Clean Energy Potential in Southland Cook County

Rooftop Solar and Energy efficiency Opportunities in Southland Cook County, IL

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Greenlink Analytics is an Atlanta-based 501(c)(3) nonprofit organization working to advance a clean energy transition as fast and fair as possible. Greenlink Analytics' team combines expert knowledge, data analytics, and machine learning to solve the most pressing climate and social issues, including energy burdens and pollution impacts, with the goal of improving lives and the environment. Greenlink Analytics conducted the quantitative data collection and analysis. URL: https://www.greenlinkanalytics.org/

Definitions and Acronyms

AEO2023	Annual Energy Outlook 2023
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CEJC	Clean Energy Jobs Calculator
CPP	Climate Prioritization Plan
CCG	Community Change Grants
DOE	Department of Energy
EIA	Energy Information Administration
EPA	Environmental Protection Agency
GEM	Greenlink Equity Map
GHG	Greenhouse Gas
NREL	National Renewable Energy Laboratory

Introduction

Five cities in Southland Cook County (Hazel Crest, Harvey, Markham, Calumet City, and South Holland) are historically under-resourced and underserved. The risk and frequency of extreme weather events such as winter storms, extreme heatwaves and cold waves, and flooding with heavy rains are increasing. The extreme weather events are exacerbating the sustainability and well-being of the vulnerable households and businesses in the area. In addition, the rolling blackouts and outages are intensifying the difficulty. To cope with such climate crisis, holding local, resilient, and affordable clean energy resources are vital for the communities.

To help the Chicago suburban region achieve their clean energy goals as a means to realizing equitable and sustainable outcomes, ELEVATE[1] has been working with the five municipalities. To develop comprehensive plans, quantitative data about their energy, climate, health, and economy are necessary. However, the five municipalities have very little data to work from and need both to understand their current situation and how the community could develop in the future. To promote the climate prioritization efforts, Greenlink was engaged in the data collection and analytics providing information about existing community electricity usage, clean energy potentials, emissions benefits, job creation potentials, the distribution of various economic, social, and health-associated burdens.

In parallel, EcoHealth Strategies[2] worked on a qualitative analysis to identify the five municipalities' climate and energy needs and drive the recommendations to resolve their major issues. In May 2024, EcoHeath released a case study titled, "Southland Cook County Climate Prioritization Plan: A Community Study of Climate Change Resilience in Southland Cook County" to the communities and stakeholders with a conclusion of that the five municipalities are particularly vulnerable to the effects of climate change.[3] The case study says that several factors magnify its effects and impact including aging infrastructure, aging population, limited financial resources and locational realities. As a result, EcoHealth proposed four recommended projects of: 1) Public Infrastructure Management, 2) Green Infrastructure, Stormwater Management and Forestry Services, 3) Emergency Preparedness and Community Education, and 4) Clean Energy, Electrification and Energy Efficient Upgrades.

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1 Elevate is a 501(c)(3) nonprofit organization that works nationally and is headquartered in Chicago. Elevate seeks a just and equitable world in which everyone has clean and affordable energy and water in their homes and communities. URL: https://www.elevatenp.org/

2 EcoHealth Strategies is a Chicago-based climate consultancy dedicated to safeguarding our future by developing and equitably implementing climate solutions including, climate resilience programs, solar energy, energy efficiency and workforce development to meet community impact and business goals. URL: https://www.ecohealthstrategies.com/

3 EcoHealth (2024) "Southland Cook County Climate Prioritization Plan: A Community Study of Climate Change Resilience in Southland Cook County" released to the five municipalities and stakeholders in May 2024 and not to the general public yet.

Greenlink's efforts focused on the fourth recommendation. Greenlink quantitatively analyzed the environmental and the economic benefits of clean energy adoption. This focused on solar power and energy efficiency as a realistic and affordable solution for the five cities. This report is focused on the electricity demand and supply and identified key resource categories to support grant proposals aiming for federal funding such as EPA's Community Change Grants. This report is comprised of the five components:

- **Energy burden and health-associated indicators** are presented by each city and the implications are discussed in Section 2.
- **Rooftop Solar Photovoltaics (PV) Potential:** The economic and environmental potential of rooftop PV and are analyzed in Section 3.
- **Energy Efficiency (EE) Potential in homes and buildings:** Energy savings through five EE practices and the associated GHG reduction are discussed in Section 4.
- **Resiliency and Reliability solutions** are discussed in Section 5 and Job Creation Potential of five clean energy resources are presented in Section 6.

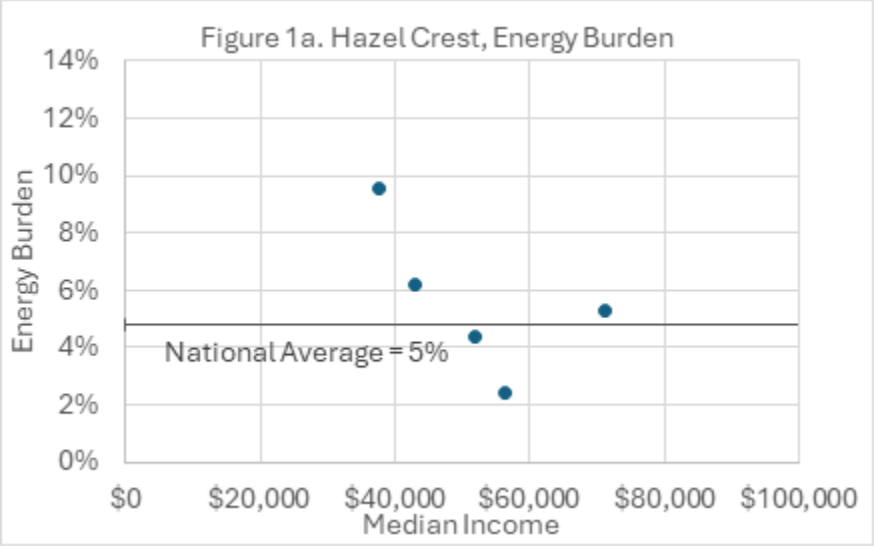
Energy Burden and Public Health Issues

The Southland Cook area struggles with both economic and public health issues. Energy burden is one economic measure discussed further; it represents the share of the expenditure a household pays for home energy bills to the total income. Southland Cook communities have high energy burdens in the country, which is driven primarily by low incomes, inefficient structures, and outdated appliances and equipment.

High energy burdens disproportionately impact low-income households.[4] In the US, the energy burden of average households is approximately 5%. Figures 1a – 1e show the energy burden by census tract in each city. As can be seen from the figures, most of the census tracts in Markham and Harvey are above the national average.

4 Households that spend more than 6% percent of their income paying for utility bills are considered communities with high energy burdens.

Figures 1a- 1e Energy Burden by Census Tract



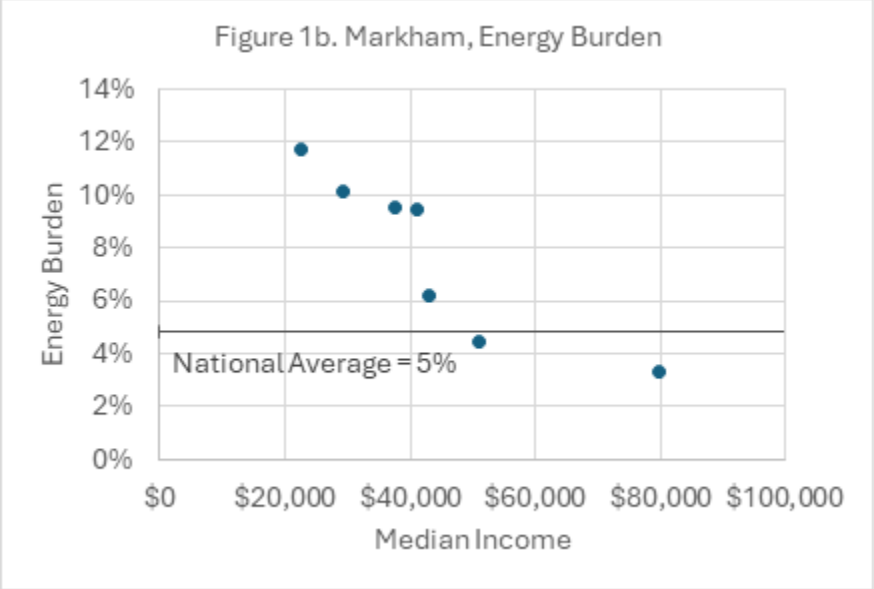


Figure 1c. Harvey, Energy Burden

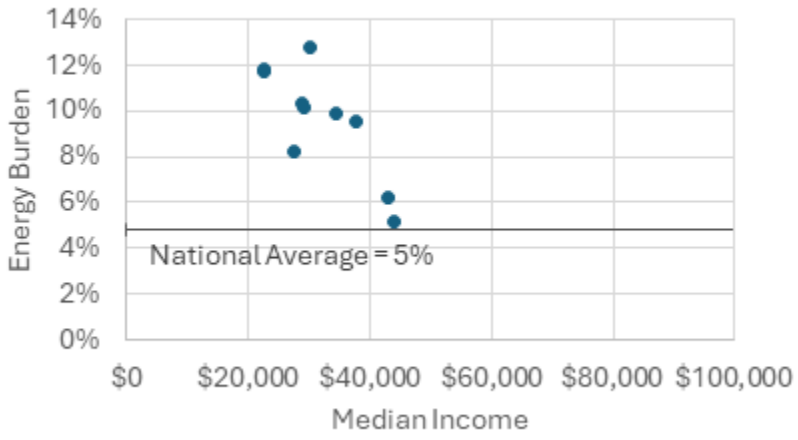


Figure 1d. Calumet City, Energy Burden

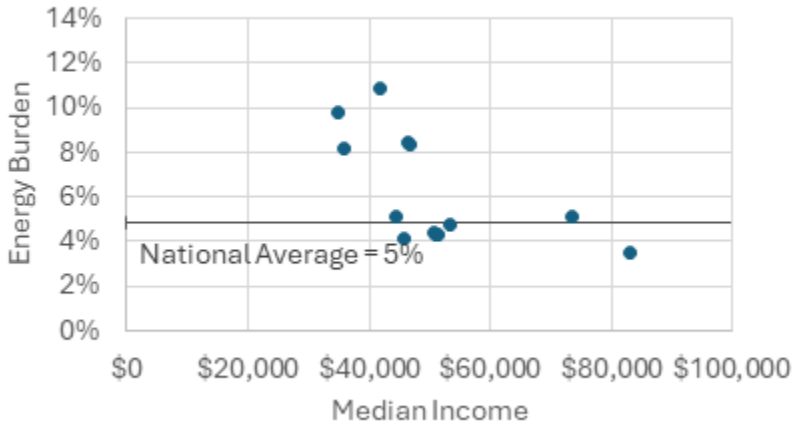
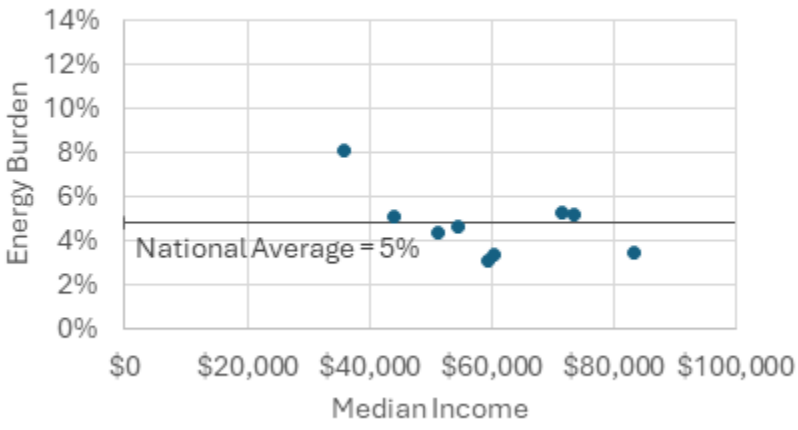
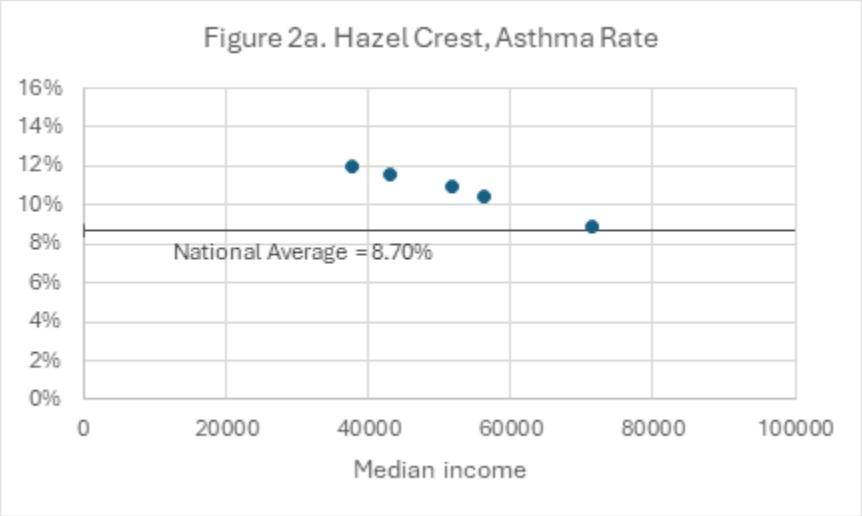


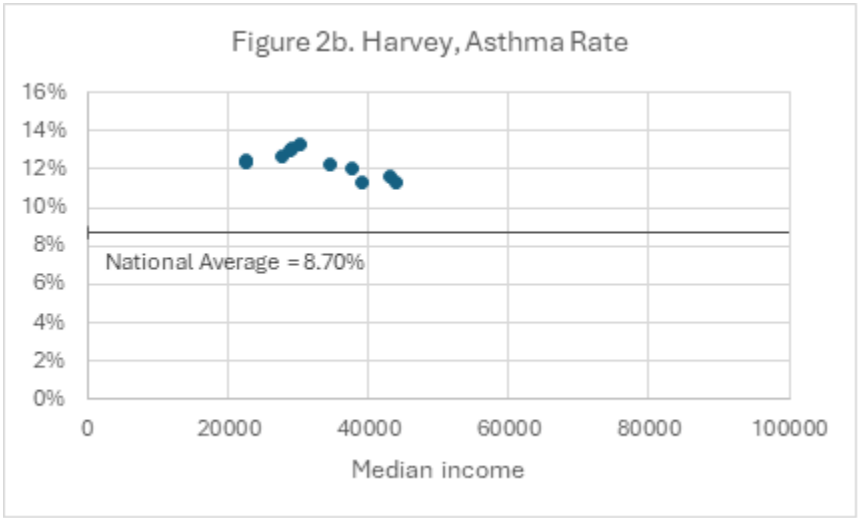
Figure 1e. South Holland, Energy Burden



In addition to the economic burden associated with energy, the five cities are facing serious public health issues. Asthma rate by census tract is shown in Figures 2a-2e. Asthma rates indicate vulnerability associated with local air pollution. The national average asthma rate is 8.7%, while most of these census tracts in Southland show far above that threshold. The issue is correlated with the income levels and the census tracts with lower median income have the more serious public health issues (Figures 2a-2e). A similar pattern is seen when measuring Health Insurance Stress. Health Insurance Stress is defined as percentage of adults without health insurance (see Appendix B). The less income communities are struggling with the more financial stress in paying medical bills.[5]

Figure 2a-2e: Asthma Rate by Census Tract





5 For more information, see GEM equity indicators at https://www.equitymap.org/_files/ugd/4aef44_92ea7a0176f144ed810d85fe73cde1a6.pdf

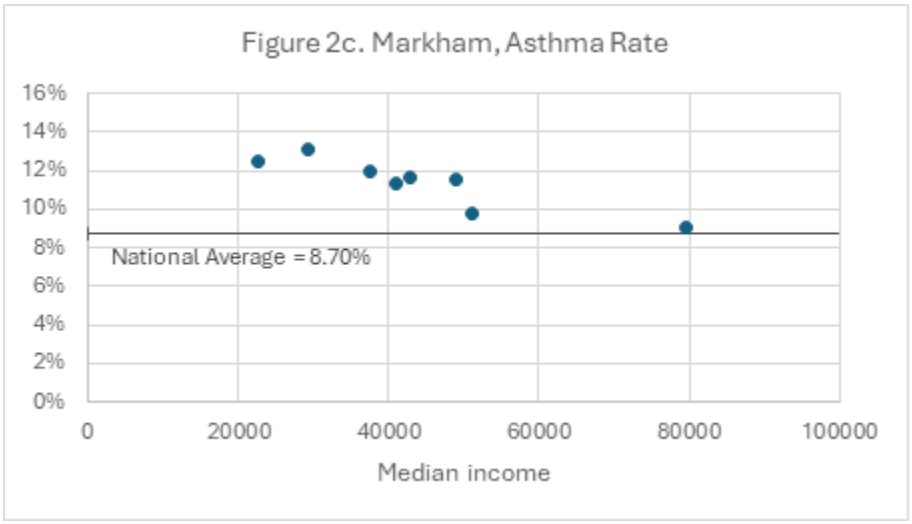


Figure 2c. Markham, Asthma Rate
16%
14%
12%
10%
8%
6%
4%
2%
0%
National Average = 8.70%
0
20000
40000
60000
80000
100000
Median income

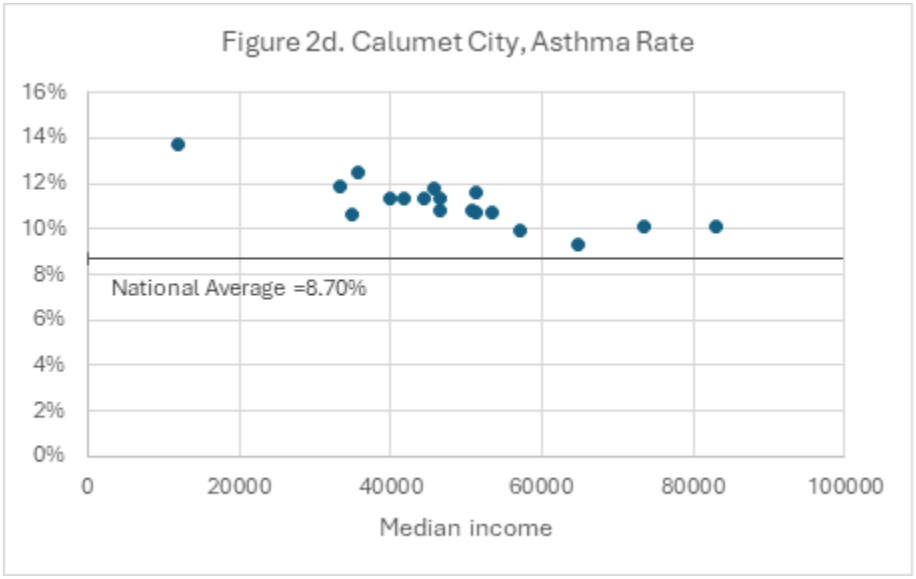


Figure 2d. Calumet City, Asthma Rate
16%
14%
12%
10%
8%
6%
4%
2%
0%
National Average =8.70%
0
20000
40000
60000
80000
100000
Median income

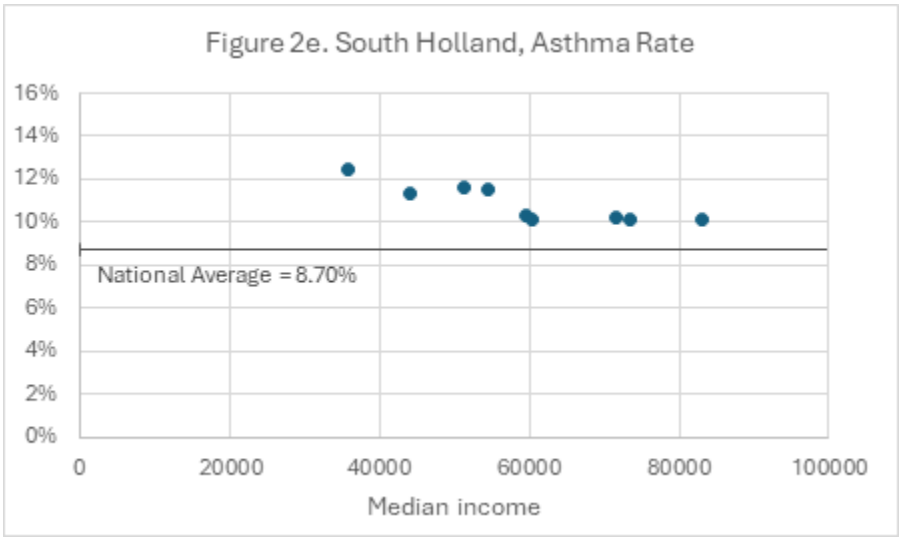


Figure 2e. South Holland, Asthma Rate
16%
14%
12%
10%
8%
6%
4%
2%
0%
National Average = 8.70%
0
20000
40000
60000
80000
100000
Median income

Rooftop Solar Installation

Hosting solar panels on the roof of homes and businesses can supply required electricity on site, reduce customers' electricity bills, and end up enabling to lower energy burden of residents and business owners and greenhouse (GHG) emissions. Rooftop solar in the five cities in Cook County has a large untapped potential. According to the 2019 Project Sunroof data[6], around 68% of the roofs are technically solar viable (Hazel Crest, 69%; Markham, 61%; Harvey, 60%; Calumet City, 78%; South Holland, 74%). However, currently less than 1% of the technical potential is realized. To estimate the potential of the rooftop solar, Greenlink Analytics set an outcome-based scenario and calculated how much CO_2 emissions would be avoided. Using the Project Sunroof data, Greenlink figured out the technical potential of the rooftop areas in the five cities. Considering the economic and regulatory constraints, Greenlink evaluated several achievable ramp-up schedules, meaning how much technical potential would be realized how quickly. After testing a moderate (5% by 2030, 20% by 2050) and an aggressive (10% by 2030; 50% by 2050) schedule, Greenlink chose the moderate schedule as a reasonable and actionable scenario and developed the following analyses about solar capacity projection, cost estimation, emission reduction, and job creation (see Tables 1-3).

Table 1. Outcome-based PV adoption schedule

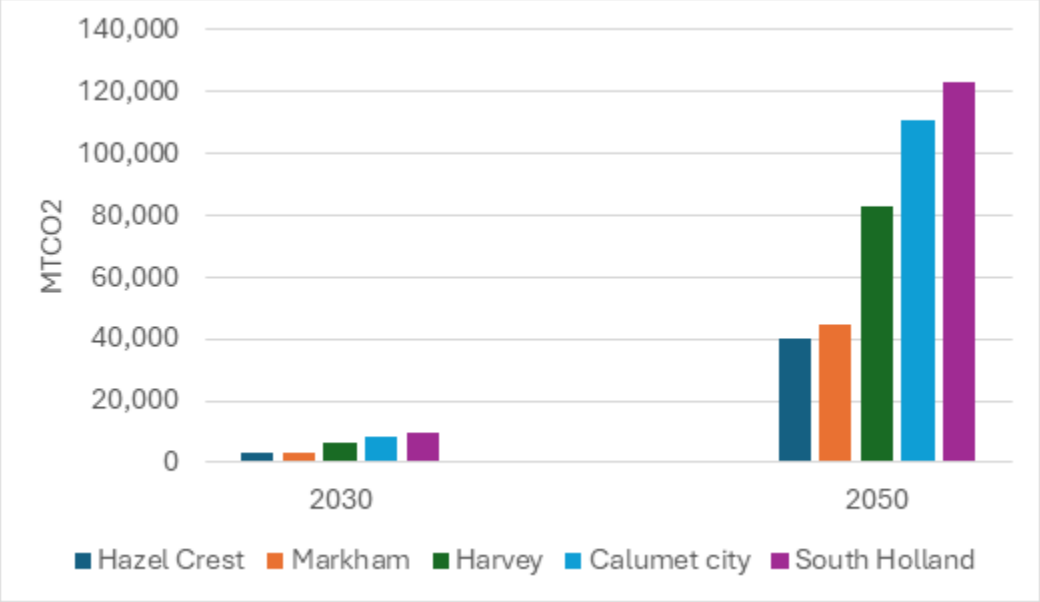
	Total expected rooftop PV (MW) installed		Annual electricity generation from rooftop PV (GWh)	
	2030	2050	2030	2050
Hazel Crest	2	8	2	8
Markham	2	9	2	9
Harvey	4	16	4	16
Calumet city	5	22	5	21
South Holland	6	24	6	23
TOTAL	19	79	19	76

6 Google Project Sunroof (2019) estimate what percentage of the available rooftop areas are solar viable considering the structure and the strength of the roof space. URL: https://sunroof.withgoogle.com/ visited July 30, 2024.

If the five cities grow their rooftop PV capacity following this ramp-up schedule, the cumulative rooftop PV capacity would reach 19 MW by 2030 and 79 MW by 2050. Greenlink took these installation targets to calculate expected solar power generation. Solar generation can determine avoided electricity consumption, which allows calculation of avoided emissions.

Overall, this rooftop PV adoption would contribute to collectively reducing GHG emissions by 31,000 $MTCO_2$ through 2030 and 401,000 $MTCO_2$ through 2050 (see Figure 3). To explain the calculation in more detail, Greenlink converts the solar capacity projections to city-specific annual average power generation (kWh) using Google's Project Sunroof locational generation rates (kWh/kW-year). Then to convert solar power generation to greenhouse gas reduction potential, Greenlink assumes 100% of solar generation would be consumed on site and replaces electricity demand. Electricity demand becomes a carbon emission reduction by multiplying the Greenlink-calculated carbon intensity estimate ($MTCO_2$ / kWh) for PJM.

Figure 3. Cumulative Avoided Emissions through the Roof PV installation



The cost required for realizing the PV ramp-up shown in Table 1 is calculated. As seen in Table 2, the estimated net present value of the overnight capital cost to realize 19 MW by 2030 would be 19 - 30 million dollars with federal Investment Tax Credit (ITC) (Table 2).

Table 2. Overnight Capital Cost for Rooftop PV adoption

Overnight Capital Cost estimates (NPV in 2022 million dollars) *

	2030		2050	
	Before ITC**	After ITC	Before ITC	After ITC
Hazel Crest	2.7 4.2	1.9 - 3.0	5.9 - 8.9	4.4 - 6.9
Markham	3.0 - 4.8	2.1 - 3.4	6.7 - 10.0	4.9 - 7.4
Harvey	5.5 - 8.8	3.9 - 6.2	12.3 - 18.4	9.2 - 13.6
Calumet City	7.4 - 11.8	5.2 - 8.3	16.5 - 24.7	12.2 - 18.2
South Holland	8.2 - 13.2	5.8 - 9.3	18.4 - 27.5	13.6 - 20.3
TOTAL	26.8 - 42.8	18.9 - 30.2	59.8 - 89.5	44.3 - 66.4

* NREL's Annual Technology Baseline (ATB) 2023 was used to estimate the overnight capital cost by investment option. The overnight capital cost to install the rooftop PV is estimated in net present value at 3% discount rate.

** This analysis takes federal Investment Tax Credit (ITC) into account in the cost estimation for the Solar PV installation. Additional monetary benefits can be expected through Illinois Shine, Solar-for-All programs, and other utility programs.

If these investments are made to install rooftop solar panels in the five municipalities, the associated jobs would be expected. Through 2030, approximately 235 jobs would be expected and through 2050, about 458 jobs would be created in Illinois.

Table 3. Job Creation Potential from the Rooftop PV

	Job Creation Potential (job years*)	
	through 2030	through 2050
Hazel Crest	18 - 28	40 - 60
Markham	20 - 32	45- 68
Harvey	37 - 60	83 -125
Calumet city	50 - 80	112 -167
South Holland	56 - 89	129 - 186
TOTAL (mid-point estimate)	181 – 289 (235)	309 – 606 (458)

*One job year means one average job lasting one year.

Energy Efficiency Improvement in Buildings

The housing quality of homes in the five cities could magnify the effects of flooding and extreme temperature. Areas with the oldest homes and infrastructure often experience the worst of these weather impacts. Energy efficiency practices such as retrofitting, and weatherization would not only improve the energy savings potential but also could make buildings climate resilient and contribute to improving the energy burden in the area. According to the Community and Economic Development Associate (CEDA)[7] running a Home Weatherization program, weatherization services can lead to energy savings of up to 30% or more on customers' bills.[8]

Energy efficiency is regarded as an important energy source readily available for local communities. Energy efficiency improvement can be a realistic and affordable clean energy solution for the area in that it would be related to the climate resilience of the homes and business buildings. The American Council for an Energy-Efficient Economy (ACEEE) reviewed and analyzed energy efficiency opportunities and established a strategic goal to reduce projected 2050 energy use by 50%.[9] Among the 13-energy efficiency (EE) measures in the analysis

7 CEDA is a community action agency that provides social service programs in Cook County and serves thousands of homes in the southland every year. URL: https://www.cedaorg.net/find-services/home-weatherization/

8 See page 29 of EcoHealth's 2024 analysis.

9 ACEEE (2016) Pathway to Cutting Energy Use and Carbon Emissions in Half. URL: https://www.aceee.org/sites/default/files/pathways-cutting-energy-use.pdf [accessed on August 1, 2024].

covering all end-use sectors, Greenlink selected 5 EE measures that would be most applicable for homes and businesses in the Southland Cook County:

1. Improvement of appliance and equipment efficiency
2. Zero net energy (ZNE) new buildings and homes
3. Smart buildings and homes
4. Home and building retrofit
5. Behavioral change in building energy consumption

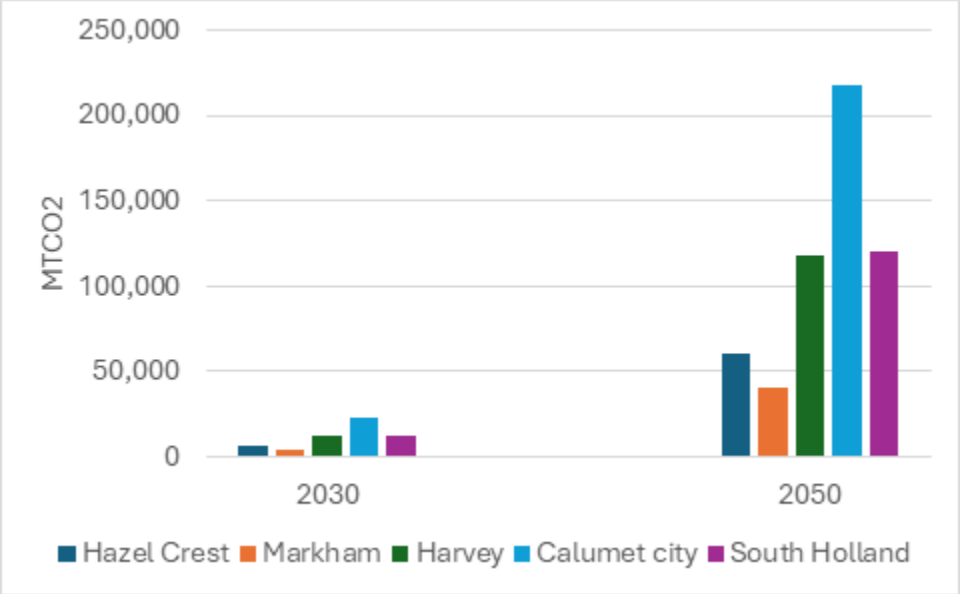
Based on the ACEEE's estimates, Greenlink assumed that through the five EE practices each city would be able to achieve 16% of energy savings by 2040 and 23% by 2050. Table 4 shows the electricity savings expected through the five EE practices: 27 GWh in 2030 and 99 GWh in 2050 respectively.

Table 4. Annual Electricity Savings through Energy Efficiency Upgrade in Homes and Businesses

(GWh)	2030	2050
Hazel Crest	3	11
Markham	2	7
Harvey	6	21
Calumet city	11	39
South Holland	6	21
TOTAL	27	99

The annual energy savings through EE would also contribute to reducing GHG emissions. The overall abatement potential would be 58,726 $MTCO_2$ through 2030 and 556,679 $MTCO_2$ through 2050 (Figure 4).

Figure 4. Cumulative Avoided Emissions through Energy Efficiency in the buildings sector



Energy efficiency practices involve various types of technologies such as HVAC, heat pumps, light bulbs and fixtures, water heaters, air conditioning systems, and materials for insulation. Also, the cost for the labor and the appliance purchase varies by location.[10]

Reliability and Resilience solutions

In general, low-income communities are vulnerable to extreme weather events due to lack of backup power options. Southland Cook residents also have emphasized the need for a publicly accessible and disseminated emergency preparedness plan. Pursuing clean energy opportunities can help address some of the recommendations from the CPP. One potential avenue forward to address infrastructure improvement and emergency preparedness is to consider installation of a microgrid[11]. The Notice of Funding Opportunity (NOFO) of the Community Change Grant (CCG) grant under the Inflation Reduction Act (IRA)[12] also mentions the importance of 1) Energy-Efficient, Healthy, and Resilient Housing and Buildings and 2) Microgrid Installation for Community Energy Resilience. While this analysis was not focused on the economics of microgrids, the energy efficiency and solar PV opportunities are critical to

10 To get the cost and performance estimates for installing and maintaining energy efficient end-use appliances and materials, industry data sources such as homewyse.com (https://homewyse.com/) can be utilized.

11 Microgrids are local energy grids entirely separated or connected to the larger grid and power single facilities or serve larger areas such as small towns or campuses.

12 Seven example strategies are described on page 12 of NOFO of CCG. URL: https://www.epa.gov/system/files/documents/2024-02/community-change-grants-modified-nofo-2.12.24.pdf accessed on July 30, 2024.

understand when considering how to design, deploy, and operate a microgrid. As a next step, a comprehensive cost-to-benefit analysis is recommended to figure out the economic feasibility of installing a microgrid operated by communities in the Southland Cook County.

Job Creation Potential

Investment in clean energy resources such as solar PV, residential and commercial energy efficiency, electric vehicle (EV) and EV infrastructure have significant job creation potential. Greenlink's Clean Energy Jobs Calculator (CEJC) Version 2.1 was used to estimate the impact of clean energy investment on jobs and GDP. CEJC analyzes the economic impact of clean energy investments in job creation with proprietary and publicly available datasets.[13] CEJC estimates changes in labor and income influenced by economic activities. CEJC also identifies which industries, occupations, and skills would benefit most from the expenditures associated with clean energy policies and programs. Table 5 shows how many jobs can be expected when investing one million dollars each in five different clean energy areas. The interpretation of each metric in table are explained in Appendix C.

Table 5. Job Creation Potential per 1-million-dollar investment each in clean energy resource

Rooftop Solar			
Jobs Summary		**Income Summary**	
Direct	4	Direct	$434,768
General Economy*	5	General Economy	$362,790
Jobs Added	9	Income Added	$797,559
Jobs Lost	3	Income Lost	$340,892
Net Job Effect	7	Net Income Effect	$456,666
Commercial Energy Efficiency			
Jobs Summary		**Income Summary**	
Direct	4	Direct	$382,520
General Economy	4	General Economy	$326,983
Jobs Added	8	Income Added	$709,502
Jobs Lost	3	Income Lost	$340,892
Net Job Effect	6	Net Income Effect	$368,610

13 2022 version of IMPLAN multipliers and BEA and BLS's labor and state GDP data were used for CEJC version 2.1.

Residential Energy Efficiency			
Jobs Summary		Income Summary	
Direct	4	Direct	$377,294
General Economy	5	General Economy	$332,430
Jobs Added	8	Income Added	$709,725
Jobs Lost	3	Income Lost	$340,892
Net Job Effect	6	Net Income Effect	$368,833
Electric Vehicle			
Jobs Summary		Income Summary	
Direct	3	Direct	$263,886
General Economy	4	General Economy	$304,055
Jobs Added	7	Income Added	$567,940
Jobs Lost	n/a**	Income Lost	n/a
Net Job Effect	7	Net Income Effect	$567,940
Electric Vehicle Supply Equipment (EVSE)***			
Jobs Summary		Income Summary	
Direct	7	Direct	$492,687
General Economy	4	General Economy	$331,940
Jobs Added	11	Income Added	$824,627
Jobs Lost	n/a	Income Lost	n/a
Net Job Effect	11	Net Income Effect	$8 24,627

*General Economy jobs in this table indicate the sum of indirect and induced jobs.

**Job losses associated with investments in EV and EVSE are not estimated due to the lack of accuracy with the existing data available in version 2.1.

***EVSE systems usually mean the infrastructure to supply electricity to EVs. E.g. EV charging stations or charging docks, which provide electric power to EVs and to recharge the vehicle's batteries. EVSE systems include the electrical conductors, related equipment, software, and communications protocols that help deliver power to the vehicle.

Conclusion

Advancing energy efficiency and expanding the rooftop solar would significantly reduce energy consumption and associated GHG emissions as well as improve the resiliency and reliability in Southland Cook and the surrounding areas. Those two resources would not only become the backbone of the local energy infrastructure such as microgrids or weather emergency shelters but also contribute to improving air quality and public health through the emissions reduction associated with power generation. The clean energy future discussed in this report can be realized through enhancing residents' awareness about climate and energy challenges and utilities, state, and federal supports. Federal funds such as EPA's CCG could provide great opportunities for the low-income communities in the five cities to build their own climate and energy solutions with sovereignty. Holding, operating, improving the climate and energy infrastructure with local people would empower the communities and help the economy of the Southland area thrive.

References

ACEEE (2016) “Pathway to Cutting Energy Use and Carbon Emissions in Half.” ACEEE White Paper, December 2016. URL: https://www.aceee.org/sites/default/files/pathways-cutting-energy-use.pdf accessed on July 30, 2024.

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EPA (2024) Notice of Funding Opportunity of Environmental and Climate Justice Community Changes Grans Program. Funding opportunity number: EPA-R-OEJECR-OCS-23-04. URL: https://www.epa.gov/system/files/documents/2024-02/community-change-grants-modified-nofo-2.12.24.pdf accessed on July 30, 2024.

Google Project Sunroof (2019) estimate what percentage of the available rooftop areas are solar viable considering the structure and the strength of the roof space. URL: https://sunroof.withgoogle.com/ accessed on July 30, 2024.

Greenlink (2024) Greenlink Equity Map (GEM) equity indicators. URL: https://docs.google.com/spreadsheets/d/1j-4J3VIvu10XewqTsTCiu676wXZSYjjFxKNCC6cJ2Ok/edit?gid=0#gid=0 accessed on July 30, 2024.

Appendix A. Electricity Demand Forecast

A.1. Commercial Electricity Consumption Forecast for the five cities

To accurately assess the impact of the energy efficiency projects (or programs), figuring out the baseline energy consumption projections is necessary. Ideally, information on energy sales can be made available from utility data request. However, the direct observations from the utilities are often not readily accessed and materialized. To overcome the data collection challenge, Greenlink estimated the electricity consumption of the commercial buildings in the five cities with publicly available datasets of:

1. NREL's 2019 Commercial Building Inventory data
2. Load profiles from DOE's Commercial Reference Building (CRB) models, and
3. EIA's AEO 2023 Table 2. Energy Consumption by Sector and Source, Reference case for East North Central.

Greenlink first collected typical hourly load profiles by DOE's 16 commercial reference building types in climate zone of 5A (Chicago, Illinois). Each load profile by building type was normalized per square foot. Greenlink then calculated the annual electricity consumption in the commercial buildings from those load profiles and the total floor area obtained from the NREL's commercial building inventory data. Finally, the commercial electricity demand of the five cities through 2050 was calculated by applying the annual growth rate of the electricity consumption in the commercial sector obtained from EIA's AEO 2023.

A.2. Residential Electricity Consumption Forecast for South Holland

Data and Assumptions:

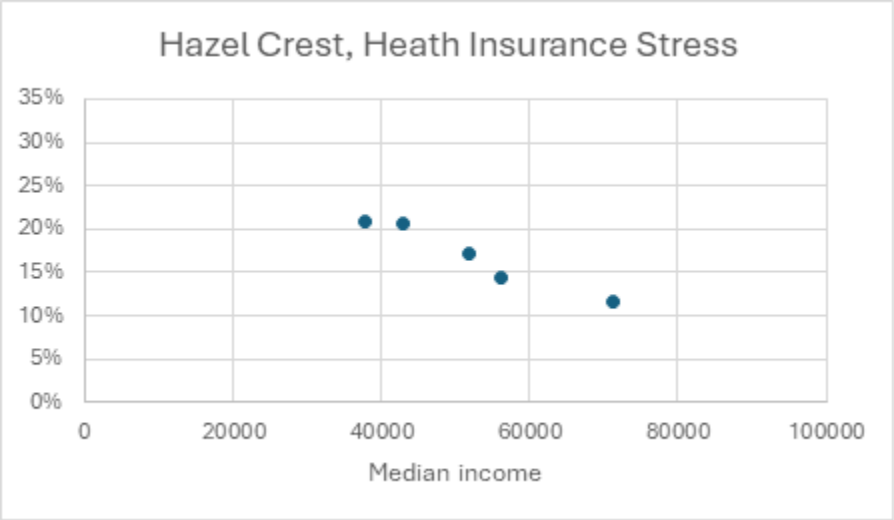
To accurately assess the impact of the energy efficiency projects (or programs), figuring out the baseline energy consumption projections is necessary. Ideally, information on energy sales can be made available from utility data request. However, the direct observations from the utilities are often not readily accessed and materialized. To resolve the data collection issue, Greenlink has estimated the electricity consumption of the residential buildings placed in South Holland with publicly available datasets of:

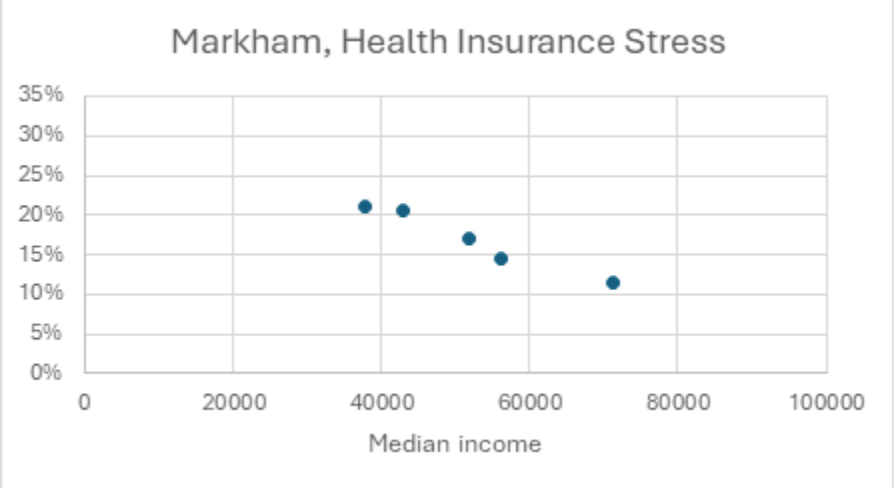
Methodology:

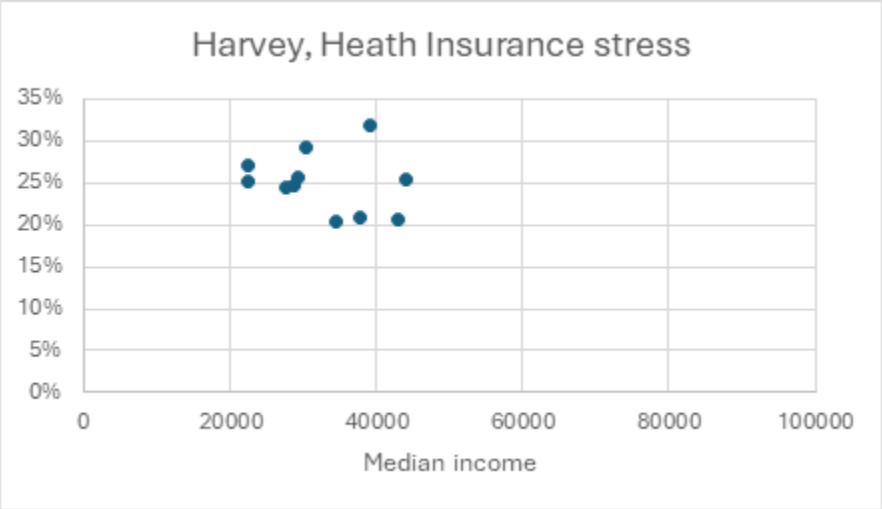
- Step 1) Using the 2022 version of NREL's ResStock data, Greenlink calculated annual average energy consumption by building size class (less than 1,000 sqft; 1,000-2,000 sqft; 2,000-3,000 sqft; greater than 3,000 sqft) in climate zone of 5A (Chicago, Illinois).
- Step 2) With the building stock data provided by the municipality data, we estimated the total floor area by building class.
- Step 3) With the annual average electricity consumption calculated in Step 1) and the total floor area of the residential buildings in each class Greenlink estimated the total annual electricity consumption in the residential building in South Holland in 2018
- Step 4) Applying the annual growth rate (0.5%) of the electricity consumption in the residential sector in East North Central from the EIA's AEO 2023, Greenlink forecasted the residential electricity demand of South Holland through 2050.

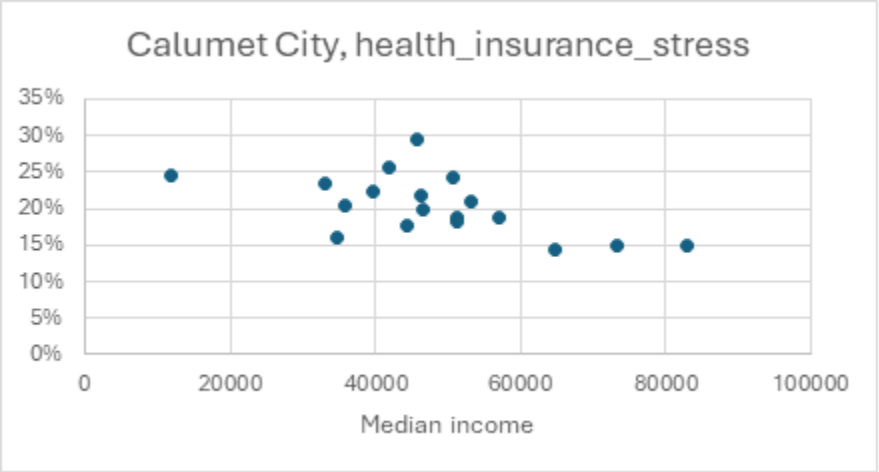
Appendix B. Health Insurance Stress from Greenlink Equity Map (GEM) Tool

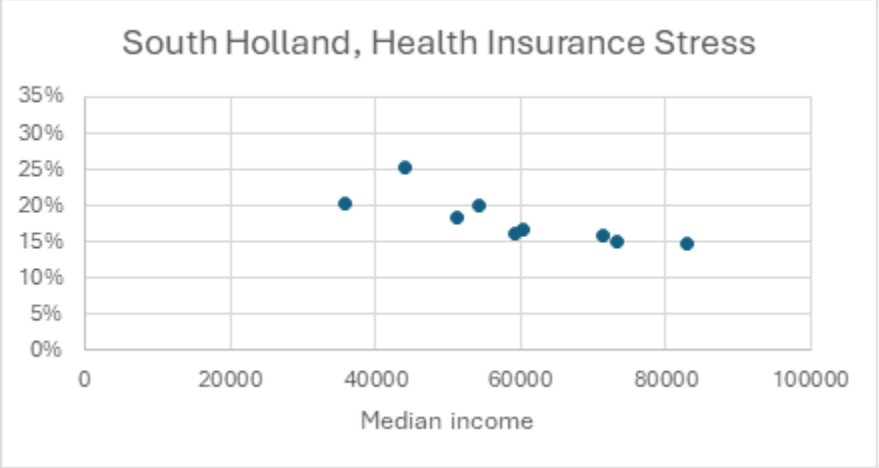
Health insurance stress is defined as percentage of adults without health insurance based on 2019 version of CDC 500 data. For more information, see the description of GEM equity indicators at: https://docs.google.com/spreadsheets/d/1j-4J3VIvu10XewqTsTCiu676wXZSYjjFxKNCC6cJ2Ok/edit?gid=0#gid=0






Harvey, Heath Insurance stress
35%
30%
25%
20%
15%
10%
5%
0%
0
20000
40000
60000
80000
100000
Median income


Calumet City, health_insurance_stress
35%
30%
25%
20%
15%
10%
5%
0%
0
20000
40000
60000
80000
100000
Median income


South Holland, Health Insurance Stress
35%
30%
25%
20%
15%
10%
5%
0%
0
20000
40000
60000
80000
100000
Median income

Appendix C. Job Creation Potential per million-dollar investment

Number of Jobs

A typical job in a given period means a full-time/part-time annual average in terms of work hours. Thus, the number of jobs refers to the total number of "typical/average" jobs of the location of the period in question. If the duration of the investment, policy, or program is not a single year but multiple years, the number of jobs should be interpreted as job years, which is a two-dimensional concept reflecting the quantity and the time.

Job creation over time

The number of jobs would be interpreted as the total number of jobs could possibly be created throughout the financial time horizon of the clean energy investment/ program.

- **Direct Jobs** include direct employment created in the specific industry.
- **General Economy Jobs**. It captures the spillover effects of clean energy investments to other industries.
- **Jobs Added** shows the sum of the jobs created across all industry and occupation classifications.
- **Jobs Lost** also shows the total across all classifications. It is also regarded as an opportunity cost, representing hypothetical jobs in other sectors that might have been supported if the clean energy investments had not occurred.
- **Net Jobs** is calculated as the difference between Jobs Added and Jobs Lost.

Income Effects

Income effects are estimated in mostly the same way as jobs effects are. Income describes the dollars of labor income generated as a result of dollars of investment in the target Industry or occupation.