

# VIRGINIA CLEAN ENERGY ADVISORY BOARD

## MEETING AGENDA

October 20, 2021 (Wednesday)

10:30 am – 12:00 pm

Fairfield Public Library, HENRICO COUNTY, Virginia

1401 N Laburnum Ave, Richmond, VA 23223

**\*\*Meeting will be held in-person and open to the Public \*\***

*Virtual accommodations have also been arranged through Webex. See Page 2 for Details.*

Times	Topics	Speakers/Presenters
10:30 – 10:32 am	Call to Order and Roll Call	Hannah Coman, Chair
10:32 – 10:35 am	Board Member Introductions, Virginia Energy and Office of Attorney General Staff Introductions and New Member Welcome	Board, Virginia Energy and OAG Staff
10:35 – 10:40 am	Review Previous Meeting Minutes <i>July 21, 2021 Board Meeting</i>	Hannah Coman, Chair Carrie Hearne, Staff
10:40 – 10:45 am	Electronic Meetings Policy <i>Update per recent legislative changes</i>	Hannah Coman, Chair Grant Kronenberg, OAG
10:45 – 10:55 am	Virginia Energy – Virginia LMI Solar Pilot Program <i>Update on Location Analysis and RFP Progress</i>	Carrie Hearne, Virginia Energy
10:55 – 11:10 am	Board Committee Updates	Committee Chairs
11:10 – 11:15 am	Shared Solar Update	Board and Staff
11:15 – 11:20 am	2021 Year-end Board Schedule and Investor-Owned Utility (IOU) Consultations	Hannah Coman, Chair Carrie Hearne, Staff
11:20 – 11:30 am	2022 Legislative Agenda and Update on Green Bank Market Assessment	Carrie Hearne and Bettina Bergoo, Virginia Energy
11:30 – 11:45 am	Public Comment	Members of the Public
11:45 – 11:55 pm	Discussion and Next Steps: <i>Action Plan and Committee Meetings</i>	Board and Staff
12:00 pm	Meeting Adjourn	Hannah Coman, Chair

**Code of Virginia Title 45.2. Mines and Mining**  
**Chapter 19. Clean Energy Advisory Board § 45.2-1913.**

*The Clean Energy Advisory Board (the Board) is established as an advisory board in the executive branch of state government. The purpose of the Board is to establish a pilot program for disbursing loans or rebates for the installation of solar energy infrastructure in low-income and moderate-income households.*

More information can be found at the Virginia Department of Energy:  
<https://www.energy.virginia.gov/renewable-energy/CEAB.shtml>

**Clean Energy Advisory Board – Virtual Guest Participation Accommodations through Webex**

**For guest participation:**

<https://covaconf.webex.com/covaconf/j.php?MTID=m128bbdcafd98f2665b1e44dca0792e58>

Wednesday, Oct 20, 2021 10:30 am | 1 hour 30 minutes | (UTC-04:00) Eastern Time (US & Canada)

Meeting number: 2434 344 5221

Password: VAenergy1

Join by video system

Dial [24343445221@covaconf.webex.com](mailto:24343445221@covaconf.webex.com)

You can also dial 173.243.2.68 and enter your meeting number.

Join by phone

+1-517-466-2023 US Toll

+1-866-692-4530 US Toll Free

Access code: 243 434 45221

**CLEAN ENERGY ADVISORY BOARD**  
**DRAFT MEETING MINUTES**

**July 21st, 2021 (Wednesday)**  
**11:00AM – 1:00PM**

**\*\*Meeting was open to the Public \*\***

Meeting Recording Found [here](#)  
CEAB website hosted at [DMME.Virginia.gov](http://DMME.Virginia.gov),  
(As of Oct 1, 2021, [energy.virginia.gov](http://energy.virginia.gov))

Chair Hannah Coman called meeting to order at 11:05AM

Roll Call:

KC Bleile – present, Sam Towell – present, Janaka Casper – present (electronic; due to personal matter of travel constraints and health concerns relating to COVID-19), Bill Greenleaf – (joined after roll call), Hannah Coman – present, Will Reisinger – present, Susan Kruse – present, Toni Ostrowski – present, Katharine Bond – absent, Will Cleveland – present, Taylor Brown – present, Sam Brumberg – present, Kirk Johnson – present, John Warren – present.

Quorum was met with the above present

DMME Staff present: Carrie Hearne, Bettina Bergoo, Jordan Burns, Erik Olson, Larry Corkey, Al Christopher  
Office of Attorney General: Grant Kronenberg

The meeting was held in person with a hybrid system via WebEx.

John Warren moved to approve electronic participation of board member Janaka Casper after having notified the Chair of his inability to participate physically due to a personal matter, relating to travel constraints and health concerns relating to COVID-19. Seconded by Susan Kruse. A voice vote was conducted with all board members voting in the affirmative.

Meeting minutes from previous meeting (March 24th , 2021) were reviewed.  
Corrections were submitted

- Correcting spelling of names
- COVID instead of Covid

Motion to approve meeting minutes as edited above was made by John Warren, seconded by Susan Kruse. A vote was conducted with the majority of votes in the affirmative.  
Will Cleveland abstains. The motion carried; minutes approved.

**Clean Energy States Alliance Presentation by Nate Hausman and Wafa May Elamin**

Presentation attached (links on [energy.virginia.gov](http://energy.virginia.gov) forthcoming due to website change)  
CESA research report attached

Presentation team included Nate Hausman, Project Director, CESA  
Wafa May Elamin, Project Manager, CESA

Recording of presentation can be found [here](#)

Key takeaways from CESA and NC analysis (Presentation from Nate Hausman):

1. Initial negative cashflow from taking out a loan to finance a solar system on top of Virginia's relatively low costs of electricity makes it difficult to pencil out residential solar projects for LMI households.
2. A 25-year lease offers preferable financing terms for LMI homeowners in Virginia.
3. Solar property tax exemption has a substantial impact on the amount of subsidy needed to achieve cash-flow positive solar installations for Virginians.
4. Based on NCCETC's analysis, CESA estimates that about \$6,500 in public subsidy per solar project will be necessary to ensure participating LMI households benefit beginning day one from their rooftop solar installation.
5. Assuming an initial pilot program financing budget of \$200,000 and approximately \$6,500 in direct public subsidy per project, about 30 solar installations could be completed under the pilot.

Recommendations for Pilot Program from CESA (outlined in Power Point Presentation by Nate Hausman):

1. Focus on LMI single family homes already qualified for or having gone through WAP within past 5 years.
2. Competitively select solar companies and provide outreach assistance to reach underserved markets.
3. Use focused community based marketing campaigns for 2-3 Virginia communities.
4. Guarantee that solar projects are structured with cashflow positive contracts for participating households.
5. Demonstrate prior reduced energy consumption: Rely on Weatherization Assistance Program audits and final work scopes with a Savings to Investment Ratio (SIR) of greater than 1.0 for energy efficiency measures to serve as a proxy for the 12% reduction in energy consumption requirement.
6. Local installer requirement: Allow solar providers who contract with local installers to satisfy this statutory requirement.
7. Incentive Payment: A lump-sum incentive payment should be factored into the system cost so it reduces LMI customers' monthly loan, solar lease, or solar power purchase agreement payments.
8. Incentive Cap: Interpret this to be a cap on the incentive amount, not on the allowable system size under the pilot program.
9. Income Threshold: Focus the pilot on LMI homeowners who have already qualified for WAP or LIHEAP (at 60% SMI in Virginia) to streamline eligibility verification.
10. Pilot Locations: Allow pilot participation by any Virginia resident but focus marketing campaigns in selected jurisdictions.

Next Steps from CESA:

1. CEAB to approve core program design recommendations and have CESA work with DMME to continue developing a draft RFP.

2. Work with CEAB Stakeholder Engagement and Marketing subcommittee to perform outreach to organizations in the pilot areas to get input on program design.
3. Develop timeline for pilot development.
4. Draft RFP/RFI solicitation for solar providers.

**Questions/Comments from Board:**

- Question regarding how the pilot projects would be split among the three communities, importance and benefit of getting the balance correct.
- Question regarding if the analysis considered homeownership rates in the localities and within LMI households.
- Hannah Coman comments that the pilot program is eligible to all qualifying households across the state, just the pilot marketing outreach will be focused on three communities.
- Questions regarding whether the subsidies would be first come first served and how the analysis arrived at the \$6,500 number. Discussion from CESA on how they arrived at the number.
- Question regarding if the lessor should be able to monetize the federal Investment Tax Credit (ITC).
- Question regarding if roofs for eligible customers would be able to handle 25 year lease and if analysis team looked at the data. Extensive discussion on various sources of public funding, program coordination, and revolving funding. Clarified that RGI funding is not a source for this program.
- Questions on timeline and nature of the pilot program and how funding supports.
- Questions on legality of solar leasing. Several board members stated that solar leases are legal in Virginia, but currently no companies are offering solar leases in Virginia. Follow up if clarity on that point of law from the SCC is necessary for the RFP. Discussion on next steps included a company or RFP manager requesting an opinion/declaratory letter from the AG's office.
- Discussion on SIR requirement of 12% and if that target can be easily met. Getting effective data is a challenge and can create a burden. May need to pursue changes but can work on parallel tracks in the meantime.
- Discussion on staying within time limits and decision to put a pin in these discussions until a later time. DMME and CESA can work and incorporate some of these questions/concerns/suggestions as they work. Draft RFP will give a more concrete way to give feedback at a later time.

**MOTION:**

John Warren moved to propose that CESA works with DMME to continue developing a draft RFP.

Second by Susan Kruse. A voice vote was conducted with all board members present voting in the affirmative. Motion is unanimously approved.

**Policy Discussion:**

Carrie Hearne recognized that several areas of Virginia Code could create challenges with rolling out program. Asks for input from board members and public related to amending Code while preserving spirit of laws. Recognizes Larry Corkey and his work in this area.

**Public Comment:**

Will Geise, SEIA. New Southeast Regional Director from Solar Energy Industries Association. Will be participating in these meetings. Happy to be a part of it.

Lauren Gonzales, Clean Virginia. Including homes that rent would be useful to study.

Kate Debrant. Asked what whether 22 or 26 percent was assumed for the ITC in modeling.

Fatimeh (full name not captured), supported Laura's point.

Al Christopher, DMME. Stated that his comment was addressed in discussion.

Kate Debrant. Not clear if DMME will seek funding in 2022.

Beth Galante, PosiGen. Pleasure hearing presentations. Introduces PosiGen which is a low income solar lease provider with activities around the country. Expresses that PosiGen would be happy to compete for the RFP when developed.

**Announcements and Committee Updates:**

New members have been appointed to the CEAB. Describes current subcommittees (Program Design and Stakeholder Engagement and Marketing). A new subcommittee focused on policy and regulatory affairs is suggested. Membership of various subcommittees is discussed and board members proposed moves. New members assigned to committees.

Will Cleveland moves to create new Policy and Regulatory subcommittee and make Sam Brumberg chair. Will Reisinger seconds. Motion passes with all board members present voting in the affirmative. Unanimously approved.

Hannah Coman moves to approve membership as previously stated. Sam Brumberg seconds. Motion passes with all board members present voting in the affirmative. Unanimously approved.

VCEA requires the Investor-Owned Utilities (IOUs) to consult with the Clean Energy Advisory Board about solar programs that would reduce bills of low-income customers. This consultation happened with Dominion in the Fall of 2020. Haven't yet had this with APCo and ODP but they have submitted paper consultation statements. Hoping to invite them in-person soon.

CESA and DMME will continue to work on Pilot program structure.

DMME is changing name to Virginia Department of Energy (Virginia Energy) to reflect new changes in focus of agency.

Brief discussion on future schedule.

1:00PM meeting adjourned.

All presenters and members of the public were thanked for the informative discussion.

DRAFT

**Policy on Individual Participation in Clean Energy Advisory Board Meetings  
by Electronic Means Pursuant to § 2.2-3708.2**

It is the policy of the Clean Energy Advisory Board (“Board”) that individual members of the Board may participate in meetings of the Board by electronic means as permitted by Code of Virginia § 2.2-3708.2 [copy of Code section attached]. This policy shall apply to the entire membership of the Board and without regard to the identity of the member requesting remote participation or the matters that will be considered or voted on at the meeting.

If an individual member of the Board wishes to participate through electronic communication means due to being unable to attend the meeting in-person as the result of a temporary or permanent disability or other medical condition preventing the member’s physical attendance or a family member’s medical condition that requires the Board member to provide care for such family member thereby preventing the Board member’s physical attendance, or due to a personal matter, the Board member shall notify the chair of the Board of the Board member’s request to attend by electronic communication means. If the Board member’s absence is due to a personal matter, the Board member shall identify with specificity the nature of the personal matter.

Whenever an individual member wishes to participate from a remote location, the law requires a quorum of the Board to be physically assembled at the primary or central meeting location, and arrangements must be made for the voice of the remote participant to be heard by all persons at the primary or central meeting location.

The reason that the member is unable to attend the meeting and the remote location from which the member participates will be recorded in the meeting minutes. When such individual participation is due to a personal matter, such participation is limited by law to two meetings each calendar year or 25 percent of the meetings held per calendar year rounded up to the next whole number, whichever is greater.

Individual participation from a remote location shall be approved unless such participation would violate this policy or the provisions of the Virginia Freedom of Information Act. If a member's participation from a remote location is challenged, then the Board shall vote on whether to allow such participation. If the Board votes to disapprove of the member's participation because such participation would violate this policy, such disapproval shall be recorded in the minutes with specificity.

This policy applies to all committees of the Board.



**Policy on Meetings of the Clean Energy Advisory Board Pursuant to Enactment 17 of Chapter 1 of the 2021 Special Session II Acts of Assembly**

As an executive advisory board, it is the policy of the Clean Energy Advisory Board (“Board”) that the Board may conduct a meeting by electronic communication means without a quorum of the Board physically assembled at one location if the meeting is being held solely to receive presentations, updates, public comment, or conduct other forms of information gathering. In the event of such a meeting of the Board without a quorum being physically assembled, the Board shall not take any votes or make any formal recommendations at the meeting.

The voice of those participating remotely must be able to be heard by those at the primary meeting location, if any such location exists.

This policy is adopted pursuant to Enactment 17 of Chapter 1 of the 2021 Special Session II Acts of Assembly.

This policy applies to all committees of the Board and supersedes any similar policy adopted by a committee of the Board.

# Developing a Solar Pilot Program for Low-and Moderate-Income Households in Virginia

Virginia Clean Energy Advisory Board Meeting

*July 21, 2021*

# Presenter Team



**Wafa May Elamin**  
Project Manager  
Clean Energy States Alliance



**Nate Hausman**  
Project Director  
Clean Energy States Alliance



# CleanEnergy States Alliance



GOVERNOR'S  
Energy Office



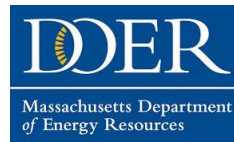
Maryland  
Energy  
Administration



NYSERDA



Department of Commerce  
Innovation is in our nature.



# Presentation Overview

- **CESA's Workplan and Summary of Findings**
- **Pilot Program Design Recommendations**
  1. Pilot Structure
  2. System Ownership
  3. Demonstrating Reduced Energy Consumption
  4. Local Installer Requirement
  5. Incentive Payment
  6. Incentive Cap
  7. Income Threshold
  8. Pilot Location
  9. Locational Variables and Potential Pilot Jurisdictions
- **Next Steps**
- **Recommendations Recap**
- **Q&A**

# CESA Work Plan

- CESA was awarded an anonymous grant to assist DMME and the CEAB in the development of a solar pilot for low- and moderate- income (LMI) households in Virginia over the course of one year.
- Our overall aim is to launch a successful pilot program that can be scaled and that will help demonstrate the case for long-term program investment and expansion.
- In March, CESA presented background market research to the CEAB. After receiving feedback from the CEAB and DMME staff, we expanded our pilot program selection variables and re-examined potential jurisdictions for a pilot. In conjunction with DMME, we conducted informational interviews with solar providers that offer residential solar leases in other state markets.
- We will present our pilot design recommendations today. With the CEAB's approval, we plan to develop these recommendations into a draft program solicitation.



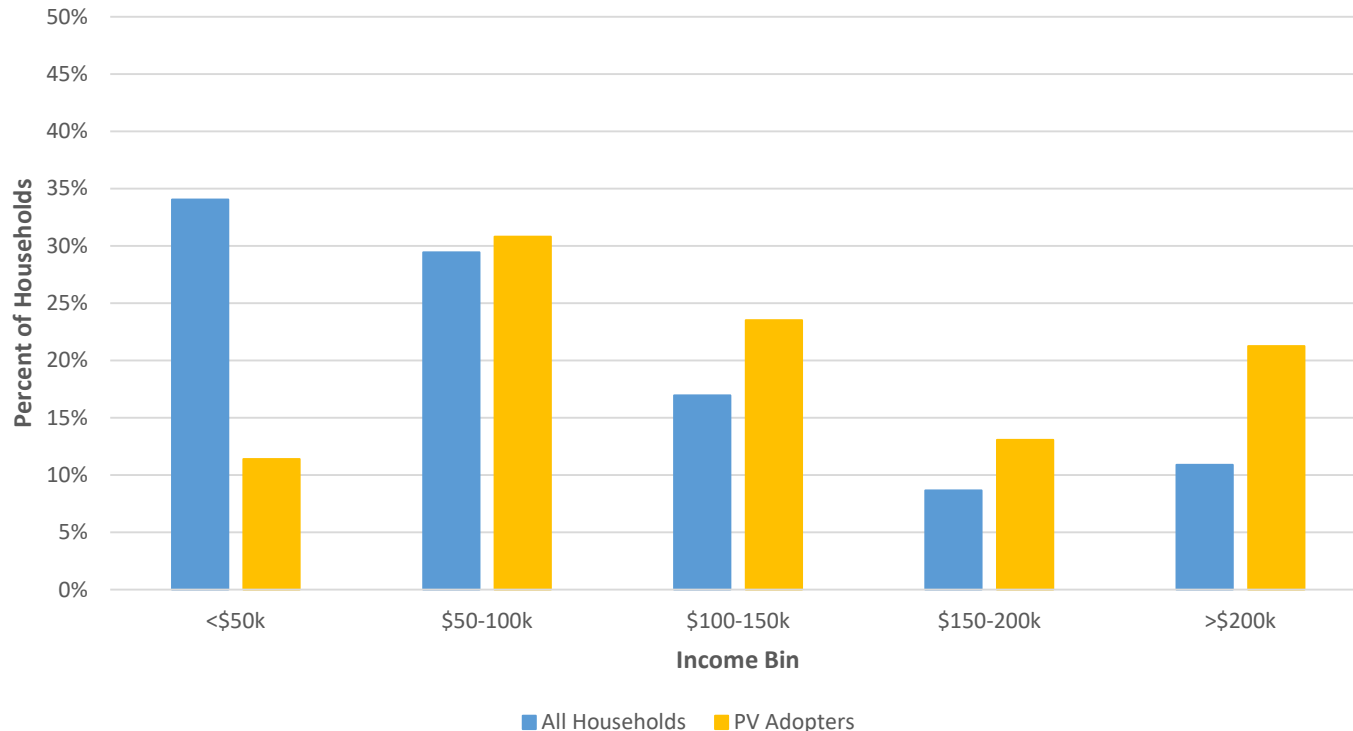
# Summary of Findings

- Virginia's Low-to-Moderate Income Solar Loan and Rebate Fund is currently capitalized with \$200,000 in re-purposed federal American Recovery and Reinvestment Act (ARRA) funds.
  - No other funding for the program has been secured to date.
- Market economics in Virginia make it difficult for residential solar projects for LMI households to pencil out.
- A 25-year lease offers preferable financing terms for LMI homeowners in Virginia.
- Solar property tax exemption has an impact on the amount of subsidy needed to achieve cashflow positive solar transactions for Virginians.
- Our estimates show that about \$6,500 in public subsidy per solar project will be necessary to ensure participating LMI households benefit from their solar transactions.
- 30 solar installations could be completed under the pilot assuming an initial pilot program financing budget of \$200,000 and approximately \$6,500 in direct public subsidy per project.

# Income Distribution of PV Adopters: Virginia

Based on all PV systems installed from 2010 to 2019

## Income Distribution by Census Income Groups



## Specific Income Groups of Interest

Income Group*	Percent of PV Adopters
<60% of AMI	10%
60-80% of AMI	8%
80-100% of AMI	11%
100-120% of AMI	11%
≥120% of AMI	60%

### General note on PV-adopter incomes:

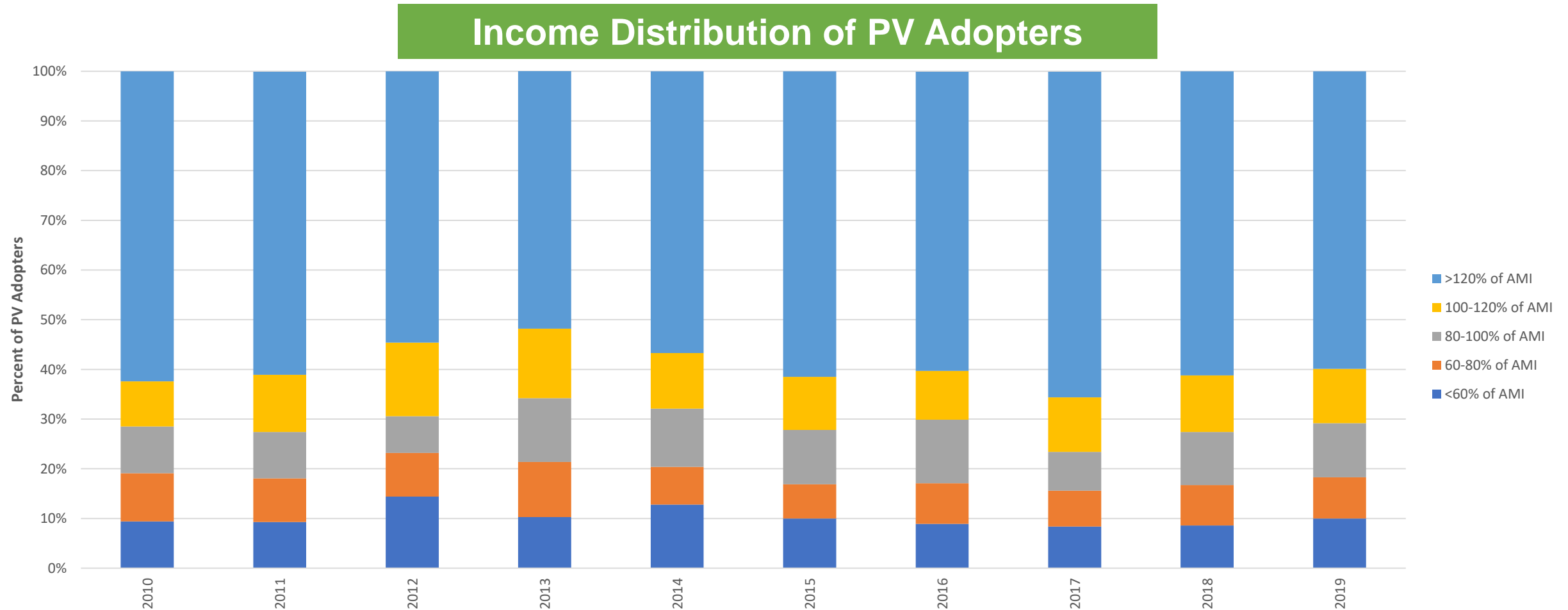
*These values are estimates developed by Experian, based on a statistical model trained to household-level survey data. As such, they entail some level of uncertainty.*

**Notes:** The income distribution for PV adopters is based on Experian estimated incomes for systems in Berkeley Lab's dataset, while the income distribution for all households is directly from the U.S. Census.



# PV Adopter Income Trends over Time: Virginia

According to year of installation (2010-2019)



**Notes:** The time period shown in the figure is based on the set of years for which we have sufficient data. Income levels for PV adopters in each year are based on the estimated current income of those households, not the income at the time of installation.

# Recommended Pilot Structure

- The pilot focuses on LMI single-family homeowners who have previously participated in weatherization services.
- DMME competitively selects solar companies and provides support and outreach assistance for them to reach underserved markets.
- The pilot uses focused, inclusive, and community-based marketing campaigns to reach 2-3 selected underserved communities.
- The program guarantees that solar projects are structured with contracts that are cashflow positive for LMI participants and have no hidden fees.
- The program provides direct oversight controls over participating solar companies.



# Other Pilot Program Design Considerations

# System Ownership

- A third-party system ownership model can stretch pilot program dollars further, but how residential solar leases and PPAs are regulated in Virginia is somewhat uncertain.
- We are not aware of any solar companies that are currently residential solar lease products in Virginia.

***Recommendation: Draft the solicitation with open-ended financing terms.***

# Comparing Residential Solar Financing Models

	Solar Leases	Residential Solar PPAs	Solar Loans/Direct Purchase
<b>Who buys the system?</b>	Third-party developer.	Third-party developer.	Homeowner.
<b>Who owns the system?</b>	Third-party developer.	Third-party developer.	Homeowner.
<b>Who takes advantage of most of the federal and state solar incentives?</b>	Third-party developer.	Third-party developer.	Homeowner.
<b>Who is responsible for operations and maintenance of the solar system?</b>	Usually the third-party developer.	Third-party developer.	Homeowner, though some state incentive programs require installers to provide a workmanship warranty for a set period.
<b>Who incurs the risk of damage?</b>	Third-party developer.	Third-party developer.	Homeowner.
<b>What happens if the homeowner sells the home where the solar system is located?</b>	Depends on the contract, but most leases allow the new buyers to take over the lease at contract terms.	Depends on the contract, but most PPAs allow the new buyers to take over the PPA at contract terms.	If the homeowner finances the system through a loan, the homeowner remains responsible for loan payments after the transfer unless negotiated with the buyer.
<b>Are financing payments fixed?</b>	Yes, payments are pre-set but may include an annual escalator, increasing payments each year.	No. Payments to the third-party owner are on a per kilowatt-hour basis based on electricity generated by the solar array. Per kilowatt-hour payments may include an annual escalator.	If the homeowner finances the system through a loan, the loan payments will be fixed. If the homeowner decides to purchase a system outright, a contractor may sometimes offer several payment installments instead of one lump sum.
<b>What contract duration terms are available?</b>	Terms can vary.	Terms can vary, but often in the range of about 20 years.	If the homeowner finances the system through a loan, the loan terms can vary.
<b>Does this type of financing arrangement require a down payment?</b>	Not necessarily; down payment requirements vary.	Not necessarily; down payment requirements vary.	If the homeowner finances the system through a loan, down payment requirements can vary.
<b>Is this type of financing arrangement widely available?</b>	No. Solar leasing is only available in some states. Some states regulate the sale of electricity in ways that effectively preclude solar leases.	No. PPAs are only available in some states. Some states regulate the sale of electricity in ways that effectively preclude residential solar PPAs.	Yes. Solar and energy improvement loans are increasingly available. A homeowner can always directly cash-purchase a solar system.
<b>Do contracts provide minimum production guarantees?</b>	Yes, usually. Solar lease providers commonly provide minimum production guarantees.	Yes, usually. PPA providers commonly provide minimum production guarantees.	A loan contract does not include production guarantees. A solar panel manufacturer or developer/installer may provide a production guarantee.
<b>Are there escalator clauses in the contract?</b>	Sometimes. Check the specific terms.	Sometimes. Check the specific terms.	If the homeowner finances the system through a loan, interest rates may increase over time depending upon the loan terms.
<b>Is insurance coverage provided?</b>	Yes.	Yes.	No. Homeowners who directly own their solar system and want to be covered will need to find coverage either through a homeowner's existing insurance policy or through the purchase of a new or expanded policy. Homeowners may decide to forgo insurance coverage altogether and bear the risks.

# Demonstrating Prior Reduced Energy Consumption

- § 45.1-399(B)(iii): “Each application shall include...evidence of the completion of a home performance audit, conducted by a qualified local weatherization service provider, before and after installation of energy efficiency services...to demonstrate that such energy efficiency services were completed and resulted in a reduction in consumption of at least 12 percent...”
- This provision presents some ambiguity about how such a “reduction in consumption” might be demonstrated (e.g., electric, thermal, or both) and could present challenges for pilot eligibility.

***Recommendation: Rely on Weatherization Assistance Program audits and final work scopes with a Savings to Investment Ratio (SIR) of greater than 1.0 for energy efficiency measures to serve as a proxy for the 12% reduction in energy consumption requirement.***

# Local Installer Requirement

- § 45.1-399(E)(iv): “All of the work of installing the energy system shall be completed by a licensed contractor that...has installed a minimum of 150 net-metered residential solar systems in Virginia.”

***Recommendation: Allow solar providers who contract with local installers to satisfy this statutory requirement.***

# Incentive Payment

- § 45.1-399(G): “...The Director shall disburse from the Low-to-Moderate Income Solar Loan and Rebate Fund ... the loan or rebate for each approved claim within 60 days of its receipt of the claim and according to the order in which its respective application was approved.”
- This provision points toward an LMI incentive issued as a lump-sum payment, not ongoing payments over the lifetime of a lease, loan, or solar power purchase agreement.

***Recommendation: A lump-sum incentive payment should be factored into the system cost so it reduces LMI customers’ monthly loan, solar lease, or solar power purchase agreement payments.***



# Incentive Cap

- § 45.1-399(G): “Any rebate or grant shall be in the amount of no more than \$2 per DC watt for up to six kilowatts of solar capacity installed.”

***Recommendation: Interpret this to be a cap on the incentive amount, not on the allowable system size under the pilot program.***

# Income Threshold

- § 45.1-399(A): “The Program shall be open to any Virginia resident whose household income is *at or below 80 percent of the state median income or regional median income, whichever is greater.*”
- Virginia’s Weatherization Assistance Program (WAP) income guidelines follow the state Low-Income Heating Assistance Program (LIHEAP) limit of 60% state median income (SMI) or below for households of seven or less. Independently verifying LMI solar pilot program eligibility at a different threshold than is used by other social service programs in Virginia could be administratively burdensome.

***Recommendation: Focus the pilot on LMI homeowners who have already qualified for WAP or LIHEAP (at 60% SMI in Virginia) to streamline eligibility verification.***

# Pilot Locations

- § 45.1-399(A): “The Program shall be open to *any Virginia resident* whose household income is at or below 80 percent of the state median income or regional median income, whichever is greater.”
- Limiting the pilot to particular jurisdictions within Virginia might run afoul of the statutory provision to make the program open to any Virginia resident.

***Recommendation: Allow pilot participation by any Virginia resident but focus marketing campaigns in selected jurisdictions.***

# Locational Variables

Variables assessed for pilot program development include:

- Cities and counties
- Utility Service territory
- Solar Property Tax Exemption Status
- Energy burden and costs
- Population and demographics
- Income information (median income, area median income, state median income)

Feedback from the March CEAB meeting informed the expansion of variables

# Electric Service Territories

## Electric Utilities

### Investor Owned Utilities

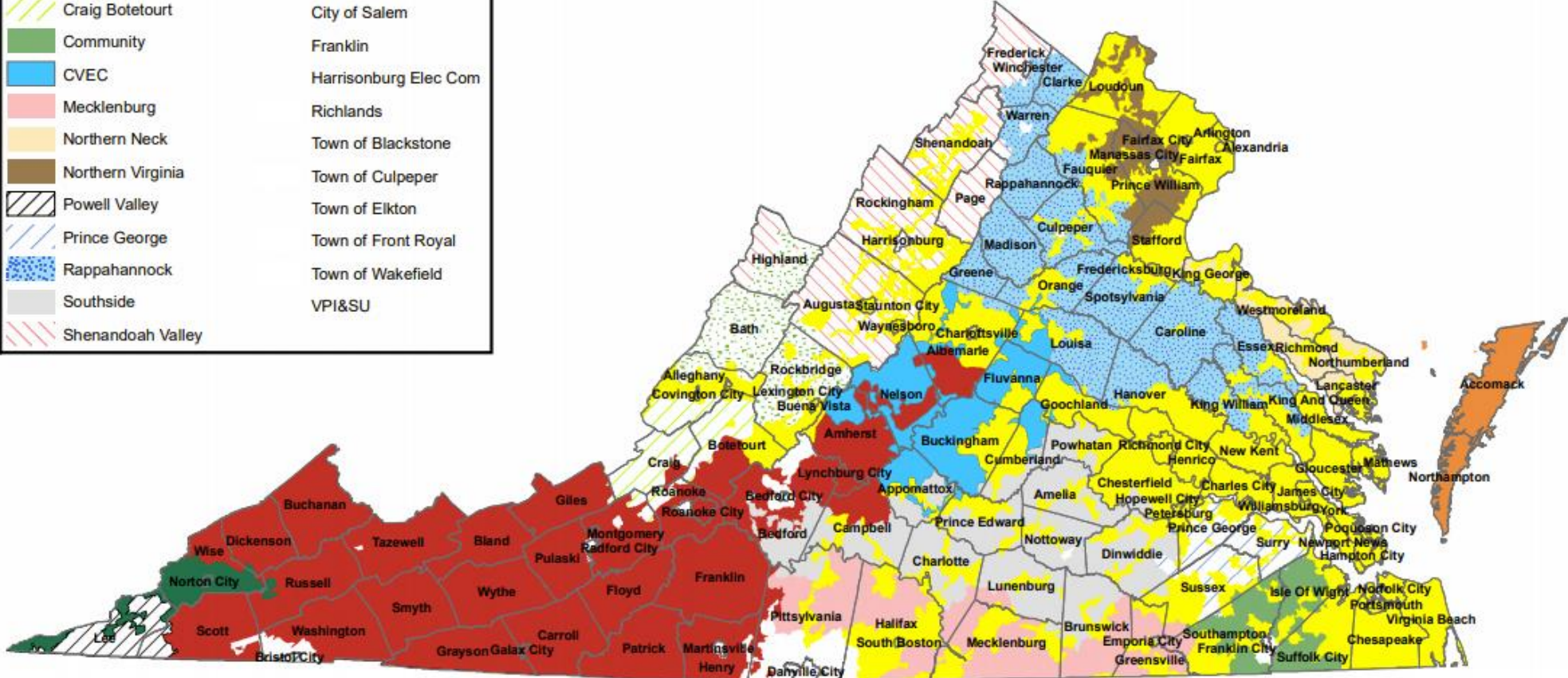
- APCo
- Kentucky Utilities
- Dominion Energy Virginia

### Electric Cooperatives

- A&N
- BARC
- Craig Botetourt
- Community
- CVEC
- Mecklenburg
- Northern Neck
- Northern Virginia
- Powell Valley
- Prince George
- Rappahannock
- Southside
- Shenandoah Valley

### Non-Jurisdictional Utilities

- Bristol Power Board
- City of Bedford
- City of Danville
- City of Manassas
- City of Martinsville
- City of Radford
- City of Salem
- Franklin
- Harrisonburg Elec Com
- Richlands
- Town of Blackstone
- Town of Culpeper
- Town of Elkton
- Town of Front Royal
- Town of Wakefield
- VPI&SU



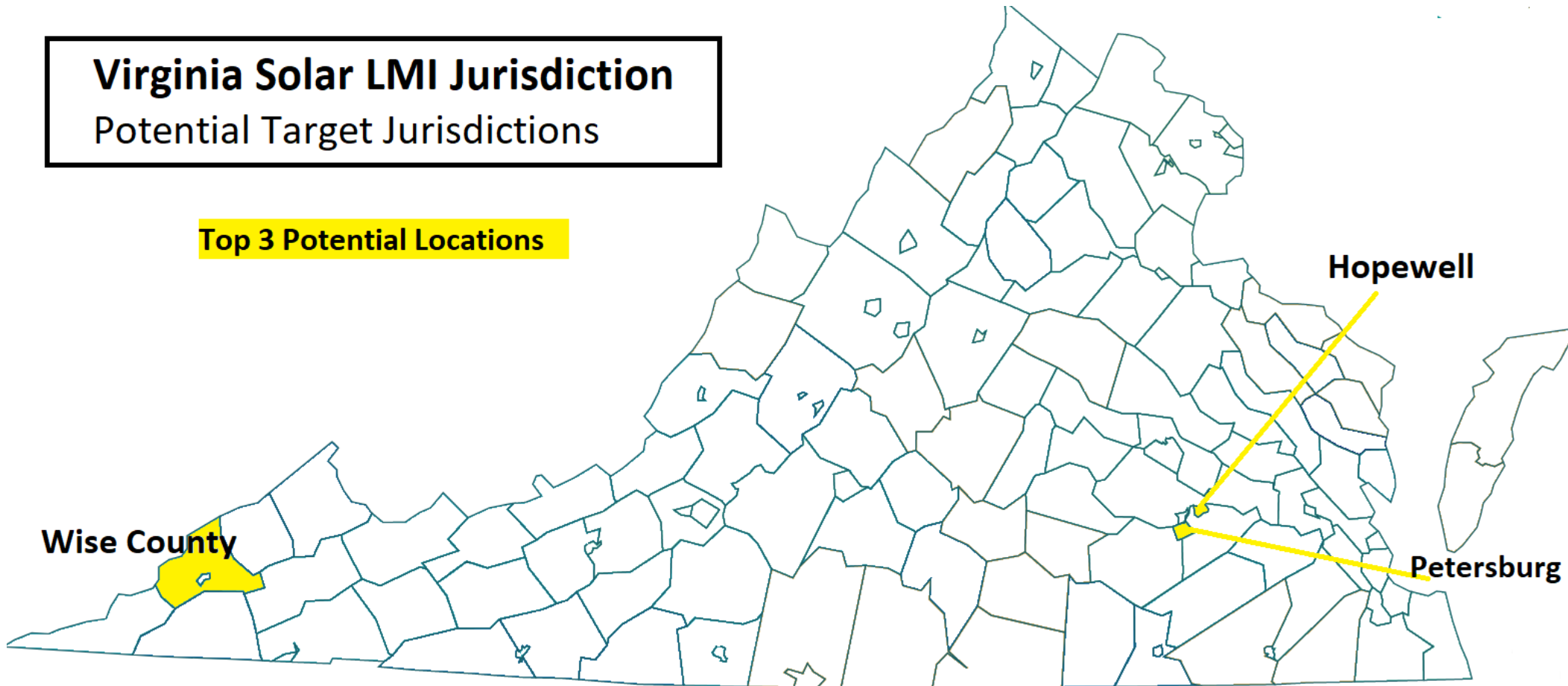


# Potential Pilot Locations: Top 3

## Virginia Solar LMI Jurisdiction Potential Target Jurisdictions

### Top 3 Potential Locations

- Hopewell
- Petersburg
- Wise County



# Potential Pilot Locations: Top 3

	Hopewell	Petersburg	Wise County
Income (2019)	Median Annual : \$41,600	Median Annual : \$39,843	Median Annual : \$38,880
	46.5% of AMI, 56.1% SMI	44.6% of AMI, 53.7% of SMI	77.3% of AMI, 52.4% SMI
% Population of Color (2019)	54%	85%	7.5%
Virginia Region	Central	Central	Southwest
Utility Service Territory	Dominion Energy	Dominion Energy	Appalachian Power Old Dominion Powell Valley TN ODP Kentucky
Solar Development	Solar Property Tax Exempt-at county level		SolSmart Silver – receptive to solar development

# Next Steps

1. Approve core program design recommendations
2. In conjunction with the CEAB Stakeholder Engagement and Marketing Committee, conduct outreach to stakeholders in pilot jurisdictions (community-based organizations, weatherization service providers, local utilities, municipal officials, solar installers, single-family affordable housing providers, and other) to solicit input on program design and viability
3. Develop a timeline for pilot program development
4. Draft a solicitation for solar providers for the pilot



# Pilot Recommendations Recap

1. Focus on LMI single-family homeowners who have already qualified for WAP or LIHEAP (at 60% SMI in Virginia) to streamline eligibility verification
  - Rely on WAP audits and final work scopes with a Savings to Investment Ratio (SIR) of greater than 1.0 for energy efficiency measures to serve as a proxy for the 12% reduction in energy consumption requirement
2. Competitively select solar companies and provide outreach assistance to help them to reach underserved markets
  - Issue a solicitation with open-ended financing terms but provide an economic analysis demonstrating the cost-effectiveness of third-party ownership
  - Allow solar providers who contract with local installation companies to satisfy the local installer requirement
3. Use focused, community-based marketing campaigns to reach 2-3 selected underserved Virginia communities
  - Allow pilot participation by any Virginia resident but focus marketing campaigns in selected jurisdictions
  - Explore the cities of Hopewell and Petersburg and Wise County as potential locations for the pilot and conduct outreach to stakeholders in these jurisdictions to probe program viability
4. Guarantee that solar projects are structured with cashflow positive contracts for participating LMI households
  - Structure the incentive payment as a lump-sum, reducing customers' financing payments over time
  - Provide direct oversight controls over participating solar companies to ensure robust consumer protection



Questions or Comments?



# Thank You

Wafa May Elamin  
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Nate Hausman  
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Clean Energy States Alliance  
802-779-3756  
nate@cleanegroup.org





# Market Research for Developing an LMI Solar Pilot Program in Virginia

Presented March 24, 2021

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## **CESA Role**

In early 2021, Clean Energy States Alliance (CESA), a coalition of state energy organizations working together to advance clean energy and bring the benefits of clean energy to all, received an anonymous grant to help Virginia develop a solar pilot program for low- and moderate-income (LMI) homes. Under the grant, CESA has been funded to work with the Virginia Department of Mines, Minerals and Energy (DMME) and the Clean Energy Advisory Board (CEAB) over the course of 12 months to support the design and implementation of a solar pilot program for LMI homeowners. In collaboration with DMME and the CEAB, CESA will work to advance a pilot program that reaches its intended audience, provides maximum impact without excessive administrative burdens, meets program benchmarks, and delivers meaningful benefits to participating LMI households.

Under the grant, CESA is prepared to provide assistance to DMME and the CEAB in several areas, including:

1. LMI Solar Program Design: CESA will prepare a written pilot program design and implementation plan.
2. Stakeholder Engagement and Program Refinement: CESA will help find meaningful ways to engage underserved communities and community-based organizations in the program design process.
3. Preparation of a Program Solicitation: CESA is prepared to help draft an RFP for DMME to issue to attract solar providers to participate in the program.
4. Advising on Program Implementation and Marketing: CESA is prepared to provide advice to DMME to ensure that the pilot program reaches its intended audience.
5. Production of Educational and Promotional Materials: CESA is prepared to help develop and design accessible materials and program information.

CESA's primary aim for its engagement with DMME and the CEAB is to help get a successful solar pilot for LMI homeowners up and running. After 12 months, CESA will continue to assist DMME on the operation of its program through DMME's membership in CESA, but to a much lesser degree.

As a starting point for the development of a LMI solar pilot program, CESA began focused, market research on Virginia's solar policy and regulatory landscape, residential solar project economics, income and energy burden demographics, and barriers and opportunities for launching solar program for LMI homeowners in the Commonwealth. This is the basis for this report. CESA research is intended to build off, not to supplant, prior research completed by DMME and the CEAB in these areas. We plan to use this research to inform an LMI solar program design proposal for the Commonwealth.

## **Virginia's Residential Solar Policy Solar Landscape**

Virginia ranks 11<sup>th</sup> among US states in overall solar installed capacity. The number of residential solar installations has grown sharply in the last few years, driven by a range of solar friendly policy developments. Some policy developments have helped expand the solar market in the Commonwealth while others hold particular promise for enabling low- and moderate-income (LMI) Virginians to access solar energy.

### Renewable Energy Targets

In 2007, the Virginia General Assembly passed legislation establishing a framework for a voluntary Renewable Portfolio Standard (RPS) program for the Commonwealth. Recently, the state's RPS targets have increased in ambition and enforceability. In 2018, the Virginia Grid Transformation and Security Act (SB 966) deemed 5,500 megawatts of solar and wind resources to be in Virginia's public interest. Then, in September 2019, Governor Ralph Northam issued an executive order (EO 43) calling for the development of an action plan to produce 100 percent of Virginia's electricity from carbon-free sources by 2050. In 2020, the Virginia General Assembly codified Governor Northam's goal, requiring the Commonwealth's two major investor-owned utilities to become carbon free by 2050 at the latest.

### Virginia Clean Economy Act

In addition to establishing zero-carbon emissions goals for the Commonwealth's major utilities, the 2020 Virginia Clean Economy Act (SB 851/HB1526) requires Dominion Energy to procure at least one percent of its annual electricity for Renewable Portfolio Standard compliance from distributed generation facilities. It also requires that at least one quarter of such distributed generation be obtained from low-income qualifying projects. The law defines a low-income qualifying project as "a project that provides a minimum of 50 percent of the respective electric output to low-income utility customers." The State Corporation Commission is assessing Dominion Energy's proposal to comply with its Renewable Portfolio Standard obligations, including the utility's low-income obligations, in a pending case (SCC Case No. PUR-2020-00134).

The Virginia Clean Economy Act allows the use of power purchase agreements (PPAs) for solar projects sized between 50 kW and 3 MW through pilot programs conducted by Dominion Energy, Appalachian Power, and Old Dominion Power. LMI customers and tax-exempt organizations are exempted from the 50-kw size minimum for PPAs for solar projects, effectively making them eligible for small-scale solar PPAs under these pilot programs.

The Virginia Clean Economy Act directed the Commonwealth to join the Regional Greenhouse Initiative (RGGI), a voluntary, market-based, cap-and-invest program that has been joined by other Northeast and mid-Atlantic states. RGGI imposes limits on greenhouse gas emissions from electric plants, which has created a market for emissions allowances. Through an auction process, these RGGI allowances generate proceeds. The Virginia Department of Housing and Community Development (DHCD) Housing Innovations in Energy Efficiency Program is funded through RGGI proceeds. HIEE will make energy efficiency upgrades to new and existing residence to reduce energy bills for low-income Virginians. DHCD has embarked on a stakeholder process for HIEE program development. Currently, solar PV is not an eligible technology under this program, but roof repairs, which can help enable rooftop solar adoption for homeowners, is.

### Virginia Solar Freedom Act (HB 572)

In 2020, the Virginia General Assembly enacted the Virginia Solar Freedom Act (HB 572). It established a program for Dominion and Old Dominion Power customers living in multifamily housing to offset their electricity usage through a subscription to a solar facility. The legislation also increased the state's cap on net energy metering from 1% to 6% of each Virginia utility's

peak load and set aside one percent of the available net energy metering capacity for low-income customers. The State Corporation Commission has proposed regulations to implement the amended net metering cap under the Act (SCC Case No. PUR-2020-00195).

### Shared Solar Legislation (SB 629)

In 2020, the Virginia General Assembly passed SB 629, which ordered the State Corporation Commission to establish a shared solar program for Dominion Energy customers in Virginia. The statute allows Dominion Energy customers to subscribe to a shared solar facility for the amount of electricity generated by it.

In December 2020, the State Corporation Commission issued shared solar program rules (SCC Case No. PUR-2020-00125). Under the rules, the maximum size of the shared solar program must not exceed 150 megawatts, at least 30% of which must be apportioned to low-income customers. Each entity operating or owning a shared solar facility must demonstrate that it meets the low-income customer requirement. After the program's 30% low-income requirement is satisfied, the program will be expanded to a cumulative total of 200 megawatts. Generally, Dominion Energy customers will be subject to a minimum bill requirement to subscribe to a shared solar facility, but low-income customers are exempt from this provision. Dominion Energy is to begin accepting applications for registration by July 1, 2021.

### Enabling Statute for the Virginia Clean Energy Advisory Board

In 2019, Virginia General Assembly passed HB 2741, which created the CEAB and directed it to work with the DMME to “establish a pilot program for disbursing loans or rebates for the installation of solar energy infrastructure in low-income and moderate-income households” (HB 2741). Through this legislation, the Virginia General Assembly designated a special non-reverting fund in the state treasury for LMI solar program financing. The CEAB was convened in 2020 and is working to advance an LMI solar pilot program in the Commonwealth. In 2020, the General Assembly passed HB 1707, which repealed a 2022 sunset provision for the CEAB, and added additional Board members to its composition.

### Law Authorizing On-Bill Financing Programs for Coops

During the 2020 legislative session, Governor Northam signed SB 754 into law. The statute allows electric cooperatives in Virginia to create an on-bill tariff program on or after January 1, 2021. On-bill financing programs enable electric cooperative customers to pay the costs of energy efficiency and clean energy upgrades over time through a line-item charge on their monthly electric bills. This on-bill line-item charge is assigned to the electric meter rather than to a customer personally. Virginia's law allows electric cooperatives to create programs without State Corporation Commission approval, but program development requires a stakeholder process that “include[s] an opportunity to participate for low-income and middle-income advocates, energy efficiency advocates, affordable housing advocates, and the staff of the [State Corporation] Commission.”

### Funding for a Solar Pilot Program for LMI Homeowners

DMME has received approval to re-purpose approximately \$200,000 in federal American Recovery and Reinvestment Act (ARRA) funds to support an LMI solar pilot program. This



funding is being placed in Virginia’s statutorily created Low-to-Moderate Income Solar Loan and Rebate Fund. It represents the entire corpus of Virginia’s Low-to-Moderate Income Solar Loan and Rebate Fund and is the only dedicated, direct, public program funding available for an LMI solar pilot under HB 2741 to date.

In future years, DMME staff may petition for a program funding allocation from Virginia’s General Funds as part of the state’s annual budget process. (DMME has requested funding through these channels to support an LMI solar pilot before, but with other pressing budgetary spending priorities, these have been denied.) A successful pilot program might help demonstrate the case for long-term program investment and expansion by the Virginia General Assembly. DMME and the CEAB have also explored the possibility of leveraging private investment to support solar for LMI residents with organizations such as the Coalition for Green Capital and the Climate Access Fund. Through CESA’s US Department of Energy-supported *Scaling Up Solar for Under-Resourced Communities* project, Virginia may apply to for up to \$50,000 to support the launch of a solar program for LMI homeowners.

### **Residential Solar System Cost Analysis**

We conducted a residential solar installation financial analysis for Virginia under different financing parameters to get an indication of the costs of a typical rooftop system and to help identify the level of subsidy necessary for cash-flow positive solar transactions for LMI Virginians. The methodology we used was developed by the North Carolina Clean Energy Technology Center, and they calculated the results.

#### **Methodology and Assumptions**

We costed out a typical residential solar system in three Virginia locations—Accomack County, Roanoke, and Virginia Beach—served by three different utilities—A&N Cooperative, Appalachian Power, Dominion Energy, respectively. We examined three different scenarios for financing such a system in these locations without any new special incentives for LMI solar. The three scenarios involved 15-year market-rate loans at 4.74 percent, described below:

1. A homeowner who takes out a loan and then claims the federal investment tax credit and any applicable state credit at the end of the year.
2. A homeowner who takes out a smaller loan that does not include the value of the tax credits. For example, the homeowner has savings or another way to pay for part of the system upfront and then receives the tax credits at the end of the year.
3. A homeowner who is unable to take advantage of the federal tax credit or any applicable state tax credit.

To begin to understand the level of special state incentives that might be needed for cash-flow positive solar transactions for LMI homeowners, we modeled two alternative possible special incentives for each of the loan scenarios:

- 1) A buy-down of the interest rate from 4.74 percent to 2 percent. If this interest rate-buy-down was subsidized by state, it would cost Virginia between \$1,800 to \$4,000 per installation.



- 2) An upfront cash payment that reduces the system cost by \$5,000.

For the Virginia Beach (Dominion Energy), we also looked at the amount required for an upfront cash payment to enable a cash-flow positive transaction in Year 1.

Because residential solar leases are not currently being offered in the Virginia marketplace, there is no existing data for lease prices for Virginia. However, the numbers for loan products with monetization of the federal tax credit gives a rough sense of the economics of a residential solar system under a lease model. We also modeled a solar lease based on the structure used in some other states. This is not to say that solar companies in Virginia would offer leases with these terms, but it provides an estimate of what a residential solar lease could look like in the Commonwealth.

We modeled a 6.4-kilowatt system because that was the median size for all residential systems installed in the US in 2018, according to Lawrence Berkeley National Laboratory’s *Tracking the Sun* report, and is coincidentally also the median size for the systems installed on LMI single-family homes through the Connecticut Green Bank’s Solar for All Program. We assumed an annual electricity price escalation rate of 2.5% and an annual degradation rate of 0.5% and a discount rate of 0%. We modeled a typical solar loan term—in this case, a 15-year loan with no payments due in years 16-25. We assumed a monetizable federal investment tax credit of 26% would be monetizable. (Currently, the investment tax credit for solar installations is set at 26% and is scheduled to step down to 22% in 2023. Thereafter, no investment tax credit is available for resident-owned solar installations.) Our analysis assumed a per kilowatt system cost of \$3.05 for a 6.4-kW installation. Different rate tariffs—fixed bill charges and energy rates—as well as sale tax and property tax rates, apply depending upon the system location modeled.

## Results

### Accomack 6.4-kW Installation

Scenario	Monthly Loan Payment	Net Monthly Savings		Payback Period
<b>Market Rate Loan (4.74%) without Special State Incentives</b>				
Loan for homeowner who qualifies for federal tax credit	\$158.22	Year One	(\$83.84)	22 Years
		25-Year Average	\$20.11	
Loan with federal tax credit received and excluded from upfront cost	\$116.20	Year One	(\$41.82)	20 Years
		25-Year Average	\$27.93	
Loan with no federal or state tax credit	\$158.22	Year One	(\$83.84)	25 Years
		25-Year Average	\$2.92	
<b>State Incentive: 2% Interest Rate</b>				
Loan for homeowner who qualifies for federal tax credit	\$130.09	Year One	(\$55.71)	18 Years
		25-Year Average	\$36.99	

Loan with federal tax credit received and excluded from upfront cost	\$95.54	Year One	(\$11.16)	17 Years
		25-Year Average	\$40.33	
Loan with no federal or state tax credit	\$130.09	Year One	(\$55.71)	22 Years
		25-Year Average	\$19.60	
<b>State Incentive: \$5,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$118.78	Year One	(\$44.40)	17 Years
		25-Year Average	\$43.77	
Loan with federal tax credit received and excluded from upfront cost	\$76.76	Year One	(\$2.38)	15 Years
		25-Year Average	\$51.60	
Loan with no federal or state tax credit	\$118.78	Year One	(\$44.40)	20 Years
		25-Year Average	\$26.39	

Roanoke 6.4-kW Installation

Scenario	Monthly Loan Payment	Net Monthly Savings		Payback Period
<b>Market Rate Loan (4.74%) without Special State Incentives</b>				
Loan for homeowner who qualifies for federal tax credit	\$158.22	Year One	(\$88.56)	>25 Years
		25-Year Average	(\$2.37)	
Loan with federal tax credit received and excluded from upfront cost	\$116.20	Year One	(\$46.54)	24 Years
		25-Year Average	\$5.46	
Loan with no federal or state tax credit	\$158.22	Year One	(\$88.56)	>25 Years
		25-Year Average	(\$19.75)	
<b>State Incentive: 2% Interest Rate</b>				
Loan for homeowner who qualifies for federal tax credit	\$130.09	Year One	(\$60.43)	22 Years
		25-Year Average	\$14.51	
Loan with federal tax credit received and excluded from upfront cost	\$95.54	Year One	(\$25.88)	21 Years
		25-Year Average	\$17.86	
Loan with no federal or state tax credit	\$130.09	Year One	(\$60.43)	>25 Years
		25-Year Average	(\$2.87)	
<b>State Incentive: \$5,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$118.78	Year One	(\$49.12)	20 Years
		25-Year Average	\$21.29	
Loan with federal tax credit received and excluded from upfront cost	\$76.76	Year One	(\$7.10)	18 Years
		25-Year Average	\$29.12	

Loan with no federal or state tax credit	\$118.78	Year One	(\$49.12)	24 Years
		25-Year Average	\$3.91	

Virginia Beach 6.4-kW Installation

Scenario	Monthly Loan Payment	Net Monthly Savings		Payback Period
<b>Market Rate Loan (4.74%) without Special State Incentives</b>				
Loan for homeowner who qualifies for federal tax credit	\$158.78	Year One	(\$89.62)	23 Years
		25-Year Average	\$14.60	
Loan with federal tax credit received and excluded from upfront cost	\$116.09	Year One	(\$59.22)	21 Years
		25-Year Average	\$22.76	
Loan with no federal or state tax credit	\$158.78	Year One	(\$89.62)	>25 Years
		25-Year Average	(\$2.85)	
<b>State Incentive: 2% Interest Rate</b>				
Loan for homeowner who qualifies for federal tax credit	\$130.55	Year One	(\$61.39)	19 Years
		25-Year Average	\$31.54	
Loan with federal tax credit received and excluded from upfront cost	\$95.45	Year One	(\$36.47)	19 Years
		25-Year Average	\$35.15	
Loan with no federal or state tax credit	\$130.55	Year One	(\$61.39)	23 Years
		25-Year Average	\$14.09	
<b>State Incentive: \$5,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$119.34	Year One	(\$50.18)	18 Years
		25-Year Average	\$32.55	
Loan with federal tax credit received and excluded from upfront cost	\$76.65	Year One	(\$7.49)	16 Years
		25-Year Average	\$46.43	
Loan with no federal or state tax credit	\$119.34	Year One	(\$50.18)	22 Years
		25-Year Average	\$20.81	
<b>State Incentive: \$12,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$64.12	Year One	\$5.04	11 Years
		25-Year Average	\$71.39	
Loan with federal tax credit received and excluded from upfront cost	\$64.82	Year One	\$4.35	15 Years
		25-Year Average	\$53.52	

## Findings and Conclusions

A number of key findings emerged from this analysis:

1. The overall costs for typical residential installation did not yield dramatically different results between the three Virginia locations we modeled.
2. None of the basic loan financing scenarios in any of the modeled locations yielded a positive cash flow in Year One. Initial negative cash flow from taking out a loan to finance a solar system is a large hurdle for LMI customers in Virginia.
3. Being able to take advantage of the federal investment tax credit makes a significant difference in Year One monthly loan costs. If a customer is able to deduct the value of the federal tax credit from the upfront cost of the system, Year One loan costs are roughly half of what they would otherwise be under a “no federal or state tax credit” scenario.
4. Neither a buy-down of the interest rate of the loan to 2 percent, nor adding an upfront cash payment to reduce the system cost by \$5,000 was sufficient by itself to generate a cash-flow positive solar loan transaction. A significant incentive—greater than an interest rate buydown to 2 percent or a \$5,000 rebate—is necessary for a customer to have a cash-flow positive solar loan transaction from Year One through the life of the system.
5. The hypothetical lease structure we modeled, which would enable monetization of the federal tax credit, could provide first-year savings of around \$16 to \$20. No solar leases are being offered in Virginia and the lease terms we modeled are theoretical, but it suggests cash-flow positive leases could be achieved in Virginia, especially with an additional solar rebate folded in.
6. Under our model, the rebate necessary to achieve a first-year savings of about \$4 to \$5 for a 6.4-kw system in Virginia Beach is \$6,500, assuming that federal tax credit can be monetized and is used to offset the upfront system cost. If the federal tax credit is not monetized and deducted from the system cost, a \$12,000 rebate would be necessary to achieve nominal savings in Year One.

Based on this analysis, we reached the following conclusions:

1. A 25-year lease offers a preferable financing product for LMI homeowners compared to a loan:
  - A 25-year lease spreads out the financing over a longer period than a typical 15-year loan. That makes it easier to ensure immediate savings in Year One, even if the average annual savings over 25 years may be less.
  - Because the leasing company, rather than the homeowner, owns the solar system, it can take advantage of a federal tax credit even if the customer cannot. Low-income customers often do not have sufficient tax liability to take advantage of the federal tax credit.
  - Low-income customers may not be able to qualify for market rate loans due to insufficient income, credit score, or debt-to-income ratios. LMI customers may

also be reluctant to take on additional debt. Solar leases offer an alternative. Some solar lease companies offer alternative underwriting criteria.

- A solar lease offers LMI customers fixed monthly expense predictability. Leases may also avoid the need for LMI customers to carefully manage their solar systems since insurance, maintenance, repairs, and inverter replacement are often included as part of a solar lease package.
2. Since we did not have access to real-world lease data from Virginia, to better understand the market conditions necessary to create a cash-flow positive solar lease transaction, we looked at California, where we had access to real-world loan and solar lease data. In California, a solar loan for a homeowner who qualifies for the federal tax credit produces Year One savings of about four dollars. In the same California market, a real-world 25-year solar lease product yields savings of about \$50 per year. To analogize to the Virginia market, to make a solar loan yield four dollars of Year One savings for a customer requires an upfront cash incentive of \$6,500-\$12,000.
  3. Virginia allows local jurisdictions to exempt residential solar from property taxes. This can have a substantial impact on solar project economics. With a property tax exemption, the rebate necessary to achieve a first-year savings of about \$5 for a 6.4-kw system is \$4,750, assuming the federal tax credit could be used to offset the upfront cost of the system. Without a property tax exemption, the rebate necessary to achieve a first-year savings of \$4-\$5 is \$6,500 under the same parameters.
  4. Analyzing the financial models, we think it is reasonable to assume that approximately \$6,500 in public subsidy project is necessary to ensure participating LMI households benefit from their solar transaction.
  5. Assuming approximately \$6,500 in direct public subsidy is necessary for each system installed and an initial pilot program financing budget of \$200,000, about 30 cash-flow positive projects could be completed under the pilot.

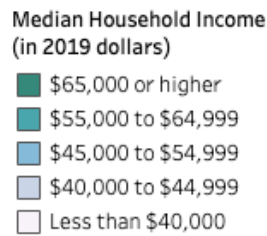
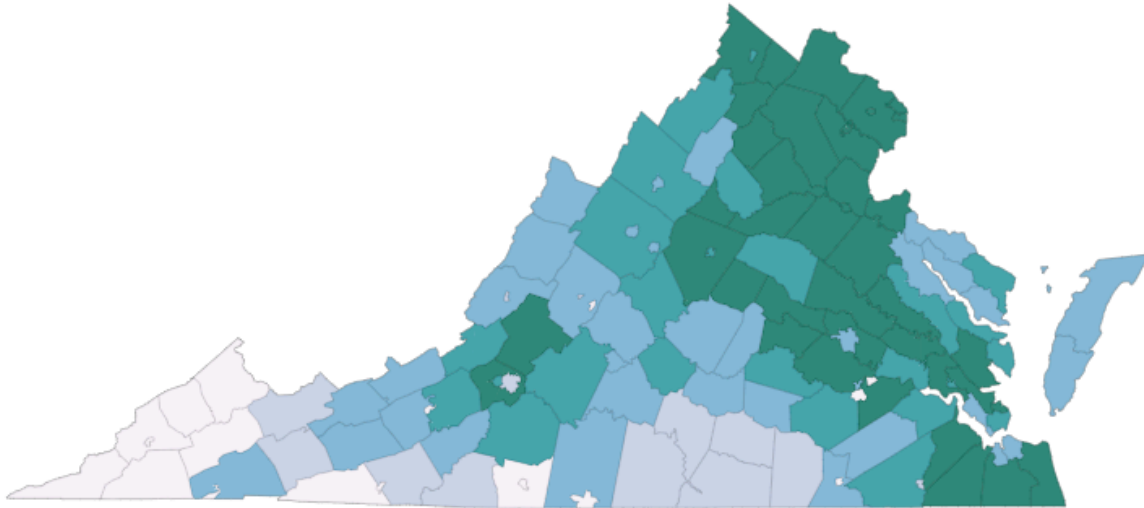
### **Virginia Income and Energy Burden Demographics**

Virginia ranks 12<sup>th</sup> among US states in population and 14<sup>th</sup> in population density. The most populous areas of the Commonwealth are in the northeast part of the state (in the broader metropolitan area outside the District of Columbia), in and around metropolitan areas of Charlottesville, Richmond, and Roanoke, and in the southeastern part of the state (in the greater Virginia Beach metropolitan area).

Based on US Census Bureau data, the median household income in Virginia between 2015 and 2019 was \$74,222, considerably above the 2019 US median household income of \$65,712. The owner-occupied housing rate between 2015 and 2019 was 66.3%. Virginia's poverty rate (the percentage of a population whose income falls below the poverty line) in 2018 was 10.7%, which is below the national poverty rate of 13.1%. But despite Virginia's higher-than-national median household income and lower-than-national poverty rate, poverty and high energy burdens remain prevalent, especially in rural parts of the Commonwealth.

The figure below shows median household income ranges by county between 2015-2019 in Virginia.

Figure 1. Median Household Income by County (2015-2019)

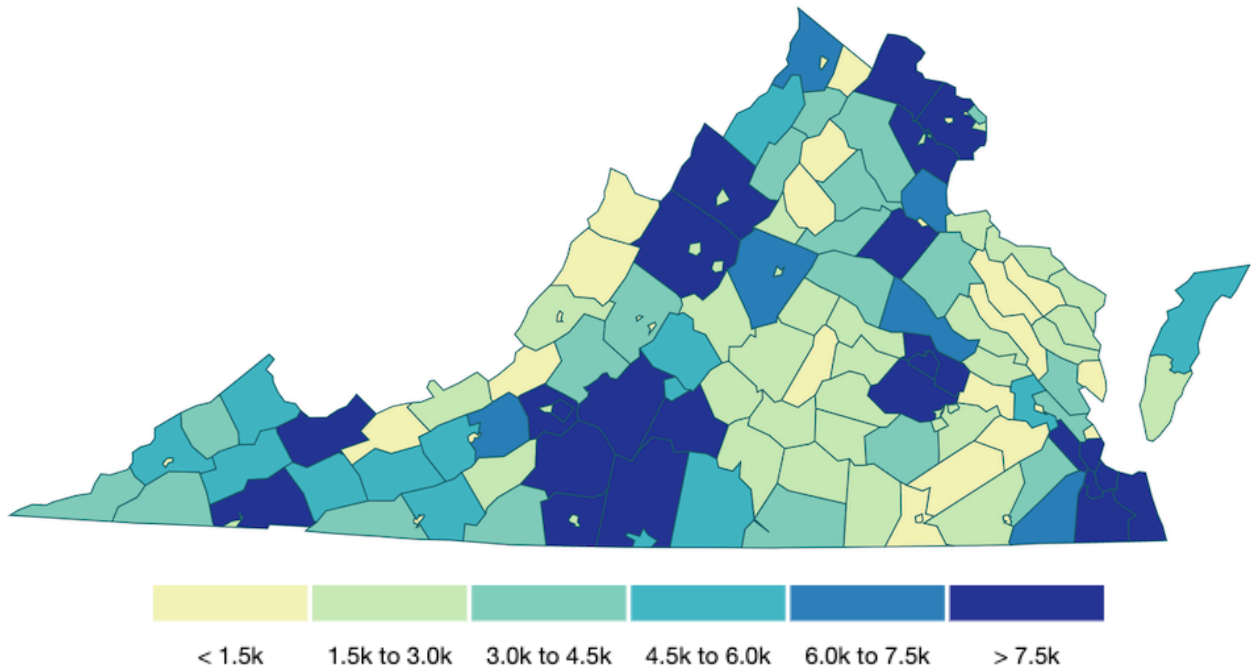


Source: US Census Bureau, <https://www.census.gov/library/visualizations/interactive/acs-median-household-income-2015-2019.html>

Unsurprisingly, median household incomes in more rural counties tend to be lower than in their population-dense counterparts.

The figure below shows low-income (80% or below the area median income), owner-occupied housing counts by county.

Figure 2. Low-Income, Owner-Occupied Housing Counts by County



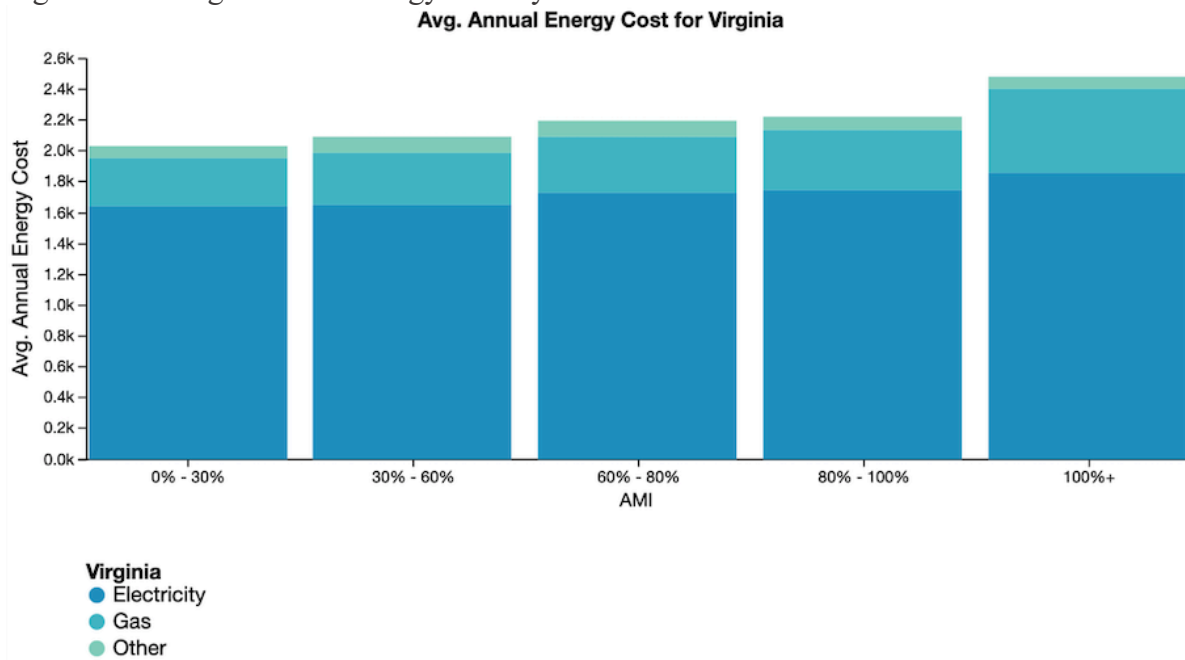
Source: US Department of Energy Low Income Energy Affordability Data (LEAD) Tool, <https://www.energy.gov/eere/slsc/maps/lead-tool#>

Low-income households living in owner-occupied homes are widespread in more densely populated counties, but the figure also indicates some concentrations in a handful of less population-dense counties (for example, Tazewell County in the southwestern region and Henry County in the southside region of the state).

The figure below shows the average annual energy cost for Virginia broken out by area median income stratification and by energy source (electricity, gas, and other).



Figure 3. Average Annual Energy Cost by Area Median Income Band

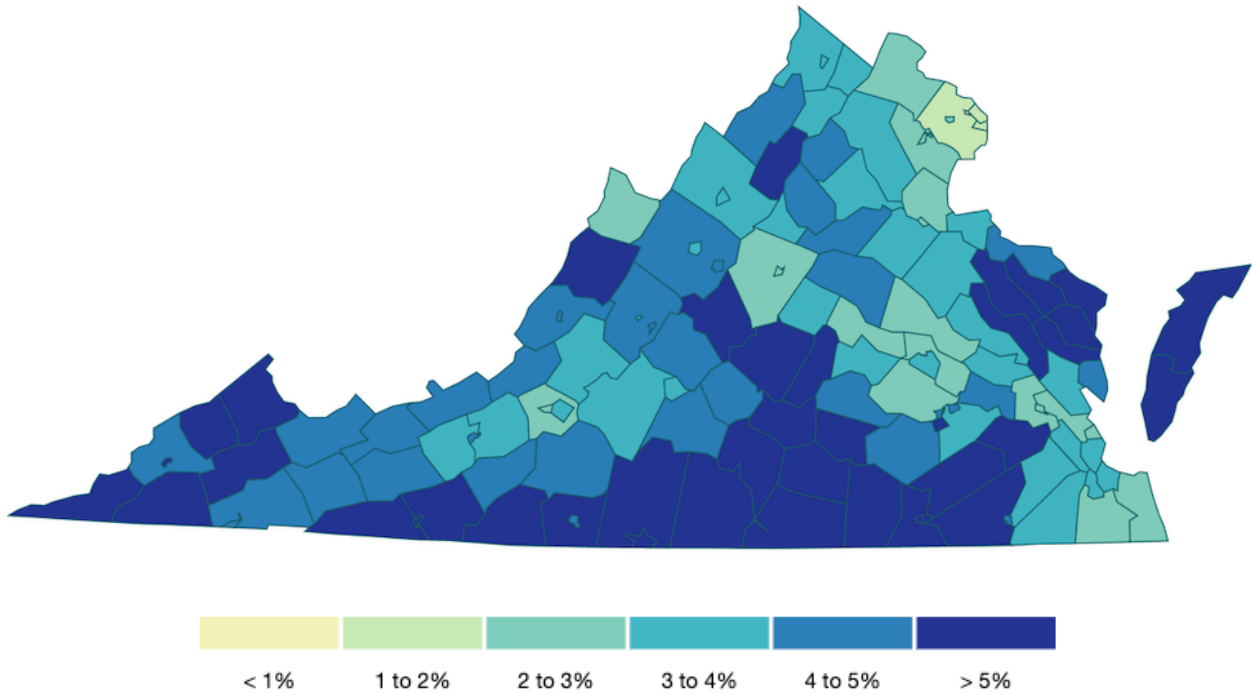


Source: US Department of Energy Low Income Energy Affordability Data (LEAD) Tool, <https://www.energy.gov/eere/slsc/maps/lead-tool#>

Virginia households in lower area median income stratifications tend to spend slightly less in gross on electricity annually, but as a percentage of income, this picture changes dramatically. Across the Commonwealth, the average energy burden for low-income, owner-occupied households is 8% according to the US Department of Energy LEAD Tool. An energy burden above 6% is typically considered a high energy burden.

The figure below shows the average energy burden (the percentage of gross household income spent on energy costs) by county.

Figure 3. Average Energy Burden by County



Source: US Department of Energy Low Income Energy Affordability Data (LEAD) Tool, <https://www.energy.gov/eere/slsc/maps/lead-tool#>

Darker blue counties—those with higher energy burdens—tend to be concentrated in the more rural parts of the state in the southwestern, southside, and eastern counties of Virginia.

Overall, Virginia’s income and energy burden demographics demonstrate ample opportunity to deliver bill savings and reduce energy burdens for LMI owner-occupied homes in Virginia through a solar program targeted for this population.

### Locational Variables

Knowing that a pilot with an initial budget of \$200,000 can only reach a relatively small number of households (30, based on our rough approximation), we have begun to zero in on potential jurisdictions. Our basic assumption for zeroing in on potential target jurisdictions for a LMI solar pilot was that a program at the scale being contemplated would be focused in a few select communities so it could take advantage of focused marketing and community engagement and leverage economies of scale using a competitively selected installer model. Under a competitively selected installer model, DMME would be able to retain direct oversight controls over participating solar companies. Selected solar installers could offer cost-competitive pricing with increased installation volumes and targeted customer acquisition support.

Using analysis generated by DMME staff through the US Department of Energy’s Low Income Energy Affordability Data (LEAD) Tool as our starting point, we assessed the following variables at the county and city level in Virginia:

### Electric Utility Service Territory

Dominion Energy and Appalachian Power are in the process of developing LMI solar and efficiency programs. To avoid potential program redundancy, we gave preference to jurisdictions outside of the Dominion Energy and Appalachian Power service territory.

### Energy Burden

We gave preference to jurisdictions with higher energy burdens—average annual energy expenditures as a percentage of annual household income. The 21 potential target locations all displayed high energy burdens (between 9 and 24 percent).

### Single-Family Owner-Occupied Housing Count

Because the LMI renter population will be eligible to participate in Virginia’s forthcoming shared solar program, we assumed that this LMI solar pilot program would target single-family homeowners. We gave slight preference to those cities and counties with higher single-family owner-occupied housing counts.

### LMI Housing Count

We gave significant preference to jurisdictions with higher LMI housing counts. Since § 45.1-399 of the Code of Virginia dictates pilot program eligibility as “open to any Virginia resident whose household income is at or below 80 percent of the state median income or regional median income, whichever is greater,” we used 80% area median income as our LMI thresholds for the purpose of our housing count.

### Percentage of LMI Single-Family Housing

In addition to looking at LMI and single-family owner-occupied housing counts, we also explored the LMI single-family housing count as a percentage of the total housing count for Virginia. This gave us a sense of the density of LMI single-family homes within each jurisdiction.

### Population

We assessed the overall population of the potential target jurisdictions we zeroed in on to ensure that there would be an adequate population base in selected jurisdictions to enable a pilot to generate sufficient program enrollment. Overall jurisdictional population numbers also helped us diversify our potential pilot locations between urban and rural geographies. Hopewell has a significantly higher population than the other cities we identified as potential targets.

### Solar Property Tax Exemption Status

Virginia law allows cities and counties to exempt or partially exempt solar equipment from local property taxes. Solar property tax exemption reduces the amount of public subsidy necessary to ensure cashflow positive solar transactions for LMI customers and can have a substantial impact on residential solar project economics. Thus, we gave preference to those that jurisdictions that provided solar property tax exemptions.

## Potential Target Jurisdictions

Weighing all these factors, we arrived at a list of 21 potential target jurisdictions for consideration. Below is a table of the potential jurisdictions we derived in our assessment.

Table 1. Table of Potential Jurisdictions with Data on Locational Variables

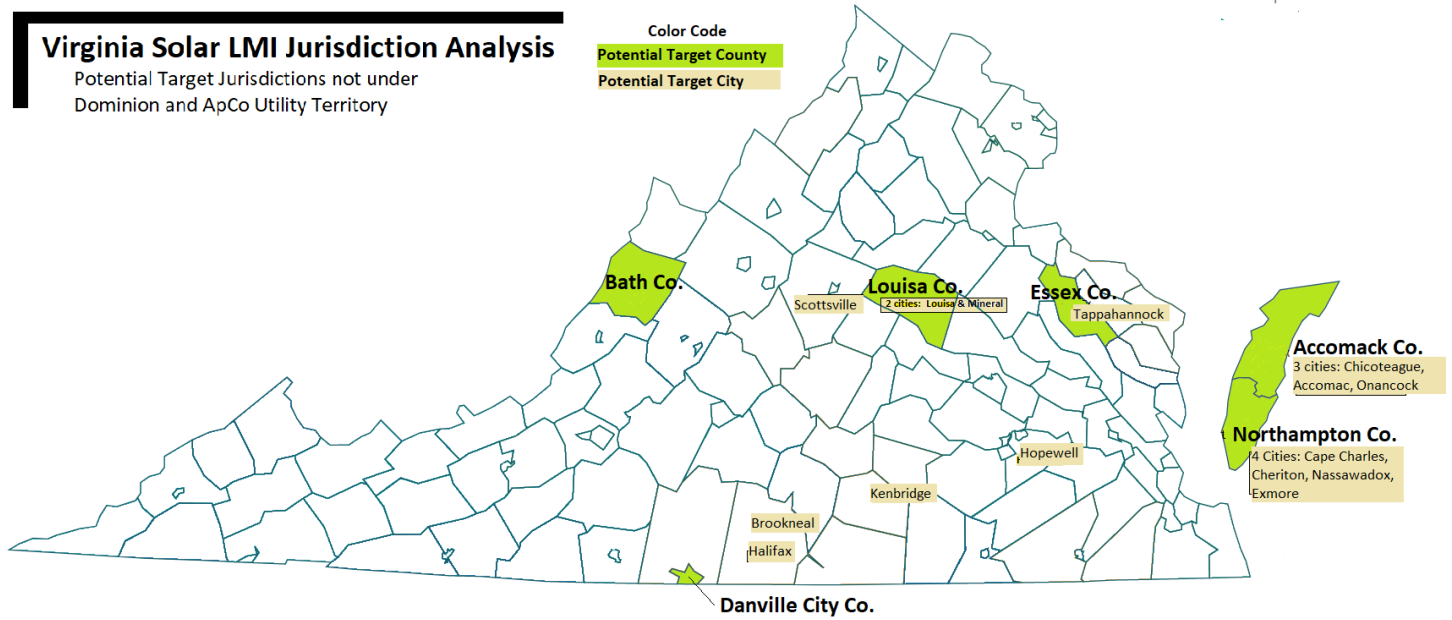
Jurisdiction Type	Jurisdiction	Solary Property Tax Exemption	Avg. Energy Burden (% income)	Avg. Annual Energy Cost	% LMI Housing Counts (All/LMI)	LMI Housing Counts	All Housing Count	Population	Primary Utility Service Territory
County	Danville city County	Y	19	4566	37%	1105	2979	38,834	Danville Utilites
County	Accomack County	N	14	3119	26%	1025	4018	31,786	A&N Electric Cooperative
City	Chincoteague	N	24	4847	23%	127	557	2,913	A&N Electric Cooperative
City	Tappahannock	N	14	2701	31%	105	337	2,380	Rappahannock Electric Cooperative
City	Cape Charles	N	14	3097	28%	56	199	990	A&N Electric Cooperative
County	Northampton County	N	14	2932	23%	351	1549	11,608	A&N Electric Cooperative
County	Essex County	N	14	2846	22%	398	1849	11,067	Rappahannock Electric Cooperative
City	Louisa	N	10	2638	34%	74	217	1,610	Rappahannock Electric Cooperative
County	Louisa County	N	10	2799	26%	1592	6123	39,205	Rappahannock Electric Cooperative
City	Scottsville	Y	9	3060	44%	61	138	597	Central Virginia Electric Cooperative
City	Accomac	N	14	2739	29%	15	51	496	A&N Electric Cooperative
County	Bath County	N	12	2878	35%	160	457	3,935	BARC Electric Cooperative
City	Hopewell	N	8	2514	51%	1386	2734	22,196	Prince George Electric Cooperative
City	Cheriton	N	14	3097	28%	14	50	477	A&N Electric Cooperative
City	Onancock	N	14	2678	24%	49	203	1,262	A&N Electric Cooperative
City	Nassawadox	N	13	2823	21%	10	48	495	A&N Electric Cooperative
City	Exmore	N	13	2823	21%	32	154	1,445	A&N Electric Cooperative
City	Brookneal	N	13	2908	21%	26	126	1,115	Southside Electric Cooperative
City	Halifax	N	12	2698	34%	52	151	1,252	Mecklenburg Electric Cooperative
City	Kenbridge	N	12	2828	32%	37	116	1,241	Southside Electric Cooperative
City	Mineral	N	11	2965	26%	21	80	510	Rappahannock Electric Cooperative

Table 2. Potential Target Jurisdictions and Their Primary Electric Utilities

21 Target Jurisdictions		8 Electric Cooperatives
Potential Target	Potential Target Cities	Primary Utility Service Territory
Accomack County	(3) Chincoteague, Accomac, Onancock	A&N Electric Cooperative
Louisa County	(2) Louisa, Mineral	Rappahannock Electric Cooperative
Northampton County	(4) Cape Charles, Cheriton, Nassawadox, Exmore	A&N Electric Cooperative
Bath County		BARC Electric Cooperative
Essex County		Rappahannock Electric Cooperative
Danville city County		Danville Utilities
	Brookneal, Halifax	Mecklenburg Electric Cooperative
	Tappahannock	Rappahannock Electric Cooperative
	Hopewell	Prince George Electric Cooperative

Kenbridge	Southside Electric Cooperative
Scottsville	Central Virginia Electric Cooperative

Figure 4. Map of Potential Target Jurisdictions



### Next Steps

With input from DMME, the CEAB, and stakeholders on the ground in these jurisdictions, we plan to narrow down our list of potential target jurisdictions to two or three, which we will put forward as proposed locations for a pilot. Key stakeholders to solicit input from within the potential target jurisdictions include community-based organizations, Weatherization Assistance Program providers, local electric utility representative, municipal officials, local solar installers, and single-family affordable housing providers.

### Statutory Considerations

Various considerations emerged as we began to outline LMI solar pilot design possibilities and more deeply delve into the program’s authorizing legislation:

#### Third-Party Solar System Ownership

As noted above, third-party residential solar system ownership structures hold promise for solar programs for LMI homeowners because they enable monetization of the federal solar tax credit and reduce capital investment burdens on participating LMI households, but their legality is somewhat uncertain in Virginia. Attorneys for the Commonwealth are exploring this issue further. Resolving this issue will be helpful for LMI solar pilot program development.

### Income Threshold

The enabling statute for Virginia’s LMI solar pilot calls for the program to “be open to any Virginia resident whose household income is at or below 80 percent of the state median income or regional median income, whichever is greater.” Virginia’s Weatherization Assistance Program (WAP) income guidelines follow the state Low-Income Heating Assistance Program (LIHEAP) limit of 60% state median income (SMI) or below for households of seven or less. Independently verifying LMI solar pilot program eligibility at a differently threshold than is used by other social service programs in Virginia could present a heavy administrative burden. Since WAP and LIHEAP eligibility currently cap at 60% SMI in Virginia, we suggest focusing the solar pilot for LMI homeowners on those who have already qualified for WAP or LIHEAP. Leveraging existing programs’ income verification will make intake and customer qualification much less burdensome for an LMI solar pilot. If the pilot program is expanded at a later date, the target income band could be enlarged at that time.

### Requirement to Demonstrate Reduced Energy Consumption through Prior Efficiency Upgrades

Section 45.1-399(B)(iii) of the enabling statute for Virginia’s LMI solar pilot requires that program applicants demonstrate prior energy efficiency upgrades resulting in a reduction of energy consumption at least 12 percent. The CEAB 2020 Annual Report suggests “using WAP program audits and final work scopes with a Savings to Investment Ratio (SIR) of greater than 1.0 for energy efficiency measures as a proxy for the 12% reduction in energy consumption required in the Virginia Code to qualify WAP customers for eligibility under the LMI Solar Loan and Rebate program.” We are strongly inclined to follow the CEAB’s recommendation here. The CEAB’s Annual Report notes, “A reasonable interpretation of the Virginia Code allows for a reduction to be measured in terms of dollar cost savings, so that both electric and fuel savings can be included and stated as a single metric.” We agree. Further exploration and coordination with WAP providers will be necessary for demonstrating SIR scores of greater than 1.0 for pilot program eligibility.

### Incentive Payment

The enabling statute for the LMI solar pilot requires any loans or rebates issued under the program to be remitted within 60 days of the receipt of the claim. This suggests that the structure of the LMI incentive under the program will be issued as a lump-sum payment. We think a lump-sum incentive is workable if it can be effectively factored into the system cost so it reduces LMI customers’ monthly loan, solar lease, or solar power purchase agreement payments.

### Incentive Cap

Section 45.1-399(G) of the enabling statute for Virginia’s LMI solar pilot states that “[a]ny rebate or grant shall be in the amount of no more than \$2 per DC watt for up to six kilowatts of solar capacity installed.” We interpret this provision to be a cap on the incentive amount, not on the allowable system size under the pilot program. We think that it is likely that system sizes could exceed six kilowatts under the pilot since the median residential solar system size is over six kilowatts in the US.

## **Conclusion**

Overall, Virginia is well-primed for the launch a solar program for LMI homeowners. The Commonwealth has a statutory directive to launch a LMI solar pilot program, and a surge of solar-friendly policies have opened up the residential solar market in Virginia considerably in recent years. But considerable work lies ahead to get a pilot off the ground under existing resource and statutory constraints.

A significant part of the challenge for LMI solar pilot program development comes down to project economics. Virginia's relatively low cost of electricity makes it difficult to pencil out residential solar projects for LMI households.

We welcome feedback from DMME and the CEAB on our research and initial program design considerations.



## Residential Solar System Cost Analysis

We conducted a residential solar installation financial analysis for Virginia under different financing parameters to get an indication of the costs of a typical rooftop system and to help identify the level of subsidy necessary for cash-flow positive solar transactions for LMI Virginians. The methodology we used was developed by the North Carolina Clean Energy Technology Center, and they calculated the results.

### Methodology and Assumptions

We costed out a typical residential solar system in three Virginia locations—Accomack County, Roanoke, and Virginia Beach—served by three different utilities—A&N Cooperative, Appalachian Power, and Dominion Energy, respectively. We examined three different scenarios for financing such a system in these locations without any new special incentives for LMI solar. The three scenarios involved 15-year market-rate loans at 4.74 percent, described below:

1. A homeowner who takes out a loan and then claims the federal investment tax credit and any applicable state credit at the end of the year.
2. A homeowner who takes out a smaller loan that does not include the value of the tax credits. For example, the homeowner has savings or another way to pay for part of the system upfront and then receives the tax credits at the end of the year.
3. A homeowner who is unable to take advantage of the federal tax credit or any applicable state tax credit.

To begin to understand the level of special state incentives that might be needed for cash-flow positive solar transactions for LMI homeowners, we modeled two alternative possible special incentives for each of the loan scenarios:

- 1) A buy-down of the interest rate from 4.74 percent to 2 percent. If this interest rate-buy-down was subsidized by the state, it would cost Virginia between \$1,800 to \$4,000 per installation.
- 2) An upfront cash payment that reduces the system cost by \$5,000.

For the Virginia Beach (Dominion Energy), we also looked at the amount required for an upfront cash payment to enable a cash-flow positive transaction in Year 1.

Because residential solar leases are not currently being offered in the Virginia marketplace, there is no existing data for lease prices for Virginia. However, the numbers for loan products with monetization of the federal tax credit gives a rough sense of the economics of a residential solar system under a lease model. We also modeled a solar lease based on the structure used in some other states. This is not to say that solar companies in Virginia would offer leases with these terms, but it provides an estimate of what a residential solar lease could look like in the Commonwealth.

We modeled a 6.4-kilowatt system because that was the median size for all residential systems installed in the US in 2018, according to Lawrence Berkeley National Laboratory's *Tracking the Sun* report, and is coincidentally also the median size for the systems installed on LMI single-

family homes through the Connecticut Green Bank’s Solar for All Program. We assumed an annual electricity price escalation rate of 2.5% and an annual degradation rate of 0.5% and a discount rate of 0%. We modeled a typical solar loan term—in this case, a 15-year loan with no payments due in years 16-25. We assumed a monetizable federal investment tax credit of 26% would be monetizable. (Currently, the investment tax credit for solar installations is set at 26% and is scheduled to step down to 22% in 2023. Thereafter, no investment tax credit is available for resident-owned solar installations.) Our analysis assumed a per kilowatt system cost of \$3.05 for a 6.4-kW installation. Different rate tariffs—fixed bill charges and energy rates—as well as sale tax and property tax rates, apply depending upon the system location modeled.

## Results

### Accomack 6.4-kW Installation

Scenario	Monthly Loan Payment	Net Monthly Savings		Payback Period
<b>Market Rate Loan (4.74%) without Special State Incentives</b>				
Loan for homeowner who qualifies for federal tax credit	\$158.22	Year One	(\$83.84)	22 Years
		25-Year Average	\$20.11	
Loan with federal tax credit received and excluded from upfront cost	\$116.20	Year One	(\$41.82)	20 Years
		25-Year Average	\$27.93	
Loan with no federal or state tax credit	\$158.22	Year One	(\$83.84)	25 Years
		25-Year Average	\$2.92	
<b>State Incentive: 2% Interest Rate</b>				
Loan for homeowner who qualifies for federal tax credit	\$130.09	Year One	(\$55.71)	18 Years
		25-Year Average	\$36.99	
Loan with federal tax credit received and excluded from upfront cost	\$95.54	Year One	(\$11.16)	17 Years
		25-Year Average	\$40.33	
Loan with no federal or state tax credit	\$130.09	Year One	(\$55.71)	22 Years
		25-Year Average	\$19.60	
<b>State Incentive: \$5,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$118.78	Year One	(\$44.40)	17 Years
		25-Year Average	\$43.77	
Loan with federal tax credit received and excluded from upfront cost	\$76.76	Year One	(\$2.38)	15 Years
		25-Year Average	\$51.60	
Loan with no federal or state tax credit	\$118.78	Year One	(\$44.40)	20 Years
		25-Year Average	\$26.39	

Roanoke 6.4-kW Installation

Scenario	Monthly Loan Payment	Net Monthly Savings		Payback Period
<b>Market Rate Loan (4.74%) without Special State Incentives</b>				
Loan for homeowner who qualifies for federal tax credit	\$158.22	Year One	(\$88.56)	>25 Years
		25-Year Average	(\$2.37)	
Loan with federal tax credit received and excluded from upfront cost	\$116.20	Year One	(\$46.54)	24 Years
		25-Year Average	\$5.46	
Loan with no federal or state tax credit	\$158.22	Year One	(\$88.56)	>25 Years
		25-Year Average	(\$19.75)	
<b>State Incentive: 2% Interest Rate</b>				
Loan for homeowner who qualifies for federal tax credit	\$130.09	Year One	(\$60.43)	22 Years
		25-Year Average	\$14.51	
Loan with federal tax credit received and excluded from upfront cost	\$95.54	Year One	(\$25.88)	21 Years
		25-Year Average	\$17.86	
Loan with no federal or state tax credit	\$130.09	Year One	(\$60.43)	>25 Years
		25-Year Average	(\$2.87)	
<b>State Incentive: \$5,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$118.78	Year One	(\$49.12)	20 Years
		25-Year Average	\$21.29	
Loan with federal tax credit received and excluded from upfront cost	\$76.76	Year One	(\$7.10)	18 Years
		25-Year Average	\$29.12	
Loan with no federal or state tax credit	\$118.78	Year One	(\$49.12)	24 Years
		25-Year Average	\$3.91	

Virginia Beach 6.4-kW Installation

Scenario	Monthly Loan Payment	Net Monthly Savings		Payback Period
<b>Market Rate Loan (4.74%) without Special State Incentives</b>				
Loan for homeowner who qualifies for federal tax credit	\$158.78	Year One	(\$89.62)	23 Years
		25-Year Average	\$14.60	
Loan with federal tax credit received and excluded from upfront cost	\$116.09	Year One	(\$59.22)	21 Years
		25-Year Average	\$22.76	

Loan with no federal or state tax credit	\$158.78	Year One	(\$89.62)	>25 Years
		25-Year Average	(\$2.85)	
<b>State Incentive: 2% Interest Rate</b>				
Loan for homeowner who qualifies for federal tax credit	\$130.55	Year One	(\$61.39)	19 Years
		25-Year Average	\$31.54	
Loan with federal tax credit received and excluded from upfront cost	\$95.45	Year One	(\$36.47)	19 Years
		25-Year Average	\$35.15	
Loan with no federal or state tax credit	\$130.55	Year One	(\$61.39)	23 Years
		25-Year Average	\$14.09	
<b>State Incentive: \$5,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$119.34	Year One	(\$50.18)	18 Years
		25-Year Average	\$32.55	
Loan with federal tax credit received and excluded from upfront cost	\$76.65	Year One	(\$7.49)	16 Years
		25-Year Average	\$46.43	
Loan with no federal or state tax credit	\$119.34	Year One	(\$50.18)	22 Years
		25-Year Average	\$20.81	
<b>State Incentive: \$12,000 Rebate</b>				
Loan for homeowner who qualifies for federal tax credit	\$64.12	Year One	\$5.04	11 Years
		25-Year Average	\$71.39	
<b>State Incentive: \$6,500 Rebate</b>				
Loan with federal tax credit received and excluded from upfront cost	\$64.82	Year One	\$4.35	15 Years
		25-Year Average	\$53.52	

### Findings and Conclusions

A number of key findings emerged from this analysis:

1. The overall costs for typical residential installation did not yield dramatically different results between the three Virginia locations we modeled.
2. None of the basic loan financing scenarios in any of the modeled locations yielded a positive cash flow in Year One. Initial negative cash flow from taking out a loan to finance a solar system is a large hurdle for LMI customers in Virginia.
3. Being able to take advantage of the federal investment tax credit makes a significant difference in Year One monthly loan costs. If a customer is able to deduct the value of the federal tax credit from the upfront cost of the system, Year One loan costs are roughly half of what they would otherwise be under a “no federal or state tax credit” scenario.
4. Neither a buy-down of the interest rate of the loan to 2 percent, nor adding an upfront cash payment to reduce the system cost by \$5,000 was sufficient by itself to generate a

cash-flow positive solar loan transaction. A significant incentive—greater than an interest rate buydown to 2 percent or a \$5,000 rebate—is necessary for a customer to have a cash-flow positive solar loan transaction from Year One through the life of the system.

5. The hypothetical lease structure we modeled, which would enable monetization of the federal tax credit, provides first-year savings of around \$16 to \$20. No solar leases are being offered in Virginia and the lease terms we modeled are theoretical, but our analysis suggests cash-flow positive leases could be achieved in Virginia, especially with an additional solar rebate folded in.
6. Under our model, the rebate necessary to achieve a first-year savings of about \$4 to \$5 for a 6.4-kw system in Virginia Beach is \$6,500, assuming that federal tax credit can be monetized and is used to offset the upfront system cost. If the federal tax credit is not monetized and deducted from the system cost, a \$12,000 rebate would be necessary to achieve nominal savings in Year One.

Based on this analysis, we reached the following conclusions:

1. A 25-year lease offers a preferable financing product for LMI homeowners compared to a loan:
  - A 25-year lease spreads out the financing over a longer period than a typical 15-year loan. That makes it easier to ensure immediate savings in Year One, even if the average annual savings over 25 years may be less.
  - Because the leasing company, rather than the homeowner, owns the solar system, it can take advantage of a federal tax credit even if the customer cannot. Low-income customers often do not have sufficient tax liability to take advantage of the federal tax credit.
  - Low-income customers may not be able to qualify for market rate loans due to insufficient income, credit score, or debt-to-income ratios. LMI customers may also be reluctant to take on additional debt. Solar leases offer an alternative. Some solar lease companies offer alternative underwriting criteria.
  - A solar lease offers LMI customers fixed monthly expense predictability. Leases may also avoid the need for LMI customers to carefully manage their solar systems since insurance, maintenance, repairs, and inverter replacement are often included as part of a solar lease package. Under a lease model, the homeowner can usually transfer the solar lease to the next homeowner for the remainder of the contract term, provided the new owner meets the qualifying criteria to take over the third-party lending agreement obligations.
2. Since we did not have access to real-world lease data from Virginia, to better understand the market conditions necessary to create a cash-flow positive solar lease transaction, we looked at California, where we had access to real-world loan and solar lease data. In California, a solar loan for a homeowner who qualifies for the federal tax credit produces Year One savings of about four dollars. In the same California market, a real-world 25-year solar lease product yields savings of about \$50 per year. To analogize to the Virginia

market, to make a solar loan yield four dollars of Year One savings for a customer requires an upfront cash incentive of \$6,500-\$12,000.

3. Virginia allows local jurisdictions to exempt residential solar from property taxes. This can have a substantial impact on solar project economics. With a property tax exemption, the rebate necessary to achieve a first-year savings of about \$5 for a 6.4-kw system is \$4,750, assuming the federal tax credit could be used to offset the upfront cost of the system. Without a property tax exemption, the rebate necessary to achieve a first-year savings of \$4-\$5 is \$6,500 under the same parameters.
4. Analyzing the financial models, we think it is reasonable to assume that approximately \$6,500 in public subsidy per project is necessary to ensure participating LMI households benefit from their solar transaction.
5. Assuming approximately \$6,500 in direct public subsidy is necessary for each system installed and an initial pilot program financing budget capped at \$200,000, about 30 cash-flow positive projects could be completed under the pilot.

Dominion Energy / Virginia Beach, VA							
<b>Incentives:</b> Federal ITC (26%)		<b>Rate Tariff:</b> Schedule 1 - Residential Service Fixed Charge: \$6.58 Energy Rates: Tiered and seasonal rates with several riders. Rates range from 9.44 cents/kWh to 12.13 cents/kWh.			<b>Assumptions:</b> Includes 2.5% electricity price escalation and 0% discount rate. Assumes \$3.30/W system cost for a 4 kW system and \$3.05/kWh for a 6.4 kW system. Assumes 0.5% annual degradation rate. Assumes sales tax rate of 6% and property tax rate of 0.87%.		
Case	Monthly bill without solar	Monthly Bill with solar	Monthly Electric Bill Savings	Monthly Loan or Lease Payment	Net Monthly Savings	Simple Payback Period	Notes
<b>4 kW System Size</b>							
Loan (4.74%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$107.37 Y16-25: \$0	Y1: <b>-\$65.41</b> 25-YR AVG: \$3.77	24 Years	<i>\$118.42/year for all cases (\$9.87 per month). Property taxes are factored into payback period.</i>
Loan (2%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$88.28 Y16-25: \$0	Y1: <b>-\$46.32</b> 25-YR AVG: \$15.22	21 Years	<i>Total system cost difference between 4.74% and 2% interest rate loan options is \$3,436.50</i>
Loan (4.74% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$78.74 Y16-25: \$0	Y1: <b>-\$36.78</b> 25-YR AVG: \$9.15	23 Years	<i>factoring into cash flow and payback period, the loan does not include the amount of the tax credit at</i>
Loan (2% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$64.74 Y16-25: \$0	Y1: <b>-\$22.78</b> 25-YR AVG: \$17.55	20 Years	<i>Total system cost difference between 4.74% and 2% interest rate loan options is \$2,520.12.</i>
Loan (4.74%) - no tax credits	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$107.37 Y16-25: \$0	Y1: <b>-\$65.41</b> 25-YR AVG: <b>-\$8.03</b>	>25 Years	
Loan (2%) - no tax credits	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$88.28 Y16-25: \$0	Y1: <b>-\$46.32</b> 25-YR AVG: \$3.42	24 Years	<i>Total system cost difference between 4.74% and 2% interest rate loan options is \$3,436.50.</i>
Lease (15% first year savings with 2.5% escalator)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1: \$33.49 25-YR AVG: \$45.76	Y1: \$18.34 25-YR AVG: \$20.50	N/A	



Dominion Energy / Virginia Beach, VA							
<b>Incentives:</b> Federal ITC (26%)		<b>Rate Tariff:</b> Schedule 1 - Residential Service Fixed Charge: \$6.58 Energy Rates: Tiered and seasonal rates with several riders. Rates range from 9.44 cents/kWh to 12.13 cents/kWh.			<b>Assumptions:</b> Includes 2.5% electricity price escalation and 0% discount rate. Assumes \$3.30/W system cost for a 4 kW system and \$3.05/kWh for a 6.4 kW system. Assumes 0.5% annual degradation rate. Assumes sales tax rate of 6% and property tax rate of 0.87%.		
Case	Monthly bill without solar	Monthly Bill with solar	Monthly Electric Bill Savings	Monthly Loan or Lease Payment	Net Monthly Savings	Simple Payback Period	Notes
Loan (4.74%) with \$5,000 rebate	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$67.93 Y16-25: \$0	Y1: <b>-\$25.97</b> 25-YR AVG: \$27.43	17 Years	
Loan (4.74% with tax credits excluded from upfront cost) with \$5,000 rebate	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$39.30 Y16-25: \$0	Y1: \$2.66 25-YR AVG: \$32.81	15 Years	
Loan (4.74% with \$5,000 rebate and no tax credits)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$70.42 25-YR AVG: \$100.81	Y1: \$51.83 25-YR AVG: \$66.26	Y1-15: \$67.93 Y16-25: \$0	Y1: <b>-\$25.97</b> 25-YR AVG: \$15.63	21 Years	
<b>6.4 kW System Size</b>							
Loan (4.74%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$158.78 Y16-25: \$0	Y1: <b>-\$89.62</b> 25-YR AVG: \$14.60	23 Years	<i>\$175.12/year for all cases (\$14.59 per month). Property taxes are factored into payback period.</i>
Loan (2%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$130.55 Y16-25: \$0	Y1: <b>-\$61.39</b> 25-YR AVG: \$31.54	19 Years	<i>Total system cost difference between 4.74% and 2% interest rate loan options is \$5,081.85.</i>
Loan (4.74% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$116.09 Y16-25: \$0	Y1: <b>-\$59.22</b> 25-YR AVG: \$22.76	21 Years	<i>factoring into cash flow and payback period, the loan does not include the amount of the tax credit at</i>
Loan (2% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$95.45 Y16-25: \$0	Y1: <b>-\$36.47</b> 25-YR AVG: \$35.15	19 Years	<i>Total system cost difference between 4.74% and 2% interest rate loan options is \$3,715.65.</i>

Dominion Energy / Virginia Beach, VA							
<b>Incentives:</b> Federal ITC (26%)		<b>Rate Tariff:</b> Schedule 1 - Residential Service Fixed Charge: \$6.58 Energy Rates: Tiered and seasonal rates with several riders. Rates range from 9.44 cents/kWh to 12.13 cents/kWh.			<b>Assumptions:</b> Includes 2.5% electricity price escalation and 0% discount rate. Assumes \$3.30/W system cost for a 4 kW system and \$3.05/kWh for a 6.4 kW system. Assumes 0.5% annual degradation rate. Assumes sales tax rate of 6% and property tax rate of 0.87%.		
Case	Monthly bill without solar	Monthly Bill with solar	Monthly Electric Bill Savings	Monthly Loan or Lease Payment	Net Monthly Savings	Simple Payback Period	Notes
Loan (4.74%) - no tax credits	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$158.78 Y16-25: \$0	Y1: <b>-\$89.62</b> 25-YR AVG: <b>-</b>	>25 Years	
Loan (2%) - no tax credits	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$130.55 Y16-25: \$0	Y1: <b>-\$61.39</b> 25-YR AVG: \$14.09	23 Years	Total system cost difference between 4.74% and 2% interest rate loan options is \$5,081.85.
Lease (15% first year savings with 2.5% escalator)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1: \$65.41 25-YR AVG: \$89.37	Y1: \$18.34 25-YR AVG: \$17.64	N/A	
<b>6.4 kW System Size &amp; \$2.75/W System Cost</b>							
Loan (4.74%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$143.16 Y16-25: \$0	Y1: <b>-\$72.57</b> 25-YR AVG: \$23.69	21 Years	\$157.90/year for all cases (\$13.16 per month). Property taxes are factored into payback period.
Loan (2%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$117.71 Y16-25: \$0	Y1: <b>-\$47.12</b> 25-YR AVG: \$38.96	18 Years	Total system cost difference between 4.74% and 2% interest rate loan options is \$4,582.05.
Loan (4.74% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$106.20 Y16-25: \$0	Y1: <b>-\$35.61</b> 25-YR AVG: \$30.13	20 Years	factoring into cash flow and payback period, the loan does not include the amount of the tax credit at
Loan (2% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$87.32 Y16-25: \$0	Y1: <b>-\$16.73</b> 25-YR AVG: \$41.46	17 Years	Total system cost difference between 4.74% and 2% interest rate loan options is \$3,715.65.

Dominion Energy / Virginia Beach, VA							
<b>Incentives:</b> Federal ITC (26%)		<b>Rate Tariff:</b> Schedule 1 - Residential Service Fixed Charge: \$6.58 Energy Rates: Tiered and seasonal rates with several riders. Rates range from 9.44 cents/kWh to 12.13 cents/kWh.			<b>Assumptions:</b> Includes 2.5% electricity price escalation and 0% discount rate. Assumes \$3.30/W system cost for a 4 kW system and \$3.05/kWh for a 6.4 kW system. Assumes 0.5% annual degradation rate. Assumes sales tax rate of 6% and property tax rate of 0.87%.		
Case	Monthly bill without solar	Monthly Bill with solar	Monthly Electric Bill Savings	Monthly Loan or Lease Payment	Net Monthly Savings	Simple Payback Period	Notes
Loan (4.74%) - no tax credits	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$143.16 Y16-25: \$0	Y1: <b>-\$72.57</b> 25-YR AVG: \$7.96	24 Years	
Loan (2%) - no tax credits	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$117.71 Y16-25: \$0	Y1: <b>-\$47.12</b> 25-YR AVG: \$23.23	21 Years	Total system cost difference between 4.74% and 2% interest rate loan options is \$4,582.05.
Rebate Scenarios (6.4 kW)							
Loan (4.74%) with \$5,000 rebate	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$119.34 Y16-25: \$0	Y1: <b>-\$50.18</b> 25-YR AVG: \$38.26	18 Years	
Loan (4.74% with tax credits excluded from upfront cost) with \$5,000 rebate	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$76.65 Y16-25: \$0	Y1: <b>-\$7.49</b> 25-YR AVG: \$46.43	16 Years	
Loan (4.74% with \$5,000 rebate and no tax credits)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$119.34 Y16-25: \$0	Y1: <b>-\$50.18</b> 25-YR AVG: \$20.81	22 Years	
\$2.75/W Cost - Loan (4.74%) with \$5,000 rebate	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$103.72 Y16-25: \$0	Y1: <b>-\$33.13</b> 25-YR AVG: \$47.35	16 Years	
\$2.75/W Cost - Loan (4.74% with tax credits excluded from upfront cost) with \$5,000 rebate	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$66.76 Y16-25: \$0	Y1: \$3.83 25-YR AVG: \$53.80	14 Years	

Dominion Energy / Virginia Beach, VA							
<b>Incentives:</b> Federal ITC (26%)		<b>Rate Tariff:</b> Schedule 1 - Residential Service Fixed Charge: \$6.58 Energy Rates: Tiered and seasonal rates with several riders. Rates range from 9.44 cents/kWh to 12.13 cents/kWh.			<b>Assumptions:</b> Includes 2.5% electricity price escalation and 0% discount rate. Assumes \$3.30/W system cost for a 4 kW system and \$3.05/kWh for a 6.4 kW system. Assumes 0.5% annual degradation rate. Assumes sales tax rate of 6% and property tax rate of 0.87%.		
Case	Monthly bill without solar	Monthly Bill with solar	Monthly Electric Bill Savings	Monthly Loan or Lease Payment	Net Monthly Savings	Simple Payback Period	Notes
\$2.75/W Cost - Loan (4.74% with \$5,000 rebate and no tax credits)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$103.72 Y16-25: \$0	Y1: <b>-\$33.13</b> 25-YR AVG: \$31.62	19 Years	
<b>Rebate Necessary for Savings in Year 1</b>							
Loan (4.74%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$64.12 Y16-25: \$0	Y1: \$5.04 25-YR AVG: \$71.39	11 Years	\$12,000 Rebate
Loan (4.74% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$64.82 Y16-25: \$0	Y1: \$4.35 25-YR AVG: \$53.52	15 Years	\$6,500 Rebate
Loan (4.74%) & \$2.75/W Cost	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$68.23 Y16-25: \$0	Y1: \$2.36 25-YR AVG: \$68.65	11 Years	\$9,500 Rebate
Loan (4.74% with tax credits excluded from upfront cost) & \$2.75/W Cost	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$66.76 Y16-25: \$0	Y1: \$3.83 25-YR AVG: \$53.80	14 Years	\$5,000 Rebate
<b>Rebate Necessary for Savings in Year 1 (With Property Tax Exemption)</b>							
Loan (4.74%)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$79.90 Y16-25: \$0	Y1: \$3.85 25-YR AVG: \$76.52	9 Years	\$10,000 Rebate
Loan (4.74% with tax credits excluded from upfront cost)	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$78.62 Y16-25: \$0	Y1: \$5.13 25-YR AVG: \$59.84	13 Years	\$4,750 Rebate

<b>Dominion Energy / Virginia Beach, VA</b>							
<b>Incentives:</b> Federal ITC (26%)		<b>Rate Tariff:</b> Schedule 1 - Residential Service Fixed Charge: \$6.58 Energy Rates: Tiered and seasonal rates with several riders. Rates range from 9.44 cents/kWh to 12.13 cents/kWh.			<b>Assumptions:</b> Includes 2.5% electricity price escalation and 0% discount rate. Assumes \$3.30/W system cost for a 4 kW system and \$3.05/kW for a 6.4 kW system. Assumes 0.5% annual degradation rate. Assumes sales tax rate of 6% and property tax rate of 0.87%.		

<b>Case</b>	<b>Monthly bill without solar</b>	<b>Monthly Bill with solar</b>	<b>Monthly Electric Bill Savings</b>	<b>Monthly Loan or Lease Payment</b>	<b>Net Monthly Savings</b>	<b>Simple Payback Period</b>	<b>Notes</b>
Loan (4.74%) & \$2.75/W Cost	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$80.06 Y16-25: \$0	Y1: \$3.69 25-YR AVG: \$74.71	9 Years	\$8,000 Rebate
Loan (4.74% with tax credits excluded from upfront cost) & \$2.75/W Cost	Y1: \$122.25 25-YR AVG: \$167.07	Y1: \$38.50 25-YR AVG: \$60.06	Y1: \$83.75 25-YR AVG: \$107.01	Y1-15: \$82.54 Y16-25: \$0	Y1: \$1.21 25-YR AVG: \$57.49	14 Years	\$3,000 Rebate