Sheridan Renewable Energy Assessment for Related Business Recruitment

CITY OF Sheridan WYOMING

Prepared By

K·COE ISOM

and

Community POWER GROUP

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EXECUTIVE SUMMARY

This City of Sheridan has proactively worked to create an environment that is attractive to potential employers and their employees. This work is never complete when competing with larger urban centers that offer substantial amenities. Rural areas like Sheridan need to look for ways to highlight flexibility, showcase an inventive spirit, prove resiliency, and showcase a willingness to adapt to changing realities and markets. The goal is to make sure the City continues to look forward and create even more ways to make the community attractive to both businesses and their employees.

Far too often communities fail to see emerging commercial trends and thus miss out on opportunities for economic growth. Sheridan has committed to creating local advantages and addressing obstacles to business recruitment. The City has devoted significant resources and time into making sure it has as many strategic advantages as possible and has dedicated itself to realizing a diverse industry base that can withstand the natural ebbs and flows of business cycles.

In the 21st century, creativity, technology, and innovation have replaced natural resources as the primary driver of economic growth. In response, many cities have reoriented their economic development strategies to attract an educated workforce by placing a priority on developing great schools, universities, health care systems, downtowns, and parks rather than focusing solely on individual large manufacturing firms or resource extraction. These new economic drivers include technology, healthcare and medicine, trade and logistics, as well as finance and professional services.

The adoption of renewable energy has emerged as a leading indicator of how committed a city is to technological innovations and improving its residents quality of life. Many businesses now incorporate renewable energy mandates into their siting decisions to both attract valuable environmentally conscious employees and to send a message to their consumers that the they are dedicated to sustainable development.

Sheridan has an opportunity to leverage these trends to attract new businesses and an educated workforce. An April 2018 Gallup poll showed 73% of Americans now prefer renewable energy to traditional energy sources (up from 59% in 2012). This is especially true in the tech industry and amongst the younger workforce. Beginning with a study commissioned by the Wyoming Business Council and conducted by the Wadley-Donovan Group numerous assessments have concluded that Sheridan is well positioned to attract knowledge-based industries such as data centers, information retrieval services, and light manufacturing. These are the very industries demanding renewable energy.

Sheridan should continue to employ strategies that ensure a business environment that promotes economic diversification. Sheridan needs to position itself strategically in light of the changing landscape in careers, emerging industries, and consumer demands of the 21st century. Attracting diverse industries is crucial to the creation of careers that will provide a living wage to the citizens of Sheridan. Renewable energy will help Sheridan attract such industries.

Sheridan is currently participating in renewable energy generation with the installation of a hydro turbine from which the City receives payments from the local utility for power generated. Building on this success with the development of a community-wide strategy for renewable energy will help the City attract data centers and other high-tech businesses with renewable portfolio goals.

While the City has limited wind and hydro resources as compared to other areas in Wyoming, the City does have strong solar energy potential. In fact, the solar radiance in the area is similar or better than that found in many east coast states with aggressive solar energy goals such as Massachusetts, New Jersey, New York, Georgia and almost as good as that found in Orlando, Florida. In light of this potential, we examined 22 sites identified by the City and determined that 12 of those sites had strong potential for solar energy based on available space, access to sunlight and on-site energy usage.

While great potential exists, one probable limiting factor to implementing solar energy in Sheridan is Wyoming's 25 kilowatts alternating current (kW) net metering cap. The state of Wyoming established the statewide net metering limit and includes solar, wind, biomass and hydropower systems. Based on a conversation with Montana-Dakota Utilities in connection with this report, it was indicated that exceptions to the rule can be separately negotiated, similar to what happened with the hydro generator that the City owns. Accordingly, we expanded our study to include a net metering cap of 300kWac in order to highlight the significance or raising the net metering cap.

The results of our analyses suggest that for the 12 sites identified to possess the strongest potential:

- Under the 25kW limit, the City and affiliates could install approximately 381kW of solar collection on the sites and save approximately $381,000 in net electricity costs over 25 years.
- Under a 300kW limit, the City and affiliates could install approximately 1.88 Megawatts ("MW", 1,000kW = 1MW) of solar collection on the sites and save approximately $2,097,000 in electric costs over 25 years.

	System Size (kWdc)		Estimated 25 yr Savings	
	25 kW limit	300 kW limit	25 kW	300 kW
School owned	163.3	1,226.3	$ 167,162	$ 1,381,726
City owned	119.1	131.8	$ 106,696	$ 122,326
Other	98.6	524.0	$ 107,621	$ 592,648
Total	381.0	1,882.1	$ 381,479	$ 2,096,700

Based on our findings, we recommend that the City move forward with exploring the implementation of the 1.88MW proposal. The generation of 1.88MW of solar in Wyoming would not only provide cost savings and environmental benefits, it would give the City of Sheridan an opportunity to attract businesses and to gain national recognition as an innovative city with an eye towards the future.

BACKGROUND

Rural communities are continuously looking for ways to strengthen their local economies, improve the quality of life for residents, and build on their local assets in order to recruit new business. Increasingly, rural communities are competing with larger urban centers to keep and attract businesses and employees. Over the past decade, Sheridan has devoted significant resources to planning and implementing projects designed to diversify its economy. In that time, Sheridan has witnessed substantial development in, and adjacent to, its historic downtown, extensive progress along the North Main Corridor, and the build-out of the Sheridan Hi-Tech Park. The Hi-Tech Park has proved to be a successful investment and has encouraged expansion of existing businesses and relocation of new light manufacturing businesses to Sheridan.

Beginning with a study commissioned by the Wyoming Business Council and conducted by the Wadley-Donovan Group, numerous assessments have concluded that Sheridan is positioned to attract knowledge-based industries such as data centers, information retrieval services, and light manufacturing.

Sheridan aggressively works to attract and retain industries recommended in past economic development studies and reports such as the Wadley-Donovan study, the Sheridan Economic and Educational Development Authority's (SEEDA) *Target Industry Profiles and CTET Strategy Recommendations* report and the *Northeast Wyoming Regional Marketing Plan*. At the same time,

municipalities and commercial entities across the country are increasingly looking to renewable energy as an opportunity to save money, and manage long-term costs. Industry giants such as Facebook and Apple employ renewable energy resources at their data centers as has Green House Data in Cheyenne.

The City of Sheridan has recently demonstrated an interest in renewable energy. Sheridan secured funding to install a hydro turbine to generate renewable energy from which the City receives payments from the local utility for power generated and system capacity. Capitalizing on additional opportunities like this will make it more attractive to businesses that could locate anywhere but choose communities with renewable energy interests and infrastructure.

Visioning and planning are integral to any community planning effort. Sheridan continuously strives to be "shovel ready". In the same sense, it is important to be "renewable ready". The goal of this assessment is to consider the feasibility of renewable energy development in the community and to identify strategies to create an investment environment conducive to these opportunities. This assessment will assist Sheridan in making strategic decisions that will lead to the realization of renewable energy, highlight the community's innovative thinking, foster a friendlier regulatory environment and assist business recruitment efforts.

> *"We're not perceived as a state that is open to people coming from out of state. We're perceived as a state that can't support technology because we don't have the established reputation."*
>
> JESUS RIOS, COO PTOLEMY DATA SYSTEMS AND ENDOW EXECUTIVE COUNCIL MEMBER
>
> *The Sheridan Press, May 30, 2018*

CHANGING PERCEPTIONS

While Wyoming rates high in many categories favorable for business, it ranks second to last in technology and innovation according to a recent CNBC survey.[i] This is troubling, especially given that Wyoming's population is in decline, and in fact, is experiencing the nation's slowest growth while bordering states are seeing growth. Idaho is the fastest growing state in the nation, followed closely by rural states such as Utah (third), Colorado (ninth), and Montana (thirteenth). Wyoming is ranked last in the nation.[ii]

Citing the need for a comprehensive approach to diversify the Wyoming economy, Governor Matt Mead created the Economically Needed Diversity Options for Wyoming (ENDOW) initiative. ENDOW's *20-Year Economic Diversification Strategy* highlights Wyoming's need to be a state of innovators by creating the ecosystem necessary for new technologies to thrive. The strategy calls for streamlining pathways for corporate procurement of renewable energy, increasing solar generation to be 11th in the nation

matching the state's potential, and bringing at least two wind or solar energy component manufacturers to Wyoming.

Sheridan has shown a desire to distinguish its community through its first-class parks and pathway system, a vibrant art community, a successful Hi-Tech park, a thriving downtown, and a commitment to partnerships with businesses. Integrating renewable energy into Sheridan's energy mix will further set the community apart and will highlight its commitment to attracting businesses with diverse goals and interests. Establishing Sheridan's renewable energy priorities and charting a road map to realize those priorities is the essential first step. This will help position Sheridan as a community that supports technology and innovation.

OVERVIEW OF RENEWABLE ENERGY AND RENEWABLE ENERGY TRENDS

TECHNOLOGY OVERVIEW

There are a variety of viable renewable energy technologies utilized today. Not all renewable technologies are appropriate for all locations as renewable resources and potential are not geographically evenly distributed. The following section offers a brief description of renewable energy technology options that are commonplace in the United States.

Solar Photovoltaic – Residential Solar

Solar photovoltaic (PV) panels convert sunlight to energy that can be used in everyday appliances and other applications. The cost of photovoltaic solar has declined by more than 70% between 2010 and 2016. The U.S. Energy Information Administration (EIA) estimates that 24 billion kWh of electricity were generated from small-scale solar photovoltaic systems in 2017.

Source: Department of Energy

Residential solar is one of the more visible and widely recognized applications of solar. Depending on local net metering regulations and roof size, homeowners can realize substantial savings on their electric bill by offsetting their energy usage with solar panels. As explained in more detail later, net metering is a system by which a utility customer can generate electricity from solar or another energy system and they are compensated for all or a portion of any excess electricity fed back to the grid. This allows the customer to offset some or all of the cost of the electricity they otherwise would purchase from the utility provider. Common obstacles to photovoltaic systems include shading of the roof, roofs that are not structurally suitable for solar panels,

or poor building orientation that diminishes overall efficiency.

Solar Photovoltaic – Commercial Solar

Commercial solar is similar to residential solar except that the solar energy system host is a business. Commercial solar is generally the most financially viable solar energy solution for warehouses, data centers, big box stores and other commercial buildings that have high energy demands with large roof footprints. States with sufficient net metering laws which allow for larger amounts of energy to be offset or sold back to the grid will attract green-minded businesses looking to reduce one of their larger operating costs. Due to greater space availability, commercial solar will often lead to lower overall costs per watt and greater energy savings.

Solar Photovoltaics – Community Solar

The utilization of community solar has been on the rise across the country as residents and businesses increasingly look to solar as a source of renewable electricity. However, many buildings are not appropriate for rooftop solar due to any number of obstacles mentioned in the previous section. Community solar allows for a larger facility, typically up to 2MW, to be built off-site. Community solar allows for electric customers in the surrounding area to "subscribe" to a portion of that facility. This lets customers effectively benefit from solar energy in the same way one would if they had solar on their roof but without any on-site restrictions. The main obstacles to community solar however, as is the case in Wyoming, is the absence of policy that explicitly allows for community solar.

Solar Photovoltaic – Utility-Scale Solar

Utility-scale solar typically refers to projects that exceed 20MW. In most cases it is at the 20MW level that utility-scale solar becomes economically viable. These projects may utilize thousands of acres to generate massive amounts of electricity which typically feed into an electrical substation. Projects of this

size can bring massive tax benefits to the state and local area (e.g. county, municipality) in which they are located but they are also much more difficult to realize due to the need for large tracts of land, coordination with multiple regional transmission and government authorities, and optimal local solar policies and solar radiance.

Wind Power

Wind power consists of turbines that range in height depending on the type installed. Common wind turbines can reach as high as 300+ feet when the blades are included. Industrial scale wind farms are more common in rural areas due to massive expanses of open land with plentiful wind resources and are commonly seen in states with substantial agricultural lands.

Smaller scale wind turbines can range in height from 30 feet to over 150 feet. Energy capacity increases as the size of a turbine increases. These are possible solutions for residences and businesses depending on local and state energy policy. They may be constrained by maximum height restrictions within a county or municipality.

Hydropower Energy

A typical hydropower generator produces electricity by utilizing existing water flows such as rivers, creeks or streams to move a turbine at a controlled rate. Traditional large-scale hydropower dams require large rivers and immense capital expenditures, in addition to coordination with federal agencies, to be successful. Many of the well-known larger scale hydroelectric power stations like the Hoover Dam have been in operation for decades and are considered a key part meeting base electric load demand.

Smaller hydro technologies are typically not as effective on the commercial level outside of certain agricultural hydropower technologies. Smaller hydro turbines are more appropriate in smaller water flows, like the one installed in Sheridan's Beckton Hall station or in agricultural ditches, in which they are often used to offset on-site energy needs.

Geothermal Energy

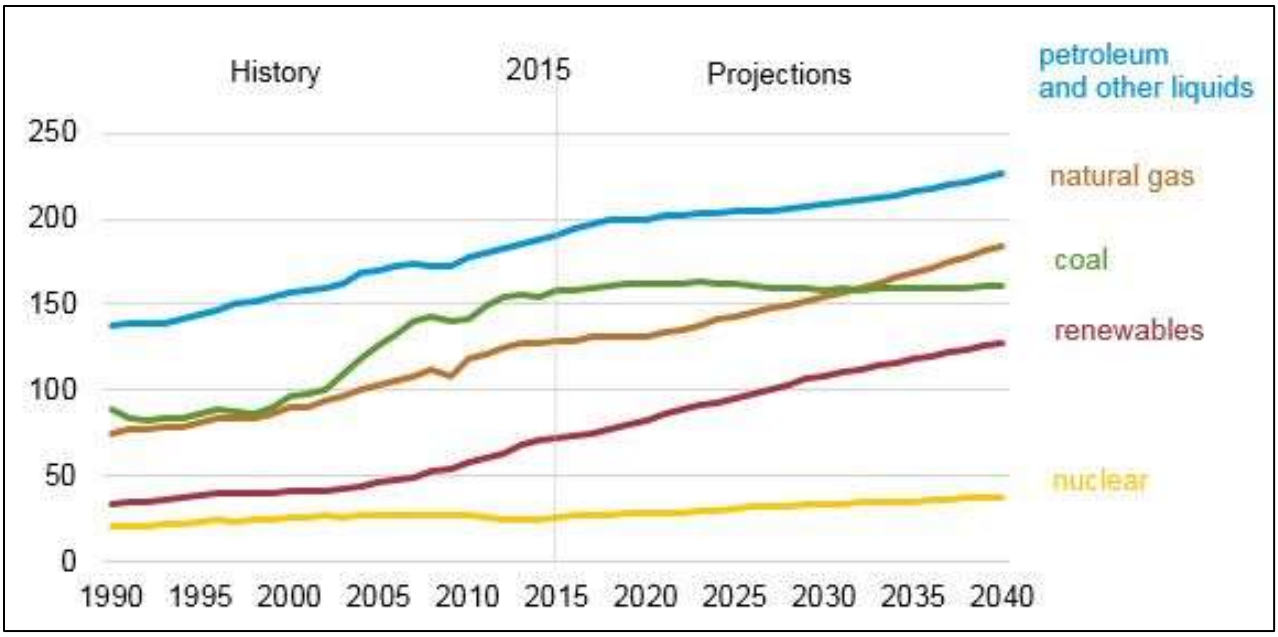
Geothermal is an emerging option for private citizens and governmental entities, especially in areas with high geothermal activity. A geothermal system uses heat energy from the earth to generate electricity. Geothermal heat pumps are used for space heating and cooling as well as water heating. There are many factors to consider when determining the viability of a larger scale geothermal facility including resource availability and financial feasibility. Geothermal can have very high, cost prohibitive initial capital expenditures. However there are lower maintenance expenses over its useful life when compared to some other energy alternatives.

RENEWABLE ENERGY TRENDS

Renewable energy has become increasingly affordable in the last few years. As a result, installed capacity has significantly increased and is now widespread across the globe and in the United States. The cost of photovoltaic systems shrank by a factor of five from 2010 to 2017.[iii]

World

The United States Energy Information Administration's *International Energy Outlook 2017* projects an increase in world consumption of energy through 2040 from nearly all fuel sources. The lone exception is coal for which predictions show demand will be flat.



Source: U.S. Energy Information Administration

Although fossil fuels still account for the majority of energy use, renewables are the world's fastest-growing energy sector. Renewable energy consumption is projected to increase by an average 2.3%

each year through the study period. Renewable energy accounted for almost two-thirds of net new power generation around the world in 2016. This was the first time solar PV additions rose faster than any other fuel surpassing the net growth of coal. In 2017, more gigawatts of solar were installed worldwide than the combined net additions of coal, gas, and nuclear plants. While investment in renewable energy capacity did fall by 23% in 2016, it was still roughly double the investment in new fossil fuel power stations and more than seven times the amount committed to new nuclear plants.

China continues to be especially aggressive in its pursuit of renewable energy. In 2017, China installed 53 Gigawatts ("GW", 1GW = 1,000MW) of solar power— more than the entire world market installed in 2014. China also invested $86.5 billion in solar last year[iv] and has plans to build a 2 GW solar farm. As China increases its renewable energy portfolio it is simultaneously moving away from fossil fuels and halting construction of 100 GW of coal power.[v] Mexico, Australia, Sweden, Brazil, and India are also significantly increasing their investment in renewable energy and EIA projections show renewable energy continuing to expand in the world's overall energy mix over the next two decades. In India, the cost of solar power has plunged below that of a new coal-fired power plant.[vi]

United States

In the United States, renewable energy sources generated approximately 17% of the nation's utility-scale energy in 2017. The EIA estimates that an additional 24 billion kWh of electricity generation was from small-scale solar photovoltaic systems in 2017. In the first five months of 2018, power generated by solar increased by 31% and wind increased by 9% compared to the same period in 2017.[vii]

These increases are largely driven by certain U.S. states aggressively pursuing pro-renewable energy legislation at the utility scale and even the smaller scale. For instance, in May of 2018, the California Energy Commission voted unanimously to require solar panels on new homes starting in 2020. Utilities are also aggressively pursuing renewable energy. In February 2018, Xcel Energy, which operates in eight states, proposed a plan that included the replacement of two large coal-burning units primarily with renewable energy. Xcel expects to save tens of millions of dollars by making this switch. While this plan will benefit from investment tax credits, costs for renewable energy are coming down so rapidly that when the federal subsidies begin to expire in 2019, wind and solar will still be cheaper than fossil fuels in many parts of the country.

Wyoming

Wyoming produced approximately 40% of all coal mined in the United States in 2016 and is one of the top 10 natural gas producing states in the nation. While known largely for its abundant fossil fuel resources, the state has also takes advantage of its massive potential for renewable energy generation. Wind power has increased rapidly in Wyoming in the last 10 years and accounted for nearly 10% of the state's net electricity generation in 2016.[viii] Due to planned wind projects, Wyoming's new power capacity is expected to be primarily from renewable energy source (add reference superscript)

Solar power on a home in Sheridan

Despite current renewable energy efforts, Wyoming is still lagging significantly behind neighboring states in terms of renewable energy generation. Wind power provided approximately 30% of South Dakota's total net electricity generation in 2016 and in 2017 and hydroelectric power provided more than 40% of South Dakota's net electricity generation.[ix] In 2016, Colorado ranked 10th for installed solar power capacity and 11th in the nation for actual solar electricity generation. Electricity from renewable sources has more than doubled since 2010 to around 20% of Colorado's net electricity generation.[x] In 2016, 79% of Idaho's utility-scale net electricity generation came from renewable energy resource- 59% of which is hydropower and 15% generated by wind.[xi]

Local communities are working to make renewable energy a reality in Wyoming. In May 2018, the Sweetwater County Commission granted a conditional-use permit to build the first major commercial solar energy project in Wyoming. The 80-megawatt solar farm will generate enough electricity for 12,000 homes. In May 2018, the Jackson town council approved a contract to build Wyoming's first solar array using virtual net metering allowing users to purchase a portion of an off-site solar system to power their buildings.

CORPORATE AND BUSINESS

Major U.S. corporations have become some of the biggest purchasers of renewable energy. Sixty percent of the largest US businesses have set public energy goals to increase their use of renewable energy. Companies are setting these goals because reducing non-renewable energy dependence and increasing renewable energy usage have become core elements of business sustainability strategies. Many businesses in the United States have built renewable energy mandates into their siting decisions as a means of fulfilling emission reduction goals and meeting consumer demand, generating an attractive return on investment, attracting talent that is environmentally conscious, and limiting exposure to energy price variability. In 2016, corporate power users, along with education and military customers, signed nearly 40% of new wind energy contracts. These users also accounted for an unprecedented 10 percent of the market for large-scale solar projects in 2016.[xii]

The move towards renewable energy is especially relevant to the tech companies and data centers that Sheridan has identified as potential targets for business recruitment. These companies often evaluate the availability of renewable energy when making decisions on where to open new operating facilities. Some of the largest companies in the industry are leading the way in renewable energy use and have either realized or set aggressive goals to power their facilities and data centers with renewable energy. Close to 50% of corporate investment in offsite renewable energy in the United States has been from tech companies.[xiii]

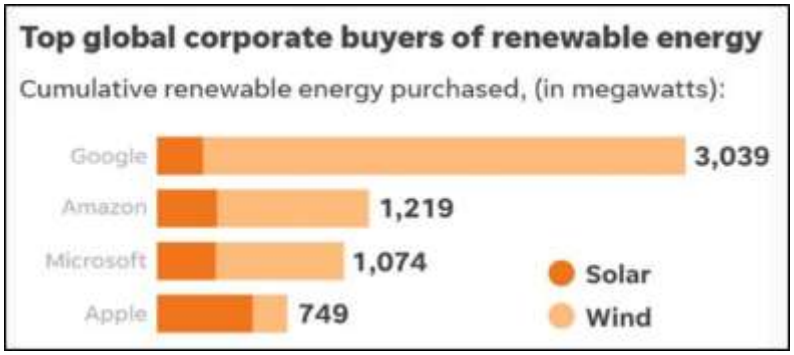
In order to recruit tech companies, states, local municipalities, and utilities are accommodating renewable energy demands. When Amazon wanted to build a data center in Virginia, Dominion Energy created a special power purchase agreement that allowed the company to contract for 100% renewable energy—which was not previously possible.[xiv] Dominion Energy also created a clean-energy tariff for a Facebook data center. Clean energy tariffs allow a utility to sell renewable energy to customers that want it while passing any additional costs to those specific customers.[xv]

Even after the United States withdrew from the Paris Climate Agreement in 2017, thousands of businesses, investors and local communities pledged to meet the terms of the agreement. The list, including Google, Amazon, Facebook, Microsoft, and Walmart further demonstrates the direction major US companies are moving. Their commitments to renewable energy has been demonstrated as follows:

- Google announced that as of 2017 all of its facilities and data centers are running on 100%

renewable energy.[xvi]

- Facebook announced in 2015 that is would use 100% renewable energy to run its new data center in Texas, collaborating with Alterra Energy to build a 202MW wind farm.[xvii]
- Forty-four percent of the electricity used by Microsoft datacenters comes from renewable energy, and the company has a goal of improving renewable energy use by its datacenters to 50% by the end of 2018, topping 60% early in the next decade and improving from there.[xviii] Microsoft built its data center in Wyoming next to a landfill in order to use the landfill's methane gas to power the facility.[xix] Microsoft signed a deal for the largest purchase of wind energy in its history, enough to power its data center in Cheyenne.[xx]
- Apple announced in April 2018 that all of its retail stores, data centers, and corporate offices run on 100% clean energy.[xxi] Apple has built solar arrays on site at several of their data centers and has created an energy company called Apple Energy LLC so it can sell energy generated by renewable-energy plants it has invested in around the US, including utility-scale solar installations.[xxii] Renewable energy powers 100% of the company's headquarters in Cupertino, California, which includes a 17-megawatt onsite rooftop solar system. In addition, 23 of its suppliers have pledged to power their Apple production with 100% clean energy.[xxiii]
- Amazon Web Services has a long-term commitment to achieving 100% renewable energy usage for their global infrastructure footprint.[xxiv]
- Hewlett Packard has pledged to achieve 100% renewable electricity usage in global operations with a short-term goal of reaching 40% renewable electricity by 2020.[xxv]
- Walmart has set a goal to source half of the company's energy needs from renewable sources to achieve an 18 percent emissions reduction in its own operations by 2025.[xxvi]



Of the top 25 large corporations that have installed solar at their U.S. facilities, five have operations in Sheridan- Walmart, FedEx, Verizon, Walgreens, and Albertsons.[xxvii] However, none of these corporations has installed solar power at their Sheridan locations.

COMPANY	SOLAR INSTALLED (MW)	NUMBER OF SOLAR PV INSTALLATIONS
Walmart	147	364
FedEx	18	17
Verizon	14	17
Walgreens	14	245
Albertsons	10	44

Source: Bloomberg Energy Finance

JOBS

Wyoming continues to strive for economic diversification, look for ways to attract new employers to the state, and retain the state's younger talent. Of all workers who are 18 years old, only 40% are still working in Wyoming ten years later.[xxviii] Given Wyoming's role in powering the nation, renewable energy jobs are a natural fit as Wyoming already exports about 60% of its generated electricity out of state.[xxix] In 2016, the solar industry added 73,000 jobs and more than 374,000 individuals worked full or part-time for solar firms. Firms focused on wind energy in the United States employed 102,000 workers. The solar workforce constituted an increase of 25% in 2016, while wind employment increased by 32%.[xxx] Renewable energy occupations are one of the fastest growing employment sectors. The Bureau of Labor Statistics has estimated that between 2016 and 2026 renewable energy occupations will see the highest change in employment.

OCCUPATION	GROWTH RATE, 2016-2026	2017 MEDIAN PAY
Solar photovoltaic installers	**105%**	$39,490 per year
Wind turbine service technicians	**96%**	$53,880 per year
Home health aides	47%	$23,210 per year
Personal care aides	39%	$23,100 per year

Source: U.S. Department of Labor

Physician assistants	37%	$104,860 per year

While there could be some fluctuation in job growth from year to year, the trend towards generating more energy through renewables is unlikely to diminish as the cost of renewable energy continues to fall. This reality will help sustain job growth in the renewable energy sector over the long-term.

The renewable energy sector is already a significant job provider in neighboring states. Colorado is home to more than 454 solar companies providing jobs for 6,000 Coloradans.[xxxi] Utah's solar industry employs over 6,000 workers, which is 4th for solar jobs per capita.[xxxii] Conversely, Wyoming ranks 49th in installed generation and 43rd in per capita solar jobs despite being ranked 11th in the country for solar generation potential.[xxxiii] The commercial solar plant being developed by Sweetwater Solar, LLC north of Rock Springs is expected to provide 150 jobs in that area over the construction period of the project[xxxiv] and according to the Bureau of Land Management 4 to 6 workers would be employed over the life of the project for management, maintenance, and other operation related needs.

PUBLIC SUPPORT

Americans are overwhelmingly supportive of renewable energy. Two-thirds of Americans favor alternative energy such as wind and solar power over fossil fuels.[xxxv] This support increases for people under the age of 50, where 73% of Americans feel that developing alternative energy sources should be a priority. For Americans under the age of 30, 75% view developing alternative energy as a priority.

BARRIERS TO RENEWABLE ENERGY DEVELOPMENT IN SHERIDAN

While nationwide demand for renewable energy is high, challenges still exist for communities seeking to stimulate the development of renewable energy. Federal, state, and local policies have a tremendous effect on the level of renewable energy adoption. A community should be prepared to realize renewable energy potential and investments when they materialize.

Barriers that hinder development renewable energy development include:

1. *Physical barriers* – The availability of natural resources often determines the functional practicality of a renewable project.
2. *Financial barriers* – The financial viability of a renewable energy generator can depend on the price of electricity as well as state, federal and local incentives.
3. *Market barriers* – Most renewable energy sources need a utility provider that allows renewable energy resources to connect to their electric grid or enable the monetization of renewable energy by providing certain services like net metering.
4. *Political barriers* –Zoning regulations, personal property taxes, and federal and state policies that promote or tax a certain energy source can have a major impact on the feasibility of a renewable resource.

Each of the barriers play a role in the viability of a renewable energy power source. However, deficiencies in one barrier can be overcome by strengths in another. For example, if a particular area does not have the best solar radiance, good local policies supporting solar power could level the playing field thus making renewable energy more viable. The following provides a detailed overview of each of these barriers as they relate specifically to Sheridan.

NET METERING

Prior to any discussion about the barriers to renewable energy in Sheridan it is important to explain the concept of net metering and why it is an important factor in the assessment of renewable energy feasibility in Sheridan. Net metering is a system by which a utility customer who generates electricity from a renewable energy system can receive payment or reduced billing charges for sending all or a portion of that electricity back onto the grid. This allows the customer to offset some or all of the cost of the electricity they otherwise would purchase from the grid.

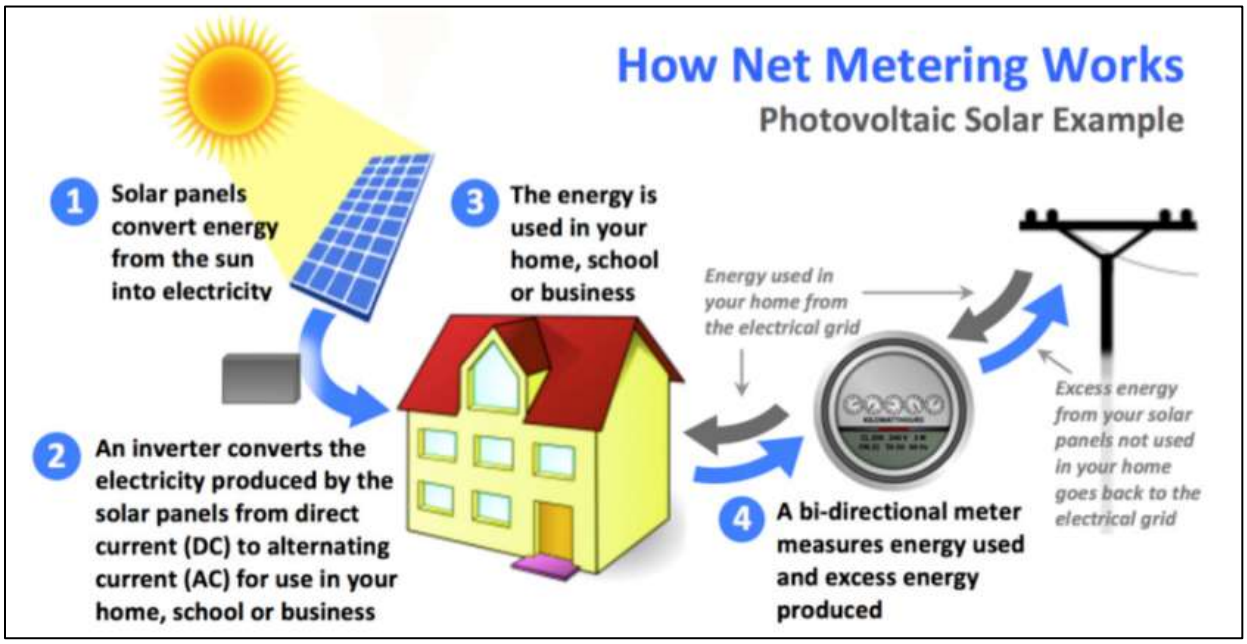
- Montana-Dakota Utilities (MDU) offers net metering to any customer that owns and operates a solar, wind or hydroelectric generating facility with a capacity of 25kW or less, is located on the customer's premises, and that is intended primarily to offset part or all of the customer's own electrical requirements. The generating facility must be interconnected and operated in parallel with the MDU's existing transmission and distribution facilities. MDU's net metering policy is located in

Appendix A.

There are two main mechanisms that allow customers to decrease their overall electric bill through net metering:

1. Customers generating their own electricity will purchase less from the grid, directly offsetting their energy supply and distribution costs on their electric bill. Montana-Dakota Utilities allows excess electricity from one month to be used in the form of a kWh credit the following month(s) until the end of the calendar year. On January 1, the customer is compensated for the remaining balance (see below) and the kWh balance is reset to zero.

2. In the case where a customer generates more electricity than they use throughout the calendar year, net metering allows customers to sell that energy back to the grid where they will receive financial compensation. Compensation varies based on state and utility policy. In Wyoming excess electricity rolls over month to month until the end of the year at which time the utility will compensate the customer for electricity sold at their avoided-cost rate.



Wyoming enacted legislation to establish net metering in 2001. The law applies to investor-owned utilities, electric cooperatives, and irrigation districts. Eligible technologies include solar, wind, biomass and hydropower systems up to 25 kilowatts (kW) in capacity. Systems must be intended primarily to offset part or all of the customer-generator's requirements for electricity.

Interconnection Standards

Interconnection standards define how a distributed generation system, such as solar photovoltaics

(PVs), can connect to the grid. System owners are required to install and are responsible for the cost of a manual external disconnect switch. An external disconnect switch allows a utility to cut off power from the renewable energy source and prevent it from sending power back on to the grid. This is usually done during routine or emergency maintenance by the utility. Wyoming's net metering law does include interconnection requirements, but it does not establish interconnection rules beyond basic safety and equipment compliance requirements. MDU's Interconnection Agreement for net metering service is located in Appendix B.

POLITICAL BARRIERS

- *Incentives:* The Wyoming state legislature has not created much in terms of incentives for renewable energy. The State of Wyoming is only one of twelve states without a renewable energy standard. Several of those twelve are now in the process of generating standards.
- *Net Metering Cap:* Wyoming's net metering cap of just 25kW is a significant barrier to renewable energy development. While 25kW is sufficient for individual residences, it is generally insufficient for corporate facilities that generate renewable energy. This limit is the smallest in the country, with only Nebraska having a similar limit. ENDDOWs *20-Year Economic Diversification Strategy* also recognizes this as a barrier and calls for less restrictive net metering regulation.
- *Solar Ordinances:* A solar ordinance is usually helpful in areas where solar is expected to experience growth. Solar ordinances address setbacks from property lines, height restrictions, and districts in which to zone solar, etc. Currently, solar is not mentioned or specifically allowed in the City code.
- *Zoning:* Sheridan does not have a significant amount of current zoning or regulatory requirements that address renewable energy. Sheridan does have height restrictions that would limit certain wind energy development within the City. Sheridan also has some placement restrictions designed to allow access to rooftops for first responders that may limit or negate solar on some rooftops.
- *Tax Exemptions:* Some states have personal property tax exemptions for solar. Other strategies include taxing the solar facility separately from the property, ensuring the property owner is not negatively impacted, or utilizing different valuation schemes to prevent inordinate property taxes that may dissuade development.
- *Retail Choice:* Retail choice in electric suppliers is beneficial. It would enable a solar developer to build a large project and then sell the electricity to whomever. Some regions, such as southwestern Wyoming, are transporting their power. Given that Sheridan is not the most resource rich place in the state, retail choice would have minimal local benefits and obtaining utility buy-in would be a significant hurdle.

As with most markets, government policies do matter. Nevada's solar market witnessed a sharp decline in 2015 when the state repealed net metering. Nevada's legislature reinstated their net metering policy after witnessing the impact.

PHYSICAL BARRIERS

- While Sheridan's solar resources are not as good as some other parts of the state, the map on the right shows they are better than many other areas in the country that already have robust solar energy markets.
- Generally speaking, Sheridan's wind, hydro and geothermal resources are limited.
- For small to medium sized solar projects (~5-2000kW) there is generally sufficient electrical infrastructure to support solar projects.
- For large industrial scale solar projects 10MW and above, Sheridan does not have the available solar potential as compared to other parts of the state to produce solar energy at a competitive price.

MARKET BARRIERS

- The market for commercial renewable energy facilitates in Wyoming is especially constrained by Wyoming's 25kW cap on renewable installations. Many small to midsized businesses, data centers, and manufacturing facilities would benefit greatly by expanding this cap. The cap is 50kW in MDU's Montana service area as established by Montana law. In communications with Walmart's senior manager for renewable energy the company communicated that if Wyoming expands the cap on solar installations to at least 500kW, allows for third-party PPAs, and maintains reasonable net-metering rules, they would consider putting solar on sites in Wyoming. This would likely be replicated by other companies. As noted earlier, more than 60% of large companies install at least some solar on their buildings.
- Wyoming's net metering law does include interconnection requirements but it does not establish interconnection rules beyond basic safety and equipment compliance requirements.

FINANCIAL BARRIERS

The upfront costs of installing renewable energy systems often serve as a barrier to their realization. While costs have been rapidly declining it is still difficult for many to find the necessary funding. To overcome the initial costs, incentives are often developed to assist those interested in renewable energy. Wyoming has little to offer in terms of incentives making renewable energy development more

difficult than it is in many other states and cities, including all of the states bordering Wyoming.

- The current Federal Investment Tax Credit (ITC) is equal to 30% of the investment in solar property through 2019. While this is currently a significant incentive the ITC then steps down to 26% in 2020 and 22% in 2021; and after 2021 the residential credit drops to zero and the commercial and utility credit drop to a permanent 10%. The ITC has been set to expire in the past but has been renewed. Due to its popularity and direct correlation to job creation there is the potential it will be renewed again.
- Many states offer financial incentives such as tax credits, sales and property tax exemptions for renewable energy, as well as grant and loan programs to encourage deployment of renewable energy. Wyoming does not incentivize renewable energy in any meaningful way and is significantly behind where neighboring states are in terms of realizing renewable energy.

See Appendix C for list of incentives bordering states offer.

SOILS AND TOPOGRAPHY BARRIERS

Soil can play a large role in determining a viable area for a solar installation. There are no accepted standards that should be met when analyzing soil characteristics for when siting solar so sites should be reviewed on a case-by-case basis.

Soil quality can affect the type of racking used for solar installations. Typically, multiple foundation posts are driven into the ground to support the panels. These stainless steel posts are easy to install and require no concrete. However, if a solar development was being installed on a landfill, an environmentally-sensitive area like a wetland or brownfield, an area with shallow soils, or one with granular, less supportive soils options for foundational support may be more limited. In those cases a concrete ballast may be used to protect any sensitive subsurface conditions. Any accommodations that have to be made due to adverse soil conditions can have a negative impact on the financial viability of a project.

An in-depth analysis of soils or a geotechnical report is often completed to ultimately determine appropriate racking. Other soil characteristics that could affect racking systems could include corrosivity which is caused by high levels of chloride solutions in the soil or other corrosive agents, the presence of rocks, and the bearing pressure.

EXISTING ELECTRIC INFRASTRUCTURE BARRIERS

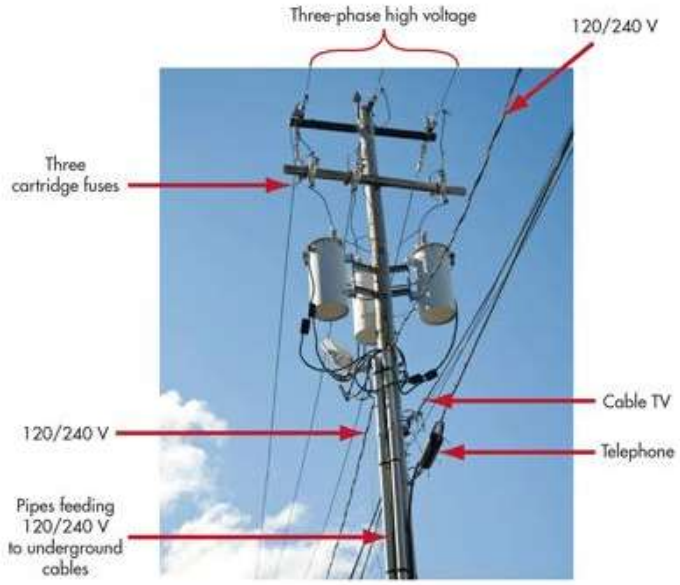
Existing Substations and Transmission lines:

Utility-scale projects, usually those of 20MW or more, require an interconnection into a substation.

More often than not the projects will be located adjacent to or near an existing substation due to the extreme costs associated with building a new substation or running lines from a solar facility to an existing one. This sort of project and interconnectivity is not likely in Sheridan due to availability of solar radiance (the amount of sunlight available) versus that of other areas in the state which have more solar radiance (see next section for analysis of solar radiance in the City) and can therefore produce cheaper energy. In the picture to the left, the green dots are substations, the yellow lines are low voltage transmission lines and the green lines are higher voltage transmission lines.

Distribution lines:

Generally speaking, three-phase electric lines (pictured to the right) are used for larger distributed generation projects (greater than 25kW). Three-phase lines are largely identified by the three electric lines that run along the top of an electric pole. The amount of electricity any building uses determines what type of electric service it would receive. Most homes will have a single-phase line providing residents with electricity while three-phase would be reserved for commercial and industrial purposes.

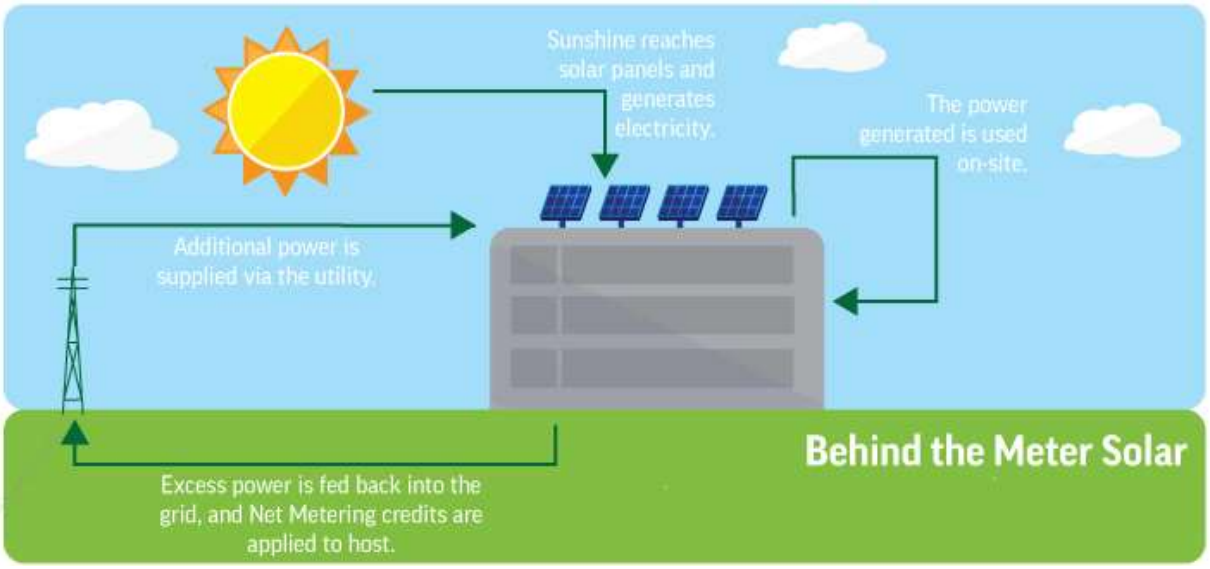


Medium-scale facilities require connection to three-phase lines (classified as between 25kW-5MW for the purpose of this report) due to the large voltage of the lines and the size of the facility. Fortunately, three-phase electric lines are far more commonly accessible than electric substations. For this reason, appropriate land can be easier to find for these distributed generation projects.

Distribution facilities are generally broken into two categories:

- Behind the meter: When all the electricity generated from a renewable source is used on site;
- In front of the meter: When the electricity generated on site is sent back to the grid.

*Net metering is behind the meter and has the ability to send electricity back to the grid.



AVAILABILITY OF RENEWABLE ENERGY RESOURCES IN SHERIDAN

SOLAR RESOURCES

While ranking as one of the states with the least amount of installed solar, Wyoming actually has an abundance of solar resources. Wyoming has just as much solar as states known for their sun (Figure 1), like Florida, and it has far more solar potential than some states with a thriving solar industry such as New York (Figure 2 and Figure 3), Massachusetts, Maryland, Illinois and Minnesota .

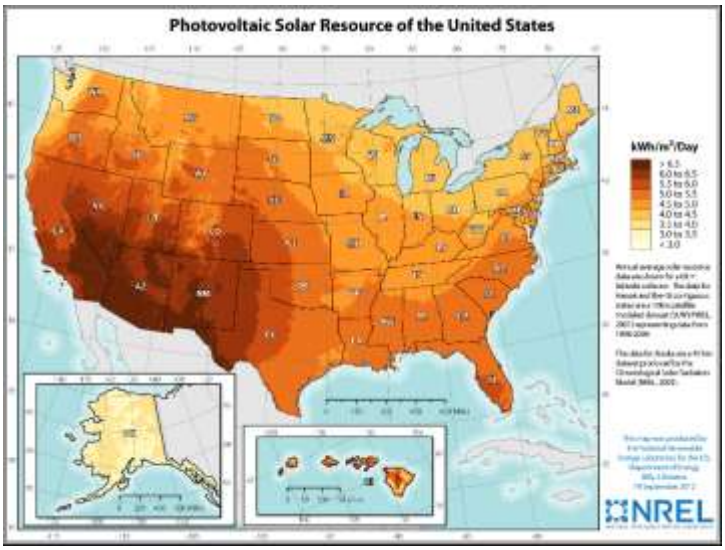


Figure 1: National Renewable Energy Laboratory

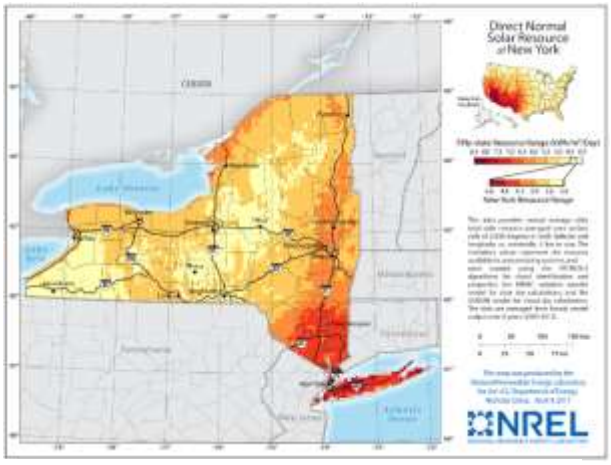


Figure 2: National Renewable Energy Laboratory

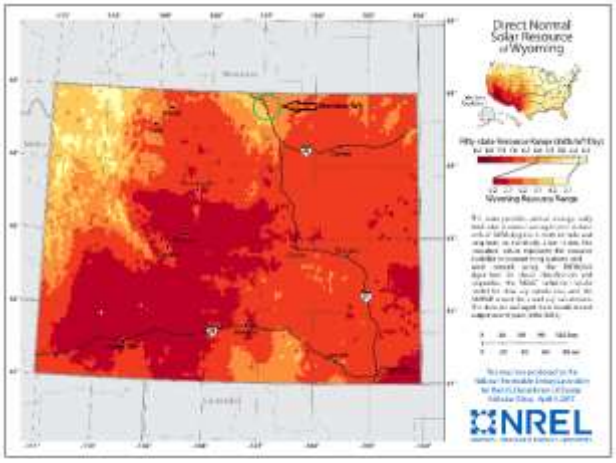


Figure 3: National Renewable Energy Laboratory

WIND RESOURCES

Similar to solar, Wyoming ranks as one of the best states for its availability of wind resources (Figure 4). However, the majority of these resources reside in the south/southeastern parts of the state as shown in (Figure 5).

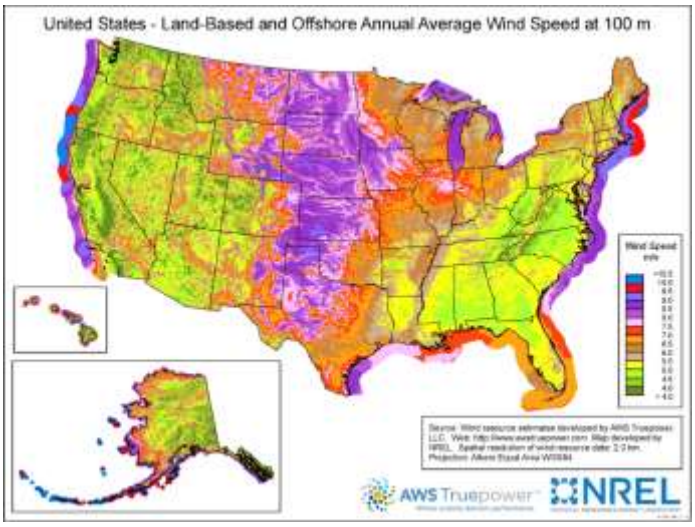


Figure 4: National Renewable Energy Laboratory

Figure 5 also shows that Sheridan has very limited wind viability with the exception of the wind resources located in the hills to the west of the city. However, the lack of availability electrical infrastructure in that area and the cost to create new infrastructure (given the amount of available wind resources in comparison to other parts of the state) may make the prospects for a wind farm in that area unfeasible.

Additionally, a typical American home would require a small turbine with a 5-kW generating capacity to meet all its electricity needs. This does not speak to the demands of businesses who may have significantly more electrical needs. The average height of a small wind turbine of any capacity is about 80 feet, but a 5-kW turbine could require a tower anywhere from 30 to 140 feet high. This would be problematic due to height restrictions and the overwhelming community desire to protect sensitive viewsheds in Sheridan.

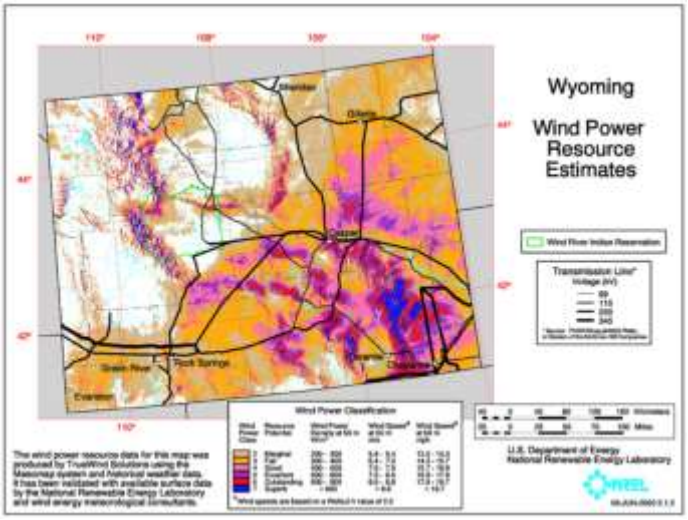
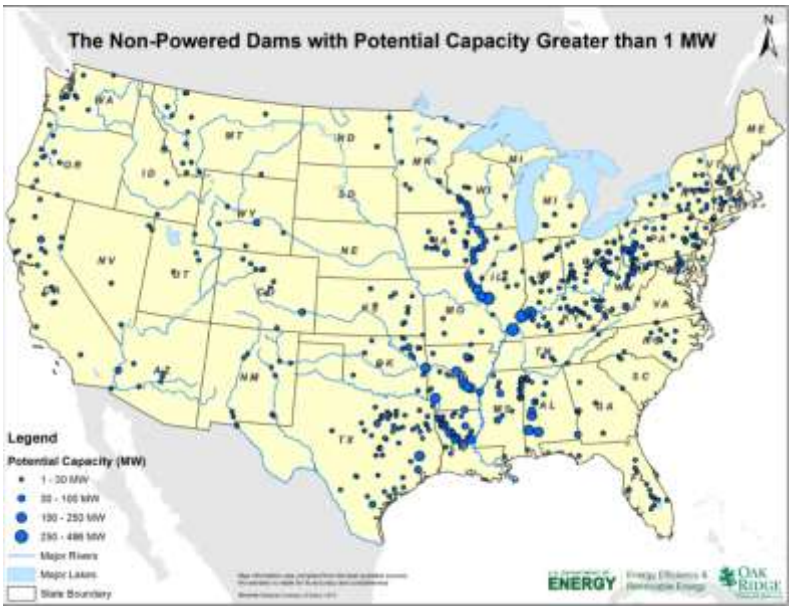


Figure 5: National Renewable Energy Laboratory

HYDRO RESOURCES

Sheridan has installed and operates the Beckton Hall Energy Recovery Project- a hydro turbine which utilizes water flowing to City water treatment plants. The micro-hydro project generates renewable energy for which the City receives payments from the local utility for power generated up to 240 kilowatts a month. This demonstrates the viability of small-scale hydro in Sheridan and there may be locations where small-scale hydropower would be appropriate. However, resources in Sheridan are not conducive to larger hydro installments.



These systems are small enough that individual landowners may have the ability to install micro-hydro themselves if they have access to water resources that can generate enough water flow. Additionally, there may be opportunities to find innovative ways to utilize pre-existing water flows, as the City already did with their system.

GEOTHERMAL RESOURCES

Geothermal heat pumps provide heating/cooling services in addition to hot water in some cases. A study commissioned by the Department of Energy"[xxxvi] analyzed cost savings of geothermal systems installed for single-family residences and standard commercial buildings in 30 metropolitan areas. In 29 of the 30 areas studied, energy savings were realized and the systems were projected to pay for themselves in the long term. Additionally, in 25 of the 30 areas, the same was true for commercial buildings. The study notes that if site-specific conditions were included in their models, all the systems would likely be paid off. It should also be noted that energy prices are likely far different in metropolitan areas when compared to energy prices in Sheridan.

Different types of geothermal systems are installed for residential purposes, depending on physical factors such as available land and soil depth. For existing homes, especially in town where space may be limited, a vertical closed loop system would be utilized. These systems drill a few hundred feet into the ground and use little space. They can range in price, but the Department of Energy quotes the national average for a single-family residence at approximately $7,500 for the heat pump and $4,500 for the looping system with other miscellaneous costs left out. While the DOE states that the cost can be recouped over time, the initial cost is a large barrier to home and business owners.

For new developments, horizontal trenching is a more cost-effective option when there is enough land available. Horizontal trenching only requires 4-6 foot trenches with pipe running through it. It uses more land but it is cheaper than vertical closed loop systems. The average price for a single-family residence would include the $7,500 for the average residential heat pump plus $2,400 for the looping system.

Overall, homes and businesses can retrofit their existing HVAC systems—and even some hot water heating systems—to utilize geothermal. The initial upfront cost, which can vary widely from less than $10,000 to $20,000 and beyond, can prove to be a barrier. This can be partially offset with the 30% federal tax credit for residential systems and a 10% tax credit for commercial installations until the end of 2019 when it is reduced.

Geothermal is highly efficient and the low electricity demand needed with heat pumps will lead to relatively low operating costs. To determine the viability of geothermal, an in depth look into the geology of the area around Sheridan, drilling options, federal regulations, material costs, transmission

capabilities and other considerations would be required.

SHERIDAN COMMUNITY DEVELOPMENT PLANS

Communities develop comprehensive plans and other more specific planning documents to guide future development and the actions of their community. These plans present a vision for the future of the community, establish long-term goals, and detail implementation measures to realize the community's objectives. As part of the planning process, the public is included to ensure any plans reflect the ideas, concepts, values, and will of the citizenry. Local governments take input from the public and use it to guide decision making concerning development, the expenditure of public funds, and community growth patterns.

Community planning documents, efforts, and initiatives should be consulted when planning for potential renewable energy developments. Although not a barrier per se, Sheridan residents place an extreme level of importance on their scenic views of the Bighorn Mountains. Renewable energy development should follow the desire of Sheridan residents and not obstruct or otherwise diminish the view of the mountains. A summary of existing plans and how they may pertain to renewable energy development can be found in Appendix D.

The Sheridan County Comprehensive Plan (2008) specifically notes the need to ensure the community meets the energy needs of future residents and businesses through a range of energy options, including renewable energy. The Sheridan County Comprehensive Plan prioritizes supporting job expansion efforts and the promoting the recruitment of "good fit" industries. The Sheridan Land Use Plan (2017) specifically notes the need to ensure that scarce resources, such as energy, are available in the long-term for Sheridan's residents and businesses. Realizing renewable energy will make sure that Sheridan is prepared with all necessary long-term energy requirements for its citizens, businesses and industries.

RENEWABLE ENERGY FEASIBILITY IN SHERIDAN

To assess the potential for an increase in renewable energy power generation in the City of Sheridan, an assessment was conducted to determine where deployment of renewable energy would be the most viable. Renewable energy feasibility studies are employed prior to the design of a project to ensure that an area or specific parcel of land is appropriate and able to host a solar array or wind project. This typically entails an initial remote evaluation of the area of interest to identify available space and the energy that could be generated based on topography and access to solar energy insolation or wind potential. It is important to define how renewable energy can contribute to Sheridan's overall energy supply and identify potential sites for renewable energy development based on site characteristics and constraints, transmission, and interconnection capacity and costs.

In order to conduct a feasibility assessment, the project team was provided with an overview of 22 sites that could potentially host a solar array – Sheridan's favorable renewable energy source. Following an evaluation of these sites, it was determined that 10 of them are infeasible due either to their electrical infrastructure or to their lack of space for the solar arrays. The remaining 12 facilities, were split into 3 categories: School Owned, City Owned and Other. The "Other" category refers to a tech center/manufacturing facility that would be representative of one likely found in Sheridan based on size and energy use. Solar power at the VA Hospital was also explored. Appendix E contains a list of the unsuitable sites and their reasons for being deemed unsuitable.

Expanding the net metering cap to 300kWac would allow for the construction of larger arrays and greater cost savings. This chart displays the total size of the arrays that would be feasible on the 12 selected sites in kWac under the 25kW and 300kW limits.

	System Size (kWdc)		Estimated 25 yr Savings	
	25 kW limit	300 kW limit	25 kW	300 kW
School owned	163.3	1,226.3	$167,167	$1,381,726
City owned	119.1	131.8	$106,696	$122,326
Other	98.6	524.0	$107,621	$592,648
Total	381.0	1,882.1	$381,479	$2,096,700

For the financial analysis, models were run for both a scenario in which the arrays were investor-funded and investor-owned, as well as a scenario in which the arrays were host-funded and host-owned. The analysis showed that although a third party could utilize the federal 30% Income Tax Credit, this amount is not enough to overcome the burden of the investor's required return on investment. It is not likely that an investor owned scenario would result in positive cost savings for the City.

To evaluate each project site, a proposed layout and production profile for each location was developed. Local Sheridan solar suppliers and installers were consulted to estimate install cost and those estimates

were used to construct a model calculating the cost savings for the City.

OVERVIEW OF FEASIBILITY STUDY

The following provides an overview of the work presented and the assumptions and calculations used in this feasibility assessment.

1. *System Sizing* – Comparing the time of day during which a solar facility generates electricity with the amount of electricity being used onsite is key in determining a solar facilities size. In certain circumstances, there will be excess generation that is sent back to the grid and monetized via net metering. Residential and commercial solar PV systems usually rely on net metering to receive the financial benefits. Each state has different laws on how much electricity can be sold back to the grid through net metering. Wyoming currently has a net metering cap of 25 kWac, one of the lowest in the country. In the past, Sheridan has been able to negotiate separate deals with the utilities like it did with the Micro-Hydro Facility, for which the local electric utility allowed for a renewable energy system size of close to 300 kWac. For the financial model, we analyzed two different system sizing scenarios: one under the current net metering law of 25 kWac, and another under a potential 300 kWac negotiated net metering limit, similar to what MDU has allowed in certain scenarios. For the case of the VA hospital, we modeled additional scenarios under a 1 MW limit, assuming that all the energy could be used onsite at the time of generation.
2. *Investor-Owned vs. Host-Owned* - There are multiple ways to pay for the construction of the solar arrays. One is with 3rd party financing, where an investor provides the capital to build the array and is paid back over time through a Power Purchase Agreement (PPA). In this situation, an investor is able to offset some of the costs of the project with the 30% Federal Investment Tax Credit. However, an investor requires return on their capital that at times can offset the benefit of the ITC. Alternatively, in Host-owned systems, the Host provides the initial capital and recoups its investment over time through a lower energy cost. However, if the Host is tax exempt, it will not have a tax liability to monetize the ITC benefits. Our models and the analysis herein compare the two scenarios as “Investor Owned (Costs)” and “Host Owned Savings / (Costs)”.
3. *System Designs* - It was important to develop realistic system designs for each of the project locations. We used Helioscope, a solar array modeling software, to model the arrays used in these financial analyses. For each project location, we modeled separate designs under both a 25kW and 300kW limit, and with either roof mounting or ground mounting. If roof mounted, they were modeled with either a fixed or flush mount. A flush mount simply means the panels lie flat along the slope of the roof whereas a fixed mount lies tilted at an angle. If the panels are ground mounted they are either single axis tracking or a fixed mount system. Unlike a fixed mount, single axis tracking allow the panels follow the sun’s movement in the sky. The solar panels used in the array are non-toxic crystalline silicon panels. Appendix D provides a description of the exact equipment used in the solar arrays.
4. *Production Estimates* - In determining production estimates, we utilized the results from the Helioscope system designs which considered the array size, azimuth, ground coverage, tilt and

shading of the panels. Next, we entered these results into a PVWatts Calculator. This is a tool developed by the National Renewable Energy Laboratory (NREL) for production estimates and takes into account these variables as well as local weather data. In general, the two solar array production results were similar and we utilized the results from PVWatts herein. The following are some of the specific parameters used in PVWatts:

Array Type	Module Type	System Losses (%)	Tilt (deg)	Azimuth (deg)	DC to AC Size Ration	Inverter Efficiency (%)	Row Spacing
Fixed Tilt, Ground Mount	Premium	14.08	30	180	1.32	98	21.4
Flush Mount, Roof	Premium	14.08	35	180	1.32	98	0
1-Axis Tracking, Ground	Premium	14.08	n/a	n/a	1.29	98	16.5

5. *Construction Costs* – Local Sheridan solar installers were consulted in determining estimated construction costs. The costs were generally provided on a per watt basis and the larger arrays had lower per-watt installation pricing due to their economies of scale.
6. *Long Term Maintenance Costs* - There are several long-term maintenance costs associated with the construction of solar arrays when they are owned by an investor. We included estimated costs for routine maintenance and insurance, assuming these costs were to escalate at a rate of 2% annually. These costs were excluded for purposes of the Host Owned model. We also assumed that because the arrays would be for the benefit of the City that no taxes would be paid on them based on current regulations.
7. *Savings Calculations* - To calculate the cost savings generated from the arrays, we obtained utility bills from the City and other analyzed entities for each location. This provided a monthly/yearly amount of electricity used and the amount paid for it. While these amounts range from $0.083 to $0.10 per kWh, we used the lower number of $0.065 per kWh in our analyses because a portion of these costs relate to “demand” charges which may not be avoided.

Name	Last 12 Months Electricity Used (kWh)	Last 12 Months Electric Bill ($)	Potential Avoided Cost (per kWh)
Woodland Park Elementary	456,250	$40,391.00	$0.0885
Sheridan Junior High School	1,067,616	$93,830.00	$0.0879
Sheridan High School	2,849,040	$263,359.00	$0.0830
Highland Park Elementary	461,800	$47,644.00	$0.1032
Coffeen Elementary	445,000	$43,379.00	$0.0975

These numbers also gave us an idea of the percent of generated electricity that would be used onsite versus net metered for each location. Using this data along with various financial assumptions we created a spreadsheet that modeled the year by year output and profit generated by the arrays. This allowed us to calculate potential returns for the City over 25 and 35 years.

PRODUCTION ANALYSIS

Project Totals Summary

The following table presents a summary financial analysis of 25kW and larger arrays on Host, school and VA owned sites.

Project Totals						Estimated Investor Owned (Costs)		Estimated Host Owned Savings / (Costs)				
	Size (kWac)	Size (kWdc)	Type	1st Year System Output (kWh/Year) (b)	Total Install Cost (c)	Average PPA Rate (per kWh) (d)	Host 25 year Savings / (costs) of PPA (e)	Host Return Profile over 25 years	Host 25 yr IRR (f)	Host Return Profile over 35 years	Host 35 yr IRR	Average Payback years
25 kW:												
Schools	125.0	163.3	Roof	224,172	268,724	$ 0.074	$ (237,527)	$ 167,162	3.9%	$ 391,946	5.4%	16.8
Host	90.0	119.1	Roof / Ground	164,417	$ 199,168	$ 0.090	$ (200,547)	$ 106,696	3.3%	$ 264,428	4.9%	18.0
VA Center	25.0	33.1	Ground	48,440	$ 55,277	$ 0.088	$ (50,485)	$ 39,260	4.3%	$ 88,013	5.8%	16
Tech Center Example	25.0	32.4	Roof	44,044	$ 54,108	$ 0.100	$ (70,154)	$ 31,850	3.7%	$ 76,178	5.2%	17
VA Chlorination Plant	25.0	33.1	Ground	48,440	$ 56,270	$ 0.086	$ (48,810)	$ 36,510	4.0%	$ 84,357	5.5%	17
Total	290.0	381.0		529,513	$ 633,547		$ (607,523)	$ 381,479		$ 904,922		
Larger:												
Schools	975.0	1,226.3	Roof	1,667,873	$ 1,749,173	$ 0.074	$ (877,026)	$ 1,381,726	4.8%	$ 2,996,309	6.2%	15.4
Host	100.0	131.8	Roof / Ground	181,457	$ 216,176	$ 0.083	$ (162,378)	$ 122,326	3.4%	$ 296,889	5.0%	17.8
VA Center (a)	300.0	381.9	Ground	562,149	$ 637,773	$ 0.080	$ (388,904)	$ 459,339	4.4%	$ 1,025,113	5.8%	16
Tech Center Example	90.0	109.0	Roof	148,384	$ 182,030	$ 0.100	$ (252,663)	$ 96,798	3.4%	$ 240,588	5.0%	18
VA Chlorination Plant	25.0	33.1	Ground	48,440	$ 56,270	$ 0.080	$ (35,962)	$ 36,510	4.0%	$ 84,357	5.5%	17
Total	1,490.0	1,882.1		2,608,303	$ 2,841,422		$ (1,716,933)	$ 2,096,700		$ 4,643,256		

Notes

a) The VA Center has multiple scenarios as further analyzed on page 34.
b) Production calculations assume a 0.5% annual degradation in solar panel production.
c) Installation prices were based off of estimates provided by a local solar installation company.
d) The PPA Rate was calculated assuming a 7.0% investor IRR.
e) Assumptions for avoided energy cost and cost of energy sent back to the grid were taken from bills collected from the City, with an estimated annual escalator of 2%.
f) Administration and insurance costs are based on estimates. It was also assumed that the project locations would not be subject to local personal property tax. Installations that are the same size under both scenarios still have a cheaper administration and insurance costs under a 300kW scenario because of the bulk purchase of solar.

Analysis

If an investor funded the construction of the array they would enter into a Power Purchase Agreement with the Host. This would allow the Host to buy energy generated from the arrays, thus paying for the cost of the arrays over time. Although this arrangement will allow both parties to utilize the 30% ITC, it

will ultimately result in an increase in the cost for the City of approximately $607,523 over the course of 25 years.

Alternatively, if the Host funds the construction of the arrays, they can potentially achieve a decrease in costs of $381,479 over the course of 25 years and an $904,922 cost/savings over the course of 35 years (in addition to recouping their initial investment).

Raising the installation limit to 300kW would allow for the Host to recoup their investment in fewer years and generate a larger long-term cost/savings of $2,096,700 over 25 years and $4,643,256 over 35 years. Although installing larger arrays results in a higher total installation cost, it would actually be a cheaper cost per watt due to the economies of scale. For site by site analysis see Appendix F.

25kW Production Analysis

25kW Array						Estimated Investor Owned (Costs)		Host Owned Savings / (Costs)				
	Size (kWac)	Size (kWdc)	Type	1st Year System Output (kWh/Year)	Total Install Cost	PPA Rate (per kWh)	Host 25 year Savings / (costs) of PPA	Host Return Profile over 25 years	Host 25 yr IRR	Host Return Profile over 35 years	Host 35 yr IRR	Payback years
School Owned:												
Sheridan Junior High School	25.0	31.7	Roof	43,131	$ 53,256	$ 0.090	$ (49,247)	$ 30,920	3.6%	$ 74,329	5.2%	17
Woodland Park Elementary	25.0	33.6	Roof	45,691	$ 54,432	$ 0.088	$ (47,035)	$ 34,740	3.9%	$ 80,726	5.5%	17
Sheridan High School	25.0	32.8	Roof	46,735	$ 53,792	$ 0.085	$ (43,236)	$ 37,418	4.2%	$ 84,454	5.7%	16
Coffeen Elementary	25.0	32.4	Roof	44,044	$ 54,108	$ 0.090	$ (49,577)	$ 31,850	3.7%	$ 76,178	5.2%	17
Highland Park Elementary	25.0	32.8	Roof	44,571	$ 53,136	$ 0.088	$ (48,431)	$ 32,234	3.8%	$ 76,259	5.3%	17
Total	125.0	163.3		224,172	$ 268,724		$ (237,527)	$ 167,162		$ 391,946		
Host Owned:												
New Cemetery Building (a)	15.0	19.3	Roof	26,245	$ 35,126	$ 0.096	$ (37,470)	$ 15,787	2.9%	$ 42,043	4.6%	19
Water Treatment 24 (b)	25.0	32.8	Roof	43,954	$ 52,152	$ 0.087	$ (47,118)	$ 32,036	3.8%	$ 75,451	5.4%	17
Water Treatment 70	25.0	34.2	Ground	49,647	$ 57,114	$ 0.085	$ (48,583)	$ 37,978	4.1%	$ 87,017	5.6%	17
Dog and Cat Shelter 85	25.0	32.8	Roof	44,571	$ 54,776	$ 0.090	$ (67,376)	$ 20,894	2.5%	$ 59,917	4.2%	19
Total	90.0	119.1		164,417	$ 199,168		$ (200,547)	$ 106,696		$ 264,428		
Other:												
VA Center	25.0	33.1	Ground	48,440	$ 55,277	$ 0.088	$ (50,485)	$ 39,260	4.3%	$ 88,013	5.8%	16
Tech Center Example	25.0	32.4	Roof	44,044	$ 54,108	$ 0.100	$ (70,154)	$ 31,850	3.7%	$ 76,178	5.2%	17
VA Chlorination Plant	25.0	33.1	Ground	48,440	$ 56,270	$ 0.086	$ (48,810)	$ 36,510	4.0%	$ 84,357	5.5%	17
Total	75.0	98.6		140,924	$ 165,655		$ (169,450)	$ 107,621		$ 248,547		
Grand Total:	290.0	381.0		529,513	$ 633,547		$ (607,523)	$ 381,479		$ 904,922		

Notes

a) The Cemetery building's roof is only large enough to fit one solar array of approximately 15 kWac.

b) The avoided cost for the Water Treatment 24 was used as the estimated avoided cost for Water Treatment 70 and the VA Center.

Analysis

The table contains the size and cost associated with constructing 25kW solar arrays on the proposed locations. It also contains the projected savings (avoided costs) under investor owned and Host owned scenarios. Constructing the 25kW arrays would be a profitable investment over the course of 25 years assuming a Host Owned system. Otherwise, without other financial incentives, the Host would end up

paying more under an investor owned scenario. However, if the Host funds the construction of the arrays, the system will pay for itself and generate a profit of $3,841,479 over the course of 25 years and $904,922 over the course of 35 years.

300kW Production Analysis

300kW Array						Estimated Investor Owned (Costs)		Estimated Host Owned Savings / (Costs)				
	Size (kWac)	Size (kWdc)	Type	1st Year System Output (kWh/Year)	Total Install Cost	PPA Rate (per kWh)	Host 25 year Savings / (costs) of PPA	Host Return Profile over 25 years	Host 25 yr IRR	Host Return Profile over 35 years	Host 35 yr IRR	Payback years
School Owned:												
Sheridan Junior High School	225.0	289.8	Roof	394,085	$ 411,516	$ 0.075	$ (202,373)	$ 343,302	5.0%	$ 732,557	6.4%	15
Woodland Park Elementary	100.0	132.0	Roof	179,296	$ 188,760	$ 0.074	$ (82,601)	$ 154,658	4.9%	$ 331,756	6.3%	15
Sheridan High School	300.0	371.9	Roof	505,802	$ 531,817	$ 0.074	$ (231,251)	$ 436,980	4.9%	$ 936,583	6.3%	15
Coffeen Elementary	125.0	146.6	Roof	199,563	$ 205,240	$ 0.073	$ (90,340)	$ 169,759	4.9%	$ 363,143	6.3%	15
Highland Park Elementary	225.0	286.0	Roof	389,127	$ 411,840	$ 0.074	$ (270,461)	$ 277,027	4.1%	$ 632,270	5.6%	17
Total	975.0	1,226.3		1,667,873	$ 1,749,173		$ (877,026)	$ 1,381,726		$ 2,996,309		
Host Owned:												
New Cemetery Building	15.0	19.3	Roof	26,245	$ 35,126	$ 0.090	$ (30,511)	$ 15,787	2.9%	$ 42,043	4.6%	19
Water Treatment 24	35.0	45.5	Roof	60,994	$ 69,160	$ 0.079	$ (40,901)	$ 47,666	4.2%	$ 107,912	5.7%	16
Water Treatment 70	25.0	34.2	Ground	49,647	$ 57,114	$ 0.079	$ (35,411)	$ 37,978	4.1%	$ 87,017	5.6%	17
Dog and Cat Shelter 85	25.0	32.8	Roof	44,571	$ 54,776	$ 0.084	$ (55,555)	$ 20,894	2.5%	$ 59,917	4.2%	19
Total	100.0	131.8		181,457	$ 216,176		$ (162,378)	$ 122,326		$ 296,889		
Other:												
VA Center	300.0	381.9	Ground	562,149	$ 637,773	$ 0.080	$ (388,904)	$ 459,339	4.4%	$ 1,025,113	5.8%	16
Tech Center Example	90.0	109.0	Roof	148,384	$ 182,030	$ 0.100	$ (252,663)	$ 96,798	3.4%	$ 240,588	5.0%	18
VA Chlorination Plant	25.0	33.1	Ground	48,440	$ 56,270	$ 0.080	$ (35,962)	$ 36,510	4.0%	$ 84,357	5.5%	17
Total	415.0	524.0		758,973	$ 876,073		$ (677,529)	$ 592,648		$ 1,350,057		
Grand Total:	1,490.0	1,882.1		2,608,303	$ 2,841,422		$ (1,716,933)	$ 2,096,700		$ 4,643,256		

Analysis

Although the limit on renewable installations in Wyoming is currently 25kW, Sheridan has been able to negotiate the construction of larger facilities with MDU in the past. This financial model analyzes the profitability of solar projects constructed under a 300kW limit. These larger solar arrays have a lower per watt installation cost than the 25kW arrays but are actually more profitable due to the economies of scale in their installation. In this case, unlike the 25kW scenario, entering into a Power Purchase Agreement with an investor may be feasible for certain projects. Alternatively, a Host owned scenario would allow for the Host to be paid back in a shorter amount of time, and to make a greater profit of $2,096,700 over the course of 25 years and $4,643,256 over the course of 35 years.

VA Center Scenarios

VA Center						Estimated Investor Owned (Costs)		Estimated Host Owned Savings / (Costs)				
	Size (kWac)	Size (kWdc)	Type	1st Year System Output (kWh/Year)	Total Install Cost	Average PPA Rate (per kWh)	Host 25 year Savings / (costs) of PPA	Host Return Profile over 25 years	Host 25 yr IRR	Host Return Profile over 35 years	Host 35 yr IRR	Average Payback years
VA Center	25.0	33.1	Fixed Mour	48,440	$ 55,277	$ 0.088	$ (50,485)	$ 39,260	4.3%	$ 88,013	5.8%	16
VA Center	300.0	381.9	Fixed Mour	562,149	$ 637,773	$ 0.080	$ (388,904)	$ 459,339	4.4%	$ 1,025,113	5.8%	16
VA Center	1000.00	1309.3	Fixed Mour	1,861,223	$ 1,702,090	$ 0.068	-$ 227,557	$ 1,930,346	6.4%	$ 3,804,449	7.6%	13
VA Center	1000.00	1300.0	Single Axis	1,920,299	$ 1,755,000	$ 0.068	-$ 233,460	$ 1,992,731	6.4%	$ 3,925,411	7.6%	13

Analysis

For the VA Medical Center site, we modeled fixed mount 25kW, 300kW and 1000kW scenarios, as well as a single axis tracking 1000kW scenario. Both the 25kW and 300kW scenarios proved to be unprofitable under a PPA agreement, generating 25-year losses of $50,485 and $388,904 respectively. Alternatively, if the Host themselves were to finance and operate the 25kW and 300kW arrays, they could generate 25-year returns of $88,013 scenario and $1,025,113, respectively.

In the case of the VA Medical Center specifically, all the electricity generated would be consumed on site. Because of this, it may be possible to negotiate the construction of a 1MW solar array with MDU. A 1MW array would have a very low per watt install cost due to its economies of scale, allowing for a PPA to be profitable. This scenario is viable as it allows for the investor to take advantage of the 30% ITC, and lets the Host save on energy costs without having to construct the array themselves.

Alternatively, the Host could finance a 1MW array themselves, generating a $1,992,731, 25-year return if single axis tracking is used and a $1,930,346, 25-year return if fixed mounting is used.

RESULTS AND ANALYSIS OF RENEWABLE ENERGY FEASIBILITY ASSESSMENT

The results of feasibility assessment suggest that there are greater energy cost savings to be achieved from Host owned solar arrays than PPA scenarios. Financing the solar arrays through PPA (Investor owned) scenarios generally results in increased costs due to Investor return requirements outweighing the benefits from the Federal Investment Tax Credit.

Sites			PPA	Host Owned		
	Installation Costs	Sizw (kWdc)	Cost/ Savings	Incremental Cost/ Savings (a)	35 yr IRR	Years to Payback
School Owned:						
Sheridan Junior High School	$ 411,516	289.8	$ (202,373)	$ 732,557	6.4%	15
Woodland Park Elementary	$ 188,760	132.0	$ (82,601)	$ 331,756	6.3%	15
Sheridan High School	$ 531,817	371.9	$ (231,251)	$ 936,583	6.3%	15
Coffeen Elementary	$ 205,240	146.6	$ (90,340)	$ 363,143	6.3%	15
Highland Park Elementary	$ 411,840	286.0	$ (270,461)	$ 632,270	5.6%	17
Total	$1,749,173	1,226.3	$ (877,026)	$ 2,996,309		
Host Owned:						
New Cemetery Building	$ 35,126	19.3	$ (30,511)	$ 42,043	4.6%	19
Water Treatment 24	$ 69,160	45.5	$ (40,901)	$ 107,912	5.7%	16
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Total	$ 216,176	131.8	$ (162,378)	$ 296,889		
Other:						
VA Center	$ 637,773	381.9	$ (388,904)	$ 1,025,113	5.8%	16
Tech Center Example	$ 182,030	109.0	$ (252,663)	$ 240,588	5.0%	18
VA Chlorination Plant	$ 56,270	33.1	$ (35,962)	$ 84,357	5.5%	17
Total	$ 876,073	524.0	$ (677,529)	$ 1,350,057		
Grand Total:	$2,841,422	1,882.1	$ (1,716,933)	$ 4,643,256		

The table above provides a summary showing the benefits of the Host owned arrays vs. a PPA in the 300kW scenario for a 25-year time period. Additionally, although our study was done using a 300kW limit, we found that Sheridan High School and the Sheridan Junior High have both the roof space and onsite electricity usage for additional capacity to be installed. It is feasible to construct arrays larger than 300kW in these cases, and we recommend the Host explore this large facility size option.

Notes

a) Cost/ savings amounts are after the installation costs of the panels have been paid (e.g. $2,841,422 of Installation costs plus $4,643,256 of Incremental savings).

FINANCING OPTIONS

As described in the renewable energy feasibility section, there are two financing options available when considering a solar energy facility (the Facility):

1. Power Purchase Agreements are arrangements in which a third party investor (the Developer) covers all the capital and operating costs of the solar facility, and the energy user (the Host) purchases the power at a rate that will repay the Developer over an agreed upon period of time; and,

2. Host ownership, in which the party that is going to use the power funds the project and recoups its investment though electricity cost-savings over the expected lifetime of the solar equipment.

A variety of factors influence which financing mechanism is used. The primary factors include:

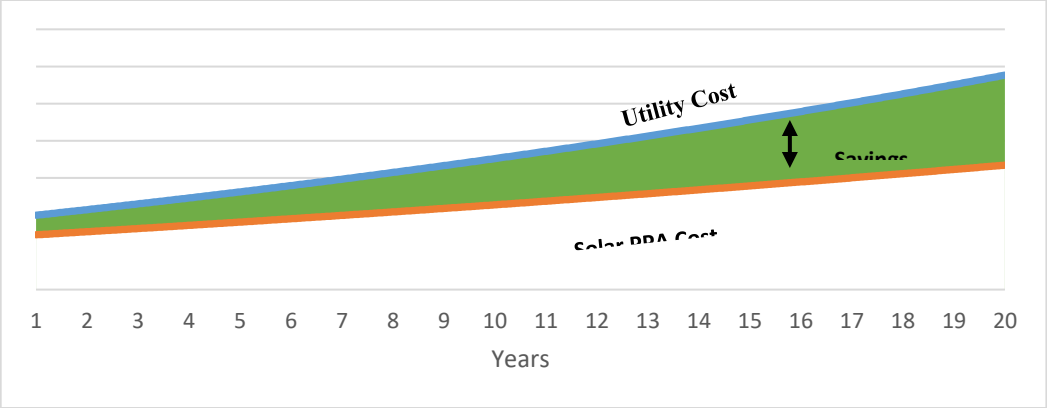
a) The Host's cost of capital as compared to the Developers required rate of return;
b) The Host's ability to monetize the federal investment tax credit (discussed in more detail below); and
c) Whether the Host has existing capabilities that could be used to maintain the facility without incurring additional costs.

The following provides further details about Power Purchase Agreements, Host-owned facilities, and a recommendation on which of these options may be best suited for the City of Sheridan.

Power Purchase Agreement

Power Purchase Agreements are the most common financial arrangements for larger Facilities for which the Host may have limited access to capital. PPAs are common because the Host can receive the benefits of solar without carrying any of the upfront costs or maintenance responsibilities. The Host only pays for the electricity received. PPAs are an especially useful option for organizations that may not be able to raise capital, nor the human resources that are necessary to maintain the solar facilities.

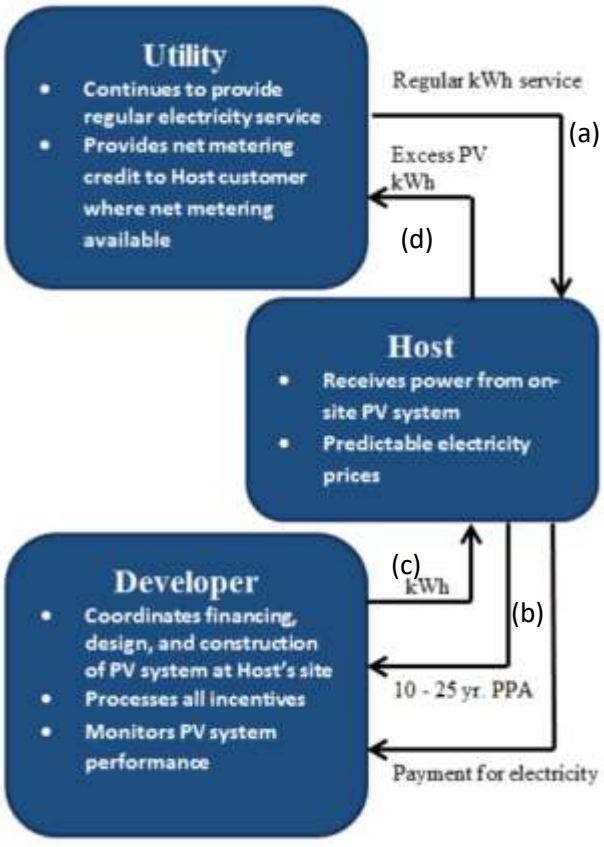
In a PPA scenario, the Host can receive a financial benefit from the Facility equal to the difference between the price of electricity paid under the terms of the PPA and the avoided cost of the electricity that they are not purchasing from the grid. PPAs generally set prices to be lower than the current and future electricity costs over a 20-25+ year period. This predicable price schedule provides budgeting certainty and can result in savings over the lifetime of the PPA, as shown below.



The graph above is an example of how savings accrue over the span of a solar project due to the long-term nature of the PPA. Not only will the Host know how much they will be paying for electricity generated by the Facility throughout the expected lifetime of the PPA, the difference between the PPA cost and the cost of the energy from the grid also has the potential to increase.

Tax implications should also be considered, particularly as they pertain to the Federal Investment Tax Credit which provides 30% of the cost of a solar energy system as a tax credit. If the Host is not a taxable entity, it cannot utilize this tax credit. However, the Developer as a taxable entity can use the ITC to offset the costs of the installation.

In practice, purchasing power through a PPA is similar to buying it through a utility provider. Typically, a bill from the owner of the Facility will be sent to the Host that shows the production of the facility and any related charges. The electricity bill from the utility provider will be similar, except that there will be less energy purchased. The adjacent chart helps explain how a PPA works in practice:



(a) The utility provider offers regular kWh service to the customer and, in this case, the Host.
(b) Simultaneously, the Host enters into a 10-25-year PPA for electricity that is generated by the on-site PV system. The Host purchases the electricity from the Developer/Owner for rates that are pre-determined for the entire duration of the PPA.
(c) The Developer sells the kWhs generated on-site to the Host at the rate specified in the PPA.
(d) Any excess kWhs generated by the PV system are sent back to the utility,

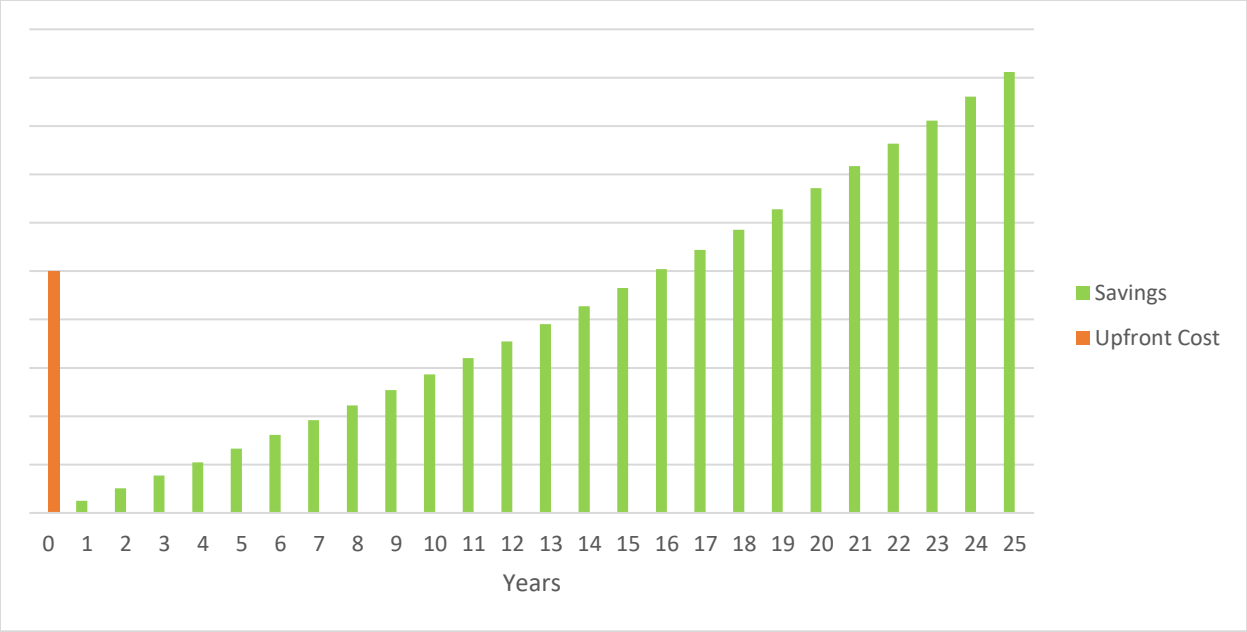
where net metering is available, at a rate determined by the utility provider or by state policy. While a PPA can be a great way to obtain the benefits of solar energy without an investment of capital, it can be more expensive than a Host-owner scenario when the Host has access to low-cost capital and existing resources to leverage in maintaining a solar facility. This is especially true as it relates to Municipal Hosts, who usually have the resources to maintain a Facility. This makes the Municipality's low cost capital more cost effective than the investment return that is built into a PPA with a Developer, even after taking into account the 30% ITC credit.

By way of example, assume a Facility costs $500,000 to install. In a Developer-owned PPA scenario, the Developer would receive a 30% investment tax credit that essentially reduces the cost of the Facility to $350,000 ($500,000 x 70%). In a Municipal Host-owned scenario, the cost of the Facility would remain at $500,000. At first glance, it seems the Developer-owned PPA model is the clear best choice. However, if the Developer had a required rate of return of 7%, and it cost them approximately $10,000 a year to maintain the facility, then the annual cost that would be passed to the Municipal through the PPA would be approximately $40,000 (around $30,000 principal and investment return, plus $10,000 of maintenance and labor costs). For the Municipal Host-owned scenario that had a 3% cost of capital and had existing resources to maintain the facility, that number would be much lower at approximately $29,000 a year (the principle and interest at 3% on $500,000 over a 25-year period, with no incremental maintenance and labor costs). This difference of $11,000 a year ($40,000 Developer PPA less $29,000 Host-owned) would be the incremental benefit of the Host-owned scenario, and it is broken down as follows:

I. $10,000 in cost savings attributable to leveraging the Municipal Host's existing resources to maintain the facility; and
II. $1,000 a year due to the annual payments on $500,000 at 3% interest being less than the annual payments of $350k at 7% interest.

Host Ownership

Host ownership is just that; the owner of the energy system is also the ultimate energy consumer. The upfront development and maintenance costs are the responsibility of the Host, along with the financial benefits of the electricity that is generated. The following presents a brief overview of how those costs and savings stack up over time:



As noted in the graph above, the Host of the Facility fronts the initial capital investment and then receives the full financial savings through net meter credits (explained below) and the avoided cost of not purchasing electricity from the grid. For non-profit institutions, the two primary considerations in the Host-owned model are:

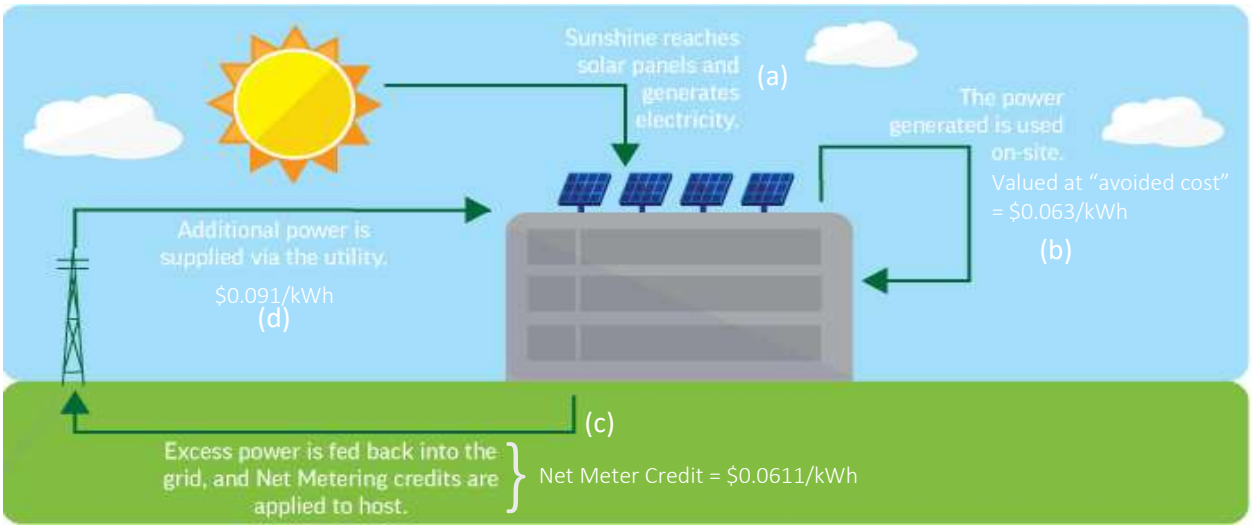
I. Does the Host have the resources to monitor the Facility; and
II. Is the cost of capital (without the ITC) more cost effective than a PPA in which the Developer will have to earn a return on its investment.

To fully understand the benefits of the Host Ownership model, it is important to first understand how net metering works.

Net Metering

Net metering comes into play when the amount of electricity that is generated by a solar energy facility is greater than the amount that is used on site. In these situations, any excess electricity is sent back to the grid/utility provider, and the customer (the owner of the solar facility) receives compensation in the form of a "net meter credit". The value of the credit can vary widely depending on state law and utility policy. In some cases the value of the net meter credit will include all costs, including transmission, distribution, taxes, energy, etc.; however, in other instances, the value may only be equal to the cost of the electricity (excluding all the other changes). Generally, the difference in this value is determined on a utility-by-utility basis.

At the time information was provided for this report, the value of the net meter credit in Sheridan was equal to approximately $0.0611/kWh.



As shown in the diagram above, net metering encompasses four key steps, as follows:

(a) The on-site solar facility generates electricity while connected to the Host's two-way electric meter;
(b) This electricity is used to offset electricity that is used on-site. Based on the bills we analyzed, the value of that energy, or the avoided cost (the value of the electricity that is being avoided by not purchasing the electricity from the utility provider), is approximately $0.063/kWh.[1] ;
(c) Any excess energy that is not used on-site is fed back into the grid by net metering in the form of "net meter credits," which have a value of approximately $0.0611/kWh at the cemetery site and approximately $.04084 at the other analyzed locations[2];
(d) Additional power is still supplied via the utility for any capacity that is not covered by the solar facility.

Net metering facilitates the monetization of excess electricity that cannot be used on-site. Without net metering, a solar facility would have to be sized to produce less electricity at its peak (the middle of a sunny day) than the least amount of electricity that is used on site at that time. Because the value received from the avoided cost of electricity taken from the grid is generally greater than the value of a net meter credit, it is important to size a facility strategically to balance the amount of power that will be used on site against how much may be sent back to the grid over the lifetime of the project.

[1] The avoided cost per kWh of electricity is calculated by taking the cost of the energy, plus the cost of delivering that energy, which is the "Power Supply Cost" on MDU bills, and then adding the 3.08% tax. Avoided Cost = $0.2699 (energy) + $0.03411 (supply cost) * 1.0308 = $0.063/kWh

[2] The value of a net meter credit (per kWh) is equal to the cost of the energy plus the cost of delivering that energy, or it is equal to the kWh charges on your electric bill (does not include tax as the energy you are credited for was still delivered at one point). For the cemetery, the Net Meter Credit = $0.02699 (energy) + $0.3411 (supply cost) = $0.0611/kWh.

OTHER FINANCING CONSIDERATIONS

Outside of traditional financing mechanisms, there are opportunities to receive grants, tax credits or other funding/financing from federal, state, local and utility programs that are designed to promote renewable energy development. It should be noted that the State of Wyoming, and therefore utility providers and cities, do not offer many incentives at this moment. The following are some options that may be relevant to the City of Sheridan as it explores financing solar installations.

Federal Investment Tax Credit

The Federal Investment Tax Credit is a 30% tax credit that promotes investments in solar facilities. The ITC will be reduced to 26% in 2020, 22% in 2021 and permanently to 10% for commercial facilities and0% for residential thereafter. The ITC is widely credited with facilitating the boom in solar energy project development over the past decade.

As previously discussed, public institutions and other tax-exempt organizations are limited in their ability to leverage the ITC as they have little to no tax liability on which to use the credit. While this does not impact solar energy projects that are developed through outright ownership it would change a PPA scenario because the ITC is used to offer a lower PPA price. Without the ITC the PPA effectively misses out on the savings that would be realized if the credit's value was incorporated in financing.

Rural Energy for America Program

The Rural Energy for America Program (REAP) is a federal financial assistance program that is offered through the United State Department of Agriculture Rural Development office. The program is available to agricultural producers and small businesses in rural areas who are looking to finance renewable energy systems, energy efficiency upgrades, energy audits, and renewable energy development assistance. These grants range from $2,500 - $250,000. However, applicants must provide at least 75% of the project cost if applying for a grant only (REAP also provides a guaranteed loan program). While the City itself would not qualify, small businesses and farmers in the Sheridan area would qualify for this program.

If the City were to implement a program to incentivize or promote private renewable energy systems, REAP could provide a valuable resource to private landowners and small business owners who are looking to take the next step towards installing a solar facility, rooftop or otherwise.

Net Metering Exemptions

Allowing the installation and net metering of facilities greater than 25kW greatly increases the economic feasibility of these projects due to economies of scale. However, MDU has previously provided exemptions for the City hydropower generator and has indicated it may be open to allowing exemptions for larger solar facilities.

Property Assessed Clean Energy Programs

Property Assessed Clean Energy (PACE) financing programs allow state and local governments, where permitted by state law, to extend the use of land-secured financing districts to fund energy efficiency and renewable energy improvements on private property. PACE programs attach the obligation to repay the cost of improvements to the property, not to the individual borrower. PACE can assist property

owners by allowing a property owner to finance the up-front cost of energy or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment. PACE programs exist for both residential and commercial properties and Wyoming has legislation in place to enable Property Assessed Clean Energy.

FINANCING ANALYSIS

City of Sheridan

Based on reading the City of Sheridan's 2017 Financial and Compliance Report, it was estimated that the City's cost of capital to be approximately 3%. We also understand that the City would likely have the resources available to maintain the solar Facilities. Given this cost of capital rate, coupled with the City's ability to maintain their own Facilities, we recommend that the City pursue the Host-owned model. Based on our assessment, the City could install approximately $216,000 of solar, and receive a net return plus $114,000 of incremental savings over the lifetime of the solar equipment.

Schools and VA Medical Center

Assuming that City of Sheridan schools and the VA Center have a similar cost of capital and maintenance resource availability, they should both follow the Host-owned model if they would decide to pursue renewable energy. Based on our assessment, the Schools and VA Medical Center could separately install approximately $1.75 million of solar energy and receive a net return plus $1.8 million of incremental savings over the lifetime of the solar equipment.

Tech Center/Manufacturing Facility

The Tech Center example is different than those discussed above because it would likely have a higher cost of capital, a lack of available space for a facility, and cheap existing electricity from the utility. It is hard to find a scenario for the example we explored in which installing solar will provide a reasonable return on investment.

ORDINANCES, PERMITTING AND INSPECTIONS, AND ZONING CODES

Proper planning and policies are vital to successfully realizing renewable energy development. It is important for communities to clearly articulate renewable energy standards and guidelines in its local ordinances, permitting processes, and zoning codes. Lack of code could create unnecessary conflicts, could lead to lawsuits, and they can serve as a barrier to renewable energy development as residents and businesses are unclear of what is allowed. Conversely, overly complicated procedures and excessive red tape can also hinder renewable energy development by suppressing enthusiasm for pursuing such development by businesses and individuals alike. The following is a list of basic clarifications to include in ordinances, zoning, and permitting.

Ordinances

It is important to clearly define what renewable energy systems are being referred to in a renewable energy ordinance or zoning regulation. It is important that specific renewable energy systems are allowed rather than simply not disallowing it and to outline a special use permit process for the others. Important aspects to be address in a renewable energy ordinance include:

- Differentiate between types of renewable energy. Each renewable energy source will have its own requirements and needs.
- Further delineate residential use, commercial rooftop, small scale (less than 2MW) and large scale more than 2MW, etc.
- Decommissioning plan and surety.
- Outline setback requirements.
- Detail screening and ground cover requirements.

Zoning

- Designate rooftop solar systems as an allowed use in all zones.
- Adding ground-mounted solar facilities greater than 50kW as an allowed use with a special use permit would greatly increase potential for solar in the area because developers would have a clear understanding of what is or isn't allowed. Often, ground-mounted solar facilities can be limited by restricting it to particular zoning districts, limiting the size by acreage or size by capacity (kilowatts), or creating different zoning laws for different sizes of facilities. The more specific the regulations are, the greater ability to dictate what is and is not allowed.

Permitting and Inspections

- Create a standard permit form that is eligible for streamlined review for standard residential or

small commercial rooftop flush-mounted systems.

- Set a flat fee cap for permitting costs for standard residential and small commercial systems.
- Provide an inspection checklist.
- Offer the option to submit paperwork online.

*It is worth noting that local solar installers have commented on the ease of Sheridan's permitting process.

Example ordinances can be found Appendix G.

NEXT STEPS

Realizing renewable energy in Sheridan takes planning and commitment. The following first steps are recommended action items for the Sheridan to undertake:

1. Update the City's ordinances and zoning code to provide a clear path for appropriate renewable energy projects. Major considerations include setting policy on decommissioning plans, setbacks and screening and ground cover.
2. Evaluate the prospects of providing personal property and sales tax exemptions for new renewable energy facilities. According to the Solar Energy Industries Association, 29 states offer sales tax exemptions for renewable energy. The real benefit to the City is not the taxes it will collect, but the image of being a City that is open to growth and new ideas.
3. Initiate a conversation with MDU about a waiver to the existing net metering cap.
4. Host a meeting with the stakeholders of the non-city owned sites explored in this report (schools, VA center, etc.) to review its findings and discuss possible next steps.
5. Schedule site walks and obtain firm bids from local solar development companies for the construction of the solar facilities proposed herein.
6. Based on the bids provided, rerun the feasibility assessment models and determine the best financing model for the development of the noted solar facilities.
7. Identify and partner with a strategic local business to apply for a Rural Energy for America Program (REAP) grant. A factsheet about the REAP program can be found in Appendix H.
8. Enlist community development organizations to help promote and highlight Sheridan's renewable energy efforts to potential business. Marketing Sheridan's renewable energy is extremely valuable.
9. Include renewable energy in community planning efforts going forward. Infrastructure projects and land use changes take years to develop and implement. As renewable energy becomes more cost competitive, it is important that planning efforts and initiatives integrate renewable energy readiness.

SUMMARY AND CONCLUSION

Recruiting new business and building a diversified, stable economic base is an extremely difficult task. New companies are more likely to form in urban areas than in rural ones. Communities across the nation are competing to attract new businesses, employees, and entrepreneurs while younger Americans are leaving rural areas for opportunities in America's largest cities. Ten years after graduation, 60% of graduates have left Wyoming.[xxxvii] According to Jesus Rios, COO of Sheridan's Ptolemy Data Systems, young employees are increasingly relocating to Denver.[xxxviii] Wyoming is losing its population while at the same time bordering states are seeing significant population growth. If a smaller, rural community is to be economically resilient it needs to adapt to changing conditions and take actions that demonstrate a desire to lead, grow, and attract talent.

Solar in Sheridan

More and more companies are prioritizing renewable energy by either installing their own renewable energy systems or seeking out access to them before moving to a certain market area. Neighboring states are capitalizing on this prioritization and are ahead of Wyoming in terms of renewable energy development. The trend towards renewable energy is not going away. Embracing this change will allow Sheridan to highlight renewable energy credentials and commitments and will give businesses one more reason seriously consider Sheridan. Restrictive or nonexistent renewable policies or initiatives could have the opposite effect.

Sheridan has gone a long way towards successfully creating an environment that is attractive for businesses and the kind of community that is attractive to employees. Sheridan should continue to make every effort to differentiate itself from similar communities. Providing renewable energy is an extension of this strategy. Data centers and tech companies often look for communities with developed, pre-engineered technology parks. Sheridan has that. They often prefer cooler climates to save money on energy costs. Sheridan's climate offers this. Increasingly companies and businesses, especially the tech industry, desire or require renewable energy. Sheridan is missing this component.

It is important to attract the jobs of the future and realize what current and potential employers and their employees' desire. Renewable energy demonstrates an innovative nature. Just like the Bighorn Mountains, Sheridan's attractive downtown, the parks and pathways, the Hi-tech Park, excellent public schools, and Sheridan College, renewable energy builds on Sheridan's existing strengths and would be another attractive marketing tool for business recruitment.

Consumers, markets, and private companies will largely determine what happens with U.S. energy production and usage. These groups are signaling a desire and preference for renewable energy. A

vibrant community willing to embrace future trends demonstrates the kind of commitment to progress that entrepreneurs and businesses desire. Emphasizing Sheridan's existing assets has always been a part of business recruitment efforts. Making renewable energy an asset will provide yet another valuable marketing tool for Sheridan.

This assessment revealed that Sheridan has adequate solar resources and electrical infrastructure to realize solar development. Sheridan should take advantage of those resources and assets. The financial assessment further demonstrated that the City could realize long-term cost savings by installing solar power.

In order to escape the boom and bust cycles that have plagued Wyoming, it is critical for Sheridan to foster a robust and diverse local economy. In order to build that economy, Sheridan must continue to pave a path that is attractive to 21st century industries and employees. If Sheridan is not prepared to capitalize on the movement towards renewable energy (and solar in particular), it will significantly disadvantage itself in business recruitment efforts that target companies and industries with renewable energy purchasing requirements. By thoroughly understanding, and ultimately removing, potential barriers impeding solar development, Sheridan will demonstrate its commitment to not only solar power, but also to businesses desiring or requiring renewable energy. By installing renewable energy on public facilities the City will demonstrate its desire to be a dynamic community, showcase its innovative spirit, and add another community asset that prospective businesses and residents alike are seeking.

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APPENDIX A

Montana-Dakota Utilities Net Metering Policy

Montana-Dakota Utilities Co.
A Division of MDU Resources Group, Inc.
400 N 4th Street
Bismarck, ND 58501

State of Wyoming
Electric Rate Schedule

W.P.S.C. Tariff No. 5
Original Sheet No. 72

NET METERING SERVICE
Rate 58

AVAILABILITY:

Available to any customer that owns and operates a solar, wind or hydroelectric generating facility with a capacity of not more than 25 Kw that is located on the customer's premises and that is intended primarily to offset part or all of the customer's own electrical requirements. The generating facility must be interconnected and operated in parallel with the Company's existing transmission and distribution facilities. This service is offered in compliance with Wyoming Statutes Annotated §37-16-101 to 104.

APPLICABLITY:

Net Metering means measuring the difference between the electricity supplied by the Company and electricity generated by an eligible customer-generator and fed back to the electric grid over the applicable billing period.

RATE:

Base Rate: The Base Rate per the applicable standard service rate.

Energy Charge: If the energy supplied by the Company exceeds the customer generated energy, the energy charge per Kwh under the otherwise applicable standard service tariff shall be applied to the positive energy balance and charged to the customer.

If the energy supplied by the customer generator exceeds the amount of energy supplied by the Company, the net Kwh shall be credited to the customer's next monthly bill.

GENERAL TERMS AND CONDITIONS:

1. At the beginning of each calendar year, any Kwh credit balance accumulated during the previous year shall be purchased by the Company at the currently effective avoided cost rate applicable under Parallel Generation Rate 57.

2. The customer is responsible for all costs associated with its facility and is also responsible for all costs related to any modifications to the facility that may be required by the Company for purposes of safety and reliability.

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Bismarck, ND 58501

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NET METERING SERVICE
Rate 58

3. A Net Metering facility shall meet all applicable safety and performance standards established by the National Electrical Code.

4. The customer is responsible, at their expense, for providing lockable switch equipment capable of isolating the net metering facility from the Company's system. Such equipment shall be approved by the Company and shall be accessible by the Company at all times.

5. Customer shall enter into an Interconnection Agreement for Net Metering Service.

6. The foregoing schedule is subject to Rate 59 and Rates 100-125 and any amendments or alterations thereto or additional rules and regulations promulgated by the Company under the laws of the state.

INTERCONNECTION AGREEMENT FOR NET METERING SERVICE

This agreement ("Agreement") dated this ____ of _____ 20___, by and between Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc. ("Montana-Dakota"), and _____, ("Customer").

Whereas, Customer owns or intends to install and own an electric generating energy facility ("Generating Facility") qualifying for "Net Metering Service", under Montana-Dakota's currently effective tariff Rate Schedule No. 58 as filed with the Wyoming Public Service Commission and attached hereto and made a part hereof. In the event of a conflict between the terms of this Agreement and the terms of Rate Schedule 58, the terms of Rate Schedule 58 shall control. The Facility will be located on Customer's premises at _____ and will be operated for the purposes of generating electric energy; and

Whereas, Customer wishes to sell and Montana-Dakota is willing to purchase electric energy produced by the Generating Facility;

Now, therefore, the parties agree:

1. Generating Facility: Customer's Generating Facility shall consist of a solar, wind, or hydroelectric generating facility located on the Customer's premises, with a capacity of no more than twenty-five (25) kilowatts. The Generating Facility will be interconnected and operated in parallel with Montana-Dakota's distribution facilities, and is intended primarily to offset part or all of the Customer's own electrical requirements measured and supplied by Montana-Dakota at a single metering point located at the immediate interconnection of the Generating Facility with Montana-Dakota's distribution facilities.

2. Term: This Agreement shall commence when signed by both Montana-Dakota and Customer. This Agreement shall terminate (1) by any change in ownership of the Generating Facility; (2) by written agreement of the parties; (3) by an effective amendment of Rate Schedule 58 and written notice of such amendment and termination by Montana-Dakota; (4) by Customer's breach of this Agreement and failure to cure such breach within 30 days following written notice by Montana-

Dakota; and (5) by any change in state or federal law or regulation that materially alters Montana-Dakota's obligation to purchase electric energy from the Customer or the requirements for interconnection of the Generating Facility to Montana-Dakota's system.

3. Definition of Terms: Net energy is the difference between the electricity supplied by Montana-Dakota through Montana-Dakota's electric grid to the Customer and the electricity generated by the Customer and fed back to Montana-Dakota during the applicable billing period.

4. Measurement of Net Energy: A meter shall be installed to measure the flow of energy in each direction between the Customer and Montana-Dakota. Customer shall be responsible for all expenses involved in purchasing and installing facilities necessary for the meter installation.

5. Price and Payment: At the end of each billing period, if the energy supplied by Customer to Montana-Dakota is less than the energy supplied by Montana-Dakota to Customer, Customer shall be billed for the net energy at Montana-Dakota's applicable standard service rate schedule. If the energy supplied by Customer to Montana-Dakota is greater than the energy supplied by Montana-Dakota to Customer, Customer shall be billed the Base Rate under the applicable standard service rate schedule and shall be credited for the net energy on the Energy Charge portion of Montana-Dakota's bill to the Customer for the following month. At the beginning of each calendar year, any remaining unused kilowatt-hour credit accumulated during the previous year shall be sold to Montana-Dakota at the avoided costs for the applicable calendar year as shown in Rate Schedule No. 57, Parallel Generation and Rate 58, Net Metering Service.

6. Interconnection: Customer shall provide, at Customer's sole expense, for the interconnection of the Generating Facility on Customer's side of the meter. At Customer's expense, Montana-Dakota shall make reasonable modifications to Montana-Dakota's system necessary to accommodate the Generating Facility. The cost for such modification is $_____ due from Customer in advance of construction. The net metering system used by Montana-Dakota shall include, at

Customer's expense, all equipment necessary to meet applicable safety, power quality, and interconnection requirements established by Montana-Dakota's electric service requirements, the National Electric Code, National Electrical Safety Code, the Institute of Electrical and Electronics Engineers, and Underwriters Laboratories. Montana-Dakota's written approval of the Customer's protection-isolation method to ensure generator disconnection in case of a power interruption from Montana-Dakota is required before service is provided under this schedule.

7. Disconnect System: Customer shall furnish and install at Customer's expense on Customer's side of the meter a safety disconnect switch which shall be capable of fully disconnecting the Generating Facility from Montana-Dakota's electric service. The disconnect switch shall be located adjacent to Montana-Dakota's meters and shall be of the visible break type in a metal enclosure which can be secured by a padlock. The disconnect switch shall be accessible to Montana-Dakota personnel at all times. Montana-Dakota shall have the right to disconnect the Generating Facility from Montana-Dakota's supply at the disconnect switch, at its sole discretion, when necessary to maintain safe electrical operating conditions, or if in Montana-Dakota's sole judgment, the Generating Facility, at any time, adversely affects the operational integrity of Montana-Dakota's service to the Customer or other customers.

8. Functional Standards: Customer shall furnish, install, operate and maintain in good order and repair, all without cost to Montana-Dakota, all equipment required for safe operation of the Generating Facility in parallel with Montana-Dakota's system. This equipment shall include, but not be limited to equipment necessary to establish automatically and maintain synchronism with Montana-Dakota's electric supply and a load break switching device that shall automatically disconnect the unit from Montana-Dakota's supply in the event of overload or outage of Montana-Dakota's supply. The Generating Facility shall be designed to operate within allowable voltage variations of Montana-Dakota's system. The Generating Facility shall not cause any adverse effects upon the quality of service provided to Montana-Dakota's non-generating customers. The customer is responsible for costs associated with any adverse effects its Generating Facility

causes to Montana-Dakota's system or to any customer(s) adjacent to Generating Facility.

9. Installation and Maintenance: Except for metering equipment, which shall be owned by Montana-Dakota, all equipment on the Customer's side of the point of interconnection, including any required disconnect switch and synchronizing equipment, shall be provided, installed and maintained in satisfactory operating condition by the Customer, and shall remain the property and responsibility of the Customer. Montana-Dakota shall bear no liability for Customer's equipment or for consequences of its operation or misoperation. For purposes of gathering research data, Montana-Dakota may at its expense install and operate additional metering and data gathering devices.

10. Pre-Operation Inspection: Prior to interconnection, the Generating Facility and associated interconnection equipment shall be inspected and approved by the state electrical inspector and any other governmental authority having jurisdiction.

11. Access: Authorized Montana-Dakota employees shall have the right to enter upon Customer's property for the purposes of operating the disconnect switch and meters and making tests concerning the operation and accuracy of its meters.

12. Indemnity: Customer agrees to indemnify and hold Montana-Dakota harmless from any and all liability and for any and all damages, including attorney's fees and costs, caused to Montana-Dakota or to third parties by the operation of the Generating Facility.

13. Enforcement Upon Default by Customer: Montana-Dakota shall have the right to specifically enforce the terms of this Agreement and collect its reasonable attorney's fees and costs associated thereto.

14. Merger: This Agreement contains the entire contract between Customer and Montana-Dakota and may not be changed except by written agreement signed by both Customer and Montana-Dakota.

Montana-Dakota Utilities Co.
A Division of MDU Resources Group, Inc.
400 N 4th Street
Bismarck, ND 58501

State of Wyoming
Electric Rate Schedule

W.P.S.C. Tariff No. 5
Original Sheet No. 78

NET METERING SERVICE
Rate 58

In witness whereof, Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc. and Customer have by their duly authorized representatives, executed this Agreement in duplicate as of the day and year first above written.

Customer	**Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc.**
By:_____	By:_____
Title:_____	Title:_____
Date:_____	Date:_____

APPENDIX B

Montana-Dakota Utilities Interconnection Agreement

INTERCONNECTION AGREEMENT FOR NET METERING SERVICE

This agreement ("Agreement") dated this ____ of _____ 20___, by and between Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc. ("Montana-Dakota"), and _____, ("Customer").

Whereas, Customer owns or intends to install and own an electric generating energy facility ("Generating Facility") qualifying for "Net Metering Service", under Montana-Dakota's currently effective tariff Rate Schedule No. 58 as filed with the Wyoming Public Service Commission and attached hereto and made a part hereof. In the event of a conflict between the terms of this Agreement and the terms of Rate Schedule 58, the terms of Rate Schedule 58 shall control. The Facility will be located on Customer's premises at _____ and will be operated for the purposes of generating electric energy; and

Whereas, Customer wishes to sell and Montana-Dakota is willing to purchase electric energy produced by the Generating Facility;

Now, therefore, the parties agree:

1. Generating Facility: Customer's Generating Facility shall consist of a solar, wind, or hydroelectric generating facility located on the Customer's premises, with a capacity of no more than twenty-five (25) kilowatts. The Generating Facility will be interconnected and operated in parallel with Montana-Dakota's distribution facilities, and is intended primarily to offset part or all of the Customer's own electrical requirements measured and supplied by Montana-Dakota at a single metering point located at the immediate interconnection of the Generating Facility with Montana-Dakota's distribution facilities.

2. Term: This Agreement shall commence when signed by both Montana-Dakota and Customer. This Agreement shall terminate (1) by any change in ownership of the Generating Facility; (2) by written agreement of the parties; (3) by an effective amendment of Rate Schedule 58 and written notice of such amendment and termination by Montana-Dakota; (4) by Customer's breach of this Agreement and failure to cure such breach within 30 days following written notice by Montana-

Dakota; and (5) by any change in state or federal law or regulation that materially alters Montana-Dakota's obligation to purchase electric energy from the Customer or the requirements for interconnection of the Generating Facility to Montana-Dakota's system.

3. Definition of Terms: Net energy is the difference between the electricity supplied by Montana-Dakota through Montana-Dakota's electric grid to the Customer and the electricity generated by the Customer and fed back to Montana-Dakota during the applicable billing period.

4. Measurement of Net Energy: A meter shall be installed to measure the flow of energy in each direction between the Customer and Montana-Dakota. Customer shall be responsible for all expenses involved in purchasing and installing facilities necessary for the meter installation.

5. Price and Payment: At the end of each billing period, if the energy supplied by Customer to Montana-Dakota is less than the energy supplied by Montana-Dakota to Customer, Customer shall be billed for the net energy at Montana-Dakota's applicable standard service rate schedule. If the energy supplied by Customer to Montana-Dakota is greater than the energy supplied by Montana-Dakota to Customer, Customer shall be billed the Base Rate under the applicable standard service rate schedule and shall be credited for the net energy on the Energy Charge portion of Montana-Dakota's bill to the Customer for the following month. At the beginning of each calendar year, any remaining unused kilowatt-hour credit accumulated during the previous year shall be sold to Montana-Dakota at the avoided costs for the applicable calendar year as shown in Rate Schedule No. 57, Parallel Generation and Rate 58, Net Metering Service.

6. Interconnection: Customer shall provide, at Customer's sole expense, for the interconnection of the Generating Facility on Customer's side of the meter. At Customer's expense, Montana-Dakota shall make reasonable modifications to Montana-Dakota's system necessary to accommodate the Generating Facility. The cost for such modification is $_____ due from Customer in advance of construction. The net metering system used by Montana-Dakota shall include, at

Customer's expense, all equipment necessary to meet applicable safety, power quality, and interconnection requirements established by Montana-Dakota's electric service requirements, the National Electric Code, National Electrical Safety Code, the Institute of Electrical and Electronics Engineers, and Underwriters Laboratories. Montana-Dakota's written approval of the Customer's protection-isolation method to ensure generator disconnection in case of a power interruption from Montana-Dakota is required before service is provided under this schedule.

7. Disconnect System: Customer shall furnish and install at Customer's expense on Customer's side of the meter a safety disconnect switch which shall be capable of fully disconnecting the Generating Facility from Montana-Dakota's electric service. The disconnect switch shall be located adjacent to Montana-Dakota's meters and shall be of the visible break type in a metal enclosure which can be secured by a padlock. The disconnect switch shall be accessible to Montana-Dakota personnel at all times. Montana-Dakota shall have the right to disconnect the Generating Facility from Montana-Dakota's supply at the disconnect switch, at its sole discretion, when necessary to maintain safe electrical operating conditions, or if in Montana-Dakota's sole judgment, the Generating Facility, at any time, adversely affects the operational integrity of Montana-Dakota's service to the Customer or other customers.

8. Functional Standards: Customer shall furnish, install, operate and maintain in good order and repair, all without cost to Montana-Dakota, all equipment required for safe operation of the Generating Facility in parallel with Montana-Dakota's system. This equipment shall include, but not be limited to equipment necessary to establish automatically and maintain synchronism with Montana-Dakota's electric supply and a load break switching device that shall automatically disconnect the unit from Montana-Dakota's supply in the event of overload or outage of Montana-Dakota's supply. The Generating Facility shall be designed to operate within allowable voltage variations of Montana-Dakota's system. The Generating Facility shall not cause any adverse effects upon the quality of service provided to Montana-Dakota's non-generating customers. The customer is responsible for costs associated with any adverse effects its Generating Facility

causes to Montana-Dakota's system or to any customer(s) adjacent to Generating Facility.

9. Installation and Maintenance: Except for metering equipment, which shall be owned by Montana-Dakota, all equipment on the Customer's side of the point of interconnection, including any required disconnect switch and synchronizing equipment, shall be provided, installed and maintained in satisfactory operating condition by the Customer, and shall remain the property and responsibility of the Customer. Montana-Dakota shall bear no liability for Customer's equipment or for consequences of its operation or misoperation. For purposes of gathering research data, Montana-Dakota may at its expense install and operate additional metering and data gathering devices.

10. Pre-Operation Inspection: Prior to interconnection, the Generating Facility and associated interconnection equipment shall be inspected and approved by the state electrical inspector and any other governmental authority having jurisdiction.

11. Access: Authorized Montana-Dakota employees shall have the right to enter upon Customer's property for the purposes of operating the disconnect switch and meters and making tests concerning the operation and accuracy of its meters.

12. Indemnity: Customer agrees to indemnify and hold Montana-Dakota harmless from any and all liability and for any and all damages, including attorney's fees and costs, caused to Montana-Dakota or to third parties by the operation of the Generating Facility.

13. Enforcement Upon Default by Customer: Montana-Dakota shall have the right to specifically enforce the terms of this Agreement and collect its reasonable attorney's fees and costs associated thereto.

14. Merger: This Agreement contains the entire contract between Customer and Montana-Dakota and may not be changed except by written agreement signed by both Customer and Montana-Dakota.

Montana-Dakota Utilities Co.
A Division of MDU Resources Group, Inc.
400 N 4th Street
Bismarck, ND 58501

State of Wyoming
Electric Rate Schedule

W.P.S.C. Tariff No. 5
Original Sheet No. 78

NET METERING SERVICE
Rate 58

In witness whereof, Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc. and Customer have by their duly authorized representatives, executed this Agreement in duplicate as of the day and year first above written.

Customer	**Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc.**
By:_____	By:_____
Title:_____	Title:_____
Date:_____	Date:_____

APPENDIX C

Incentives Offered by States Bordering Wyoming

State Examples

Many states have developed incentives, regulations, and measures to incentivize renewable energy development. This assessment focuses on the states bordering Wyoming as these states have significant similarities and are the most direct competitors for business recruitment efforts. It is important to note that these incentives and regulations can and do change periodically due to changes in funding and legislation.

Montana

Renewable Portfolio Standard

- Montana had adopted a renewable portfolio standard of 15% by 2015.

Net Metering

- Montana requires all investor-owned utilities to offer net metering (50 kW size limit).

Tax Credits

- Montana offers the Residential Alternative Energy System Tax Credit. This is a tax credit on 100% of the price of a solar power system, up to a maximum of $500 for individuals and $1,000 for households with more than one taxpayer. The credit may be carried over for up to four years.
- Montana offers an alternative energy investment tax credit. Commercial and net metering alternative energy investments of $5,000 or more are eligible for up to 35 percent tax credit against individual or corporate tax on income generated by the investment. The credit may only be taken against net income produced by the eligible equipment or by certain associated business activities. Associated facilities, manufacturing plants producing alternative energy equipment and new or expanded businesses using the energy generated by the alternative energy investment may use the tax credit.

  The tax credit must be taken the year the equipment is placed in service; however, any portion of the tax credit that exceeds the amount of tax to be paid may be carried over and applied against state tax liability for the following 7 years. A project of 5 MWs or larger on a reservation may carry the credit over for 15 years, if it has an employment agreement with the tribal government.

Property Tax Exemption

- New generating facilities with installed capacity of less than 1 MW and using an alternative renewable energy source are exempt from property taxes for 5 years after start of operation.

Grants and Loans

- Montana's alternative energy revolving loan program offers low-interest loans for up to $40,000 with repayment up to ten years. The loans are for the purpose of installing alternative energy systems that generate energy for the building occupant's own use or for net metering. Energy conservation measures may also be financed along with the alternative energy project. The number of loans that will be made is subject to funding availability. The program is administered by the Montana Department of Environmental Quality.
- Montana's Renewable Resource Grant and Loan Program (RRGL). Historically the program primarily has funded water projects, but it does offer grants to renewable energy projects of state, local, or tribal government entities. DNRC limits grant funding recommendations to a maximum of $125,000 for any one renewable resource project.

Utah

Renewable Portfolio Standard

- Utah has adopted a renewable portfolio standard of 20% by 2025. Utah's RPS only requires utilities to implement renewable energy to the extent it is "cost-effective."

Net Metering

- Utah law requires Rocky Mountain Power (RMP), the only investor-owned utility in the state, and almost all electric co-ops to offer net metering for solar panels. Under this policy, net metering is available for residential systems up to 25 kilowatts (kW) in capacity and non-residential systems up to two megawatts (MW) in capacity.

Tax Credits

- Utah just signed into law a two-year extension of a tax credit for Utah customers who adopt solar systems. The tax credit for a residential system is 25% of the purchase and installation costs up to a maximum of $1,600. Beginning in 2021, the credit will be gradually phased down until it is eliminated at the end of 2023.
- Utah offers a commercial tax credit. The commercial tax credit is calculated as 10% of the eligible system cost or $50,000, whichever is less. The Commercial Tax Credit is refundable, but can only be claimed by business, corporation, or LLC entities.
- Utah's production tax credit incentive is available for large scale projects that are 660 kilowatts or greater. The production tax credit is calculated as $.0035 (.35¢) per kilowatt hour of produced electricity during the project's first 48 months. For the purposes of the credit, the "renewable energy" category includes solar photovoltaic, wind, geothermal and biomass.

Sales Tax Exemption

- Utah has a sales tax exemption of solar panels. To qualify for the exemption a solar system has to have a capacity of 2 MW or greater. The capacity requirement would rule out residential solar but may be attractive to some businesses.

Local Incentives in Utah

- Murray City - Under a pilot program, Murray City Power offers net metering to customers that generate electricity using solar photovoltaic (PV), wind, or hydroelectric systems with a maximum capacity of 10 kilowatts (kW). Murray Power is currently in the process of revising its Pilot Net Metering Program.
- City of St. George - Customers on the City of St. George power system are eligible to participate in the City's Net Metering program. This program allows a customer to install solar photovoltaic (PV) systems on their home or business and generate energy to power their home or business. There is no cap for the amount of solar a customer can put on their home or business but the city does look at the amount of solar on a circuit when an application is filed. If there is enough solar PV generation that it could adversely affect the system, the application could be denied or a limit on the capacity could applied.

Colorado

Renewable Energy Portfolio

- Colorado's Renewable Portfolio Standard is 30% by 2020. Colorado requires that at least 3% of the electricity sold by the state's Investor-Owned Utilities come from distributed energy resources.

Net Metering

- Colorado requires utilities to pay for the net excess energy that an owner's system produces over the course of a year. Colorado also allows owners of renewable energy systems to opt either for the payout for net excess energy or owners can roll extra credit to any subsequent monthly bills.

Sales Tax Exemption

- Colorado exempts from the state's sales and use tax all sales, storage, and use of components used in the production of alternating current electricity from a renewable energy source. Effective July 1, 2009, through July 1, 2017, all sales, storage, and use of components used in solar thermal systems are exempt from the state's sales and use tax.

Property Tax Exemption

- Renewable energy personal property that is located on a residential classified property, owned by the residential property owner, and produces energy that is used by the residential property is exempt from Colorado property taxation. To qualify for the exemption the solar electric generation facility must be located on residential real property, used to produce electricity from solar energy primarily for use in the residential improvements, and have a production capacity of no more than one hundred (100) kilowatts of AC electricity.

Local Incentives in Colorado

- Boulder residents and businesses that have installed solar electric or solar thermal (hot water) systems on their property may be eligible for a sales and use tax rebate. The city may rebate approximately 15 percent of the city sales and use tax paid on materials and permits for the solar installation.

Idaho

Tax Deduction

- Homeowners who install an alternative energy device on their residence can deduct a portion of the amount actually paid or accrued (billed but not paid). In the year the device is placed in service, homeowners can deduct 40% of the cost to construct, reconstruct, remodel, install, or acquire the device, not to exceed $5,000. In the next three years after installation, taxpayers can deduct 20% of these costs per year, but not more than $5,000 in any year.

South Dakota

Renewable Energy Portfolio

- South Dakota has a voluntary Renewable Portfolio Standard of 15% by 2015.

Property Tax Exemption

- The first $50,000 or 70% of the assessed value of the property used for producing solar power (i.e., a home), whichever is greater, is exempt from property taxes for four years.

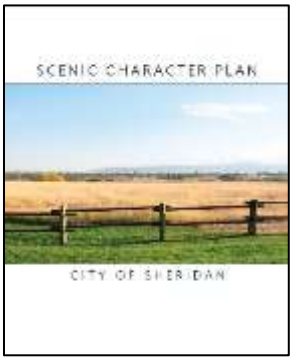
APPENDIX D

Existing Plans in Sheridan

Scenic Character and Viewshed

Sheridan is blessed with diverse landscape and world-class scenery. The Bighorn Mountains provide a picturesque frame for the city. There are many reasons people enjoy living in Sheridan but for many residents, the Bighorn Mountains are what makes living in Sheridan so unique and they play a crucial role in the community's quality of life.

A viewshed is an area visible from a specific location. Several planning documents address the importance of the view of the Bighorn Mountains for local residents.



Sheridan Scenic Character Plan (2011)

The Sheridan Scenic Character Plan guides how growth in Sheridan occurs as it pertains to the community's character. One of its intents is to provide guidance by balancing the objective of maintaining contributing natural and historic features of scenic landscapes identified by the community while limiting governmental regulation and unnecessary procedures.

The Sheridan Scenic Plan notes that community's scenic resources collectively create an experience unlike anywhere else for present-day residents and visitors, and are important to preserving Sheridan's identity and way of life.

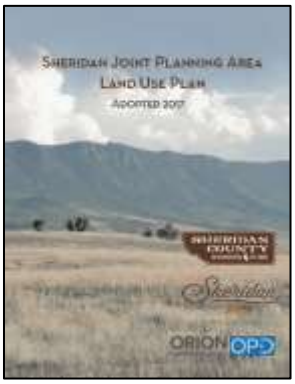
The Sheridan Scenic Plan also notes that scenic character can erode in areas where important viewsheds are obstructed, gateways are unattractive or poorly defined, and uncomplimentary land uses or buildings are placed next to key scenic features.

Scenic resources also play a critical role in the City's economic vitality. The Little Goose Valley and the Bighorn Mountains draw visitors for hiking, biking, fishing, hunting, wildlife viewing, snowmobiling, backpacking and a host of other recreational activities. These endeavors are dependent on Sheridan's unique views and open space. Preserving scenic resources will help to sustain a vibrant economy for Sheridan far into the future.

When asked how important a consideration scenery should be in evaluating land development proposals 80% of those surveys for the Sheridan Scenic Plan said either scenery was either extremely important or somewhat important. Respondents valued the mountains as the most important scenic feature contributing to the scenic character of the community.

The Scenic Community Character Preference Survey showed the public valued the mountains as the most important visual feature and the most important feature contributing to the scenic character of the community.

Sheridan Joint Planning Area Land Use Plan (Adopted 2017)



The purpose of the Sheridan Joint Planning Areas Land Use Plan provides guidance for staff, elected, and appointed officials to determine directions and make choices about land uses in the Joint Planning Area (JPA) for the City of Sheridan and Sheridan County, Wyoming.

Directions and policies for the Joint Planning Area include:

- Protect Natural Resources. Provide stewardship for resources that are important to sustain the region and that people value (e.g., water quality/creeks, riparian corridors, wildlife habitat, and mineral resources, and hillsides and ridgelines).

Sheridan County Comprehensive Plan (2008)

The purpose of the Sheridan County Comprehensive Plan is to outline Sheridan County's vision and goals for the future and provide guidance for staff, elected, and appointed officials to determine directions and make choices about short- and long-range needs. The comprehensive plan states that important natural and scenic resources will be conserved as much as possible, while respecting rights of landowners to use land.

The Sheridan County Comprehensive encourages techniques to protect the scenic nature of different areas in the County including blending structures in with the natural landscape and placing development so as not to be a prominent feature on ridgelines (as viewed from major public rights of way).

Specific goals and policies established in the Sheridan County Comprehensive Plan include conserving the Big Horn foothills.

- Policy 2.3 a: Support efforts to maintain the Big Horn Foothills Resource Conservation Area

Goal 2.8: The county will maintain its scenic quality and night skies.

- Policy 2.8 a: Protect visual quality of the county, including hillsides and ridge- Key natural landscape features including bluffs, ridgelines, escarpments, major drainage features, rock outcroppings, valley walls and other scenic topographic features should be protected.
- Policy 2.8 b: Avoid development that is visually intrusive when viewed from major public rights-of-way

East 5th Street Corridor Plan (2013)

The purpose of the East 5th Street Corridor Plan is to articulate a common vision reflective of stakeholder objectives. This Corridor Plan is a policy document intended to define the corridor's future. The plan provides a framework of community-based principles, policies, design options and implementation strategies. The plan emphasizes the importance of minimizing the predominant view toward the mountains and making natural area features paramount.

2012 Sheridan Entryway Design Standards (2012)

The goal of the 2012 Sheridan Entryway Design Standards is to provide a framework for a compatible streetscape, site and landscape development for building sites within the Sheridan Entryway. The plan included steep slope standards set forth to preserve scenic character.

Economic Development

A consistent theme throughout the Sheridan community's local development and planning documents is the need for economic diversification. In addition, some local planning documents addressing economic development also note renewable energy.

Key takeaway: Consumer preferences are shifting toward renewable energy. Certain businesses need renewable energy to satisfy customer demands. This is especially true in the tech industry. Given the findings that Sheridan should focus recruiting tech industries and light manufacturing, pursuing renewable energy could provide another helpful recruiting tool for businesses looking at Sheridan.

Northeast Wyoming Regional Marketing Plan (2016)

The New Growth Alliance *Northeast Wyoming Regional Marketing Plan (2016)* focuses on branding and marketing the northeast Wyoming region as a preferred business location to external target businesses throughout the U.S. and the world. The study noted a lack of adequate portfolio of available, prepared industrial and commercial sites and parks with the exception of Sheridan's "shovel ready" site. The study also reinforces that data centers are a regional target business segment.

Target Industry Profiles and CTET Strategy Recommendations (2014)

The Sheridan Economic and Educational Development Authority (SEEDA) produced the *Target Industry Profiles and CTET Strategy Recommendations* report in 2014. The report focused on refining the Wadley Donovan study to identify a concise list of target industry sectors. The strategy recommends data Centers as a target industry for Sheridan and lists data centers as offering the highest average pay of any targeted industry. The study also notes that data centers require large and redundant power supplies. The study points out that local Data Centers and telecommunication firms, including ACT and Ptolemy Data Centers, have had tremendous success and that Sheridan should continue to support their growth and development.

Sheridan High-Tech Park Conceptual Plan (2010)

To implement the recommendations of the Wadley-Donovan Group study, Sheridan developed a conceptual plan to lay the necessary groundwork for development of a business park in the North Main area of Sheridan. The Sheridan High-Tech Park Conceptual Plan (2010) outlines three main goals, one of which is to attract new High- Tech Businesses to Sheridan. In order to do this the plan highlights the need for redundant electric systems.

North Main Area Master Plan (2009)

The North Main Area Master Plan (2009) lists one of its goals as creating a strong mixed-use core by creating an environment that projects a positive image and attracts future investment. The North Main Corridor Economic Development Strategy and Action Plan (2012) builds upon the North Main Area Master Plan and notes that the Wrench Ranch and Hi-Tech Park will be the location for much of Sheridan's future job growth and that projects that make these areas attractive for new businesses will help increase the vitality of the entire Sheridan economy.

Sheridan County Comprehensive Plan (2008)

The Sheridan Renewable Energy Assessment for Related Business Recruitment Project will also build on goals outlined in the Sheridan County Comprehensive Plan (2008). This plan notes the need to ensure the community meets the energy needs of future residents and businesses through a range of energy options including renewables such as solar. The Sheridan County Comprehensive Plan prioritizes supporting job expansion efforts and the promoting the recruitment of "good fit" industries.

Wadley-Donovan Group

A study commissioned by the Wyoming Business Council and conducted by the Wadley-Donovan Group determined which target industries should be priority targets for business recruitment efforts. The study concluded that Sheridan County is well positioned to attract knowledge-based industries such as data processing and information retrieval services. Sheridan has used the study's finding to drive economic development planning processes and has used these plans to guide actual development.

APPENDIX E

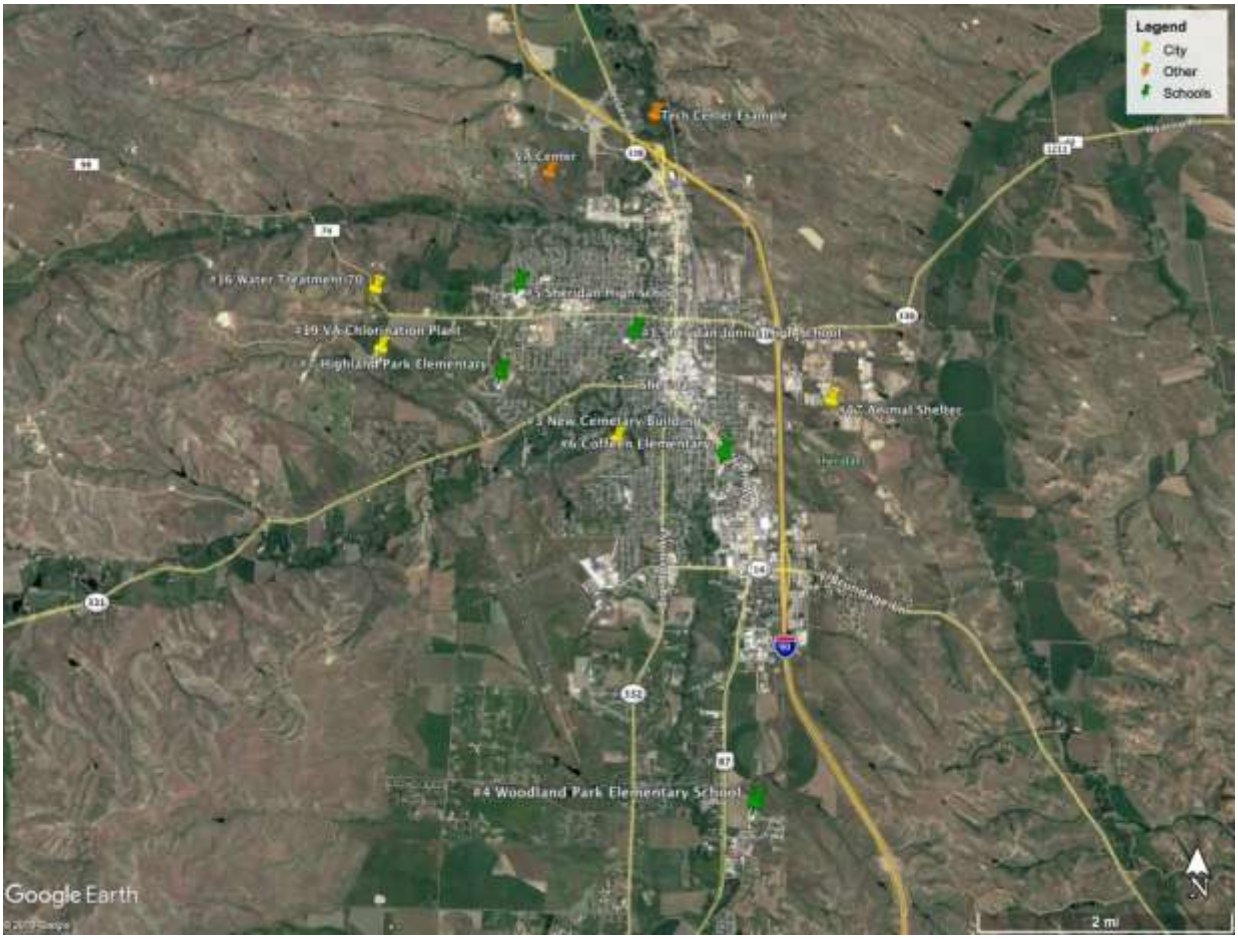
Unsuitable Sites

Site Name	Reason Deemed Unsuitable
Water Intake 21	Space was limited due to small roofs and shading from buildings
Sheridan Fire Station	Not enough contiguous space
Pump Station 41	Not enough energy usage
Thorne Rider Park	Too far from meters
Sheridan Hazardous Waste Buildings	Not enough energy usage
Sheridan Water Treatment Plant	Not enough space for an array
Sheridan Gun Range	Lacking energy usage and space was not available year round
Sheridan City Hall	Not much space on the roof
John Oatts Field	No energy usage
Sheridan Recycling Facility	Potential roof load profile issues

APPENDIX F

Site by Site Analysis

Project Locations



Sheridan Junior High

25kW

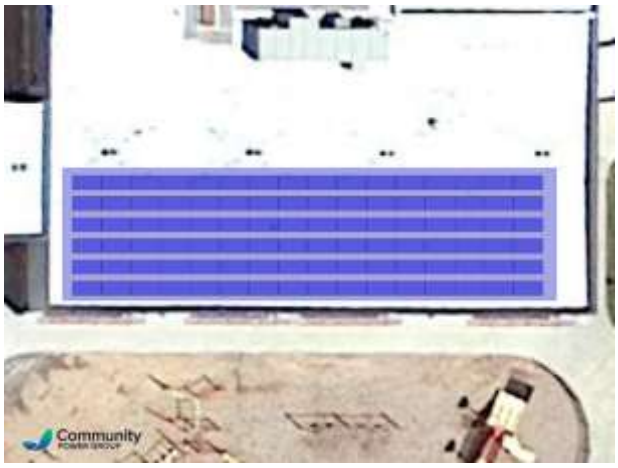
System Size AC/DC	25.0 kWac / 31.7 kWdc
System Production	43,131 kWh
# of Modules	92
Est Installation Costs	$53,265
Est 25 Year Savings/ IRR	$30,920 / 3.6%
Est 35 Year Savings/ IRR	$74,329 / 5.2%

300kW

System Size AC/DC	225.0 kWac / 289.8 kWdc
System Production	394,085 kWh
# of Modules	840
Est Installation Costs	$411,516
Est 25 Year Savings/ IRR	$343,302 / 5.0%
Est 35 Year Savings/ IRR	$732,557 / 6.4%

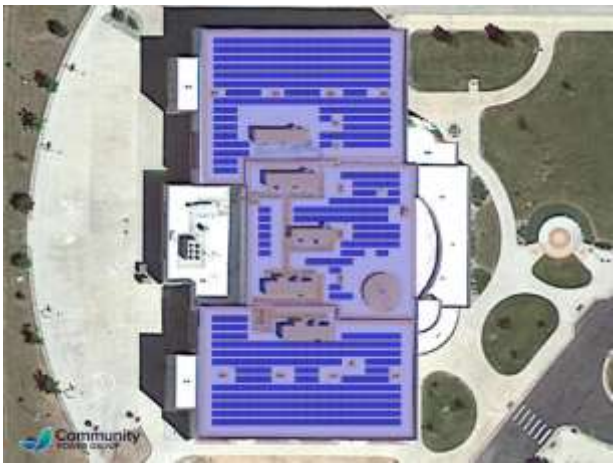
Woodland Park Elementary

25kW



System Size AC/DC	25 kWac / 33.6 kWdc
System Production	45,691 kWh
# of Modules	97
Est Installation Costs	$54,432
Est 25 Year Savings/ IRR	$34,740 / 3.9%
Est 35 Year Savings/ IRR	$80,726 / 5.5%

300kW



System Size AC/DC	100 kWac / 132 kWdc
System Production	179,296 kWh
# of Modules	382
Est Installation Costs	$188,760
Est 25 Year Savings/ IRR	$154,658 / 4.9%
Est 35 Year Savings/ IRR	$331,756 / 6.3%

Sheridan High School

25kW

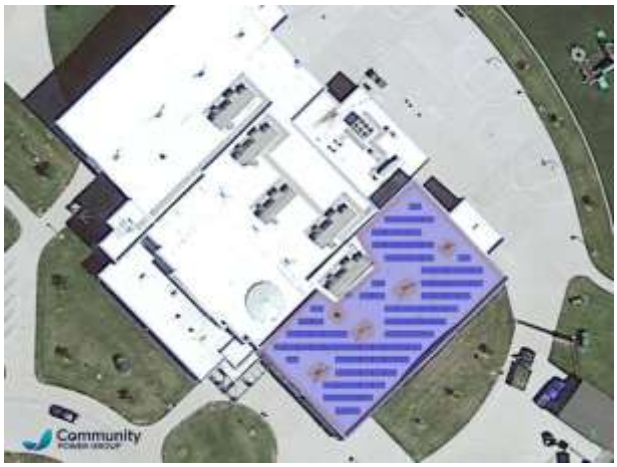
System Size AC/DC	25.0 kWac / 32.8 kWdc
System Production	46,735 kWh
# of Modules	95
Est Installation Costs	$53,792
Est 25 Year Savings/ IRR	$37,418 / 4.2%
Est 35 Year Savings/ IRR	$84,454 / 5.7%

300kW

System Size AC/DC	300.0 kWac / 371.9 kWdc
System Production	505,802 kWh
# of Modules	1,078
Est Installation Costs	$531,817
Est 25 Year Savings/ IRR	$436,980 / 4.9%
Est 35 Year Savings/ IRR	$936,583 / 6.3%

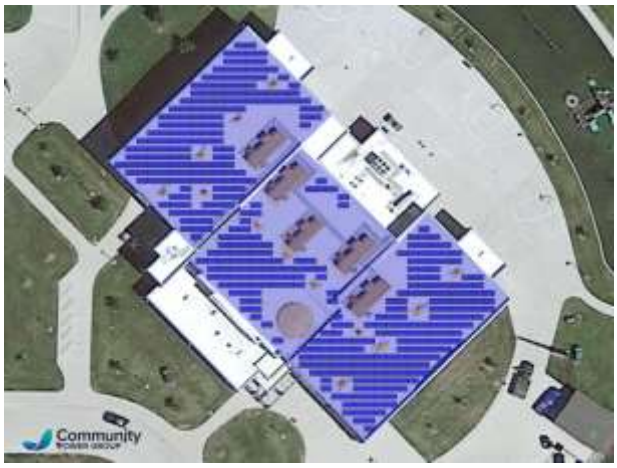
Coffeen Elementary

25kW



System Size AC/DC	25.0 kWac / 32.4 kWdc
System Production	44,044 kWh
# of Modules	94
Est Installation Costs	$54,108
Est 25 Year Savings/ IRR	$31,850 / 3.7%
Est 35 Year Savings/ IRR	$76,178 / 5.2%

300kW



System Size AC/DC	125.0 kWac / 146.6 kWdc
System Production	199,563 kWh
# of Modules	425
Est Installation Costs	$205,240
Est 25 Year Savings/ IRR	$169.759 / 4.9%
Est 35 Year Savings/ IRR	$363,143 / 6.3%

Highland Elementary

25kW

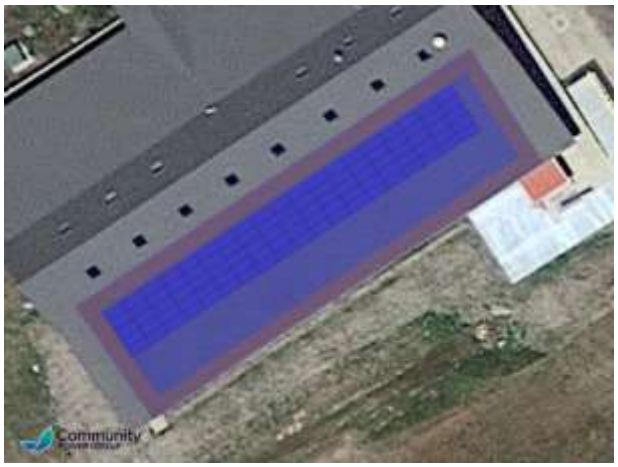
System Size AC/DC	25.0 kWac / 32.8 kWdc
System Production	44,571 kWh
# of Modules	95
Est Installation Costs	$53,136
Est 25 Year Savings/ IRR	$32,234 / 3.8%
Est 35 Year Savings/ IRR	$76,259 / 5.3%

300kW

System Size AC/DC	225.0 kWac/ 286.0 kWdc
System Production	389,127 kWh
# of Modules	829
Est Installation Costs	$411,840
Est 25 Year Savings/ IRR	$277,027 / 4.1%
Est 35 Year Savings/ IRR	$632,270 / 5.6%

Water Treatment 24

25kW



System Size AC/DC	25.0 kWac / 32.8 kWdc
System Production	43,954 kWh
# of Modules	95
Est Installation Costs	$52,152
Est 25 Year Savings/ IRR	$32,036 / 3.8%
Est 35 Year Savings/ IRR	$75,451 / 5.4%

300kW

System Size AC/DC	35.0 kWac / 45.5 kWdc
System Production	69,160 kWh
# of Modules	132
Est Installation Costs	$69,160
Est 25 Year Savings	$47,666 / 4.2%
Est 35 Year Savings	$107,912 / 5.7%

Water Treatment 70

25kW

System Size AC/DC	25.0 kWac / 34.2 kWdc
System Production	49,647 kWh
# of Modules	99
Est Installation Costs	$57,114
Est 25 Year Savings/ IRR	$37,978 / 4.1%
Est 35 Year Savings/ IRR	$87,017 / 5.6%

25kW (Under 300kW Cap)

System Size AC/DC	25.0 kWac / 34.2 kWdc
System Production	49,647 kWh
# of Modules	99
Est Installation Costs	$57,114
Est 25 Year Savings/ IRR	$37,978 / 4.1%
Est 35 Year Savings/ IRR	$87,017 / 5.6%

Sheridan Dog and Cat Shelter

25kW

System Size AC/DC	25.0 kWac / 32.8 kWdc
System Production	44,571 kWh
# of Modules	95
Est Installation Costs	$54,776
Est 25 Year Savings/ IRR	$20,894 / 2.5%
Est 35 Year Savings/ IRR	$59,917 / 4.2%

25kW (Under 300kW Cap)

System Size AC/DC	25.0 kWac / 32.8 kWdc
System Production	44,571 kWh
# of Modules	95
Est Installation Costs	$54,776
Est 25 Year Savings/ IRR	$20,894 / 2.5%
Est 35 Year Savings/ IRR	$59,917 / 4.2%

VA Chlorination Plant

25kW

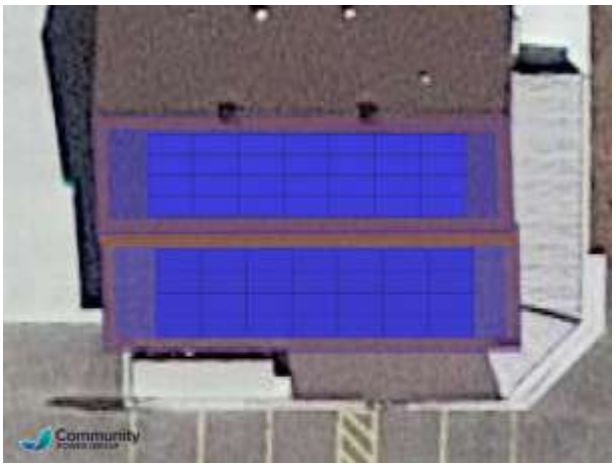
System Size AC/DC	25.0 kWac / 33.1 kWdc
System Production	48,440 kWh
# of Modules	96
Est Installation Costs	$56,270
Est 25 Year Savings/ IRR	$36,510 / 4.0%
Est 35 Year Savings/ IRR	$84,357 / 5.5%

25kW (Under 300kW Cap)

System Size AC/DC	25.0 kWac / 33.1 kWdc
System Production	48,440 kWh
# of Modules	96
Est Installation Costs	$56,270
Est 25 Year Savings/ IRR	$36,510 / 4.0%
Est 35 Year Savings/ IRR	$84,357 / 5.5%

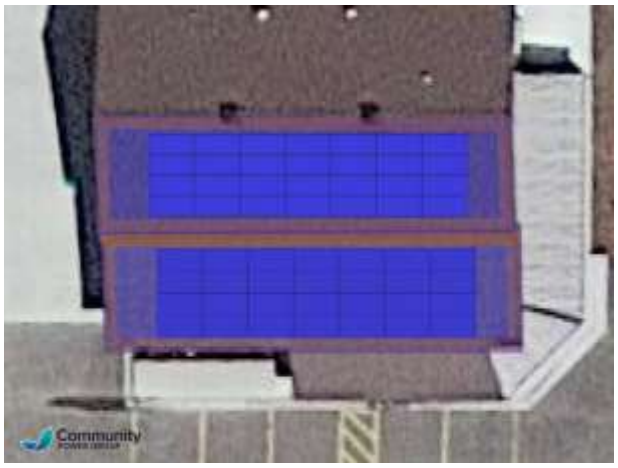
Cemetery Building

25kW



System Size AC/DC	15.0 kWac / 19.3 kWdc
System Production	26,245 kWh
# of Modules	56
Est Installation Costs	$35,126
Est 25 Year Savings/ IRR	$15,787 / 2.9%
Est 35 Year Savings/ IRR	$42,043 / 4.6%

25kW (Under 300kW Cap)



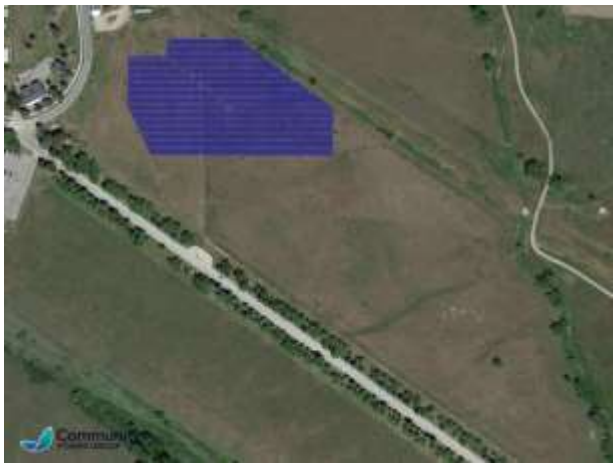
System Size AC/DC	15.0 kWac / 19.3 kWdc
System Production	26,245 kWh
# of Modules	56
Est Installation Costs	$35,126
Est 25 Year Savings/ IRR	$15,787 / 2.9%
Est 35 Year Savings/ IRR	$42,043 / 4.6%

VA Center

Single Axis Tracking

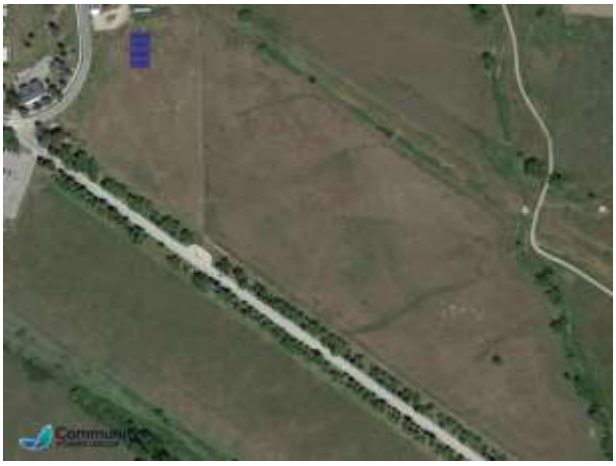
System Size AC/DC	1000.0 kWac / 1300 kWdc
System Production	1,920,299 kWh
# of Modules	3,768
Est Installation Costs	$1,755,000
Est 25 Year Savings/ IRR	$1,992,731 / 6.4%
Est 35 Year Savings/ IRR	$3,925,411 / 7.6%

Fixed Mount



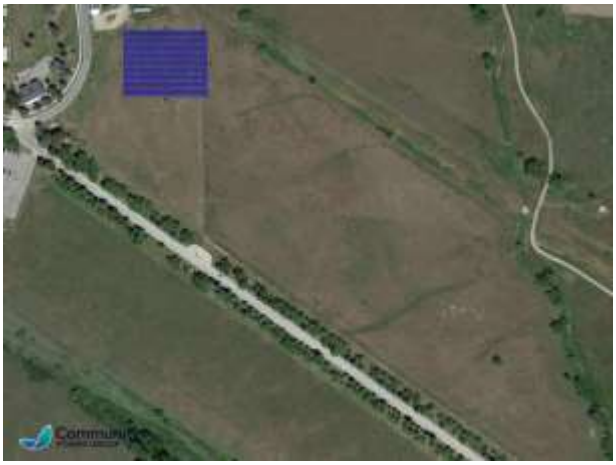
System Size AC/DC	1000.0 kWac / 1309.3 kWdc
System Production	1,861,223 kWh
# of Modules	3,795
Est Installation Costs	$1,702,090
Est 25 Year Savings/ IRR	$1,930,346 / 6.4%
Est 35 Year Savings/ IRR	$3,804,449 / 7.6%

25kW



System Size AC/DC	25.0 kWac/ 33.1 kWdc
System Production	48,440 kWh
# of Modules	96
Est Installation Costs	$55,277
Est 25 Year Savings/ IRR	$39,260 / 4.3%
Est 35 Year Savings/ IRR	$88,013 / 5.8%

300kW



System Size AC/DC	300.0 kWac/ 381.9 kWdc
System Production	562,149 kWh
# of Modules	1,107
Est Installation Costs	$637,773
Est 25 Year Savings/ IRR	$459,339 / 4.4%
Est 35 Year Savings/ IRR	$1,025,113 / 5.8%

Tech Center Example

25kW

System Size AC/DC	25.0 kWac/ 32.4 kWdc
System Production	44,044 kWh
# of Modules	94
Est Installation Costs	$54,108
Est 25 Year Savings/ IRR	$31,850 / 3.7%
Est 35 Year Savings/ IRR	$76,178 / 5.2%

300kW

System Size AC/DC	90.0 kWac/ 109.0 kWdc
System Production	148,384 kWh
# of Modules	316
Est Installation Costs	$182,030
Est 25 Year Savings/ IRR	$96,798 / 3.4%
Est 35 Year Savings/ IRR	$240,588 / 5.0%

APPENDIX G

Example Ordinances

DEPARTMENT OF BUILDING AND ZONING
OF COOK COUNTY, ILLINOIS

Timothy P. Bleuher
COMMISSIONER OF BUILDING AND ZONING
OF COOK COUNTY

County Administration Building
69 W. Washington, Suite 2830
Chicago, IL 60602-3169
TEL (312) 603-0500
FAX (312) 603-9940
TDD (800) 526-0857

SOLAR PHOTOVOLTAIC AND THERMAL SYSTEM PERMIT REQUIREMENTS FOR RESIDENTIAL INSTALLATIONS

Please address the following requirements with respect to your permit application. The Department of Building and Zoning now requires digital submissions for all applications and supporting documents. Applicants that have digital files 25MB or less are encouraged to email their submittals to: intake.bnz@cookcountyil.gov. If your submittal is larger, we accept an electronic copy on flash drive or CD (pdf format).

Complete the Full Permit Application in its entirety. Provide all the necessary contact information, estimated cost of work, company name of the contractors on the job and check the applicable water / sewer or well / septic boxes

Site and Roof Plan Locations (For All Installations)

Ground Installations:

- Submit a plat of survey signed and sealed by an Illinois licensed surveyor that is not more than five (5) years old of the subject property.
- Identify on the survey or separate site plan the location of the solar array for ground installations.
- Include setback dimensions to lot lines.
- A photovoltaic contractor shall demonstrate by letter or diagram that the ground installation will not produce reflecting glare or concentrated light onto buildings of neighboring properties.
- The maximum height above grade of any ground installation is 15'.
- A 10' setback from the house is required and the array must not block any entrances or egress areas of any building.
- Arrays shall also be located away from the septic tank and septic field and any public utility easements, all of which shall be identified on the site plan.

Roof or wall installations:

- Identify on the survey the building where the installation will be located.
- Separately, provide a roof plan drawing.
- Dimension extents of the array and the distance from eaves, ridges and valleys.
- For firefighter access, a 36" wide access-way shall be provided from the eave to ridges on all roof planes.
- No portion of the installation may be installed within 18" of the ridge for firefighter ventilation operations.

Photovoltaic and Thermal Equipment Drawings and Documentation

- Rooftop installations require a state of Illinois licensed architect or structural engineer's report and calculations determining the rooftop adequacy of supporting increased wind and equipment loads.
- Ground installations require drawings showing footings and pole or frame mounts for the equipment and shall be directly from the manufacturer or provided by a state of Illinois licensed architect or structural engineer.
- Submit cut sheets of electrical equipment (photovoltaic modules, inverters, etc.). Indicate model numbers. All electrical equipment must be listed and labeled by a Nationally Recognized Testing Laboratory (NTRL).
- For PV systems, provide a complete electrical single-line diagram indicating:

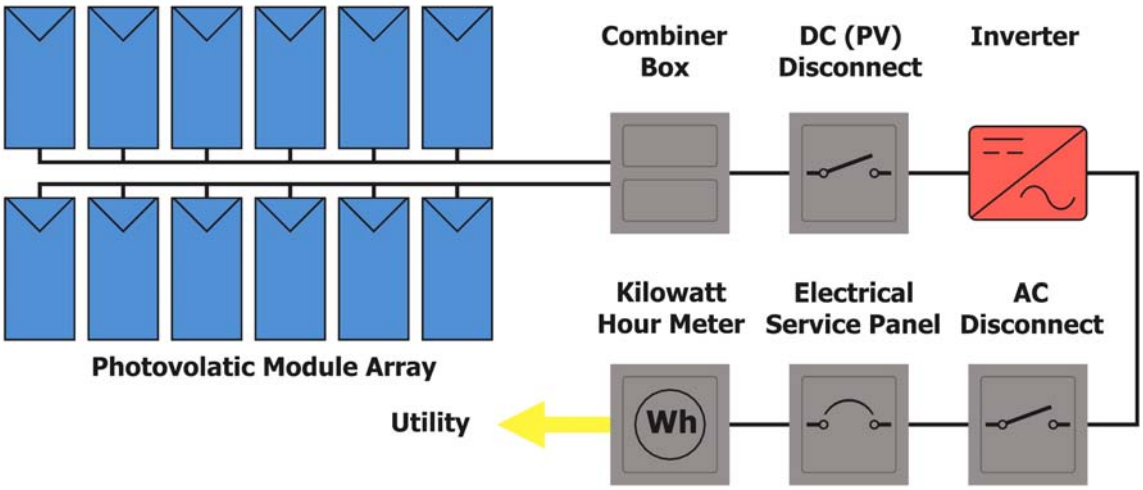
❒ Panel Modules	❒ Inverters	❒ Electric Panels	❒ Mounting System	❒ Batteries (if applicable)
❒ Meter Panels	❒ Junction Boxes	❒ Combiner Boxes	❒ Grounding	❒ Wiring Methods
❒ Disconnects	❒ Circuit Breakers	❒ Fuses	❒ Conduits (Size & type)	❒ Conductors (number, size & insulation type)

- For thermal systems, provide a riser diagram indicating:

❒ Panel Modules	❒ Riser Diagram	❒ Pipe Sizes	❒ Valves	❒ Backflow Protection

RESIDENTIAL SOLAR PERMIT REQUIREMENTS (CONTINUED)

SAMPLE ELECTRICAL DIAGRAM



Letter of Intent
All photovoltaic installations shall be performed by a REGISTERED COOK COUNTY ELECTRICAL CONTRACTOR. All thermal installations shall be performed by a REGISTERED COOK COUNTY PLUMBING CONTRACTOR.

For photovoltaic installations, the registered electrical contractor shall submit a letter of intent with detailed scope of work signed by the supervising electrician. For solar thermal installations: submit letter of intent from a registered plumbing contractor with a detailed description of the proposed work. For more information on contractor registration please visit our website for Cook County Contractor Registration Instructions

Fees
The average minimum permit fee for any installation is $465.00. A $100 deposit will be required shortly after applying online. Permit fees increase from the minimum value depending on the complexity of the project.

Other links
Permit Application Form and Permit Process Instructions
Cook County Zoning Ordinance
Solar America Board for Codes and Standards
Cook Viewer Map Service

Will County, Illinois

§ 155-9.245 SOLAR FARMS.

Solar farms are subject to all the following regulations:

(A) *Height.* Buildings are subject to the height limits of the subject zoning district. Ground-mounted solar energy systems may not exceed 25 feet in height when oriented at maximum tilt.

(B) *Setbacks.* Buildings are subject to the setback regulations of the subject zoning district. Ground-mounted solar energy systems must be set back at least 25 feet from all property lines or in accordance with the setback regulations of the subject zoning district, whichever results in a greater setback.

(C) *Visual screening.* Ground- mounted mechanical equipment that is visible outside the perimeter of the solar farm must be screened from view of roads and dwelling units located within 1,000 feet in accordance with the provisions of this subsection (C). Required screening may be located within required setbacks and must comply with one of the following options or a similar alternative approved by the County Board at the time of special use permit approval:

(1) A landscaped area at least ten feet in width with at least one shrub per five linear feet, plus at least one evergreen tree per 25 linear feet of perimeter area. Shrubs must be at least three feet in height at time of planting. Evergreen trees must be at least five feet in height at time of planting; or

(2) Provide a landscaped area at least ten feet in width with a solid wall or privacy fence with a minimum height of six feet. At least one evergreen tree is required per 30 linear feet of fence or wall.

(D) *Glare.* Solar energy systems must be designed, constructed and sited to minimize glare or reflections on adjacent properties and roadways and to not interfere with traffic, including air traffic, or otherwise create a safety hazard.

(E) *Soil and ground cover.*

(1) Top soils shall not be removed from the site during development unless the removal is expressly approved as part of the special use permit.

(2) Perennial vegetative ground cover must be maintained or established in all areas containing solar arrays and in required setbacks to prevent erosion and manage run-off.

(F) *Security barrier.* Solar energy systems that are part of a solar farm must be enclosed by perimeter security fencing or other county-approved barrier with a minimum height of at least seven feet. The use of barbed wire or razor wire is prohibited unless otherwise expressly at the time of special use perrnit approval.

(G) *Approved solar components.* Electric system components must have a UL (Underwriters Laboratories Inc.) listing.

(H) *Lighting.* Solar farms may not be artificially illuminated, unless required by the FAA or other applicable government agency or authority.

(I) *Underground utilities.* On-site power lines and utility connections must be placed underground unless otherwise expressly approved as part of the special use permit.

(J) *Abandonment and decommissioning.* Solar farms that do not produce energy for a continuous period of one year or more are presumed to have been abandoned.

(1) Any solar farm that has been abandoned must be decommissioned and removed within 180 days.

(2) Decommissioning must consist of:

(a) Physical removal of all solar photovoltaic installations, structures, equipment, security barriers and transmission lines from the site.

(b) Recycling or disposal of all solid and hazardous waste in accordance with local, state, and federal regulations.

(c) Stabilization or re- vegetation of the site as necessary to minimize erosion. The Zoning Administrator is authorized to allow the owner or operator to leave landscaping or designated below-grade foundations in place in order to minimize erosion and disruption to vegetation.

(3) Decommissioning plan.

(a) A decommissioning plan outlining the anticipated means and costs of removing the solar farm must be submitted, with the special use permit application.

(b) The decommissioning plan should ensure that the owner or operator properly removes the equipment and facilities upon the end of project life or after their useful life. The plan must include provisions for the removal of all structures and foundations, the removal of all electrical transmission components and the restoration of soil and vegetation.

(c) The owner/operator must provide a present-day decommissioning cost estimate and identify the parties responsible for decommissioning.

(d) The owner/operator must submit a copy of the decommissioning plan to all property owners within the boundaries of the special use permit. Before issuance of a zoning certificate, the subject property owners must provide to the Zoning Administrator signed affidavits acknowledging receipt of the decommissioning plan and their respective responsibility for decommissioning costs.

(K) *Monitoring and maintenance.* The owner/operator of the solar farm is responsible for keeping the facility in safe, sound and well-maintained condition, including painting, grounds keeping, structural repairs, internal access drives and the integrity of security measures.

(L) *Avoidance and mitigation of damages to public infrastructure.*

(1) *Roads.* The owner/operator must identify all roads to be used for the purpose of transporting components and equipment for construction, operation or maintenance of the solar farm and obtain applicable permits from the applicable highway authority prior to construction.

(2) *Existing road conditions.* The owner/operator must conduct a pre-construction survey, in coordination with the applicable highway authority to determine existing road conditions. The pre-construction survey must include photographs and a written agreement to document the condition of the roads and applicable public facilities. The owner/operator is responsible for on-

going road maintenance and dust-control measures identified by the applicable highway authority during all phases of construction and installation.

(3) *Drainage system.* The owner/operator is responsible for identifying the location of all subsurface drainage systems and for immediately repairing damage to drain tiles and other drainage systems that result from construction, operation, or maintenance of the solar farm.

(M) *Financial assurance.* The owner/operator must provide reasonable evidence of financial ability to construct the solar farm and all required improvements, as determined by the County Board at the time of special use permit approval.

(N) *Notice of development letters.* The owner/operator must mail letters to Will County Board representatives for the district in which the solar farm is to be built as well as to the respective township, Will/South Cook Soil and Water Conservation District, and to all municipalities located within 1.5 miles of the solar farm.

(O) *Submittal requirements.* All applications for special use permit approval must include the following information in addition to the customary submittal requirements for special use permit applications.

(1) Site plan showing property lines and physical features, including roads, setbacks, floodplain (if applicable), buildings, solar panels, right-of-way, and zoning district designation for the subject property and all abutting properties.

(2) Pre-construction survey and proposed routes as defined in subsection (K) of this section.

(3) Number, location, and spacing of solar panels/arrays.

(4) Product cut-sheets.

(5) Proposed locations of underground or overhead electric lines.

(6) Identification of access and traffic control of the project site, during construction and operation of the facility.

(7) Interconnection service agreement or evidence of filing required interconnection service applications with the electric utility.

(8) Operation and maintenance plan of the solar farm, including measures for maintaining safe access to the installation, stormwater controls, as well as general procedures for operation and maintenance of the installation.

(9) Proof of liability insurance.

(10) Emergency services plan, including but not limited to the project summary, electrical schematic and means of shutting down energy systems throughout the life of the installation.

(11) Decommissioning plan in accordance with subsection (J) of this section.

(12) Redacted lease copy.

(13) Copy of notice of development letters to Will County Board representatives for the district in which the solar farm is to be built.

(14) Copy of the notice of development letters required by this section.

(P) *Prohibited systems.* Concentrated solar power systems are prohibited.

(Ord. 18-1, passed 1-18-2018)

SOLAR ENERGY SYSTEMS

TOWNSHIP OF MANHEIM
Lancaster County, Pennsylvania

ORDINANCE NO. 2009 - 16

AN ORDINANCE TO AMEND THE ZONING ORDINANCE OF MANHEIM TOWNSHIP – 1989, AS AMENDED, BY AMENDING ARTICLE 5, DEFINITIONS, BY ADDING A DEFINITION FOR SOLAR ENERGY SYSTEMS AND BY AMENDING ARTICLE 19, RESIDENTIAL ACCESSORY REGULATIONS BY ADDING A NEW SECTION 1911 TO PERMIT SOLAR ENERGY SYSTEMS AS AN ACCESSORY TO A RESIDENTIAL USE IN ANY ZONING DISTRICT.

BE IT HEREBY ENACTED AND ORDAINED by the Board of Commissioners of Manheim Township, Lancaster County, Pennsylvania, the Manheim Township Zoning Ordinance of 1989, as amended, shall be amended in the following respects:

Section 1. The Zoning Ordinance of Manheim Township – 1989, Article 5, Definitions, shall be amended to include the following definitions:

> Solar Energy System. An energy conversion system including appurtenances which converts solar energy to a usable form of energy to meet all or part of the energy requirements of the on-site residential user.

Section 2. The Zoning Ordinance of Manheim Township – 1989, Article 19, Residential Accessory Regulations, shall be amended by adding Section 1911 as follows:

> Section 1911. SOLAR ENERGY SYSTEMS
>
> It is the purpose of this regulation to promote the safe, effective and efficient use of solar energy systems installed to reduce the on-site consumption of utility supplied energy and/or hot water as a residential accessory use while protecting health, safety and welfare of adjacent and surrounding land uses through appropriate zoning and land use controls. A solar energy system shall be permitted in any zoning district as an accessory to a residential use herein and specific criteria as set forth below. Where said general standards and specific criteria overlap, the specific criteria shall supersede the general standards.

1. The installation and construction of a solar energy system shall be subject to the following development and design standards:

   A. A solar energy system is permitted in all zoning districts as an accessory to a residential use.

   B. A solar energy system shall provide power for the principal residential use and/or residential accessory use of the property on which the solar energy system is located and shall not be used for the generation of power for the sale of energy to other users, although this provision shall not be interpreted to prohibit the sale of excess power generated from time to time to the local utility company.

   C. A solar energy system connected to the utility grid shall provide written authorization from the local utility company acknowledging and approving such connection.

   D. A solar energy system may be roof mounted or ground mounted.

   E. A roof mounted system may be mounted on a principal building or accessory building. A roof mounted system whether mounted on the principal building or accessory building, may not exceed the maximum building height or accessory building height specified for the building type in the underlying zoning district. In no instance shall any part of the solar energy system extend beyond the edge of the roof.

   F. A ground mounted system shall not exceed the maximum building height for accessory buildings.

   G. The surface area of a ground mounted system regardless of the mounted angle shall be calculated as part of the overall lot coverage. Of the allowable lot coverage, the surface area of a ground mounted system shall not constitute more than two (2) percent of the allowable lot coverage or 360 square feet, whichever is less.

   H. A ground mounted system or system attached to an accessory building shall not be located within the required front yard setback.

   I. The minimum solar energy system setback distance from the property lines shall be equivalent to the building setback or accessory building setback requirement of the underlying zoning district.

   J. The number of solar panels and supporting equipment shall be considered as one solar energy system.

K. All mechanical equipment associated with and necessary for the operation of the solar energy system shall comply with the following:

1) Mechanical equipment shall be screened from any adjacent property that is residentially zoned or used for residential purposes. The screen shall consist of shrubbery, trees, or other plant materials which provides a visual screen. In lieu of a planting screen a decorative fence meeting the requirements of the Zoning Ordinance may be used.

2) Mechanical equipment shall not be located within the minimum front yard setback of the underlying zoning district.

3) Mechanical equipment shall be setback at least ten (10) feet from the rear and side property lines.

L. Solar panels shall be placed such that concentrated solar radiation or glare shall not be directed onto nearby properties or roadways.

M. Solar panels shall not be placed in the vicinity of the Airport in a manner that would interfere with airport flight patterns. Acknowledgement from the Federal Aviation Administration may be necessary.

N. All power transmission lines from a ground mounted ~~the~~ solar energy system to any building or other structure shall be located underground.

O. A solar energy system shall not be used to display advertising, including signage, streamers, pennants, spinners, reflectors, ribbons, tinsel, balloons, flags, banners or similar materials. The manufacturer's or installer's identification and any appropriate warning signs and placards may be displayed on the solar energy system provided they comply with the prevailing sign regulations.

P. A solar energy system shall not be constructed until a building permit has been approved and issued.

Q. The design of the solar energy system shall conform to applicable industry standards. A building permit shall be obtained for a solar energy system per the PA Uniform Construction Code (UCC). All wiring shall comply with the applicable version of the National Electric Code (NEC). The local utility provider (PPL) shall be contacted to determine grid interconnection and net metering policies. The Applicant shall submit certificates of design compliance obtained by the equipment manufacturers from a

certifying organization and any such design shall be certified by an Engineer registered in the Commonwealth of PA.

R. The solar energy system shall comply with all applicable Township Ordinances and Codes so as to ensure the structural integrity of such solar energy system.

S. Before any construction can commence on any solar energy system the property owner must acknowledge that he/she is the responsible party for owning and maintaining the solar energy system. If the solar energy system is abandoned or is in a state of disrepair it shall the responsibility of the property owner to remove or maintain the solar energy system.

2. If a ground mounted solar energy system is removed, any earth disturbance as a result of the removal of the ground mounted solar energy system shall be graded and reseeded.

Section 3. All other portions, parts and provisions of the Zoning Ordinance of Manheim Township – 1989, as heretofore enacted and amended, shall remain in force and effect.

Section 4. This Ordinance shall take effect and be in force after its enactment by the Board of Commissioners of the Township of Manheim as provided by law.

DULY ORDAINED AND ENACTED the 10th day of August, 2009, by the Board of Commissioners of the Township of Manheim, Lancaster County, Pennsylvania, in lawful session duly assembled.

TOWNSHIP OF MANHEIM
Lancaster County, Pennsylvania

Attest: _____ By: _____
(Assistant) Secretary (Vice) President
Board of Commissioners

[TOWNSHIP SEAL]

(TOWNSHIP SEAL)S:\Zoning Ordinance\Amendments\Proposed\Solar Energy Systems.0522009.doc

WIND ENERGY SYSTEMS

TOWNSHIP OF MANHEIM
Lancaster County, Pennsylvania

ORDINANCE NO. 2009 - 17

AN ORDINANCE TO AMEND THE ZONING ORDINANCE OF MANHEIM TOWNSHIP – 1989, AS AMENDED, BY AMENDING ARTICLE 5, BY ADDING DEFINITIONS FOR WIND ENERGY SYSTEMS, WIND ENERGY SYSTEM HEIGHT AND WIND ENERGY SYSTEM TURBINE; AND BY AMENDING ARTICLE 23, PERFORMANCE REGULATIONS BY ADDING A NEW SETION 2323 TO PERMIT WIND ENERGY SYSTEMS AS AN ACCESSORY STRUCTURE/USE BY CONDITIONAL USE IN THE AGRICULTURAL ZONING DISTRICT.

BE IT HEREBY ENACTED AND ORDAINED by the Board of Commissioners of Manheim Township, Lancaster County, Pennsylvania, the Manheim Township Zoning Ordinance of 1989, as amended, shall be amended in the following respects:

Section 1. The Zoning Ordinance of Manheim Township – 1989, Article 5, Definitions, shall be amended to include the following definitions:

> Wind Energy System. An energy conversion system consisting of a wind turbine, a tower, blades and associated controls and appurtenances that convert wind energy to a usable form of energy to meet all or part of the energy requirements of the on-site user and which has a rated capacity that does not exceed the rated capacity appropriate to the on-site user.
>
> Wind Energy System Height. The distance measured from the ground surface of the wind energy system tower base to the highest point of the extended blade tip or highest point of the wind energy system.
>
> Wind Energy System Turbine. The parts of a wind energy system including the blades, generator and tail.

Section 2. The Zoning Ordinance of Manheim Township – 1989, Article 23, Performance Regulations, shall be amended by adding Section 2323 as follows:

Section 2323. WIND ENERGY SYSTEMS

1. Purpose: It is the purpose of this regulation to promote the safe, effective and efficient use of wind energy and to reduce the on-site consumption of utility supplied energy as an accessory use while protecting the health, safety and welfare of adjacent and surrounding land uses through appropriate zoning and land use controls. Wind energy systems shall be permitted in the agricultural zoning district as an accessory use by conditional use with the general standards as set forth in Section 2210.3 herein, and with specific criteria as set forth in this Section. This Section is intended to accomplish the following:

   A. Provide for appropriate locations and development of wind energy systems in Manheim Township.
   B. Protect Manheim Township's natural environment by promoting wind energy systems and reducing the use of fossil fuels.
   C. Minimize adverse nuisance and visual impacts of wind energy systems through careful design and siting techniques.
   D. Avoid potential damage to adjacent properties through engineering and careful siting for wind energy systems.
   E. Encourage and promote the location of wind energy systems in areas not immediately adjacent or adversely effecting residential uses.

2. Modifications: The Board of Commissioners may, by conditional use approval, permit the modification of the provisions of this Section, including but not limited to provisions related to the number of turbines and associated appurtenances per lot, the height of the system and the minimum yard dimensions in order to encourage the use of wind energy systems. An applicant desiring to obtain conditional use approval shall, when making application for conditional use under this Section shall also make application for modifications simultaneously. However, granting of a modification shall not have the effect of making null and void the intent and purpose of the Article. Any conditional use to permit a modification of the requirements of this Section shall be subject to the following standards:

   A. The design and improvement shall be in harmony with the purpose and intent of this Section.
   B. The design and improvement shall not have an adverse impact on the surrounding neighbors.
   C. The proposed modification shall not result in any danger to the public health, safety or welfare.

D. The landowner shall demonstrate that the proposed modification will allow equal or better results and represents the minimum modification necessary.

E. The applicant must demonstrate to the satisfaction of the Board of Commissioners that with respect to each request for a modification that literal compliance with the provisions of this Ordinance is unreasonable; causes undue hardship because of unique or unusual conditions pertaining to the subject property but meets the purpose and intent of the Ordinance; and is unnecessary because an alternate standard can be demonstrated to provide equal or better results.

If the Board of Commissioners determines that the landowner has met his burden, it may grant a modification of the requirements of this Section. In granting modifications, the Board of Commissioners may impose such conditions as will, in its judgment, secure the objectives and purposes of this Section.

3. General Standards: Where said general standards and specific criteria overlap, the specific criteria shall supersede the general standards. The installation and construction of a wind energy system shall be subject to the following development and design standards:

A. A wind energy system is permitted in the Agricultural district as an accessory use by conditional use.

B. A wind energy system shall provide power for the principal use and/or accessory uses of the property on which the wind energy system is located and shall not be used for the generation of power for the sale of energy to other users, although this provision shall not be interpreted to prohibit the sale of excess power generated from time to time to the local utility company.

C. A wind energy system connected to the utility grid shall provide written authorization from the local utility company acknowledging and approving such connection.

D. The maximum number of towers in a wind energy system is one per lot.

E. The maximum wind energy system height is eighty-five (85) feet. The height shall be measured from the ground surface of the wind energy system tower to the highest point of the extended blade tip or the highest point of the wind energy system. The permitted height limits are also subject to

applicable Federal Aviation Administration regulations regarding objects affecting navigable airspace. The applicant shall provide acknowledgement from the Federal Aviation Administration or from a representative from the Lancaster Airport Authority authorized to acknowledge such request indicating that the height of the wind energy system does not adversely affect the airspace of the airport.

F. Setbacks from the wind energy system shall be as follows:

i) Setback from property line - The minimum wind energy system setback distance from the nearest property line shall be a distance equal to or greater than the distance from the wind energy system tower base to the tip of the blade or the highest point of the wind energy system.

ii) Setback from residential dwellings - The minimum wind energy system setback distance from any residential dwelling excluding the dwelling situated on the property where the wind energy system will be located shall be five hundred (500) feet from the property line and one thousand (1,000) feet from the residential dwelling. The distance shall be measured from the nearest point of the extended tip of the blade or nearest point of the wind energy system to the residential dwelling.

Upon written notice and approval from the adjacent property owner, a less restrictive setback may be accepted by the Board of Commissioners. Any such written acknowledgement shall include a protection zone extending and covering the area a distance equal to the height of the wind energy system such that no building may be constructed within this protection zone.

iii) The minimum wind energy system setback distance from all above ground utility lines, radio, television or telecommunication towers shall be a distance equal to or greater than the distance from the wind energy system tower base to the tip of the blade or the nearest point from the wind energy system to the above ground utility lines, radio, television or telecommunication towers.

iv) The minimum distance from guy wires, accessory structure, and other appurtenances of the wind energy system shall be ten (10) feet from the property lines.

v) Wind energy systems shall not be located within the required front yard setback.

G. The distance between the ground and any part of the rotor or blade system shall be no less than fifteen (15) feet.

H. Wind energy systems shall be equipped with an appropriate anti-climbing device or other similar protective device to prevent unauthorized access to the wind energy system. Such anti-climbing device shall be installed to a minimum height of fifteen (15) feet from the ground or roof if the wind energy system is situated on the roof. Access doors to wind energy systems and electrical equipment shall be locked to prevent entry by non-authorized person.

I. All power transmission lines from the wind energy system to any building or other structure shall be located underground. There shall be no exposed wiring.

J. Wind energy systems shall be a neutral non-obtrusive color such as white, off-white, gray, brown or earth tone shade unless required by the Federal Aviation Administration or other regulatory agency to be otherwise.

K. Audible sound from a wind energy system shall not exceed sixty (60) decibels, as measured at the exterior of any occupied building on the adjacent parcels.

L. All wind energy systems shall be designed with an automatic brake to prevent over-speeding and excessive pressure on the wind energy system tower structure.

M. Wind energy systems shall not be artificially lighted unless required by the Federal Aviation Administration or other applicable regulatory authority. If the Federal Aviation Administration requires safety lighting, the use of red beacons is preferred to flashing strobe lights. Illumination of the wind energy system shall be avoided.

N. Wind energy systems shall not be used to display advertising, including signage, streamers, pennants, spinners, reflectors, ribbons, tinsel, balloons, flags, banners or similar

materials. The manufacturer's or installer's identification and any appropriate warning signs and placards may be displayed on the wind energy system provided they comply with the prevailing sign regulations.

O. Mechanical equipment associated with the use of the wind energy system shall comply with the following:

i) Any mechanical equipment associated with and necessary for the operation of the wind energy system that is not enclosed within the wind energy tower or within an accessory structure on the property shall comply with the following:

a) Mechanical equipment shall be screened from any adjacent property that is residentially zoned or used for residential purposes. The screen shall consist of shrubbery, trees, or other plant materials which provides a visual screen. In lieu of a planting screen a decorative fence meeting the requirements of the Zoning Ordinance may be used.

b) Mechanical equipment shall not be located within the minimum front yard setback of the underlying zoning district.

c) Mechanical equipment shall be setback at least ten (10) feet from the rear and side property lines.

P. A site plan including the following information shall be included:

i) Overall site boundary with sufficient information to show the location of the property in proximity to adjacent properties and existing features located within five hundred feet (500') of the subject property boundaries.

ii) Identification of adjacent property owners.

iii) Location, dimensions, and types of existing structures on the property and proximity to structures on adjacent lots within five hundred feet (500') of the subject wind energy system.

iv) Location and dimension of driveways, roadways and significant features within and adjacent to the subject property within five hundred feet (500') of the subject property boundaries.

v) Location of the proposed wind energy system, foundations, guy anchors and associated equipment.

vi) Setback requirements as outlined in this ordinance and proposed setbacks.

vii) The location of any rights-of-way, easements, floodplains, or other covenants restricting the use of the property.

viii) The location of any overhead utility lines, radio transmission lines, cable lines or other overhead lines within five hundred feet (500') of the subject property boundaries.

ix) The location of any telecommunication towers within 1,000' of the subject property.

x) Wind energy system specifications, including manufacturer, model, rotor diameter, tower height, tower type.

Q. A report from a qualified engineer, licensed in the State of Pennsylvania, documenting the following shall be submitted for review:

i) Description of the wind energy system including overview, project location, the rated capacity for the on-site user, type and height of facility including generating capacity, dimensions and respective manufacturers and a description of the ancillary facilities. Description should include technical, engineering, economic, and other pertinent factors governing selection of the proposed design.

ii) Evidence of structural integrity of each tower structure.

iii) Structural failure characteristics of the each tower structure and demonstration that site and setbacks are of adequate size to contain debris.

iv) Information demonstrating that the proposed wind energy system is for the sole purpose of generating energy for the user of the property with the exception of the excess energy that may be generated from time to time and sold to the local utility company.

v) Identification of the nearest wind energy system, telecommunication tower and residential homes.

vii) The applicant shall describe the technical options available and reasons why the technical option selected was chosen over the other options.

viii) Provide make, model, picture and manufacturer's specifications.

R. Visual Impact - demonstrations including before and after photo-simulations and elevation drawings showing the height, design, color, night lighting and proposed location of the facility as viewed from neighboring areas. The applicant shall demonstrate through project site planning and proposed mitigation that the wind energy system's visual impacts will be minimized for surrounding neighbors and the community. This may include, but is not limited to information regarding site selection, turbine design or appearance, buffering and screening of mechanical equipment.

i) Clearing of natural vegetation shall be limited to that which is necessary for the construction, operation and maintenance of the wind energy system.

S. Other relevant studies, reports, certifications and approvals as may be reasonably requested by the Township to ensure compliance with this Ordinance.

T. Evidence that the applicant is the owner of the premises involved or that the applicant if he is a tenant of the property has written permission of the owner to make such application.

U. Permitting - A wind energy system shall not be constructed until a building permit has been approved and issued.

i) The design of the wind energy system shall conform to applicable industry standards. A building permit shall be obtained for wind energy systems per the PA Uniform Construction Code (UCC). All wiring shall comply with the applicable version of the National Electric Code (NEC). The local utility provider (PPL) shall be contacted to determine grid interconnection and net metering policies. The Applicant shall submit certificates of design compliance obtained by the equipment manufacturers from a certifying organization and any such design shall be certified by an Engineer registered in the Commonwealth of PA.

ii) The wind energy systems shall comply with all applicable Township Ordinances and Codes.

V. Maintenance - All wind energy systems shall be maintained in compliance with Township standards contained in the

applicable codes and ordinances so as to ensure the structural integrity of such facilities. If, upon inspection by the Zoning Officer or any code official, any such facility determined not to comply with the applicable codes and ordinances or to constitute a danger to persons or property, then notice of such lack of compliance shall be provided to the owner of the property. Failure to bring such facility into compliance shall constitute a violation of this ordinance.

i) Before any construction can commence on any wind energy systems the property owner must acknowledge that he/she is the responsible party for owning and maintaining the wind energy system. If the wind energy system is abandoned or is in a state of disrepair it shall be the responsibility of the property owner to remove or maintain the wind energy system.

ii) Any earth disturbance as a result of the removal of the ground mounted wind energy system shall be graded and reseeded.

Section 3. All other portions, parts and provisions of the Zoning Ordinance of Manheim Township – 1989, as heretofore enacted and amended, shall remain in force and effect.

Section 4. This Ordinance shall take effect and be in force after its enactment by the Board of Commissioners of the Township of Manheim as provided by law.

DULY ORDAINED AND ENACTED the 10th day of August, 2009, by the Board of Commissioners of the Township of Manheim, Lancaster County, Pennsylvania, in lawful session duly assembled.

TOWNSHIP OF MANHEIM
Lancaster County, Pennsylvania

Attest: _____ By: _____

(Assistant) Secretary

(~~Vice~~) President
Board of Commissioners

[TOWNSHIP SEAL]
(TOWNSHIP SEAL)S:\Zoning Ordinance\Amendments\Proposed\Wind energy systems.052009.doc

ORDINANCE NO. 2064

AN ORDINANCE OF THE BURGESS AND TOWN COUNCIL OF THE BOROUGH OF POTTSTOWN CREATING A NEW SECTION 503 TO BE ADDED TO ARTICLE 5, GENERAL REGULATIONS, OF CHAPTER 27, ZONING, OF THE CODE OF ORDINANCES OF THE BOROUGH OF POTTSTOWN, AS AMENDED, TO ESTABLISH REGULATIONS FOR THE USE OF SOLAR ENERGY EQUIPMENT; AND AMENDING THE REGULATIONS FOR ALL ZONING DISTRICTS TO PERMIT SOLAR ENERGY EQUIPMENT AS AN ACCESSORY USE.

WHEREAS, the Burgess and Town Council of the Borough of Pottstown has adopted a comprehensive Zoning Ordinance to preserve and enhance the character of the Borough and promote the general welfare of its residents; and

WHEREAS, Borough Council and the Borough Planning Commission periodically review the Zoning Ordinance to determine if revisions are warranted; and

WHEREAS, due to a number of factors, a greater interest has been expressed in alternative energy sources for both residential and commercial uses, including the use of solar panels and other forms of solar energy equipment; and

WHEREAS, Borough Council believes that regulations are appropriate for solar energy equipment to permit their use subject to certain conditions, to allow Borough residents to take advantage of solar energy equipment while attempting to protect and ensure the value of neighboring properties.

NOW, THEREFORE, BE IT ENACTED AND ORDAINED by the Burgess and Town Council of the Borough of Pottstown, Montgomery County, Pennsylvania, and **IT IS HEREBY ENACTED AND ORDAINED** by the authority of same as follows:

SECTION 1. Section 200, Permits Required, of Article 2, Applications, of Chapter 27, Zoning, of the Code of Ordinances of the Borough of Pottstown, as amended, is hereby amended to create a new subsection "D", which shall provide as follows:

§200. **Permits Required.**

D. Install solar energy equipment with a total combined area of eight (8) square feet or more, pursuant to Section 503 of this Chapter.

SECTION 2. A new Section 503, Solar Energy Equipment, is hereby created and added to Article 5, General Regulations, of Chapter 27, Zoning, of the Code of Ordinances of the Borough of Pottstown, as amended, and shall provide as follows:

§503. **Solar Energy Equipment.**

1. **Purpose:** The purpose of this Section is to provide standards for the use of solar energy equipment as accessory uses within the Borough of Pottstown. This Section seeks to protect properties from incompatible uses and to conserve and enhance property values, while promoting the use of alternative energy sources, where appropriate. This Section provides a process to facilitate the use of solar power in a manner that minimizes visual impacts of solar energy equipment and the potential for nuisance.

2. **Definition:** Solar energy equipment is defined as a solar photovoltaic panel, solar hot air or hot water panel collector device, or other type of energy system which relies upon solar radiation as a source for the generation of electricity or transfer of stored heat.

3. **Accessory Use:** Solar energy equipment shall be permitted as an accessory use in any zoning district upon receipt of a permit from the Zoning Officer.

A. Exclusions from zoning permit requirement.

1. The installation of one (1) solar panel with a total area of less than eight (8) square feet.

2. Repair and replacement of existing solar energy equipment, provided that there is no expansion of the size or coverage area of the solar energy equipment.

4. **Application for Zoning Permit:** An applicant who seeks to install solar energy equipment shall submit an application for a zoning permit, as provided by the Borough. The application shall include photographs of the existing conditions of the property as well as renderings of the proposed solar energy equipment and a description of the screening to be provided for ground or wall mounted solar energy equipment.

5. **Review of Application:**

A. Upon receipt of a completed application for the installation of solar energy equipment, the Zoning Officer shall refer the application to the Borough Planning Commission and the Montgomery County Planning Commission to review the application and either recommend approval of the solar energy equipment or recommend alternatives to the applicant within thirty (30) days. Recommendations of the Planning Commissions shall be advisory only and shall not be considered as grounds for approving or denying an application.

B. If the Planning Commissions recommends approval of an application, the Zoning Officer shall issue a permit for the work if the application complies with the requirements of this Section. If the Planning Commissions recommend alternatives to the applicant, no permit shall be issued until the applicant formally acknowledges that he or she has received the recommendations of the Planning Commissions.

C. Regardless of the action of the Planning Commissions, the Zoning Officer shall have the

authority to impose reasonable conditions to safeguard the public health, safety and welfare.

6. **Criteria for the use of solar energy equipment:**

A. General.

1. Solar energy equipment shall be located in the least visibly obtrusive location where panels would be functional.

2. Solar energy equipment must comply with all setback and height requirements for the zoning district in which the property is located.

3. Non-functioning solar energy equipment shall be repaired or replaced within three (3) months of becoming nonfunctional.

B. Ground-mounted solar energy equipment.

1. Solar energy equipment shall only be located in the side or rear yard of a property.

2. Ground -mounted solar energy equipment may not exceed a height of ten (10) feet in height above the ground.

3. Solar energy equipment must be substantially screened from public view (including adjacent properties and public rights of way) by fencing, plantings, or a combination thereof, as determined by the Zoning Officer.

4. All exterior electrical and/or plumbing lines must be in placed in a conduit and buried below the surface of the ground.

5. Solar energy equipment shall not block any required parking areas, sidewalks or walkways.

C. Roof or wall-mounted solar energy equipment.

1. It is encouraged that roof-mounted solar energy equipment shall be installed in the plane of the roof (flush mounted) or made a part of the roof design (capping or framing is compatible with the color of the roof or structure). Mounting brackets shall be

permitted if the applicant can demonstrate that the existing pitch of the roof would render the solar energy equipment ineffective or would be impossible.

2. Solar energy equipment shall be located on a rear or side facing roof, as seen from the fronting street, unless the applicant can demonstrate that such installation would be ineffective or is impossible.

3. Solar energy equipment shall not project vertically above the peak of the roof to which it is attached, or project vertically more than five (5) feet above a flat roof.

4. All exterior electrical and/or plumbing lines mus be painted in a color scheme that matches as closely as reasonably possible the color of the structure and the materials adjacent to the lines.

7. In the event of a conflict between this Section and the provisions of Chapter 23 of the then-current version of the International Residential Code (IRC), the IRC shall supercede this Section.

SECTION 3. The following Sections of Article 3, Districts, of Chapter 27, Zoning, of the Code of Ordinances of the Borough of Pottstown, as amended, are hereby amended to permit solar energy equipment as an accessory use within each zoning district:

Section 318.4, Neighborhood Residential (Conservation);
Section 319.4, Traditional Town Neighborhood (Conservation);
Section 320.3, Downtown (Conservation);
Section 332.4, Neighborhood Business (Gateway);
Section 333.5, Downtown Gateway (Gateway);
Section 334.4, Gateway East and Gateway West (Gateway);
Section 335.3, Park (Gateway);
Section 336.4, Flex Office (Contemporary);
Section 337.4, Highway Business (Contemporary);
Section 338.4, Heavy Manufacturing (Contemporary).

SECTION 4. Reenactment. In all other respects, the remaining provisions of Chapter 27, Zoning, of the Code of Ordinances of the Borough of Pottstown, as amended, to the extent not inconsistent herewith, are hereby reenacted and reordained.

SECTION 5. Severability. If any sentence, clause, section or other part of this ordinance is, for any reason, found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not effect or impair any remaining provisions, sentences, clauses, sections or other parts of this ordinance. It is hereby declared as the intent of the Burgess and Town Council of the Borough of Pottstown that this ordinance would have been adopted had such unconstitutional, illegal or invalid sentence, clause, section or part thereof not been included herein.

SECTION 6. Effective Date. This ordinance shall become effective immediately upon enactment.

ENACTED and **ORDAINED** this 13TH day of JULY, 2009.

THE BURGESS AND TOWN COUNCIL
OF THE BOROUGH OF POTTSTOWN

BY: Mark S. Schell
VICE President

ATTEST: Virginia L Takach
Secretary

Approved this 13TH day
of JULY, A.D., 2009.

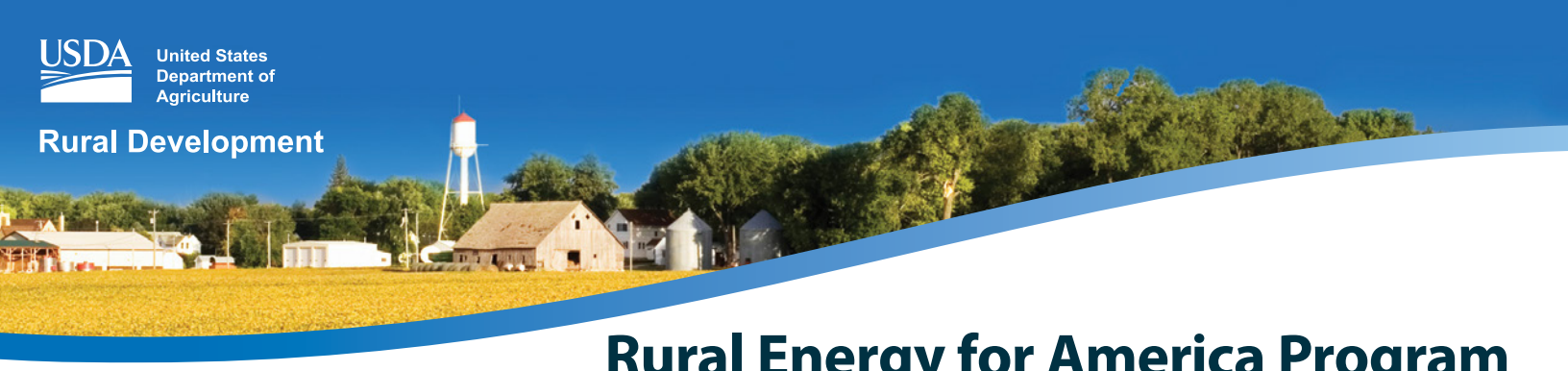
Sharon V Thomas
Mayor

APPENDIX H

Rural Energy for America Program Factsheet

USDA United States Department of Agriculture

Rural Development



Rural Energy for America Program Renewable Energy & Energy Efficiency

What does this program do?

Provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses to purchase or install renewable energy systems or make energy efficiency improvements.

Who may apply?

- Agricultural producers with at least 50% of gross income coming from agricultural operations, and
- Small businesses in **eligible rural areas**.

NOTE: Agricultural producers and small businesses must have no outstanding delinquent federal taxes, debt, judgment or debarment.

What is an eligible area?

- Businesses must be in an area other than a city or town with a population of greater than 50,000 inhabitants and the urbanized area of that city or town. **Check eligible business addresses**.
- Agricultural producers may be in rural or non-rural areas.

How may the funds be used?

Funds may be used for the purchase, installation and construction of renewable energy systems, such as:

- Biomass (for example: biodiesel and ethanol, anaerobic digesters, and solid fuels).
- Geothermal for electric generation or direct use.
- Hydropower below 30 megawatts.
- Hydrogen.
- Small and large wind generation.
- Small and large solar generation.
- Ocean (tidal, current, thermal) generation.

Funds may also be used for the purchase, installation and construction of energy efficiency improvements, such as:

- High efficiency heating, ventilation and air conditioning systems (HVAC).
- Insulation.
- Lighting.
- Cooling or refrigeration units.
- Doors and windows.
- Electric, solar or gravity pumps for sprinkler pivots.
- Switching from a diesel to electric irrigation motor.
- Replacement of energy-inefficient equipment.

What funding is available?

- Loan guarantees on loans up to 75% of total eligible project costs.
- Grants for up to 25% of total eligible project costs.
- Combined grant and loan guarantee funding up to 75% of total eligible project costs.

What are the loan guarantee terms?

- $5,000 minimum loan amount.
- $25 million maximum loan amount.
- Up to 85% loan guarantee.
- Rates and terms negotiated with the lender and subject to USDA approval.
- Maximum term of 30 years for real estate.
- Maximum term of 15 years, or useful life, for machinery and equipment.
- Maximum term of 7 years for capital loans.
- Maximum term of 30 years for combined real estate and equipment loans.

USDA United States Department of Agriculture

Rural Development

Rural Energy for America Program Renewable Energy & Energy Efficiency

What are the grant terms?

Renewable Energy System Grants:

- $2,500 minimum.
- $500,000 maximum.

Energy Efficiency Grants:

- $1,500 minimum.
- $250,000 maximum.

Are there additional requirements?

- Applicants must provide at least 75% of the project cost if applying for a grant only.
- Applicants must provide at least 25% of the project cost if applying for loan, or loan and grant combination.
- Projects greater than $200,000 require a technical report.
- Energy efficiency projects require an energy audit or assessment.

How do we get started?

Applications for this program are accepted year round at your **local office**.

Who can answer questions?

Contact your **State Rural Development Energy Coordinator**.

What governs this program?

- Basic Program – **7 CFR 4280, Subpart B**
- This program is authorized by Title IX of the **Agricultural Act of 2014**, (2014 Farm Bill)

Why does USDA Rural Development do this?

This program helps increase American energy independence by increasing the private sector supply of renewable energy and decreasing the demand for energy through energy efficiency improvements. Over time, these investments can also help lower the cost of energy costs for small businesses and agricultural producers.

NOTE: Because citations and other information may be subject to change please always consult the program instructions listed in the section above titled "What Law Governs this Program?" You may also contact **your local office** for assistance. You will find additional forms, resources, and program information at **www.rd.usda.gov**. ***USDA is an equal opportunity provider, employer, and lender.***

Last Updated March 2015