop financing and market development solutions to address each market sector. They are outlined in detail below, and include using tools like credit enhancements, direct lending, PACE, innovative auction-licensing mechanisms, and alternative underwriting criteria. All of this financing activity will need to be paired with greater market transparency and consumer protection mechanisms. By offering these solutions in concert with private lenders, contractors, and existing government/utility programs, the Green Bank can grow the clean energy economy of Nevada while lowering energy costs.

Green Bank Structure Options

Legal analysis finds that the best, and possibly only, viable structural option for a Nevada Green Bank is the creation of a new, purpose built non-profit corporation. This could be created either under existing statutory authority of the GOE, or through legislation.

Legal Restrictions and Precedents

A primary concern in creating a Nevada Green Bank would be the constitutional provisions around lending public money to corporations. Specifically, the constitution states:

> The State shall not donate or loan money, or its credit, subscribe to or be, interested in the Stock of any company, association, or corporation, except corporations formed for educational or charitable purposes.[66]

This suggests that the state cannot directly lend public capital or make investments in private for-profit businesses. However, there are exceptions and precedents that demonstrate ways that a Green Bank could use public capital to private entities, via the use of a non-profit charitable organization.

One simple exception is that the rule does not appear to apply to federal funds. Nevada governmental entities can and do directly lend federal funds to private businesses. For instance, the GOE presently lends federal stimulus dollars from ARRA through its revolving loan fund. This program is meant to support local project developers. As specified in the law creating the program, "Only federal money…may be used to benefit a qualified applicant."[67]

Beyond this exception, there are other precedents and laws that create an avenue through which state money can be used to provide finance for private activity. The key to implementing this structure is the creation of a non-profit corporation that actually provides the loans. In effect, the state government grants capital to the non-profit, which in turn provides financing to the relevant markets.

There are two precedents to examine. One is a program created provide financial support for unemployed veterans and senior citizens. To serve this market, the law calls for a program Administrator to:

> [E]stablish a program to disburse grants of money to non-profit private entities…to be used exclusively to assist start-up businesses which are at least majority owned and controlled by one or more veterans or one or more senior citizens.[68]

The law then allows for that nonprofit receiving state funds to lend that money to private businesses. The statute reads:

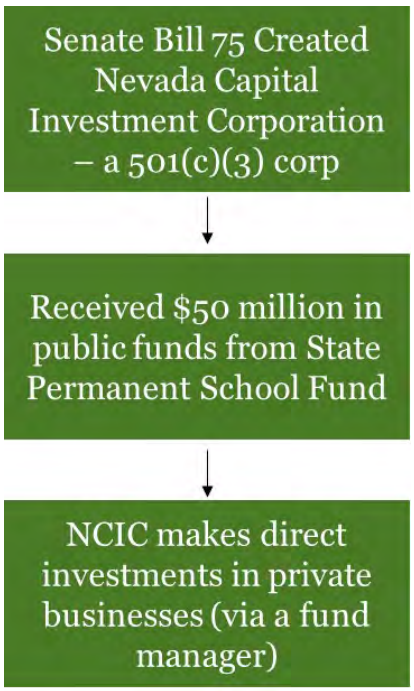
> A nonprofit private entity which administers the disbursement of money received as a grant pursuant to the program may approve an individual loan of up to $15,000 to a start-up business without the approval of the Administrator. The Administrator may waive the loan limit prescribed in this subsection for a loan not exceeding $20,000.[69]

[66] The Constitution of the State of Nevada, Article 8, Section 9.
[67] NRS 701.580 (4).
[68] NRS 612.673.
[69] NRS 612.679.

This law provides a clear precedent and legal allowance for using public money for lending to private activity when it is expressly designated to serve a public purpose.

The second precedent that identifies a legal path for Green Bank creation is the Nevada Capital Investment Corporation (NCIC). SB75, passed in 2001, called on the state Treasurer to create an independent corporation for public benefit (a nonprofit) that could provide equity investments in Nevada businesses in certain sectors. It also authorized the Treasurer to invest $50 million in public funds from the State Permanent School Fund into that non-profit corporation. As per the bill, the Treasurer established the NCIC, which still resides under the Treasurer's office. The NCIC then selected a private fund manager, Hamilton Lane, to actually evaluate and make the investments. Hamilton Lane formed the Silver State Opportunities Fund (SSOF), to actually receive the $50 million of capital from NCIC and make the business investments.[70] This activity looks very similar to how a Green Bank might operate, using public capital to invest in private activity that has a public benefit, via a non-profit corporation.

Figure 22: Structure for NCIC Creation & Capitalization



It is worth noting that in the Legislative Counsel's Digest attached to the enrolled version of SB75 that created the NCIC, Counsel specifically cites the constitutional issues identified above. And describes that the Treasurer is creating the nonprofit NCIC to specifically make investments using public capital.[71] This indicates that the NCIC structure was specifically built with the constitutional limitation in mind, and was found to be legally acceptable.

[70] http://www.nevadatreasurer.gov/NCIC/NCIC_Home/; http://www.nvssof.com/.

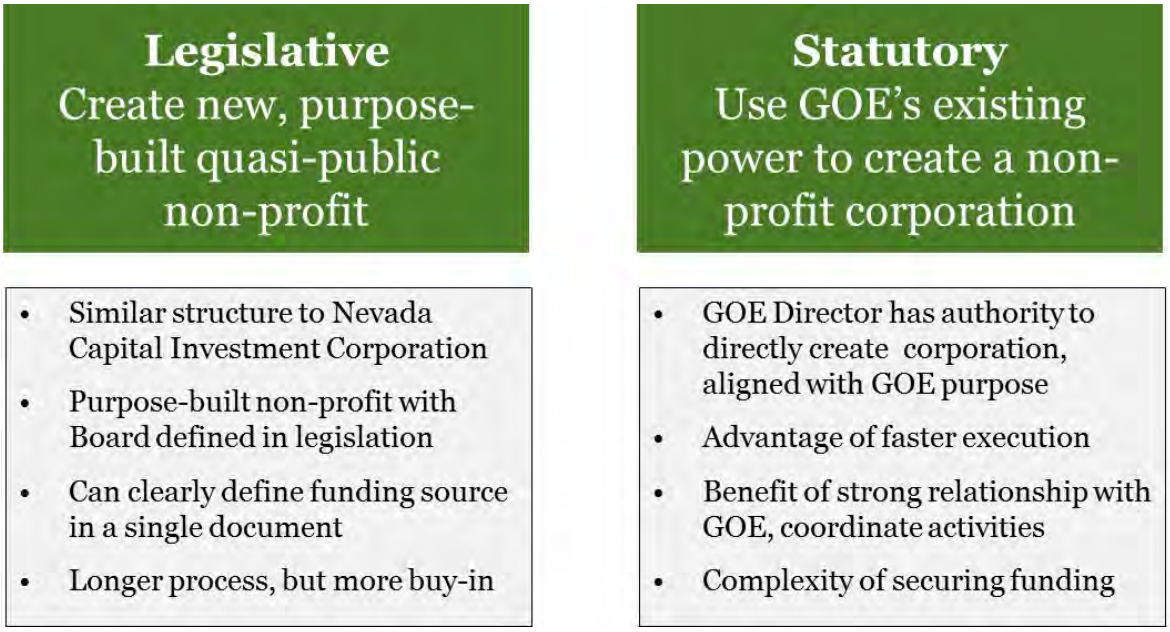
[71] Senate Bill 75- Select Committee on Economic Growth and Employment, "AN ACT relating to public financial administration; establishing a program to provide private equity funding to businesses engaged in certain industries in this State; and providing other matters properly relating thereto."
See https://www.leg.state.nv.us/Session/76th2011/Bills/SB/SB75_EN.pdf.

In sum, the Nevada state constitution specifically allows the state to lend public money to a private corporation as long as it is formed for charitable or public benefit purposes, defined as a non-profit. And there are two clear precedents where the state has established and granted money to non-profits, or directly granted money to existing non-profits, in order for that non-profit to lend the funds to private activity that is aligned with the public mission and goals of the state government. A Nevada Green Bank, created as a non-profit corporation, would be allowed under similar conditions.

Application to Nevada Green Bank

Based on this legal analysis, the most suitable, and likely the only viable way to create a Nevada Green Bank would be to form a non-profit corporation. This could be accomplished through one of two methods. The state legislature could pass a bill, similar in concept to SB75. Alternatively, the GOE could directly create a non-profit corporation using its existing statutory authority.

Figure 23: Legislative v. Statutory Approach to Green Bank Creation



Under the legislative approach, the legislation would be comprehensive in defining and creating the Green Bank. It should address the follow topic areas:

- Organization Placement & Structure – This section would define the legal nature of the Green Bank - in this case, a non-profit corporation. Just as in the case of the NCIC and its relationship to the Treasurer, the Green Bank should be related to the GOE.

- Organization Governance – This would address the exact Board composition of the Green Bank, how Directors are appointed, how long their terms are and if there are any required committees. This could also enumerate the specific responsibilities of the Board. In SB75, the Board of the NCIC is defined and includes 5 members with specific kinds of experience appointed by leaders of the state government, and two ex-officio members including the Treasurer. A Green Bank Board would likely have a similar construct, though with different members and requirements.

- Capitalization – This section would identify the exact source and amount of capital that would be given to the Green Bank.

- Bond Authority – This section would outline the bonding authorities granted to the Green Bank, and the financial relationship between the Green Bank's bonds and the credit of the state government (if any).

- Types of Investment – This section would enumerate the specific financing powers and authorities that the Green Bank has. The legislation could explicitly ease different financing mechanisms, or it could give a broad authority to use public capital to drive private investment in clean energy. (It is often wise to explicitly state that the Green Bank is authorized to co-invest in projects with the private sector.)

- Eligible Technologies & Projects – this section would define what technologies are eligible for Green Bank financing, and what constitutes an eligible project that can receive funds. For instance, the state may decide that EV charging stations are eligible for Green Bank financing, but not EV's themselves. Or these decisions can be a left to specific board approval process, with the general process laid out in legislation.

- Related Mechanisms & Powers – This section may also explicitly define the Green Bank's relationship to PACE, if any. And it may also give the Green Bank a role or authority to create an on-bill financing program.

The advantage of the legislative approach is that it allows policymakers to holistically define the Green Bank, its purpose and its role in the state. It also simplifies the funding process, as the legislation would specifically name the source and amount of funding. Also, by going this route, general fund budget appropriations are an available source of funding, which is not the case under the statutory approach. Though there is certainly potential complexity in passing legislation, it can sometimes serve as an important signaling device that indicates to the private sector (lenders, contractors and individual consumers) that the state has made this effort a priority.

Alternatively, a non-profit corporation could be created directly by the GOE using statutory authority that already exists. According to the general powers of the GOE:

> [GOE may] promote, participate in the operation of, and create or cause to be created, any non-profit Corporation…which the Director determines is necessary or convenient for the exercise of the powers and duties of the Office of Energy. The purposes, powers and operation of the corporation must be consistent with the purposes, powers and duties of the Office of Energy.[72]

By this statute, the GOE Director could immediately establish a non-profit corporation to be the state's Green Bank. As the incorporating entity, the GOE could write the rules for governance and determine the

[72] NRS 701.170 (5).

desired makeup of the Green Bank's Board of Directors. (There is little reason to think the Board should be substantially different under this approach, rather than the legislative approach.)

The advantage of this approach is that it would be far faster, and simpler to create the entity. The GOE Director could literally act right away. There are two disadvantages to this approach. The first is that funding the Green Bank becomes much more complex, as it will rely on piecing together multiple sources without legislative directive. Nearly all sources of funding identified in this Study are legally available to the Green Bank even without legislation (except budget appropriation). However it may be more complex to pull those sources together and re-purpose dollars. The other potential downside to this approach is that it does not send the same policy signal to the market that legislation might send, about the vision and purpose of the Green Bank. This is not necessarily true, as the GOE and the Governor's office could make a concerted effort to define and launch the Green Bank to indicate the value and importance of the institution. But it is a strategic consideration that the state should address.

Green Bank Capitalization Methods & Sources

A Green Bank could be funded using several different methods, and within each of those methods could draw upon multiple potential actual funding sources. This section describes the different funding methods, and the value they each bring to the Green Bank's operations and capabilities. And then individual funding potential funding sources are considered for a Nevada Green Bank.

Green Bank Funding Methods

The Green Bank could be funded under multiple structures and sequences. They are:

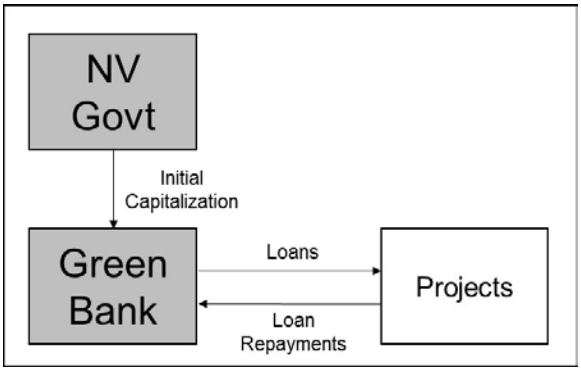
- Upfront initial capitalization or "grant"
- Recurring revenue stream
- Bond Issuance

Each is considered in detail in this section.

Upfront Initial Capitalization

The Green Bank could be capitalized with an upfront infusion of public money at its inception. If no other funds were authorized, or no bonding authority were granted, then the Green Bank would effectively operate as a revolving loan fund, relying exclusively on the repayment, over time, of the loans it made in order to recapitalize and make new loans. This structure is simple, but limits lending capacity.

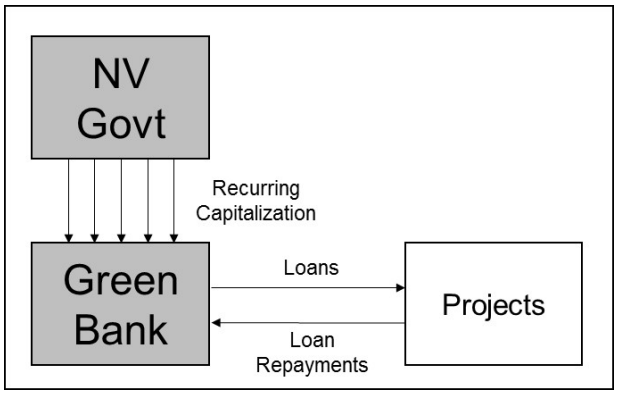
Figure 24: Single Initial Capitalization Model



Recurring or Time Specific Revenue Stream

Another structure is for the Green Bank to receive capital over time from a dedicated stream of revenue. This could be a perpetual stream of revenue, where the capital raised from a tax, for instance, is indefinitely committed to the Green Bank. Or the stream could be directed to the Green Bank only for a set amount of time. The Connecticut Green Bank is funded through a dedicated stream of ratepayer dollars, which flow to the Green Bank indefinitely. This structure ensures the Green Bank has liquid assets, and provides flexibility for the Green Bank to take on activity that may not generate returns for recapitalization for a long period of time. The NYGB receives funds over time from a dedicated revenue stream in the form of a system benefits charge, but only for a set period of time. The NYGB will continue to receive funds until it reaches $1 billion in total funding in 2025. A Nevada Green Bank could be similarly structured to have certain capital sources "sunset" over time.

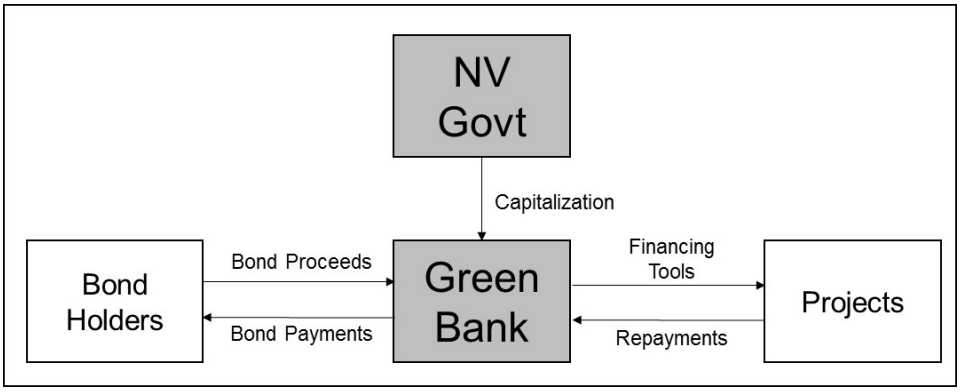
Figure 25: Recurring Capitalization with Dedicated Revenue Model



Bond Issuance

The final method for funding a Green Bank would be through bonds. Issuing bonds would allow the Green Bank to draw in private capital from institutional investors beyond the initial or on-going public capitalization. There are many potential permutations of Green Bank bonding in Nevada (explained in more detail in the following section). By issuing bonds, the Green Banks can expand the amount of capital available for lending beyond an initial or recurring infusion of capital from public sources.

Figure 26: Bond Issuance Capital Expansion Model



The value of bond issuance is two-fold. Bonds allow the Green Bank to sell loans it has already made off of its balance sheet, and replenish its cash balance to then make more loans. This kind of recapitalization

accelerates the velocity of Green Bank lending. Bonds also allow the Green Bank to raise a large amount of capital for lending in the event that only a small amount of initial or on-going public capital can be put in the Green Bank. If only a small amount of public dollars are available, rather than lend those dollars, the Green Bank can hold that public money as an equity reserve to support a larger bond issuance. This kind of "leveraged finance" structure is similar to that used by other development finance agencies. Therefore, no matter the form, size and timing of public capital allocated, it will be critical for the Green Bank to have the ability to issue bonds.

Funding Sources

Based on this outline of the methods for funding a Green Bank, the following section identifies specific sources of capital and bonding structures that a Nevada Green Bank could draw upon. The state should consider any and all of these funding sources, particularly for the upfront capitalization. The best source of funds for the upfront capitalization is the one that is most accessible, with the least amount of restrictions placed on the use of the funds. It is also possible, and likely prudent, to try to draw from multiple funding sources. Nearly all U.S. Green Banks are funded from multiple sources or streams of revenue. Nevada should similarly consider what combination of sources are most suitable. The options considered in this section are:

- Upfront initial capitalization or "grant"
    - Nevada state budget appropriation
    - Renewable Energy Fund
    - Funds from DSM Budget Cuts
    - Potential federal resources
    - Foundation grants
- Recurring revenue stream
    - Ratepayer funds
    - Renewable Energy Funds
- Bond Issuance
    - General bonding authority
    - Project-specific bonds
    - Bond backed by revenue stream
    - Qualified Energy Conservation Bonds (QECBS)
    - Industrial Development Revenue Bonds

This section addresses each of these sources in detail, organized into the three categories of methods of funding.

Upfront Funding

Listed here are several potential sources of funds Nevada could explore for upfront, initial capitalizations. They would provide a one-off infusion of capital into the Green Bank.

State Budget Appropriation

The state could simply appropriate funding to the Green Bank through its annual General Fund budgeting process. This can often be challenging if there is a budget shortfall or when there are many competing interests vying for new funding. However, this would be the most direct method of funding. This may not be the source of on-going funding, if Nevada chooses to continue funding the Green Bank over time. But

as an upfront, initial source of capital, it would be a simple and direct mechanism. This is the one source of funding identified in this study that would not be possible without legislation.

Renewable Energy Fund

Presently, the GOE collects a dedicated tax stream and places those dollars into the Renewable Energy Fund. The dedicated tax stream that flows into the Fund represents the property taxes that are collected from renewable projects built in the state that get the benefit of certain tax abatements. Because the Fund will continue to collect property taxes on existing renewable projects, even if no new projects are built, the total cash available in this account is expected to increase over time. Presently, the Fund is used for several programs, including to provide loans through the state's payroll-based DEAL program.

The Director of the GOE has broad authority for how to use the money collected by the Fund. As written in statute:

> Not less than 75 percent of the money in the [Fund] must be used to offset the cost of electricity to or the use of electricity by retail customers of a public utility that is subject to the portfolio standard established by the [PUC].[73]

The statute also states that "The Director of the Office of Energy may by regulation establish [o]ther uses of the money in the [Fund]."[74] Therefore, under existing statute the GOE can use the Fund to capitalize a Green Bank.

Funds from DSM Budget Cut

In 2015, the PUC reduced the annual DSM collection from ratepayers by NV Energy. This reduced the overall funding available to support energy efficiency deployment through rebates and market development programs, and eliminated specific programs.[75] What had been an annual DSM budget of $51 million in 2015 was reduced to $41 million in 2016. The state and the Green Bank could petition the regulator to collect that $10 million reduction in funding for the purposes of capitalizing the Green Bank. This would represent a more cost-effective use of public funds, as the dollars would be used for financing (which is repaid) rather than rebates. Therefore the regulators might find this re-directed use of ratepayer funds more satisfactory. The PUCN could also specifically require reporting of certain metrics and compliance with specified hurdles, such as the Utility Cost Test (UCT) which measures for cost effectiveness of programs.

Potential Federal Resources

The federal government offers several financing and grant programs that could support local Green Bank activity. These programs exist within the USDA and the DOE. And there is also pending legislation to create a federal Green Bank that would provide funds to state Green Banks.

The USDA, through its Rural Development Program, offers a number of potential funding sources for a Green Bank in Nevada. The USDA already operates the Rural Energy for America Program (REAP), which offers grants and financing for clean energy projects in rural America. The funds can be used for a range of kinds of projects. During the period 2003 to 2014, over $107 million of USDA funds were used to support

[73] NRS 701A.450 (4).
[74] NRS 701A.450 (6)(a).
[75] Pyper, Julia, "Regulators Cut Funding for Efficiency Programs in Nevada," Greentech Media, January 25, 2016.

projects in Nevada. However, over $105 million of this was used for a single biorefinery project. If that project is excluded, the total REAP funds used in Nevada is one of the lowest in the nation, despite Nevada having the 35th largest population.[76] A Green Bank could work in partnership with the USDA office in Nevada to identify, develop and co-fund projects, in order to better utilize cheap unused federal dollars.

The Rural Utility Service (RUS) also operates the Energy Efficiency and Conservation Loan Program. It is a re-lending program, whereby the RUS lends very low-cost capital to a rural utility, who in turn lends that money to residents and business owners to perform energy upgrades. The funds can be used for both efficiency and renewables. Large amounts of funding are available and can be used by a Green Bank. The Green bank would not act as the actual borrower, but would be allowed to act as an application aggregator, turning many small applications from rural co-ops into a single, more streamlined application to the Federal RUS. The Green Bank could also help administer the financing for the utilities.

Another promising potential path for funding a Green Bank is the U.S. Department of Energy's Loan Program Office (LPO). The LPO is designed to give large (~tens of millions of dollars) loans and loan guarantees. It is also specifically designed to direct loans to "projects" (rather than programs) and those projects must be "technically innovative."

In August of 2015, LPO offered guidance that "LPO is supplementing the Solicitation to make clear that state-affiliated financial entities, including state Green Banks, may submit applications for Eligible Projects, including Distributed Energy Projects" and "state and state-affiliated entities may participate in Distributed Energy Projects as lenders or co-lenders, equity providers, or off-takers."

Historically, a project has been interpreted to mean a large, individual installation. But with this broader definition of project, a whole world of possible structures has opened up. A Green Bank may submit an application to the LPO to help fund a portfolio of multiple underlying installations, each of which is technically and financially similar so as to be considered part of a single portfolio. LPO still has significant funds available ($4.5 billion for REEE, $3 billion in loan guarantees), and the recent LPO guidance also included an announcement that $1 billion would specifically be dedicated to distributed projects. The LPO could be an attractive route for the Nevada Green Bank to finance innovative projects through a unique and ground-breaking federal-local structure that also uses a public-private partnership.

Importantly, the requirement that projects be technically innovative may be eliminated through federal legislation. The US Senate recently passed comprehensive energy legislation, which included an LPO-related provision. Specifically, it states that Green Bank applicants for financing from the LPO are exempt from the technical innovation requirement. This means that the Nevada Green Bank could use federal support to finance a portfolio of more standard, bankable efficiency projects, for example.

Also, as a longer-term solution, legislative leaders are preparing to re-introduce federal Green Bank legislation. Bills have been introduced in 2009 and 2014, with the 2009 bill receiving broad bi-partisan support and passing the House of Representatives. The bill is likely to be re-introduced soon in 2016 and/or 2017, with a focus on supporting state/local Green Banks. In fact, new legislation is likely to establish a federal Green Bank to act solely as a pass through funding mechanism for state and local Green Banks, rather than to provide direct project financing. So a Nevada Green Bank would be perfectly positioned to receive capital from the federal Green Bank, should legislation pass.

[76] USDA Rural Development.

Foundation Grants

Nevada could also seek out foundations that would be interested in supporting the Green Bank financially. Foundations could provide a grant directly to the Green Bank, which would be used for lending and any other Green Bank activity. This would be equivalent to public capitalization, especially because neither capital source carries a cost of capital. Alternatively, a foundation could make a program-related investment (PRI), where it seeks to earn a nominal return (e.g. 2%). That PRI could be made to the general balance sheet of the Green Bank, where it was up to the Bank to invest the capital and earn the return required. Or the PRI could be for a designated project or market segment. For instance, a Foundation could make a PRI to fund a loan loss reserve to support Green Bank or private loans to upgrade homes for low-income households.

Recurring Revenue Stream

Nevada could tap into existing recurring revenue streams or create new ones. The proceeds from the revenue streams would then be pledged to the Green Bank to continuously increase the capital base for the Green Bank.

Ratepayer Funds

The Green Bank could be funded by a stream of ratepayer funds collected by the utility. This is the method used to fund the Connecticut and New York Green Banks. Nevada could use this approach, with either an indefinite funding stream or a finite capped amount collected over time.

Presently, the state collects roughly $50 million annually for electric and gas efficiency rebates across the electric and gas utilities (DSM programs). However, this collection is different from those used by states like Connecticut and New York. In those states, the utility collects the money merely as a pass through. That is, the funds are not treated as part of the rate base for the utility, and they do not earn a rate of return on the funds collected. In Nevada, though, the dollars collected from ratepayers for efficiency rebates are rate based, and the utility earns a return on the funds collected and given away as rebates.

If a ratepayer collection mechanism was used to fund the Green Bank over time, it would be wise to do so using a surcharge, or system benefits charge structure, where the funds collected are not rate based. In this situation the utility would act merely as a pass through, and the impact on ratepayers would be lower than it is under the traditional DSM fund collection process.

Table 19: Comparison of State EE Program Funding Levels[77]

State	2014 Electric Efficiency Program Spending (M)	% of Statewide Electricity Revenue	Rank (out of 54 states & territories)
Oregon	$159.8	3.88%	6th
Utah	$57.2	2.27%	10th
Colorado	$95.1	1.77%	15th
Idaho	$31.7	1.72%	16th
Arizona	$120.1	1.54%	19th
Nevada	**$49.2**	**1.46%**	**21st**
New Mexico	$24.9	1.12%	27th

[77] ACEEE, "The 2015 State Energy Efficiency Scorecard," October 2015, at 26.

As shown in the table above, based on the latest data from the energy efficiency industry association, the ACEEE, Nevada's relative level of funding for efficiency programs is below nearly all of its neighboring states. This demonstrates that, if the state were to collect dollars from ratepayers through a surcharge in order to fund the Green Bank, the total level of money collected from ratepayers to support clean energy would still be in line with comparable states. But this funding increase would come with the benefit that the new dollars collected would be preserved and revolved through Green Bank financing.

Renewable Energy Funds

As described above, the Renewable Energy Fund continues to receive money every year, as existing projects pay annual property taxes. Also, new projects may be built that will generate new stream of payment into the Fund. The GOE could dedicate all of these on-going funding streams to capitalizing the Green Bank. This would allow the Green Bank to increase its capital base, and have some level of assurance that it can rely on new funding going forward.

Bonding Authority

In addition to directly appropriating funds to the Green Bank to be used as lending and operating capital, a Green Bank could supplement and expand its capital base by issuing bonds. With the ability to issue bonds, the Green Bank could more efficiently recycle its capital, draw in new private investors, and expand its ability to address market needs.

General Institutional Bonding Authority

As a non-profit corporation, the Green Bank would have its own, independent bonding authority. Legislation could be written so it is explicitly clear that the Green Bank's bonds have no recourse to the state, and do not come with the state's full faith and credit. If the state so chose, the Green Bank could also be provided a limited reserve from the state to sit behind and strengthen a bond issuance. The Connecticut Green Bank, for instance, has its own bonding authority that is not backed by the state, but it was granted $50 million of bonding authority supported by a state Special Capital Reserve Funds.

If the Green Bank has a sufficient balance sheet and equity reserve, it could also issue revenue bonds where recourse isn't limited to a specific set of projects. This would allow the Green Bank to expand its overall lending capacity in a fashion similar to that used by traditional development finance authorities. The bonds could be labelled as "green bonds" potentially giving the Green Bank a slight pricing advantage in the market. (As all Green Bank activity is necessarily focused on clean energy activity, there would be no question that the use of the bond proceeds would allow the issuance to qualify as a green bond.)

Project Specific Bonds

The Green Bank could issue revenue bonds that are solely repaid by the repayments of loans to specific projects financed by the Green Bank. This would allow the Nevada Green Bank to sell loans off the balance sheet, replace it with cash, and make more loans. The bonds would have no recourse to the Nevada and would not count toward Nevada's debt cap. This kind of project-specific bond is viable for the Green Bank, because the Green Bank typically only invests in projects that can pay for itself through savings, assuring a strong repayment stream.

Bond Backed by Revenue Stream

Under certain constructs, it might be viable for the Green Bank to issue bonds that are repaid exclusively by a revenue stream dedicated to the Bank. This kind of bond would be supported by a dedicated tax stream or revenue stream, collected by the government. For instance, the Green Bank could bond against

a utility surcharge-based revenue stream. Specifically, if the Green Bank is capitalized with an on-going stream of revenue akin to the DSM mechanism, the Green Bank could bond against that stream. That would allow the Green Bank to realize upfront the cash that it would take years to accumulate through the stream of ratepayers collections. This is the construct used in Hawaii to capitalize the Green Infrastructure Authority (discussed in Chapter 3). The Green Infrastructure Fee collected on all ratepayer bills was pledged to support the bond, allowing the state to raise $150 million upfront to finance projects.

Qualified Energy Conservation Bonds (QECBs)

A Nevada Green Bank could be given the authority to aggregate and issue the state's allocation of Qualified Energy Conservation Bonds (QECBs). This bond structure, created by the federal government, allows state and local governments to issue bonds and access low-cost capital for qualifying projects. QECBs are taxable bonds, but interest payments are subsidized by the federal government, thereby reducing the ultimate cost of capital the issuer must pay; lower interest rates can then be passed on to consumers. Congress authorized $3.2 billion of QECB issuance capacity, which was then allocated to state and local government.[78]

Nevada received $26,975,000 in QECBs, with all but $3.1 million allocated to large local governments. However, only $8 million of this total allocation has been used to date, with nearly $19 million in low-cost bonding capacity dedicated to clean energy financing left unused. Las Vegas issued a $5.9 million bond in 2011 and Reno issued a $2.3 million bond in 2010.[79] The remaining allocation mostly rests with local governments, and, as is often the case in many other states, those allocations have not been issued due to deal complexity and the relative cost of small issuances.

Table 20: Status and Remaining Nevada Allocation of QECBs[80]

QECB Allocation Jurisdiction	Original Allocation	Amount Used	QECB Allocation Remaining
State Govt (DBI)	$3,101,538	$0	$3,101,538
Clark County	$8,575,996	$0	$8,575,996
Las Vegas	$5,874,351	$5,874,300	$0
Henderson	$2,621,091	$0	$2,621,091
Reno	$2,261,645	$2,261,650	$0
North Las Vegas	$2,229,404	$0	$2,229,404
Washoe County	$2,012,271	$0	$2,012,271
Tribes	$298,705	$0	$298,705
Total	$26,975,000	$8,135,950	$18,839,050

A Green Bank could be assigned the unused allocation for a wide range of potential uses. Most, if not all, Green Bank activity proposed would qualify for QECB issuance. QECBs could be issued to fund specifically

[78] Department of Energy, Qualified Energy Conservation Bonds, http://energy.gov/eere/slsc/qualified-energy-conservation-bonds, as viewed on November 7, 2015.

[79] Energy Programs Consortium, "QECB Appendix," as of May 31, 2016. http://www.energyprograms.org/2016/05/qecb-papers/

[80] Energy Programs Consortium, "QECB Appendix I: QECB Sub-Allocations."

identified projects, or they could be issued to fund a warehouse, which then finances a large number of smaller projects through a dedicated loan program.[81]

Given that the current allowance for QECBs are sitting unused, a Green Bank could present a viable way for the state to finally realize the value offered from the federal government through these bonds. To do this, the state would need to collect the remaining QECB allocations from local governments. Both Virginia and Rhode Island have recently pursued this strategy in order to unlock all potential funding in the state and realize the scale efficiencies needed for QECB usage.[82] If the Nevada Green Bank proves unable to actually collect the allowances for the Green Bank, it could instead use its experience and staff of financial professionals to work directly with local governments to help them design turnkey programs and issue bonds to take advantage of the financing capacity.

Industrial Revenue Bonds

The Green Bank could be authorized to use the state's Industrial Development Revenue Bond (IDRB) program to finance energy upgrades for certain buildings. The program provides access to tax-exempt financing, which can secure a lower cost of capital for project financing. Presently the IDRB program is operated by the Department of Business and Industry (DBI). The Green Bank would not need to be given the authority to actually issue bonds under this program. Rather, the Green Bank could form an agreement with DBI to act as a conduit issuer, using tax-exempt bonds, for the Green Bank projects. This is a way the Green Bank could use an existing and trusted mechanism to offer low-cost financing for projects.[83]

Green Bank Operations

Once formed, a Green Bank needs to carefully budget and consider its expenses in order to be a break even entity. Principally, a Green Bank should cover its operating expenses through returns on lending, like any other bank. However, it may take time to deploy capital and generate returns to cover all operating expenses. That is why a Green Bank should hire a lean staff to begin, and only ramp employees over time as the bank reaches maturity and fiscal sustainability.

Self-Sustainability

Funding a Green Bank is different from funding other typical government programs because Green Banks can ultimately pay most, if not all, of their own operating expenses. A typical clean energy program DSM rebates must receive annual infusions of cash, in perpetuity, to cover both operating expenses and program expenses. A Green Bank does not require this form of funding because it offers financing, which can generate returns that cover operating expenses.

A Green Bank can reach a point of fiscal self-sustainability over time. At creation, the Green Bank does not yet have loan volume to create return and cover operating expenses. Therefore at the start, a Green Bank needs a dedicated pool of funds to hire staff and cover other upfront costs. For example, when the NYGB was created, the NY Public Service Commission (PSC) specifically ordered that $13.3 million of the

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[81] "Using Qualified Energy Conservation Bonds (QECB's) to Fund a Residential Energy Efficiency Loan Program: Case Study on Saint Louis County, MO," Clean Energy Policy Brief, LBNL, June 20, 2011.

[82] Executive Order Number Thirty Six (2014), "Continuing Qualified Energy Conservation Bonds," Commonwealth of Virginia, Office of the Governor; FY 2016 Rhode Island State Budget, Article 14.

[83] Department of Business and Industry, IDRB Program Overview, http://business.nv.gov/Resource_Center/Access_to_Capital/IDRB/IDRB_Program_Overview/.

$165.6 million of initial public capitalization could be used for start-up operating expenses.[84] Over time, as loan volume increases, the NYGB can generate more returns, reducing the need for this kind of set aside of public funds. But it demonstrates how a Green Bank, at its founding, needs to identify either an upfront source of funds or an on-going stream of funds to support start-up costs.

Any returns will be off-set by losses experienced on Green Bank loans and financing. Losses are to be expected, like in any financing activity, which means rates and terms offered must account for those expected losses. Across nearly 1,500 loans, the Connecticut Green Bank has experienced zero defaults, and six late payments.[85] This low rate of loss means a Green Bank can recover operating expenses through its financing activity, while still offering rates that enable market growth.

Market development programs do not directly generate returns, though they may improve market conditions and increase loan volume. If the Green Bank takes on multiple market development programs that do not directly generate a return, the Bank will have higher operating expenses and will draw down its capital. Returns from other financing programs may be able to cover the costs of the lending programs and some of the costs of other market development programs. However, if a significant number of market development activities are pursued, Green Bank managers will need to cover those costs with the public capitalization funds. (This is why having an on-going annual revenue stream is extremely beneficial for market development purposes.)

Staffing

A Green Bank is ultimately defined by its executives and staff. The people that make up the Green Bank define its culture, interpretation of Green Bank purpose, and form(s) of market engagement. Therefore staffing models and hiring criteria must be considered from the outset. Filling the Green Bank CEO or Executive Director position with an experienced commercial banker with deep finance experience versus a clean energy market expert familiar with the barriers to growth can produce vastly different institutions.

The NYGB Business Development Report, which was the basis of the NYGB creation, pointed to four general capability sets needed by a Green Bank: energy capabilities, finance capabilities, business development capabilities, and operational capabilities.[86] Some of these capabilities can be developed over time, and some can be borrowed or out-sourced.

For an entirely new Green Bank, the positions and functions necessary for the first year of Green Bank operation are chief executive officer (or executive director), chief investment officer, legal, accounting, communications, and human resources. This requires a staff of at least six. The roles of communications, accounting, and human resources could be outsourced or shared with other organizations, at least for start-up phase of the Green Bank. The Green Bank can look to other, related government entities to manage certain back-office functions. For instance, GOE could manage some of those functions on behalf of the Green Bank.

The chief executive officer provides the leadership and vision for the organization, manages the operation of the organization, and makes strategic decisions about where to allocate capital across the Green Bank's activities, working with the Board of Directors. The chief investment officer provides the financial

[84] "Order Establishing New York Green Bank and Providing Initial Capitalization," Case 13-M-0412, New York Public Service Commission, December 19, 2013.
[85] Connecticut Green Bank.
[86] New York State Green Bank Business Development Plan, Final Report, September 3rd, 2013.

expertise necessary to build the financial products, allocate capital across products, interface with private capital providers, and build partnerships with external organizations. Legal counsel ensures compliance with bylaws, adherence to Nevada and federal law, authors and checks term sheets and contracts, and structures specific terms of Green Bank partnerships.

Depending on the initial capitalization, the Nevada Green Bank may add additional supporting roles from the outset. This includes other finance and business development staff to support product design and demand generation. Ultimately the exact staffing model and level is highly dependent on the amount of capital available to the Green Bank, and the degree to which the Green Bank is fiscally self-sufficient.

Green Bank Activities

Based on the market assessment and stakeholder interviews, there are a number of financing products and market development activities a Green Bank can engage in to support multiple clean energy markets. This section outlines a portfolio of products a Green Bank could offer in partnership with private actors to drive investment in underserved and untapped clean energy markets. This section also discusses a range of actions a Green Bank can take to increase market transparency, generate demand for clean energy, and provide all market participants with more assurance on the quality and cost of clean energy solutions.

Target Market Segments

This study finds that a Nevada Green Bank should focus on five target market segments

- Whole-home energy upgrades;
- Whole-building energy upgrades for the commercial sector;
- Energy upgrades for low-to-moderate income (LMI) households;
- Solar + battery-storage applications; and
- Vehicle electrification

These sectors are the most underserved in the current market, hold tremendous economic opportunity, can lower energy costs for residents and businesses, and allow for significant reduction for greenhouse gas emissions. In addition, several of these markets were identified in Governor's Sandoval's Executive Order 2016-04. Innovative finance structures and focus on demand generation can lead to far greater market penetration in each sector.

Financing Activities

This section describes a number of financing solutions that the Nevada Green Bank could offer to support the target markets described above. They include:

- Solar and Efficiency Finance
    - Whole-home upgrade loans with deep efficiency and solar
    - Tariff-based financing for rural households, LMI market, and renters
    - Small-to-medium business upgrade loans
    - Revamped commercial PACE for larger projects
    - LMI-specific whole-home solution with alternative underwriting
- Finance and Market Innovative Solutions
    - Net-metering Aggregation Financing
    - Solar + battery storage combined-financing
    - EV fleet conversion & charging station network licensing

Each of these solutions are described in detail below.

Whole-home upgrade loans with deep efficiency and solar

A Nevada Green Bank could support the creation of a new, whole-home direct loan product that allows homeowners to perform a deep energy efficiency upgrade along with a rooftop solar installation. A turn-key product designed to allow both project components would simplify the adoption process, streamline the application, and ensure solar capacity added to the home is only for as much as is necessary, thus reducing payments. There are several structures a Green Bank could use to deploy such a product, all of which would require coordination with a number of market participants, most importantly contractors.

DEAL Expansion

The Green Bank could build on the successful model deployed by the GOE with DEAL, and bring payroll-based financing to private sector employers. DEAL currently only is available to state employees, but the model is easily replicable for any kind of employer. All that is necessary is program administration, a capital source to make the loans, and the participation of an employer to make loan collections through payroll deductions. A Green Bank could spearhead the outreach effort to find employers, potentially targeting large employers like casinos to reach as many people as possible. The Green Bank help administer the program and reach out to contractors to inform them of which employers are running the program. A contractor could even be given an exclusive opportunity to serve certain employees in exchange for group-based discounts on installations. The Green Bank could also support the loan capital, either by directly providing funds for loans, or offering credit enhancement to a private capital provider. The employer itself may choose to offer the loans directly to employees. This structure has the benefit of building on a successful model that Nevada already has experience operating.

Standard-Offer Credit Enhancement

The Green Bank could use the models deployed by other Green Banks and similar organizations and create a loan loss reserve pool that any lender in the state could access in order to support lower cost loans for whole-home upgrades. This would be similar to the CT Green Bank's Smart-E Loan, or a residential Home Energy Loan Program offered by the non-profit, Michigan Saves. The Nevada Green Bank would make capital available to sit behind a portion of loans, in exchange for the lenders offering loans they wouldn't have made otherwise, or offering the loans at better terms. The advantage of this approach is that it naturally builds a network of lenders that become familiar with clean energy lending. It also can highly leverage public dollars, driving as much as $10 per single public dollar set aside in the reserve. The Green Bank could establish standard underwriting criteria, with either strict rules standardizing each loan, or with flexibility that allow lenders to determine their own exact product structures. The Green Bank would have to support contractor training, lender education, and program marketing to drive demand for the loan products offered by participating lenders.

Warehouse for Energy Efficiency Lending (WHEEL)

WHEEL is an "off-the-shelf" solution that Nevada can enroll in to bring private capital into the state for home upgrade lending. WHEEL is a national platform, operated by the Energy Programs Consortium, Renew Financial and Citibank, that makes capital available for home energy loans at good terms. To enroll, a state "sponsor" (which could be the Green Bank) makes a credit enhancement investment into the WHEEL program to access the loan capital provided by Citi. Renew Financial then administers the loan program in the state, which includes contractor outreach. WHEEL has standard underwriting criteria and terms across states. A number of states are already enrolled, including New York Pennsylvania, Ohio and

Kentucky. The WHEEL program successfully completed its first securitization of loans in the warehouse last year, and was able to reduce the interest rates for its loans, as a result. New York is the latest state to enroll, making a $20 million subordinated capital investment to open up $100 million of lending capacity into the state. The only limitation on this program is that the maximum loan size is $20,000, effectively preventing whole-home upgrades that include solar.

New Revamped Fannie Mae Efficiency Mortgage Product

Fannie Mae recently launched a new, revamped efficient mortgage product called "HomeStyle Energy." The product is designed to streamline efficiency upgrades at the time of home purchase or refinancing, combining home financing with efficiency financing into a single product. It allows homeowners to add financing up to 15% of the assessed property value, and it can also be used to refinance existing, higher interest debt for prior efficiency improvements. The product does require an energy audit, except for a streamlined application for a weatherization product under $3,500 (which would necessarily exclude solar). Lenders are also given a $500 cash grant for every loan made. This product has the benefit of a built-in network of lenders. However, the prior versions of this product had little uptake, and home purchase or refinance is just one potential inflection point for a homeowner decision to do an upgrade. The Green Bank could support the roll out by working with mortgage lenders to understand the product, connecting lenders with contractors and real estate agents, and generally marketing the product.

Tariff-based financing for rural households, LMI and renters

The Green Bank could help implement, administer and/or finance an on-bill repayment/financing program in Nevada. This program would open up clean energy adoption to renters and potentially other kinds of market participants (like LMI households) who are otherwise shut-out of cost-saving opportunities. And on-bill financing could be particularly well-suited to rural communities, where new program and financing solutions, paired with low-cost federal capital, have been developed.

The Green Bank could play multiple roles in the creation of an on-bill program. Creating an on-bill program often requires heavy coordination efforts among regulators, utilities, potential third-party lenders and policymakers. The Green Bank could play this central role, helping to design the program with an eye toward marketability. Design parameters include borrower eligibility, underwriting guidelines, technology eligibility and repayment terms.

If the program is designed for the loan funds to come directly from the utility, the Green Bank could still provide market development and contractor training services to ensure adoption. If the program is designed to be open platform, where loans come from multiple private investors, then the Green Bank could facilitate engagement with those lenders to bring them into the program. The Green Bank could also provide a credit enhancement, if necessary, to support that private lending. Finally, the Green Bank could also directly provide loan capital into the program if private capital is unavailable, or if the utility objects to using their capital in this way. No matter the structure, the utility must be fairly compensated for taking on the activity of loan repayment collection.

Ideally, the on-bill loan would be treated as a direct tariff on the meter, which would allow the loan to stay with the meter and transfer from tenants/owners when people move. This overcomes the principal-agent problem that typically prevents renters from adopting efficiency and gaining access to financing. A special category of the on-bill program could be specifically designed for lending to low-income households, with underwriting criteria based on utility bill repayment history rather than FICO score.

A tariff-based on-bill financing structure would also be well-suited for new program structures, such as Pay-As-You-Save (PAYS), that enable cost-saving energy upgrades for rural communities at no cost to the homeowners.[87] Under the PAYS product, rural utilities would offer tariff-based EE and solar financing that is tied to the meter. There is no loan or lien and the tariff charge, by rule, is less than the savings from the project. The PAYS structure is also designed to easily access and deploy cheap capital from the Rural Utility Service's Energy Efficiency & Conservation Loan Program (EECLP), so no utility funding is required.[88] The Roanoke Electric Cooperative in North Carolina was one of the first utilities in the nation to roll-out this program, and has had strong results.[89] Nevada's 6 rural co-ops only cover about 4% of households, but those households have an average income 16% below the state-wide average, making a financing option even more valuable.[90]

Any on-bill program should include specific consumer protection rules if it. This can be done to ensure that consumers are only taking on projects that save them money, and also do not greatly increase debt burdens. For instance, the Green Bank could implement a bill neutrality rule, which would require all projects financed on bill to reduce electricity bills or keep them the same. Bills could never increase. (This is equivalent to the CT Green Bank's requirement that savings-to-investment ratios on commercial PACE projects exceed 1:1.)

The Green Bank could also provide assurances or mitigate the risk of power shut-off, in the case of tariff-based financing. In some jurisdictions, if a customer does not pay the on-bill financing portion of the utility bill, the power to the customer could be shut off. The Green Bank should consider rules or mechanisms to ensure this either cannot happen, or can only happen in extreme circumstances.

Small-to-medium business upgrade loans

Small-to-medium sized businesses in Nevada often struggle to find financing for energy upgrades for their buildings. This is a market segment notoriously underserved, and would be highly suitable for Green Bank financing. This market segment is underserved because project sizes are typically small, under $50,000. But the cost of underwriting loans to these businesses can be high, because they aren't credit rated and may have uncertain or complex financials. This makes lending unattractive and costly for banks. In turn, this leaves businesses often using more expensive solutions (like credit cards), providing personal guarantees for lending, or not moving forward with projects at all.

This segment, which is sometimes called "resi-mercial" because of its resemblance to the residential sector, could be supported by the Green Bank. A simple solution for a Green Bank would be a dedicated revolving loan fund, focused exclusively on providing loans to this market segment. The Green Bank could offer loans at standard terms with a simplified underwriting process. The program could also attempt to standardize the equipment installed, as well, to minimize project complexity. The warehouse of capital used for the revolving loan fund could be 100% public Green Bank capital, or it could also be seeded with

[87] www.cleanenergyworks.org

[88] http://www.seealliance.org/wp-content/uploads/Roanoke-EC-Upgrade-to-ave-Program-Overview-and-EECLP-4-9-2015.pdf.

[89] Roanoke Electric Cooperative, "Sharing Insights of Our Experience with Pay As You Save® (PAYS®)." http://www.roanokeelectric.com/content/PAYS.

[90] Nevada Electric Cooperative Consumers Legislative Profile – State Demographics & U.S. Senate Information, National Rural Electric Cooperative Association (NRECA), http://www.nreca.coop/about-electric-cooperatives/congressional-district-maps/#Nevada

private investment, too. The fund could operate like a traditional revolver, where loans are repaid over time and those repayments go back out as loans. Or the velocity of lending could increase by selling loans off of the balance sheet of the Green Bank and recapitalizing the loan fund more quickly. (The Connecticut Green bank has successfully done this with several loan portfolios.) The Green Bank would be responsible for program design, marketing, and demand generation, working closely with contractors and key networks, like the Chamber of Commerce. The Green Bank could also coordinate with GOED to identify target customers through some of their existing programs designed to support small businesses.

New York operates a similar program called Green Jobs – Green New York. A dedicated fund was established to lend to small businesses. And the loans are paired with technical assistance and energy assessments to make the solution turn-key for customers. In this case, the borrower can repay directly or through an on-bill mechanism. And public capital only covers half of the project cost, with the remaining capital coming from a private lender. This program found that the technical assistance was critical. As stated in the program's annual report:

> Results demonstrate that small business customers benefit from dedicated project implementation assistance, including assistance identifying and accessing financial incentives and low-interest energy efficiency financing, to help lower the cost of implementing energy efficiency improvements recommended on Qualified Energy Assessments.[91]

So no matter the exact financing structure of the program, it is essential to pair the loan product with wrap-around service to support demand.

Revamped commercial PACE for larger projects

Commercial Property Assessed Clean Energy (PACE) has proven to be a highly effective tool for driving energy upgrades for medium-to-large business. But the program can only operate successfully with good law, smart program design, and capital on-demand. Presently, the law and programmatic structure in Nevada has resulted in zero commercial PACE activity, leaving an untapped opportunity for investment. A Green Bank can play a significant role in turning around the PACE situation in Nevada.

The most effective commercial PACE program in the nation, by far, is run by the Connecticut Green Bank. Despite accounting for only 1% of the national population, Connecticut has well over 50% of the national commercial PACE market. This is because Connecticut has a simple, consistent, statewide structure that is centrally operated and financed by the Green Bank. PACE is framed and operated primarily as a loan product for building upgrades. The fact that those repayments are collected through tax liens on the building is merely the security mechanism for the collection. This is different from Nevada's framing, where PACE is viewed as another kind of municipal-based investment under the construct of a special-improvement district. This framing has led to confusion about the role of the taxing municipality, the credit risk to the municipality and the overall programmatic structure.

In Connecticut, law was passed designating the Green Bank as the single statewide operator. All that was necessary to enroll in the program was for any interested municipality to pass a standard resolution to allow PACE, which then automatically enrolled that municipality in the Green Bank's program. There is no

[91] NSYERDA Green Jobs – Green New York February 2016 Monthly Update; Green Jobs – Green New York 2015 Annual Report, Reporting Period Ending June 30, 2015, Final Report, September 2015.

complex municipal bonding structure, and there is no need for conduit financing. It is more like a direct lending program, where any building located in a participating municipality can receive a PACE loan, and that lender is paid back on that loan through property tax collections. The Green Bank administers every aspect of the program, removing all burden and cost from the tax-collecting municipality. The Green Bank has standardized forms, resolutions and processes that all municipalities can use. The Green Bank even directly pays municipalities for costs they incur collecting PACE liens, and they pay for municipalities to upgrade their tax collecting software if necessary. This simple enrollment process has allowed 121 separate municipalities to enroll, covering the vast majority of the state population and buildings.[92]

This statewide consistency also means that completing projects is far simpler. There is only one set of program rules, one set of eligibility criteria, and one set of underwriting criteria. This makes market entry far more attractive for private lenders and contractors. This structure is also very different from the approach taken in other states, where every single county or town has its own rules, making business far more complicated for lenders and contractors. This is why the Connecticut commercial PACE market has grown so much more quickly than all others, with over $100 million in projects financed.

In addition to this administrative role, the Connecticut Green Bank directly loans to PACE projects. The interest rate is 6% and the term is equal to the weighted average effective useful lifetime of the measures installed. The Green Bank plays this role as lender because when the program was originally established, no private lenders were willing to participate. Now that the market opportunity has been proven, and a track record established, many private PACE lenders have come into the market. This is a central role a Green Bank in Nevada can play.

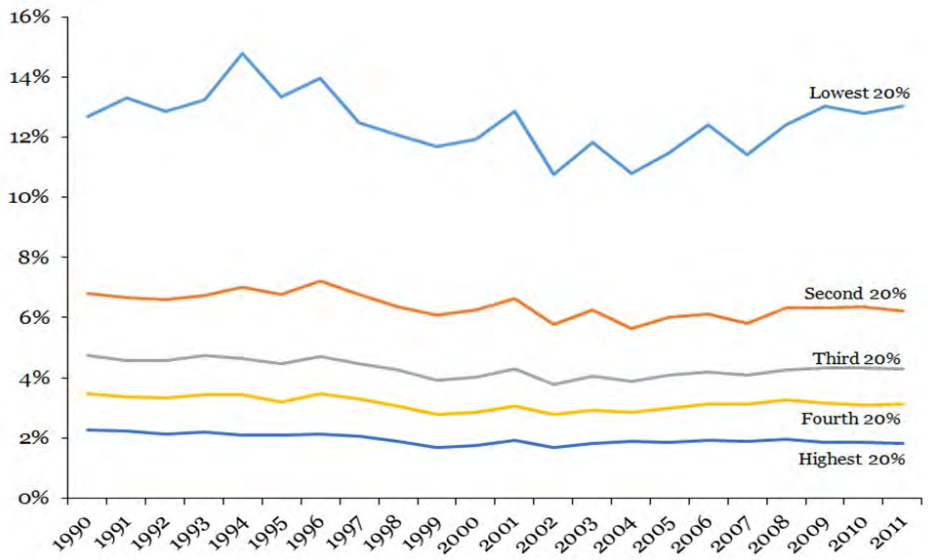
Nevada can and should draw from these lessons, and adapt the PACE model to suit the specific conditions and requirements of the Nevada market. A Green Bank could provide centralized administrative service and run a state-wide program. Or it may be more suitable for larger municipalities, like Las Vegas, to run their own programs, with the Green Bank focusing on supporting programs in smaller, more rural communities (with identical program rules to more easily build a state-wide market) The key components of a Nevada program, though, should be taking the administrative burden off the shoulder of municipalities, creating as much consistency and simplicity as possible in the program rules, and reframing the PACE discussion around a clean energy loan with an innovative collection mechanisms, and out the realm of narrow focus on special improvement district dynamics.

LMI-specific whole-home solution with alternative underwriting

Low-to-moderate income (LMI) homeowners are being left behind in the clean energy transition. This market is particularly important in Nevada, as many residents are still recovering from the effects of the deep recession at the end of the last decade. The energy burden (disposable cash used for energy costs) is typically highest in low-income homes, and therefore are in greatest need for cost-saving measures. However, private financing providers and contractors typically do not target this market because they can be harder to reach and may not qualify for financing. This inequality should be addressed by a Green Bank.

[92] http://www.cpace.com/townscities.

Figure 27: Utility Cost as % of Disposable Income by Income Quartile[93]



Serving low-to-moderate income homeowners typically requires focused programs and products. Expanding program eligibility or lowering financial underwriting requirements is often insufficient, as program participants and contractors will still target and market to high income households. Tailor-made solutions are needed. This includes financing and market development mechanisms specifically suited to the needs of this targeted market segment. For instance, rather than underwrite based on FICO score, loan qualification should be based on utility bill repayment history (as is done through the Connecticut Green Bank's low-income product). To achieve maximum energy savings, programs could include a minimum bundle of efficiency measures to produce deeper savings. And homes adopting solar should first have an efficiency retrofit to ensure the minimum size solar system is installed. The need for maximized energy cost savings means that LMI households may be suitable for lower interest rates.

In addition to these product attributes, a Nevada Green Bank should design a contractor engagement program to increase buy-in and commitment from market participants to serve LMI households. For instance, contractors might be given financial incentive to serve this community. And the Green Bank could work with contractors to ensure that program application and participation is entirely seamless. LMI households typically have less disposable time available to address energy needs. Therefore the Green Bank and its partners have to take the burden of program complexity and administration off the customers' shoulders. By combining these product and program attributes, Nevada can create a solution that is comprehensive, turn-key and economically attractive for LMI households.

Net-Metering Financing & Aggregation

No matter the long-term net-metering solution Nevada stakeholders decide on, the Green Bank can play a role in delivering value to solar owners, reducing operational complexity for the utility and potentially making clean energy market growth more predictable. The Green Bank can act as an aggregator of net-metering payments from utilities, delivering upfront value to solar customers and simplifying the utility transaction process. By turning a long, low and unpredictable stream of payments into upfront value for

[93] Consumer Expenditure Survey, Bureau of Labor Statistics, Accessed on June 2015.

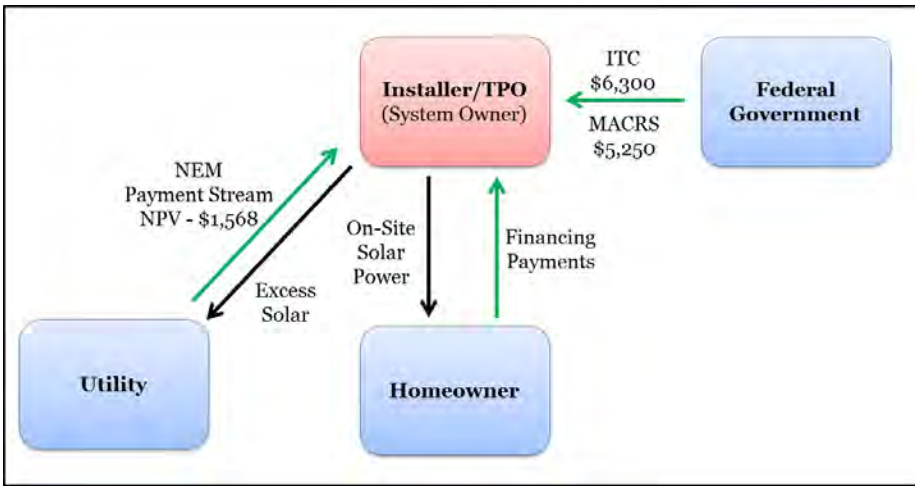
customers, the Green Bank can take advantage of differentials in discount rates. Utilities can simplify the payment process by directing net-metering payments to a single recipient (the Green Bank), and the utilities can reduce uncertainty over the expense.

A net-metering policy for solar should:

- enable rapid but predictable pace of solar growth;
- generate competition among installers to drive down price; and
- make utility expenditures predictable.

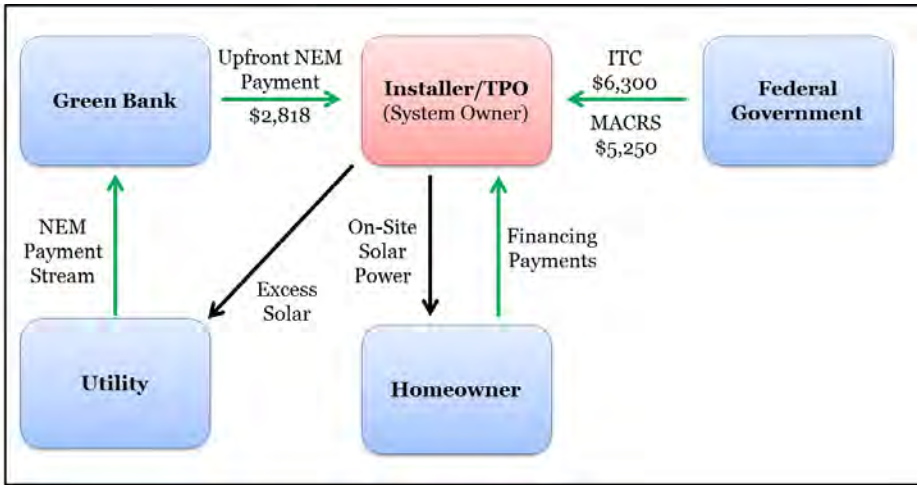
A Green Bank can be part of a net-metering solution that helps facilitate the achievement of these objectives. The Green Bank can act as a market maker, helping solar owners monetize a long-term stream of net-metering payments at installation. The Green Bank can write solar owners a check for the value of all their net-metering at the time of installation, effectively buying down the upfront cost/principal that must be financed. Meanwhile, the Green Bank receives the net-metering payments over time from the utility. The current and the proposed structure of flows are shown below, using illustrative example numbers for average Nevada load profile from for a 6kw leased system.[94] The value of this structure to the end customer is that it allows the solar owner to realize the value of net-metered solar payments sooner and take advantage of different discount rate.

Figure 28: Standard Net-Metering Structure with Lease Financing



[94] Household load profile data from Hugh Wynne et al., "U.S. Utilities – Has Nevada Created the First U.S. Market for Residential Energy Storage."

Figure 29: Aggregated Net-Metering Structure through Green Bank with Lease Financing



The Green Bank's discount rate (or time value of money) is fairly low, so receiving money today compared to the future makes little difference. However, individual consumers are shown to have extremely high implicit discount rates (as high as 25%).[95] Under Nevada-specific assumptions, the net present value (NPV) of the stream of net-metering payments from the customer perspective (with new reduced rates) in this illustrative example is $1,568. But from the Green Bank's perspective, because of its lower discount rates, this same stream is worth $2,818.[96] Because the Green Bank is non-profit, and has access to low-cost "patient" capital, it can pay the customer the $2,818 amount upfront at installation to the solar owner as a rebate, in exchange for the rights to receive the stream of net-metering payments from the utility.

Over the project lifetime, on an NPV basis this structure delivers more value to the customer. As shown in the bar chart below, in real terms the total household electricity cost under this structure is lower than the standard net-metering structure, and lower than using only power from the grid. In nominal terms, there is little impact on the monthly energy costs compared to the current net-metering structure. The lower monthly financing repayments (achieved from buying down the principal with the rebate) are offset by the loss of the monthly net-metering payment.[97] But in both real terms and behaviorally, delivering thousands of dollars cash back to a customer at point of sale can be an attractive proposition.

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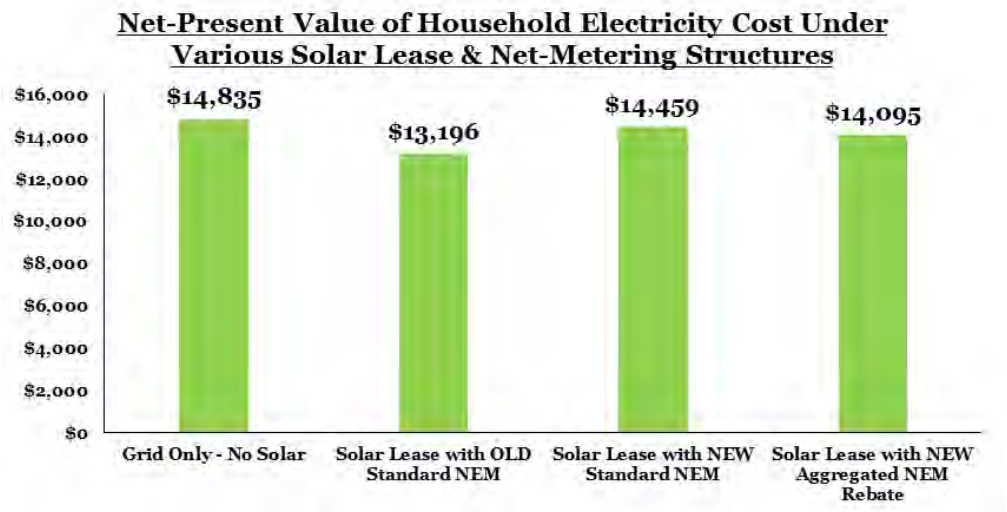
[95] Academic research has found that the implicit discount rate of consumers when making consumption choices related to energy savings is significantly higher than 14%. See Alan K. Meier and Jack Whittier, "Consumer discount rates implied by purchases of energy-efficient refrigerators, Energy, Vol. 8. Iss. 12, December 1983, 957-962; Henry Ruderman, Mark D. Levine and James E. McMahon, The Behavior of the Market for Energy Efficiency in Residential Appliances Including Heating and Cooling Equipment, The Energy Journal, Vol. 8, Iss. 1, 1987, 101-124.

[96] Assumes 6kw system in Las Vegas; installed at $3.50/w, 30% ITC and MACRS present value equal to ~25% of install cost; generation based on PVWatts data; assumes 0.5% annual degradation; assumes homeowner discount rate of 15%; Green Bank discount rate of 4%; WACC for lease of 9%. Uses real net-metering and electricity rates from https://www.nvenergy.com/renewablesenvironment/renewablegenerations/NetMetering.cfm.

[97] If the rebate is used to pay down the principal borrowed upfront (conceptually similar to treatment of ITC, then this produces reduced monthly financing payment through the lease. However, the homeowner doesn't receive the monthly net-metering benefit. Based on assumptions and model described above, these two changes effectively offset each other, producing a monthly electricity cost equal to cost under standard NEM structure.

Figure 30: NPV of Solar Ownership Under Varying Conditions



From the utility perspective, there are two benefits to this structure. The first is that it greatly reduces the operational complexity for the utility to implement net-metering. Presently the utility must send quantity-based, fluctuating payments to every solar owner in the state. And it must continue to do so in perpetuity under fluctuating rates. Under this structure, the utility would send payments to a single entity, who is then responsible for distributing funding.

The second benefit is that this can effectively make solar growth more predictable. The utility, industry and regulator agree at the beginning of the year on a predicted level of new DG solar penetration. The expected annual cost to the utility can then be sent directly to the Green Bank in one lump sum payment. The Green Bank can then announce to the market how much net-metering benefit is available in a given year, enabling the predicted amount of DG solar generation to be installed. The solar market would continue to grow every single year based on best industry projections, but the cost to the utility would be limited and calibrated to predicted growth. This would achieve the objective of rapid, but predictable growth, rather than boom and bust.

Also, if the Green Bank were given this money upfront, it might find a whole range of methods to distribute these funds that actually result in more solar installed, but with no new cost to the utility. For instance, the Green Bank could hold a reverse auction to find installers that are able to install solar for the lowest rebate amount per watt installed. This would put downward pressure on costs and expand the market while public costs remain capped. This program could be combined with a tiered-pricing peer-to-peer marketing program like Solarize (outlined later in Chapter 5). Or the Green Bank could set a standard per-home rebate amount and execute an RFP to find installers who will fill market capacity under the set amount. In effect, the Green Bank would be able to stretch the aggregated dollars further by supplementing pairing them with other techniques and programs that lower other solar balance of system costs (like marketing and customer acquisition) that would contribute to lowering the total amount a customer pays for solar.

Solar + battery storage combined-financing

Due to new, lower net-metering rates, the value of selling solar electricity back on to the grid for existing solar customers is now reduced. This means that there is an opportunity to find more valuable uses and

points of sale for that excess electricity. In-home battery storage is now a viable solution as a result of this net-metering change, and the implementation of new time-of-use rates.

With time-of-use rates, solar producers can save excess generation in order to draw power from the battery when grid power is most expensive. Or the owner can purchase and store power in the battery at night when it is cheapest from the grid. This new ability to arbitrage price differences means that, with battery storage and increasing self-consumption of solar, existing solar owners are less affected by the reduced economics of net-metering their power back into the grid.

Independent, third-party analysis has shown that the savings from battery storage can be meaningful, despite the high upfront cost of the battery itself. For an existing solar customer who installed solar prior to the change in the net-metering rates, the installation of a battery for storage and switch onto the time-of-use rate plans will produce approximately $220 of annual savings compared to simply net-metering power under the reduced rate. Over 20 years of production, this would accumulate to several thousands of dollars of value.[98]

To take advantage of this new cost-saving opportunity, though, existing solar customers will have to pay what can be a significant upfront cost for the battery. A Nevada Green Bank could provide direct financing for this battery installation, removing the barrier to adoption. A Green Bank could also more broadly cover financing for combined installations of solar and battery storage, through a single unified financing product. This broader deployment of batteries would not only allow customers to make more rational electricity consumption choices, responding to time-of-use price signals, it would provide value to the utilities and grid by enabling better load management as the use of solar resources on the grid increases.

EV fleet conversion & charging station network licensing

To support the broader deployment of electric vehicles, Green Banks can support both the vehicle and charging station sides of the market. Both market segments require not only financing, but also innovative mechanisms and structures to spur growth.

On the vehicle side, the Green Bank could initiate ESCO-style fleet conversion for state or municipal vehicle fleets. In this service-based model, rather than owning the electric vehicles, the municipality would pay a fixed fee for the right to use a fleet of electric vehicles and charging stations, and to receive vehicle maintenance service. This is similar to an ESCO model for efficiency financing, where the service provider still owns and pays for the equipment, and the customer pays off that cost over time through what is effectively a financing charge.

With the right kinds of vehicle fleets, this arrangement can create cost-savings for the municipality, as the amount paid for the EV fleet is less than the total cost of owning and maintaining the vehicles directly. This model is most suitable for passenger vehicle fleets (as opposed to trucks and sport-utility vehicles), as well as replacement of older vehicles that might have high maintenance costs. The key parameters that determine the overall cost-effectiveness of this model are the cost of operating the current vehicles as compared to the cost of financing for the EVs. This is where a Green Bank can play a role in expanding the viability of this solution. The Green Bank could not only help administer this kind of program, but could support financing, as well, to lower the cost of capital.

[98] Hugh Wynne, et al, "U.S. Utilities – Has Nevada Created the First U.S. Market for Residential Energy Storage?" Bernstein Research, Feb 1, 2016.

This model has been used in several cities, Indianapolis most notably. Through a third-party provider, Evercar (originally Vision Fleet), the city was able to adopt 425 plug-in vehicles, while lowering operating costs. Also, through innovative software designed to identify operational efficiencies, the city was able to lower its overall vehicle fleet size by 20%.[99] As of 2010, Nevada state government owned 3,600 passenger vehicles.[100]

A separate, but potentially complementary solution is an EV charging network licensing structure, where the state government incentivizes the construction of an efficiently-designed public charging network for the lowest public cost. Research shows that most EV charging is done at the home and work place.[101] But to build market confidence and provide alternative locations, public charging stations must be available. However, incentivizing private investment in charging stations is difficult. There is an uncertain return on investment, because utilization is hard to predict. And regulations on electricity sales may prohibit charging customers for the use of stations.

Governments around the US have chosen to directly pay for charging stations in select locations, fully subsidizing the cost. An alternative solution that a Green Bank could implement would be to conduct a reverse auction to license the right to install and operate a charging station. The private bidder that submitted the lowest cost would receive a low-cost, long-term loan from the Green Bank. The winning bidder's license would give that bidder exclusive access to the financing, and would work in partnership with the Green Bank to identify the optimal station locations. By optimizing the network structure, the fewest number of stations would need to be installed to serve the greatest area of the market. Any other company (non-licensee) would still be allowed to install charging stations, but they wouldn't benefit from the financing. And the winner would be given the rights to operate those stations as they saw fit, collecting revenue from the stations.

This solution would minimize the public expenditure on stations. It would create the vital public charging station networks necessary to enable EV adoption. And it would also minimize the total investment required to build a network because of the optimized locations. The state could auction off a single license for the entire state, or could sell separate licenses for different areas of the state. The state could even choose to have multiple licensees in a given area to enable competition.

Market Development Activities

In addition to providing financing, it is imperative for the State to drive demand for clean energy through greater market development. The Green Bank can naturally fill this role, as it packages its financing with other related services and in partnership with market stakeholders to drive demand. The Green Bank can support market growth and clean energy demand by focusing on three areas:

- Market transparency & reliability
- Demand generation & marketing
- Harmonization and simplification of government loan and grant programs

[99] https://www.myevercar.com/fleet/.

[100] State of Nevada, Department of Administration, Division of Internal Audits, "Audit Report; Vehicle Fleet Management," June 2010. http://iaudits.nv.gov/uploadedFiles/iauditsnvgov/content/About/EBAC/10-07.pdf.

[101] http://www.plugincars.com/ultimate-guide-electric-car-charging-networks-126530.html; http://evobsession.com/electric-car-charging-101-types-of-charging-apps-more/.

Each of these topics areas is explored in greater detail below.

Market Transparency & Reliability

A key element of market efficiency for any market, but especially for clean energy, is transparency and trust. Energy consumers typically are not highly engaged in their purchase decisions, consuming electricity without much consideration of the price, quantity and timing. Building demand for energy efficiency and renewables like solar, requires increasing the understanding of consumers about their purchase process. And because this activity is new for many, access to reliable and clear information is vital. While purchasing a plane ticket is as simple as comparing many prices from many airlines with a single click on a website, today's clean energy markets often require complex navigation and inquiries. Green Banks can help increase transparency and access to data to support market growth.

Contact point for customer inquiries

A Green Bank can serve as a central contact point for customers to ask questions and inquire about clean energy options. Customers can also call a Green Bank to act as a trusted third-party source of guidance about offers they may have received for clean energy adoption. A point that was raised throughout this Study by the legislative committee and in interviews was that customers in Nevada had no reliable place to turn to in order to ask about the quality of the clean energy offers they received. Very often these calls went to the GOE or PUC. The Green Bank could be this designated contact point.

The Green Bank could also be the central repository on basic clean energy facts and government programs to support clean energy. Today, information is scattered across the GOE, PUCN, NV Energy and other resources. This makes it far more complex for market participants to learn about clean energy options from a reliable party and to figure out what support they may be able to receive from the government or other related parties. The Green Bank can be a central repository for this kind of information, and act as the go-to source of verified market data.

Consumer protection

Another point that was raised throughout this Study was the need for more robust consumer protection structures to ensure nobody is adopting clean energy without fully understanding what they are signing up for. Stakeholders interviewed identified the Green Bank as a potential implementation point for a number of possible consumer protection rules. Any consumer protection structures put in place would need to be done so in coordination with its Board of Directors, as well as the PUCN, the GOE, the Bureau of Consumer Protection, and private market participants.

Potential consumer protections a Green Bank could consider are:

- No customer signs a clean energy contract that increases his/her energy costs above the expected amount in any given year;
- All customers are shown a reasonable estimate of expected savings from their project;
- All contract terms such as interest rate on financing and escalators on payments are clearly stated;
- No customer will be allowed to take on excess debt from a clean energy loan, without clear transparency and understanding from the customer; or
- In the case of PACE, no PACE borrower would be allowed to receive a PACE loan such that the combined loan-to-value ratio of the mortgage and PACE lien exceeds 90%.

These are just examples and hypothetical thresholds. Actual consumer protection structures may differ, but a Green Bank could be a reliable institution for implementing these rules, based on a transparent process with stakeholder consultation.

Demand Generation & Marketing

A Green Bank has to be just as focused on demand generation as it is on financing. The Green Bank itself, or its private sector partners, have to engage in marketing and related activities to facilitate demand. Demand for clean energy comes about when a finance product is delivered as part of a coordinated ecosystem of actors and information, and requires the lowest amount of customer hassle possible. And innovative market techniques that raise awareness overall are necessary.

Turnkey product design

Green Bank products have to be designed with the customer in mind, so that little or no burden falls on the customer to manage the project. Making financing available alone will not lead to adoption. For example, a loan for deep efficiency upgrades offered at a max term of 5 years doesn't enable adoption, because it will prevent the project from being cash flow-positive from day one. So the basic parameters of the financing product itself must be tuned to suit the project and customer needs.

And the product must be delivered in a fashion so that project execution and management of rebates and contractors is seamless. For instance, if a customer can access rebates in addition to financing, it is incumbent on the Green Bank or other project actors to secure those rebates. The customer should not be asked to separately apply for financing from the Green Bank and rebates from the utility. Similarly, if a project involves both efficiency and solar, the customer should not be asked to coordinate and manage multiple contractors. These kinds of project complexities create barriers that prevent a customer from going through with a project. A Green Bank needs to think carefully about every step of the customer acquisition and project completion process and coordinate with all partners to make sure saying "yes" is as easy as possible for the customer.

Contractor training on financing products

Contractors and project developers are the primary go-to-market channel for Green Bank products. They are the party directly engaging with the businesses and consumers making decisions about their clean energy consumption. Therefore the Green Bank will need to work closely with contractors, so that they can properly offer and explain the financing product and its benefits to the customer.

The Green Bank should hold training sessions and regular meetings with contractors to walk through the parameters of financing programs, and explain the benefits to their business by offering the Green Bank products to end customers. The full, multi-billion dollar market opportunity ought to be presented to contractors so that they recognize the enormous growth potential of their own businesses, if barriers to adoption are reduced. And the Green Bank should provide talking points so that contractors can explain to customers how financing enables no-money down adoption and immediate savings on energy costs. The better equipped contractors are to explain these benefits to customer, the more demand will be created for Green Bank financing.

Community-based marketing

A great driver of clean energy adoption is seeing one's neighbors and friends also adopting the technology. Peer-to-peer networks are a powerful tool for eliminating perceptions of complexity and cost, and making clean energy adoption feel far more plausible. The Green Bank should employ community-based market

practices, and potentially combine that marketing with aggregated demand structures that lower the cost to everyone in a community.

One example of a targeted marketing program is the Solarize program in Connecticut, which targets the residential solar market. Solarize is based on neighborhood and town-level peer-to-peer marketing. With support from the Green Bank, neighbors put on open houses and barbeques at the homes of community members that typically already have solar installed, so that neighbors can learn about the Solarize program. Then, solar installers on the Green Bank's list of approved contractors can submit bids (in the form dollars per installed watt of solar) to the community, and the community then selects a contractor to serve the community. The Solarize model is successful because people are able to learn about solar in a face-to-face setting from their friends and neighbors, rather than a third-party salesman, and they have the assurance that any contractor working with the program has been vetted by the Green Bank.

Solarize also works with contractors to offer a Groupon-style model of progressively lower pricing tiers in their pricing bids. Contractors agree to set price tiers based on an increasing number of installs. Community members have an incentive to encourage friends and neighbors to sign up to get to a lower tier of pricing. Installers benefit from the Solarize program because they can target neighborhood and towns for installation, lowering the costs associated with sending work crews and acquiring customers. Solarize connects contractors directly to customers that learn about energy upgrades from their neighbors, and are taking advantage of turn-key financing products from the state Green Bank.

Harmonization and simplification of government loan and grant programs

Nevada, like other states, has organically built a system of support for clean energy markets over time. A result of this organic development is that clean energy programs can end up scattered across multiple agencies and administrators, creating a complex landscape for customers and contractors to navigate. Green Banks do not need to centrally administer all state programs, but can provide a seamless turnkey experience to the customer, even if programs are located at different agencies. Indeed, coordination across agencies with relevant expertise is optimal. Green Banks can facilitate customer-facing simplicity.

Single website and brand across programs

An easy way address customer confusion is with a website and brand that unifies Nevada's clean energy programs. A single online portal to draw in customers and inform them about financing, rebates, and other tools available, no matter the administrator, will significantly increase market efficiency. Presently, there is no central website for customers to access information about their specific energy needs.

A typical customer does not know that they should be looking for a rebate and therefore should go to the website of NV Energy. More likely, that customer wants to learn about ways to lower energy costs. Structuring information around customer segment (residential, commercial, multifamily, etc.) and audience (customer or contractor) will allow users to quickly drill down to the specific opportunities pertinent to their specific needs. And depending on the option a customer is interested in pursuing, the website could direct the user to the appropriate website of the relevant administrator. From the customer perspective, the ecosystem of programs is unified, though they remain separate behind the scenes.

This effort would also benefit from a unified branding strategy to cover all of Nevada's clean energy efforts. A singular state-determined brand will create a more comprehensive language for all state programs and greatly reduce customer confusion. A state-wide brand across all programs would also demonstrate a renewed effort by the state to focus on clean energy market growth.

Program coordination across entities

Along with the creation of a unified website, a Green Bank could help coordinate the actual program execution across multiple entities where applicable. For example, a Green Bank can reach out to program administrators at utilities to align program designs to ensure that financing products work in concert with rebates. If only certain models of an efficient technology are eligible for a rebate, then the installations financed by the Green Bank should only use those models eligible for rebates. And the Green Bank can work with GOE, GOED and other NGOs participating in this market to maximize the effectiveness of all programs, ensuring efficient use of public dollars. The collective objective of these programs should be to maximize clean energy deployment with the lowest public expenditure that can be achieved. As such, a Green Bank can coordinate with other parties to ensure public dollars are used as efficiently as possible.

Green Bank Impact

A Nevada Green Bank can spark hundreds of millions of dollars of investment and create thousands of jobs for Nevada. The precise impact will depend on the level of Green Bank capitalization, and the types of projects/products the Green Bank supports. But past experience from other Green Banks is informative. The Connecticut Green Bank, in five years of activity, has approximately $120 million on its balance sheet and has driven nearly $1 billion of investment in the state's clean energy economy. Connecticut and Nevada's population are similar in size, meaning a similar impact can be expected in Nevada if equal funding were put into the Green Bank. This would go a long way to penetrating the conservatively-estimated $3.5 billion distributed energy potential the Green Bank could target.

To illustrate, consider a Nevada Green Bank hypothetically capitalized with $50 million. It could allocate those fund to three initial products. $10 million could be put into a loan loss reserve to drive residential whole home loans. This could leverage 10:1 based on the experience of Connecticut, and animate $100 million in private capital. $20 million could be used to seed a warehouse with an equal private investor to kick-start commercial PACE. And another $20 million could be used to support the LMI sector with a targeted whole-home solution. Based on experience in other states, this could leverage 5:1 to create a total of $100 million in lending capacity. Under this hypothetical portfolio, $50 million in Green Bank capital would create $240 million of total lending capacity for underserved and untapped markets.

Similarly, the Connecticut Green Bank created over 10,000 jobs. Similar results in Nevada would mean a 50% increase in the clean energy labor force over levels reported in 2014.[102] Other studies have previously identified the clean energy economic and job opportunity available to Nevada. The Brookings Institution identified clean energy as one its recommended target industries. Brookings specifically cited the potential to export power based on the immense solar resource, and the economic gains to be made from efficiency investment. The report states, "Energy efficiency retrofits, especially of the state's commercial building sector, would not only create jobs but also slow the growth of electricity demand in the state."[103] The report also found that in just five years, Nevada could create up to 5,500 clean jobs with implementation of their specific recommendations.[104] And a recent study from the American Jobs Project estimates that the state can create 28,000 jobs through focused investment in the clean energy sector.[105]

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[102] GOED – Nevada's Clean Energy Sector, http://www.diversifynevada.com/documents/clean-energy.pdf

[103] The Brookings Institution Metropolitan Policy Program, "Unify; Regionalize; Diversify; An Economic Development Agenda for Nevada," 2001, at 46.

[104] Ibid, at 152.

[105] American Jobs Project, "Nevada Jobs Project: A Guide to Creating Advanced Energy Jobs," March 2016, at 8.

Conclusion

This Study finds that Nevada can reaffirm its commitment to clean energy and realize tremendous economic gain and energy cost savings through the implementation of a Green Bank. Nevada has immense natural resources to produce and export renewable energy, and has a built environment badly in need of energy efficiency upgrades. Residents and businesses can lower their energy costs by adopting clean and cheap energy solutions through a Green Bank. A Green Bank would drive private sector activity, drawing in new investors, creating greater comfort among local lenders and sparking the creation of new businesses to serve the sector.

The barriers to market growth, gaps in clean energy financing and market inefficiency created by lack of information point to the need for a comprehensive policy solution. The state should take a holistic view of clean energy markets and address both capital supply and project demand by creating turn-key solutions attractive for all transaction parties. A Green Bank can play this coordinating role, ensuring that lenders, contractors, customers and utilities are all pulling in the same direction to align economics and incentives. Without this kind of coordination, the upfront cost and project complexity create insurmountable barriers for customers and clean energy growth will be slow.

To realize the $3.5 billion distributed energy market potential, the Green Bank should use a portfolio of finance and market development solutions to serve different segments of the market. There is no one solution that can meet the needs of all market segments. But there are tried and true methods that can be borrowed from other Green Banks and tailored to suit the unique conditions in Nevada. Each financing product should be designed in conjunction with its market delivery strategy, so that capital is delivered in a way and through a path that makes it most easily usable by all relevant parties. And the Green Bank can serve as a central hub for information sharing and market education, while also ensuring consumers are protected and knowledgeable about their clean energy choices.

A Green Bank represents an opportunity for the state to once again jump to the forefront and become a national leader in innovative clean energy policy solutions. It is a cost-effective way to deploy clean energy with limited public dollars, and attract private market participants to take the lead in market growth. Through increased investment and coordinated market development, a Green Bank can help Nevada realize its full clean energy economic potential.