

Demystifying Solar in WAP

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Objectives

By the end of this session, you will be able to:

- ✓ Identify the solar pathways in the Weatherization Assistance Program (WAP) and the Low-Income Home Energy Assistance Program (LIHEAP)
- ✓ Describe the state of solar activity in WAP and LIHEAP
- ✓ Navigate the suite of available solar implementation resources.

Project Road Map



Literature Review

2022



Data Collection

2022–2023



Stakeholder
Interviews

2022–2023



Stakeholder
Workshops

2022



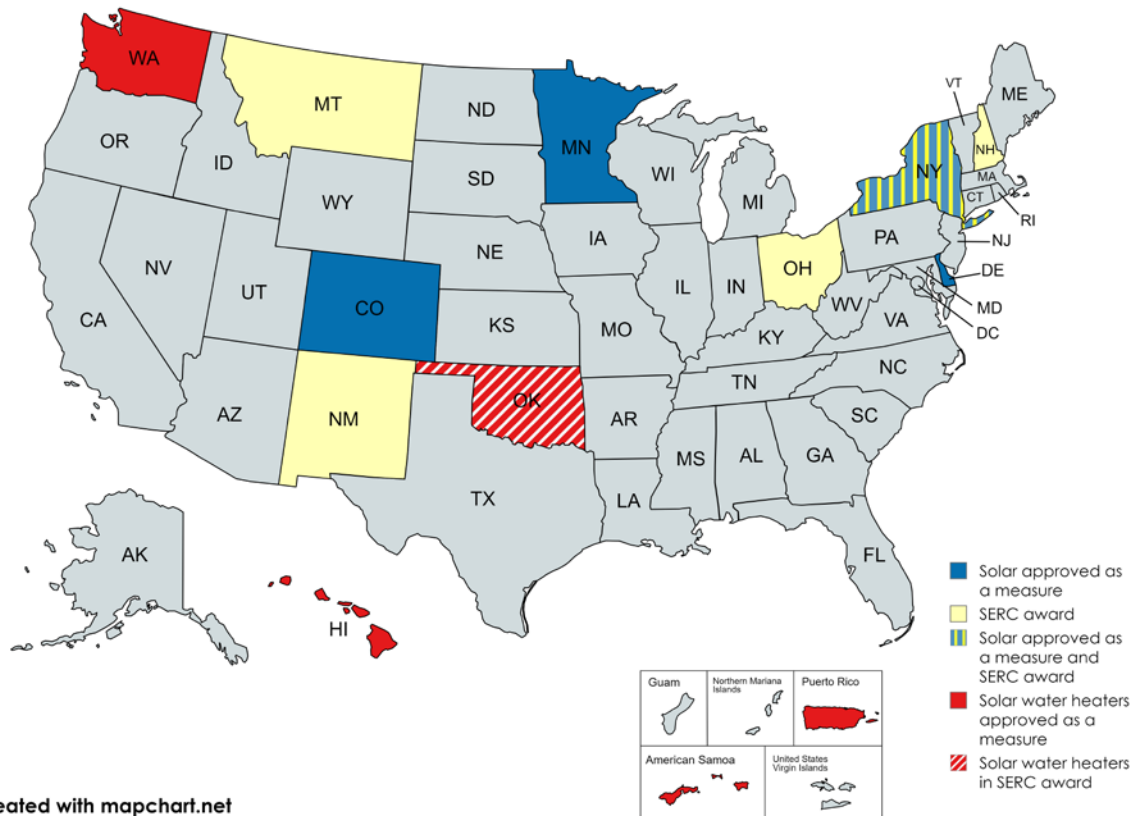
Publication of
Results

2024

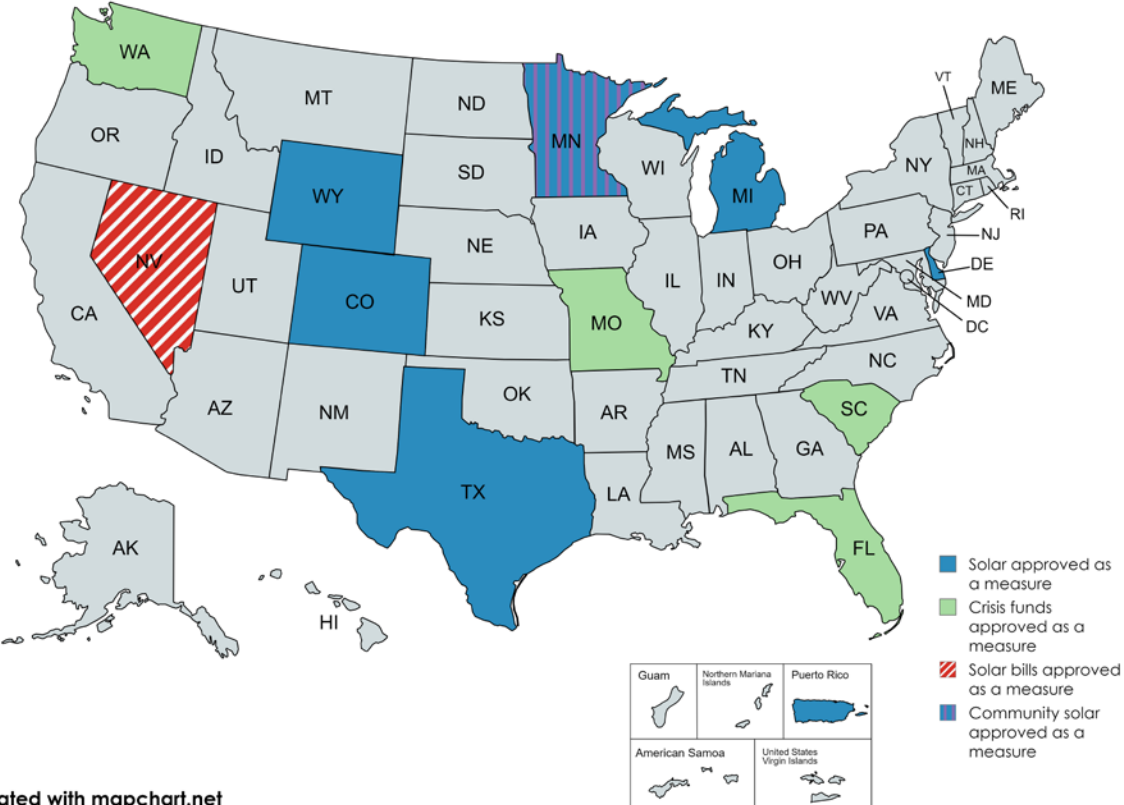
Solar Pathways in WAP and LIHEAP

1. Rooftop solar photovoltaics (PV) or solar water heaters as eligible weatherization measures in WAP
2. Rooftop solar as eligible weatherization measure in LIHEAP
3. LIHEAP crisis funds to repair or replace existing solar
4. LIHEAP funds to pay for community solar subscriptions
5. LIHEAP funds to pay for client solar bills
6. Use of WAP or LIHEAP infrastructure for external solar programs (e.g., verifying income eligibility or referrals)

Solar Activity in WAP



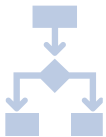
Solar Activity in LIHEAP



Solar in WAP and LIHEAP Resources



Technical Report



Decision Guide



Implementation Toolkit



Case Studies



Frequently Asked
Questions (FAQs)



Solar Savings-to-Investment Ratio
(SIR) Calculator and Energy Burden
Calculator (forthcoming)

Decision Guide

- Designed to help WAP and LIHEAP implementers assess which solar implementation pathways for rooftop solar PV, community solar, or solar water heating to pursue
 - Overview of relevant enabling policies and processes
 - Descriptions of each pathway
 - High-level program design factors
 - Scale and client impact considerations.

Implementation Toolkit

- Compiles guides, templates, and other resources that support rooftop solar installation in WAP and LIHEAP, related to:
 - Procuring solar equipment or contractors
 - Determining suitability of solar on client homes
 - Client selection and implementation
 - Contractor requirements.

FAQs for Solar Deployment in WAP and LIHEAP

Examples of answered questions included in the FAQs:

- **What sources of funding can be used to support solar in LIHEAP and WAP?**
 - WAP Formula Grant (Colorado, Delaware, Minnesota, Puerto Rico)
 - WAP Sustainable Energy Resources for Consumers (SERC) awards (rooftop solar: Montana, New York, New Mexico, Ohio; solar water heater: Oklahoma)
 - LIHEAP weatherization allocations
 - And more detailed in the FAQs!
- **What monitoring requirements apply to solar?**
 - The U.S. Department of Energy issued WAP Memorandum 122, which includes inspection checklists for technologies installed via SERC grants, including solar PV.
 - The technology-specific inspection checklists were developed to support Grantees in meeting SERC oversight requirements.
- **What training or certifications are recommended for implementing solar in WAP?**
 - Each Grantee is responsible for creating rules and guidelines on specific training and certifications required for solar.
 - The North American Board of Certified Energy Practitioners offers multiple solar-related certifications, including PV Installation Professional, PV Commissioning and Maintenance Specialist, PV Installer Specialist, and PV System Inspector.

Case Studies

- Case studies include descriptions of solar program design, the partners and funding sources involved, and lessons learned from early WAP and LIHEAP solar activity.
- Case studies from:
 - Colorado
 - Illinois
 - Minnesota
 - Puerto Rico
 - Washington, D.C.

SIR Calculator Demonstration

Select Your State or Jurisdiction

Colorado

Input Definitions, Instructions, and Notes

System Details

Expected annual production for a <u>1 kW</u> system (kWh)	1594
System Size DC (kW)	4
Expected system annual production (kWh)	6376
System Cost (\$)	\$10,000
System Life (yrs)	20
System Cost per Watt (\$/W)	\$2.50

Definition: The total amount of energy (kilowatt hours) a solar array with a system size of 1 kW is expected to during a year, based on latitude, climate, orientation, and other factors. This is a useful metric to compare different project designs or locations.

Input 2 Instructions:

Step 1. Go to <https://pvwatts.nrel.gov/>

Step 2. Enter the client address into the "Get Started" field at the top and click "Go"

Step 3. Click the "Go To System Info" arrow on the right.

Step 4. On the System Info page, set the "DC System Size (kW)" to 1. If you have site-specific details, such as the Tilt and Azimuth, enter those details. Otherwise, use the default inputs. The PVWatts defaults reflect a 20° tilt and 180 degree (i.e. south-facing) azimuth.

Step 5. Select the appropriate Array Type (Fixed (open rack) for ground-mounted systems, and Fixed (roof mount) for roof-mounted systems)

Step 6. Click the "Go to PVWatts results" arrow on the right.

Step 7. Enter the bold total kWh/Year production estimate as Input 2. This reflects the production per kW of rated system capacity.

Definition: The nameplate direct current generating capacity of a solar array in kilowatt-hours. In other words, this is the maximum amount of electricity a given system could produce at one time. This value will be determined by the solar design professional based on budget, roof size and orientation, and other design parameters.

Definition: The total amount of energy (kilowatt hours) the solar array is expected to during a year, based on latitude, climate, orientation, and other factors.

Definition: The total system cost (i.e. materials, labor, etc.) paid for the solar installation before accounting for incentives. This value will be determined by the solar design professional based on system size and other site parameters.

Definition: How long a solar array is expected to perform, based on equipment quality and environmental conditions. Most solar panel manufacturers offer product warranties guaranteeing the integrity of the equipment for a certain period. Product warranties typically range from 10 to 30 years.

Note on Input 5: The minimum expected measure life is 20 years. If the manufacturer-specified product warranty is longer than 20 years, the measure life time may match that up to 30 years or as approved by DOE for use in your Grantee's area.

Definition: A metric of the total cost to install a solar array by system size. This is a useful metric to compare different project designs, bids, or locations.

SIR Calculator—Demonstration

PVWatts® Calculator



My Location

7080 Simms St. #103, Arvada CO 80004
» Change Location

English
Español
Українська

HELP

FEEDBACK

RESOURCE DATA

SYSTEM INFO

RESULTS



Go to
resource
data

SYSTEM INFO

Modify the inputs below to run the simulation.

DC System Size (kW):

1



Module Type:

Standard



Array Type:

Fixed (open rack)



System Losses (%):

14.08



Loss
Calculator

Tilt (deg):

20



Azimuth (deg):

180



+ Advanced Parameters

RESTORE DEFAULTS



Go to
PVWatts
results

Rooftop Size Estimator

Click below to estimate the system size from your roof area on a map. (optional)



SIR Calculator—Demonstration

RESOURCE DATA

SYSTEM INFO

RESULTS



Go to
system info

RESULTS



Print Results

1,519 kWh/Year*

System output may range from 1,411 to 1,564 kWh per year near this location.

Click [HERE](#) for more information.

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)
January	3.72	98
February	4.70	109
March	5.53	137
April	6.07	144
May	6.48	153
June	6.83	151
July	6.61	149
August	6.05	138
September	5.74	130
October	4.88	119
November	4.05	99
December	3.57	93
Annual	5.35	1,520



SIR Calculator—Demonstration

Financial Incentives

Leveraged Funds, if any (\$)	\$0.00
Upfront incentives, if any (\$)	\$0.00
Production incentives, if any (\$/kWh)	\$0.00000
Years of production incentive (years)	0

Market Assumptions

% electricity exported to grid (per year)	0%
Utility Electric Rate (\$/kWh)	\$0.1433
Net metering rate (\$/kWh)	\$0.1433
Discount Rate	3.0%

Financial incentives may be offered by federal, state, and local government entities or utilities to encourage the installation of solar. Incentives may not be available to all customers or in all locations.

Definition: Leveraged funds may come from non-WAP funding sources and help to buy-down the upfront cost of solar array installation.

Input 6 instructions:

For all available leveraged funds, calculate the total dollar amount and enter it as Input 6.

Definition: Upfront incentives may be structured as a fixed dollar amount per project, a percentage of the installation cost, a dollar amount per Watt of system size, or other structure, typically paid upon complete installation of the project. Upfront incentives may include rebates, tax credits, or cash payments.

Input 7 instructions:

For all available upfront incentives, calculate the total dollar amount and enter it as Input 7.

Definition: Financial incentives that compensate solar owners a fixed dollar amount for each kWh of energy produced. Residential production incentives may be calculated and paid upfront based on the years of production incentive and expected performance. If production incentives are paid upfront, enter them as part of Input 7.

Definition: The number of years a production incentive is available.

Definition: The amount of the energy generated by a solar array that exceeds household usage at any given time and sent back to the grid divided by the total amount of solar energy generation.

Note on Input 10: Use the default value of zero unless you have location-specific information from a solar professional. This value only affects the SIR if the exported energy is priced at a net metering rate (see below) different from the utility electricity rate.

Definition: The dollar per kWh rate that utilities charge residential customers for energy. This calculator uses statewide average utility electric rates.

Definition: The dollar per kWh rate that utilities pay customers for excess solar generation that is sent back to the grid. Net metering rates are typically either equal to the Utility Electric Rate or the utility's avoided cost per kWh of energy, which is substantially lower. This calculator uses estimated statewide average net metering rates.

Definition: A discount factor used to adjust future cash flows to present dollar values which accounts for expected inflation and opportunity costs had the money been used for a different investment. DOE uses a 3% discount rate when calculating measure lifetime cost effectiveness in WAP.

SIR Calculator—Demonstration

Other Values

Expected capacity factor (%)	18.2%
Degradation rate (% per year)	1.0%

Definition: The ratio of the electrical energy produced by solar array during a year compared to the electrical energy that could have been produced at continuous full power operation during a year. In other words, the expected capacity factor is the percentage of the total possible energy that could have been generated that is expected to be generated, given variations in time of day, seasons, and weather.

Definition: The rate at which solar power production degrades each year. Industry-wide degradation rates typically range between 0.5% and 1% per year, which means that after 20 years of operation, a typical solar array can be expected to generate 80% of its nameplate generating capacity.

Note: The default is set to 1% degradation as a default. Consult with a solar design professional or manufacturer-specific documentation to determine if the annual degradation for the system(s) installed on site are different than 1%.

Model Outputs

Bill Savings	\$15,024.10
Social Cost of Carbon (SCC) Savings	\$6,503.24
SIR without SCC	1.50
SIR with SCC	2.15

Definition: The total expected electric bill savings of solar generated over the life of the system.

Definition: The total expected Social Cost of Carbon savings over the life of the system. Grantee must have preapproval from DOE to use the Social Cost of Carbon in the SIR.

Note: Grantee must have preapproval from DOE to use the Social Cost of Carbon in the SIR.

SIR Calculator—Demonstration

Grantee SIR Estimates

This tab calculates the average expected SIR for residential solar projects in 50 states and the District of Columbia based on similar inputs as the Site-Specific User Interface. The inputs on this tab are simplified to reflect average utility rates, and solar production. Users can adjust the Green Input cells to see the effect of various parameters on the average Grantee SIR estimate. Please see the instructions on the Site-Specific User Interface Tab for details on each input. These calculations are intended to provide context for Grantees considering including solar as an eligible WAP measure.

Select Your State or Jurisdiction	
Colorado	
System Size DC (kW)	4.00
Cost per Watt DC (\$/W):	\$3.00
Total System Purchase Price	\$12,000
System Life (yrs)	20
Degradation rate (per year)	1.0%
Discount Rate	2.0%
% electricity exported to grid (per year)	0%
Leveraged Funds (\$)	\$0.00
Upfront Incentive value (\$)	\$0.00
Production Incentive (\$/kWh)	\$0.00
Years of production incentive (years)	0
SIR without SCC	1.25
SIR with SCC	1.79

SIR Calculator—Demonstration

Expected average SIR without SCC by state, assuming a system cost of \$3/W and an analysis period of 20 years

Number of states with positive SIR = 34

AK	1.10	HI	3.76	MI	1.28	NV	1.30	UT	0.95
AL	1.19	IA	1.00	MN	1.05	NY	1.84	VA	1.07
AR	0.98	ID	0.80	MO	0.93	OH	1.01	VT	1.59
AZ	1.27	IL	1.19	MS	1.03	OK	1.12	WA	0.71
CA	2.35	IN	1.10	MT	0.84	OR	0.87	WI	1.14
CO	1.25	KS	1.25	NC	0.96	PA	1.34	WV	0.99
CT	2.15	KY	0.99	ND	0.82	RI	2.02	WY	0.90
DC	1.10	LA	1.05	NE	0.92	SC	1.14		
DE	1.10	MA	1.94	NH	2.11	SD	1.00		
FL	1.19	MD	1.01	NJ	1.46	TN	0.96		
GA	1.16	ME	1.86	NM	1.35	TX	1.24		

Maximum system cost to yield SIR>1 assuming no SCC savings, a system size of 4 kW, and an analysis period of 20 years. (Note: values include \$0 in incentives for the state of Colorado)

AK	\$13,252	HI	\$45,061	MI	\$15,323	NV	\$15,658	UT	\$11,363
AL	\$14,248	IA	\$11,967	MN	\$12,647	NY	\$22,088	VA	\$12,799
AR	\$11,743	ID	\$9,649	MO	\$11,140	OH	\$12,103	VT	\$19,074
AZ	\$15,265	IL	\$14,283	MS	\$12,350	OK	\$13,445	WA	\$8,479
CA	\$28,194	IN	\$13,170	MT	\$10,046	OR	\$10,408	WI	\$13,730
CO	\$14,980	KS	\$15,017	NC	\$11,477	PA	\$16,066	WV	\$11,844
CT	\$25,759	KY	\$11,904	ND	\$9,843	RI	\$24,273	WY	\$10,817
DC	\$13,215	LA	\$12,651	NE	\$10,998	SC	\$13,712		
DE	\$13,173	MA	\$23,315	NH	\$25,302	SD	\$11,971		
FL	\$14,225	MD	\$12,133	NJ	\$17,556	TN	\$11,538		
GA	\$13,935	ME	\$22,283	NM	\$16,177	TX	\$14,922		

Expected average SIR with SCC by state, assuming a system cost of \$3/W and an analysis period of 20 years

Number of states with positive SIR = 49

AK	1.52	HI	4.98	MI	2.24	NV	1.82	UT	1.61
AL	2.18	IA	1.40	MN	1.40	NY	2.05	VA	1.63
AR	1.82	ID	1.38	MO	1.49	OH	1.94	VT	1.94
AZ	1.88	IL	1.90	MS	2.06	OK	1.67	WA	0.83
CA	2.52	IN	2.06	MT	1.39	OR	1.13	WI	1.82
CO	1.79	KS	1.73	NC	1.40	PA	2.26	WV	1.94
CT	2.92	KY	2.05	ND	1.22	RI	2.31	WY	1.53
DC	1.80	LA	2.03	NE	1.38	SC	1.95		
DE	2.09	MA	2.48	NH	2.99	SD	1.47		
FL	1.87	MD	1.70	NJ	2.21	TN	2.05		
GA	2.15	ME	2.27	NM	1.76	TX	1.59		

Maximum system cost-per-watt (\$/W) to yield SIR>1 assuming no SCC savings, a system size of 4 kW, and an analysis period of 20 years. (Note: values include \$0 in incentives for the state of Colorado)

AK	\$3.31	HI	\$11.27	MI	\$3.83	NV	\$3.91	UT	\$2.84
AL	\$3.56	IA	\$2.99	MN	\$3.16	NY	\$5.52	VA	\$3.20
AR	\$2.94	ID	\$2.41	MO	\$2.79	OH	\$3.03	VT	\$4.77
AZ	\$3.82	IL	\$3.57	MS	\$3.09	OK	\$3.36	WA	\$2.12
CA	\$7.05	IN	\$3.29	MT	\$2.51	OR	\$2.60	WI	\$3.43
CO	\$3.74	KS	\$3.75	NC	\$2.87	PA	\$4.02	WV	\$2.96
CT	\$6.44	KY	\$2.98	ND	\$2.46	RI	\$6.07	WY	\$2.70
DC	\$3.30	LA	\$3.16	NE	\$2.75	SC	\$3.43		
DE	\$3.29	MA	\$5.83	NH	\$6.33	SD	\$2.99		
FL	\$3.56	MD	\$3.03	NJ	\$4.39	TN	\$2.88		
GA	\$3.48	ME	\$5.57	NM	\$4.04	TX	\$3.73		

Questions?

All resources can be accessed on the Weatherization Assistance Program Resource Hub:

<https://www.energy.gov/scep/wap/weatherization-assistance-program-resource-hub>

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Thank you!

www.nrel.gov

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References

WAP Solar Policy Guidance

[WPN 23-06](#), issued March 3, 2023, outlines the process Grantees must follow to gain approval for solar PV.

Grantees must submit:

- A. A request to include solar PV as an approved measure for specific housing types in the Grantee Plan
- B. A special materials request, including maximum PV system size and installation location
- C. Grantee policies on solar PV energy modeling, installation, inspections, and monitoring, including:
 - The process for including leveraged funds in the SIR calculations
 - Compliance with Historic Preservation requirements
 - Requirements for Grantee, Subgrantee, and/or contractor training, qualifications, or certification
- D. A sample analysis of a solar PV measure in energy modeling and cost-effectiveness calculations
- E. A declaration of eligibility for the WAP National Environmental Policy Act (NEPA) categorical exclusion, or a written process for NEPA impact assessment.

LIHEAP Solar Guidance

[Low Income Home Energy Assistance Program Act of 1981 \(amended\):](#)

- Prohibits use of funds for improvement of land or the purchase, construction, or permanent improvement of any building or other facility except for low-cost residential weatherization and energy-related home repairs.

[Energy Policy Act of 2005:](#)

- Authorizes LIHEAP funds to be used to “purchase renewable fuels.”

[Assurance 16:](#)

- Allows grant recipients to use up to 5% of LIHEAP funds to provide services that encourage and enable households to reduce their home energy needs, including need assessments, counseling, and assistance with energy vendors.

[LIHEAP Information Memorandum \(IM\) 2023-04:](#)

- Identifies that LIHEAP funds may be used for community solar subscription fees if allowed by the grant recipient’s rules and policies.

LIHEAP and WAP Interface

- LIHEAP weatherization funds:
 - Grant recipients may allocate up to 15% of funds to weatherization, or 25% if approved by U.S. Department of Health and Human Services (HHS) waiver.
 - Funds may be used for solar if approved in the grant recipient plan.
 - LIHEAP funds may be used for community solar subscriptions if approved in the grant recipient plan.
- LIHEAP grant recipient plan must identify:
 - The agency/office that will oversee LIHEAP-funded weatherization activities
 - The rules that will apply to those funds: HHS LIHEAP, WAP, or a hybrid of both regulations
 - The specific weatherization measures, which may include solar.