ENR 4600 - Campus Sustainability Spring 2021 Incentivizing Rooftop Solar Energy in Laramie, WY



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Introduction and Purpose

Solar energy technology is a viable tool for lowering the City of Laramie's municipal Greenhouse Gas Emissions (GHGs) and helping to achieve the Environmental Action Committee's (EAC) goal of a net-zero GHG community by 2050 (EAC 2020). Across the world, local governments are cooperating to develop solutions and share information on shifting to more sustainable models of living and producing energy (ICLEI 2020). On a more regional level, mountain towns with similar characteristics to Laramie are pledging to find and implement "high-impact solutions" to major sustainability problems like high levels of GHGs and barriers to solar energy implementations (Mountain Town 2020).

The purpose of this report is to analyze and present programs to incentivize the installation of more rooftop PV (photovoltaic) energy production systems in residential and commercial settings. Communities like Laramie have incentivized their local solar installations by utilizing the available federal direct incentive programs, which we cover in detail (Clark 2015). Furthermore, case studies of similar communities show that solar net metering incentives have a positive effect. In general net metering helps reduce the cost of solar installations over time by allowing owners to sell excess energy back to the utility company, making the initial capital investment more manageable for many people. Wyoming state law currently allows for solar net metering and solar installations up to 25kW. Any existing or future arrays installed will continue to receive net metering benefits, if they are installed before changes in the law. Federal direct incentives and net metering benefits are vital to solar energy development but is it important to realize that they are subject to change as regulations change, as elections change the political climate and programs expire.

Therefore, the success of this project requires us to develop creative incentives tailored to Laramie in particular. Input from City officials, including EAC members, Laramie City Council and City planners as well as other relevant local stakeholders will guide us to develop and frame our incentive suggestions. This report will serve as a guiding document and roadmap to meeting Laramie's carbon neutrality goals by encouraging residential and commercial rooftop PV energy production. As part of that discussion, we explore the theoretical and institutional basis for solar incentive programs, including definitions of financial and non-financial incentives. It is important to us that this work continue, and this report is just a small piece of the process. Therefore, we detailed the actions we took throughout this project to serve as a guide for future work and conclude with suggestions of possible avenues for continued research.

Background

Compared to pre-industrial era levels the world has seen at least 1°C average temperature increase, with eight of the ten hottest years in history occurring in the last decade (Watts 2019). During this time, the land surface air temperature has risen approximately twice as much as the global average temperature, leading to an increased risk of dryland water scarcity, permafrost degradation, wildfire damage, and food instability (IPCC 2019). Evidence strongly suggests that anthropogenic climate change caused by greenhouse gas emissions will likely continue causing major disruptions of earth systems (Hoegh-Guldberg et al, 2020). Infants today may experience a world that is 4°C warmer and in turn experience greater health impacts from pollution, increased temperature, loss of biodiversity, and malnutrition in their lifetime (Watts 2019). Reducing greenhouse emissions is a complex task that involves major systemic changes. There is significant work being done to reduce emissions through cooperation at the level of local and regional governments.

The ICLEI (Local Governments for Sustainability) is one of the leading global organizations, bringing together more than 2500 local and regional governments across more that 125 countries to "influence sustainability policy and drive local action for low-emission, nature-base, equitable, resilient and circular development" (ICLEI 2019). The ICLEI identifies 5 key pathways for local governments to achieve sustainability, one of which is "Low Emission Development" (ICLEI 2020). On a more regional scale, the Mountain Town 2030 organization was formed based on the idea that "mountain towns have the power to have a global impact on change" (Mountain 2030). Central to their vision of a sustainable future is actively sharing solutions and best practices between communities. As Laramie shares many of the same characteristics with current signatories to the MT2030 pledge, it provides a good framework for setting and reaching sustainability goals. Small scale solar energy installations reduce the amount of fossil fuels consumed by a household, therefore reducing the overall emissions of a community and the world. Laramie has both the solar resources and institutional support to reduce greenhouse gas emissions through implementing small scale solar power.

On March 3rd, 2020, the City of Laramie, WY adopted Resolution 2020-14, which resolves to uphold the community-wide emissions reduction recommendations of the Environmental Advisory Committee (EAC). Efforts of the Alliance for Renewable Energy (ARE) and many others in the community played a significant role in gaining the City of Laramie. ARE pushed for a municipal GHG inventory to be completed in 2018 – the first of its kind in Laramie. The success of this project led to the completion of the first community wide GHG inventory in 2020, in partnership with the University of Wyoming Haub through students in the ENR 4600 Campus Sustainability Course. A GHG inventory establishes a baseline carbon-footprint, which is the actionable emissions reduction goals (Eggleston et. Al 2006). These inventories were presented to the City Council, who tasked EAC with developing emissions reduction goals and plans.

The EAC is made up of seven members appointed by the City Council and the Albany County Board of Commissioners, and their function is to "analyze assigned issues, receive and analyze citizen concerns and complaints, formulate option, and advice the City Council and the Board of County Commissioners of environmental issues" (EAC). In February 2020, the EAC released a set of goals and recommendations for the City of Laramie based on the findings of the community-wide emissions inventory and insights from the GHG reduction plans of other comparable communities. Section 1 establishes the following goals: 50% net emissions reduction by 2030 (10 years), 90% net emissions reduction by 2040, and achieving net zero by 2050 (EAC Subcommittee). Their framework for meeting this goal falls into five categories: Drafting a comprehensive plan, performing regular emission assessments, implementing outreach, providing training, and exploring financing (EAC Subcommittee). Section 3 of this resolution is the call for "securing financial resources for expansion into community-wide net zero efforts for review, approval and allocation of funds" (EAC Subcommittee). Targeted recommendations that fall under the exploring financing section include seeking partnerships with local businesses and the private sector, utilizing existing opportunities and contracts to pursue grants for infrastructure development and upgrades (EAC Subcommittee). It is under this section that the application of solar incentives finds its strongest mandate from the EAC and the City Council.

The production of small-scale solar energy in Laramie is a technically and financially viable option, for both commercial and residential uses. The use and production of solar energy is a protected right. Wyoming's Solar Rights Act (1981) states that the "beneficial use of solar energy is a property right" (Wyoming Solar Rights Act). The right to solar energy is also protected in Laramie Municipal Code, Chapter 15.14.030, which is "is intended to promote

the compatible use of solar energy systems and to assist in decreasing the city's dependence upon non-renewable energy systems through the encouragement of solar energy systems for the heating of buildings and water" (Laramie Municipal 2016). In terms of average daily solar radiation, Laramie receives 5.578 kWh/m² which, due to Laramie's elevation and climate, is higher than many other cities in ¹^(m) This makes Laramie an attractive location for solar energy technology implementations and meeting net-zero emission goals.

In communities across the United States, people are seeking alternatives to conventional energy sources. Whether they aim to increase energy independence, hedge against rising fuel costs, cut carbon emissions, or provide local jobs, they are looking to community-scale renewable energy projects for solutions. Advances in solar technology, an increase in federal and state tax incentives, and creative new financing models have made solar projects including community solar projects, more financially feasible (Coughlin 2010).

The goal of solar incentives is to stimulate growth of PV installations by reducing the financial burden, which is a significant barrier to entry (Coughlin et. al. 2019; Henry 2015). Literature on solar incentives typically addresses financial incentives, and most often uses grants or loans to reduce initial costs of installation (Clark 2005). We have also identified the importance of non-financial incentives. These programs encourage the use of solar energy by addressing barriers, such as bureaucratic complexity, or attempt to influence behaviors, such as disseminating pro-solar information to build public support. Both of these approaches make renewable energy production a more attractive option, and ultimately reduces carbon emissions. Communities utilize different mechanisms for incentivizing solar energy, including net metering, tax credits, and code variances to reduce a developer's use of building credits (Clark 2015). See our community comparison table, attached as an appendix, for examples of these incentives in different communities across the USA. These incentives can be broken down into the federal, state, municipal, and private level. Another way to think about incentives is financial versus non-financial.

Financial solar incentives reduce the cost of producing solar energy and can take many forms. Net metering, for example, is a financial incentive. The ability to sell excess energy back to the utility company is an essential part of lowering the net cost of power to home, and offsets the initial capital expenditure of installing a solar array. Net metering is considered by many to be a cornerstone of developing successful small scale solar in communities (Coughlin 2010). Thanks to the work of the ARE, the City of Laramie has taken advantage of the Blue-Sky Grant program, a private renewable energy incentive in the form of a grant facilitated by Rocky Mountain Power. The Blue-Sky Funding allowed for the construction of two solar arrays on municipal buildings: the Laramie Recreation Center and the Laramie Regional Airport (Hakert et al.). Due to the regulations, residential projects, however, are not able to receive Blue-Sky Grant funding (Rocky Mountain 2021).

The Database of State Incentives for Renewables & Efficiency (DSIRE) is an online database that catalogs incentive programs operated by the University of North Carolina Clean Energy Technology Center (DESIRE 2020). An example of a widely used financial incentive listed on DSIRE is the renewable energy tax credit, which is available to both commercial and residential applications across the country. This is a commonly used federal level program and allows for a tax credit of 26% of the total installed cost of the solar energy system (DSIRE 2021). This program, along with many of the federal tax incentives, are set to reduce in scale or phase out completely over the next five years, adding to the urgency of this project (Consumer Energy Alliance 2018). DSIRE is a powerful tool for identifying current established programs in Wyoming and provides a useful summary of available financial incentives. However, the unique political climate of Wyoming means that additional creative solutions are required to incentivize solar energy and strive to meet the City's net carbon emissions goals. Wyoming's legislature has a history of passing fossil fuel positive legislation and being slow to support bills that benefit renewable energy – especially for small scale production purposes (Lockwood 2017; BetterWyoming 2021; Wendt 2021).

One of the implications of this is that Laramie does not receive the same level of state institutional support found in other municipalities that are seeking to prioritize rooftop solar (Coughlin 2010). This means that less direct funding is available, and creative solutions to incentivizing rooftop solar are needed. We are classifying these as non-financial incentives. It is important to note, however, that we have identified an economic aspect to all our recommended incentives. These non-financial incentives do not require loss of tax revenue for the state or town, and do not involve direct loans or grants. The city of Fort Collins, for example, has one of the strongest small scale solar programs in the country (Clark 2015). A non-financial incentive used there was implementing "modest, high-impact changes that allowed that city to streamline its permitting process for little to no cost and without substantial political commitment" (Clark 2015, pg 10).

Another non-financial program that has been successful in incentivizing sustainability is the RRR Business Leaders Program in Jackson, WY. This is a membership-based recognition program that incentivizes businesses to take actions to make their organization more sustainable in return for public recognition, support and networking, and access to further accreditation (RRR 2020). This program does not directly focus on incentivizing solar, but the model of public recognition and network building as a motivation is something that has potential in Laramie. This is discussed further in our "Green Checkmark" section of our project outcomes. Consideration of these non-financial incentives is important to creating a holistic and effective suite of solar incentives for Laramie.

Project Description

This report is geared to identify any existing federal and state-level incentives applicable for rooftop solar and/or energy efficiency at the local level as well as to explore incentive structures in other comparable communities. First, the team gathered input from relevant stakeholders regarding the state of solar incentive programs and possible avenues to explore in the Laramie community. And a meeting with various stakeholders was initiated. These stakeholders include the EAC members, ARE, the team mentors, city developers, city planners and Solar installers coupled with outside resources. This meeting was to assess the viability of the incentives proposed by other stakeholders from the public sector. See Appendix D for detailed stakeholders list.

Furthermore, to facilitate the finding of strategies applicable to the city of Laramie on the transition to renewable energy for its residential use, we analyzed similar communities in the U.S. To achieve this, the team started by researching cities in the U.S. that have created and followed a strategic plan for the implementation of rooftop PV cells in their community. Then, a comparison was made of communities that shared similarities to Laramie such as the number of inhabitants. This was the main similarity the team focused on since Laramie, as a small town, has not yet to have many resources or incentives available for rooftop PV cells in comparison to bigger cities.

Ruling out the significantly bigger and smaller communities, the team created a comparison table of case studies where several things were analyzed and compared from other cities to Laramie; population, average temperatures, global tilted irradiation at optimum angle, system capacity limit for state level net metering, local low interest loan options, investment and awareness (local and/or state programs), financial incentives (local and/or state), and rules, regulations and policies (local and/or state) (Case Studies excel file as a Deliverable).

Furthermore, meeting with city planners and private developers to investigate code and possible funding avenues through amendments to the variance process. Variances enable deviations from municipal codes, giving an additional cost-saving mechanism for developers provided they install solar energy. Darren Parkin, our project mentor, gave pointers to the team on meeting with developers in order to give the group some legitimacy and streamline the process. One idea that has been suggested by the city planners and city council members is a parking space variance. Under municipal code a certain number of parking spaces are mandatory, but with a code variance some selected space requirements could be swapped for PV. The team hopes that this process will be formalized to streamline the requirements, encouraging and even advertising for greater use of this tool. Another recommendation the team proposes is tying renewable energy incentives to rental properties rating systems for the town. City Council members have suggested that the team meet with ASUW about potentially coordinating a rental property rating system that includes a "green checkmark" for properties that meet some minimum sustainability requirement. This work is ongoing and is expected to develop further.

Lastly, a synthesized findings from the above activities is created for a clear, concise recommendation through concrete products which will be presented to the City of Laramie for consideration.

Outcomes Financial Incentives

It is said that the US makes its energy policy in tax code, and our research has shown to be at least partially true in the case of incentivizing small scale solar (Consumer Energy 2018; Coughlin 2015). Using the DSIRE database as a starting point, we identified 5 major financial incentive programs that are applicable to Laramie. They can be found in the table below, along with important characteristics and links for further reading/relevant forms.

| Incentive Program | Benefits | Characteristics | More information & forms: | |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Investment Tax Credit (ITC) | 26% federal tax credit for solar systems | Federal program for commercial and residential use. Phase out/Reduction by 2024 | ttps://www.energystar.gov/about/federal_tax_credits /renewable_energy_tax_credits | |
| FannieMae Green Financing Loan Program | Low interest loan for multi- family dwellings for energy saving improvements, like PV | Private federally insured loan, includes a free home energy audit | ttps://multifamily.fanniemae.com/financing-options/s pecialty-financing/green-rewards | |
| Rural Energy for America Program (REAP) Loan Guarantees and Grants | Funds up to 75% of cost of solar installation projects through grants (up to 25%) or loans (up to 75%) | Nide variety of options with high funding limits. Commerical/agricultural use – not residential | WY State Office: (307) 233-6700 <u>ittps://www.rd.usda.gov/programs-services/rural-ene</u> <u>av-america-program-renewable-energy-systems-energ</u> <u>v-efficiency</u> | |
| Blue Sky Grant | Funding for renewable energy projects from a state-wide fund that is currently at \$150,000 | Locally owned, non-residential projects only | ttps://www.rockymountainpower.net/community/blu e-sky-projects/funding-applications.html | |
| FHA Power Saver Loan Program | Federally insured low interest loans to provide funding to power-saving home improveme nts, including PV systems. | Funds loans up to \$25,000 | <u>ttps://www.hud.gov/program_offices/housing/sfh/tit</u> le/ti_abou | |

(Information sourced from the included links, as well as DSIREUSA.org)

The above incentive programs offer loans, tax credits or grants to applicants that install rooftop solar arrays with the goal of reducing energy consumption. The Investment Tax Credit (ITC) is the most widely applicable program and can be taken advantage of by anyone – commercial or residential, and used in combination with any other program (DSIRE 2021). The other programs help to reduce the cost through funding the initial capital

investment and have their own unique sets of circumstances. We have identified this difference in availability and complexity of application as a primary barrier to operationalization. A lack of awareness about these programs and their potential to reduce energy costs, in part by offsetting the initial cost of solar PV, means that they are not well understood or used in Laramie.

The FannieMae Green Financing program, for example, is a federally insured, privately funded low interest loan program for energy saving improvements available to owners of multifamily dwellings (Green Rewards 2021). An energy audit is completed on the property by certified professionals at no cost to the homeowner, prior to loan approval (Green Rewards 2021). Approved projects require an overall reduction of 30% in annual non-renewable energy (or water) use, effectively guaranteeing savings to offset the cost of installation. This program is particularly attractive for Laramie because of the significant number of multi-family dwellings, according to the city planning department. The exact number is difficult to estimate due to the number of single-family homes that have been retrofitted to allow for multiple units, as is common in a university town.

The US Department of Agriculture supports a program called Rural Energy for America, Renewable Energy & Efficiency Systems Improvement Loans and Grants – known as REAP. This program is available to small businesses in rural areas (Laramie) or businesses that receive at least 50% of their revenue from agricultural sources (Rural Energy 2021). As mentioned in the above table, REAP funds up to 25% of solar installation projects with grants (Rural Energy 2021). Combined with the ITC and benefits of solar net metering, there is potential for small businesses to considerably reduce their energy overheads.

These programs can significantly lower the costs of solar installations, incentivizing their installation to homeowners and businesses. Reducing the GHG emissions, making Laramie a more sustainable community, is the ultimate goal (EAC 2021). Financial incentives like REAP, ITC and low interest energy improvement loans have been proven as effective tools in communities with similar characteristics to Laramie (Clark 2015; Coughlin 2010; Consumer Energy 2018). In order to take advantage of these programs, people must know about them, trust them, and understand the application process.

With that in mind we recommend that the City of Laramie take a more active role in promoting and disseminating information about these incentive programs. Potential

avenues for this include featuring a "Solar Energy Incentives" webpage, that provides information, recommends trusted solar installation companies and streamlines the application process. The City can also highlight these programs to partners like the Chamber of Commerce or property developers through having information visible or direct communication about them. Additionally, support from local advocacy groups like ARE in the form of public outreach can help bridge the information gap. A simple flyer like the one found in Appendix B, distributed at public events like the Farmer's Market may be effective at engaging the public and raising awareness of the programs. There is strong evidence that leadership from trusted organizations and the local government adds legitimacy and increased public participation in financial incentive programs that may seem confusing or overwhelming (Clark 2015; Consumer Energy 2018).

City Code Building Requirement Variance

During the information gathering portion of our project, we interviewed representatives for the Laramie planning department. During these discussions, the planning department representative expressed interest in expanding and streamlining the code variance process to incentive new developments to install solar energy. A variance is a process through which a developer can petition the city for an exemption in a specific code (Laramie Municipal 2004). The request for a variance begins with an application, then moves through various levels of review, ultimately resulting in a public hearing and final decision by the Board of Adjustment within 46 days (Laramie Municipal 2016). Under the current system there is one path for all variances, and the same set of criteria for assessing their merit. These criteria and a diagram of the current process, pulled from the publicly available application, can be found in Appendix A. According to the code, "The variance process is intended to provide limited relief from the requirements of this code in those cases where strict application of a particular requirement will create a practical difficulty or unnecessary hardship prohibiting the use of land in a manner otherwise allowed under this code" (Laramie Municipal 2016).

There is potential for this process to evolve beyond that strict definition and be adapted to incentivize rooftop solar. The city expressed interest in using the variance process to allow developers to swap code requirements for solar installations. For example, municipal code requires a certain number of parking spaces per dwelling unit. These parking spaces cost

money to build, and the planning department is willing to reduce the required number of spaces per dwelling unit if rooftop solar is installed, on a case-by-case basis. We feel that if this process is streamlined, it could be a very effective tool. Streamlining includes producing materials to show developers that the city has an interest in supporting this program. Materials may include one-page explanations of variance trade-offs, benefits, and requirements.

To gather information about this incentive, and identify barriers/benefits, we contacted 7 local developers with good relationships with the City of Laramie planning department. We received 4 responses to our inquiry and found some common themes. All conveyed a general interest in the concept with the primary concern being an overall lack of information and transparency in the variance process. There also seemed to be some confusion as to the financial incentives available in Laramie, further indicating the need to make this information more widely available. Some even recommended changing the name from 'variance' to reduce any stigma associated with the term. In any case, all the developers we received responses from showed an interest in continuing to build this relationship with the city with the goal of increasing the feasibility and simplicity of installing rooftop solar.

Green Checkmark

This is an ongoing idea first mentioned by City Counselor Brian Harrington and further developed by our team where we want to associate any major findings with renewable energy incentives to rental properties. This can be achieved by adding a sustainability rating system to all rental properties in town to show potential lessees how environmentally conscious those properties are. Therefore, a recommendation is to add a "green checkmark" to all rental properties that meet with minimum sustainability requirements, more specifically to clean power.

The overall purpose of this idea is to encourage lessors to create sustainable rental properties, especially by transitioning to clean power. This not only would attract more renters to the property, but it would also create an environmentally conscious community. Moreover, this could be an addition to a broader renters' protection system. As suggested by the City Council, we looked into partnering with ASUW to expand on this idea. However, and after seeking advice from Rachael Budowle, time constraints prevented us from going further into this suggestion. Overall, this "green checkmark" idea must be further developed so that it can be implemented in Laramie. Therefore, we suggest that this is passed on to a future student group in Campus Sustainability.

Case Studies

In the U.S. similar communities to Laramie have come up with a strategic plan to transition to renewable energy for their residential use. To facilitate the creation of a strategic plan specific to the city of Laramie, we analyzed some of these communities by creating a comparison table. All cities included in this table were selected due to their similarities to Laramie in population size. The results from this table also showed more similarities such as having the availability to their unique local low interest loans, to local and state projects for investment and awareness, and to financial incentives (tax incentives and local grants). Each one of these aspects, however, may only be applicable to their own cities. Part of the purpose of this table was to compare the average temperatures and average global tilted irradiance values of each city. This with the goal of evaluating how ideal Laramie's location is for the installation of solar panels angled at an optimum value. One of the major findings in this table was that the city of Laramie had one of the highest global tilted irradiance values with 5.578 kWh/m^2/day. At the same time, the average temperatures of 23.3 and 65°F for the months of January and July respectively were some of the lowest in the table.

Comparing these values to those in Palo Alto, CA we get that their solar irradiation is 5.999 kWh/m^2/day, and that their average temperatures are 48.8 and 63.8°F for the months of January and July respectively. California is in a location where solar irradiation is abundant in the U.S. (Appendix C), however, Palo Alto's irradiance value does not seem to have that much of a difference from Laramie's. Moreover, Palo Alto's average temperatures are higher than Laramie's overall.

Knowing that the efficiency of solar panels increases at low temperatures due to an increase in voltage (Gambone, n.d.), this data proves that Laramie is located in an ideal area for the use of solar energy compared to other cities such as Palo Alto. Nevertheless, California and other states, that either have the same or less location benefits than Wyoming, have proved to keep growing in solar energy with California having the most installed solar panels in the U.S. (Choose Energy, n.d.).

This proves that the location of Laramie, even if ideal, is not enough for the transition of the city from fossil fuels to solar energies. Many more factors must be considered such as the

solar cells' system capacity limit for state level net metering, the availability of local low interest loan options, investment and awareness (local and/or state programs), financial incentives (local and/or state), and rules, regulations and policies (local and/or state). All these are incentives and general information that needs to be known and shared so that it encourages the community of Laramie to incorporate solar panels to their homes. These last-mentioned factors are also compared in the table and may give a good understanding on what other cities have available for the creation of their strategic plan to go renewable with rooftop PV cells for domestic use. For more information on the exact type of incentives each city has available, please relate to the links provided underneath the table. A selection of the most relevant comparisons can be found in Appendix E.

Conclusion

Many reasons come to mind as to why homeowners go solar but improving the environment and cutting energy costs are the most common. Although, residents in Laramie are aware that solar is a great home efficiency upgrade and are eager to reduce their carbon footprint while also improving property value, information about solar incentive seems to be out of reach for them. In this project, the team adopted IGAS (Identify-Gather-Analyze- Synthesize) approach. Identification of various existing federal and state-level incentives were made to check if those said incentives were applicable to Laramie in particular. As a second step, the team then gathered input from relevant stakeholders like the EAC, Alliance for Renewable Energy (ARE), our mentors, city developers, city planners and Solar installers coupled with outside resources. The next step, the team Analyzed incentive programs in similar communities that already have similar programs going on. Although not all those incentives could be applicable to the city of Laramie. Lastly the team synthesized the findings to come up with set recommendations for incentive programs that will be enticing as well as coming up with avenues to get the set information out to the residents of Laramie by creating a flyer that contains all the solar incentive programs that are available to the residents of Laramie. This has been presented to the city of Laramie council for consideration.

Figures & Appendices APPENDIX A.

Code Variance Language & Diagram

What is the Variance Process?



Note: All timelines noted above are estimations.

REQUIRED FINDINGS FOR APPROVAL OF A VARIANCE: (LMC 15.06.060.D.2.e.(ii))

The application must include a written response addressing each of the following points:

1. There are special circumstances or conditions, fully described in the board's findings, that are peculiar to the land or building for which the adjustment is sought and do not apply generally to land or buildings in the neighborhood, and have not resulted from any act of the applicant subsequent to the adoption of the code, such as irregularity, narrowness, or shallowness of lot, or exceptional topographical conditions;

2. The circumstances or conditions are such that the strict application of the provisions of the code would deprive the applicant of the reasonable use of the land or building;

3. If applicable, the circumstances or conditions are such that the strict application of the provisions of the code would deprive the applicant of access to alternative forms of energy such as solar and wind power;

4. The granting of the adjustment is necessary for the reasonable use thereof and the adjustment as granted is the minimum adjustment that will accomplish this purpose;

5. The granting of the variance is in harmony with the general purposes and intent of the code and will not be injurious to the neighborhood or otherwise detrimental to the public welfare; and 6. The variance, if granted, will not alter the essential character of the neighborhood or district in which the property is located, nor substantially or permanently impair the appropriate use or development of adjacent property.

APPENDIX B

We recommend using this flyer as an idea to communicate our main findings to the community:





APPENDIX C

This image illustrates the solar radiation input in the United States showing that Laramie, WY is located on an area where solar radiation abounds.



https://www.altestore.com/diy-solar-resources/solar-insolation-map-usa/

Appendix D

| Participant(s) Name | Organization/Group | | |
|---------------------|----------------------------------|--|--|
| Leo Peublitz | Creative Energies | | |
| Monika Leininger | ARE/Powder River Basin Coalition | | |
| Ed Koncel | ARE/Powder River Basin Coalition | | |
| Erin O'Doherty | EAC/City Council | | |
| Mary Grace | EAC/ Forest Service | | |
| Darren Parkin | City of Laramie | | |
| Erick Krszjzaniek | ARE/EAC/College of Business | | |
| Derek Teini | City Planning Department | | |
| Matthew Cox | City Planning Department | | |
| Todd Freezer | Assistant City Manager | | |
| Brian Herrington | City Council | | |

Appendix E

| State | Local Government | Populati on | Global tilted irradiation at optimum angle (kWh/m^2/day) | System Capacity Limit for State Level Net Metering | Investment and Awarness (Local and/or State Programs) | Financial Incentives (Local and/or State Programs) | Rules, Regulations and Policies (Local and/or State Programs) |
|-------|------------------------|----------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CA | Palo Alto | 66,573 | 5.999 | 100% of customer's annual load | Green Pricing (Local). | Grant, Rebate or Loan (Local and State). | Solar Acess (Local and State), Contractor Licensing, Equipment Certification, Net Metering, Construction and Design, Disclosure and Certification, Public Benefit Funds (all State). |
| NC | City of Asheville | 91,560 | 5.222 | Residential: 20 kW or 100% of estimated demand, and for Non-resitential: 1,000 kW or 100% of contract demand. New Installed capacity: 57.5 kW | State Green Bank (State). | On-bill financing (compensation to customers). | No 3rd Party sales but leasing of solar equipment, Net Metering (State). |
| ОН | Bowling Green | 31,541 | 4.514 | No capacity limit specified, but system must be sized primarily to offset part or all of customer's electricity requirements. | Green Pricing and Local Projects (Local). | Tax Incentive (Local and State). | Solar Acess, Disclosure and Certification, Public Benefit Funds (State), and Net Metering (Local and State). |
| ОН | City of Cincinnati | 301,394 | 4.669 | No capacity limit specified, but system must be sized primarily to offset part or all of customer's electricity requirements. | Local Projects (Local). | Tax Incentive (Local and State). | Solar Acess, Disclosure and Certification, Public Benefit Funds, and Net Metering (all State). |
| ОН | Westerville | 39,242 | 4.485 | No capacity limit specified, but system must be sized primarily to offset part or all of customer's electricity requirements. | Education and Assistance and Local Projects (Local). | Tax Incentive (Local and State). | Solar Acess, Disclosure and Certification, Public Benefit Funds, and Net Metering (all State). |
| VA | Loundon County | 413,538 | 4.56 | Residential : 20 kW, and for Non- Residentail : 1,000 kW | Education and Assistance and Local Projects (Local). | Grant, Rebate or Loan (State) and Tax Incentive (Local and State). | Solar Access, and Net Metering (State). |
| W | City of Eau Clairel | 68,187 | 4.572 | 20 kW (some utilities allow larger systems to net meter). | Local Projects (Local). | Grant, Rebate or Loan (State) and Tax Incentive (Local and State). | Net Metering (State-developed mandatory rules for certain utilities) and NEG credited at retail rate at first, then credits expire or are reduced (e.g., to the avoided cost rate at the end of year). |
| WY | City of Laramie | 32,381 | 5.578 | 25 kW | Blue Sky Grant. | Investment Tax Credit (ITC), FannieMae Green Financing Loan Program, Blue Sky Grant, FHA Power Saver Loan Program. | Net Metering (State-developed mandatory rules for certain utilities) and NEG credited at retail rate at first, then credits expire or are reduced (e.g., to the avoided cost rate at the end of year). |

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