AGENDA ITEM or FINAL CONTRACT REVIEW SUBMITTAL FORM

AgendaTitle:
Potential Alternative Energy Source Discussion

Action Requested: Discussion

Parties to the Agreement:

Term Begins: **Term Ends:** **Grant Contract #:**

Summary:
Presentation and discussion on summary document for Strategic Result #4 of the BoCC Strategic Plan/ Protect the Environment

Fiscal Impact:

Submitted by: John Cattles **Submitter's Email Address:** jcattles@gunnisoncounty.org

Finance Review: (●) Required ( ) Not Required

Comments:

Reviewed by: GUNCOUNTY1\lNienhueser Discharge Date: 11/18/2014

County Attorney Review: ( ) Required (●) Not Required

Comments:

Reviewed by: Discharge Date: Certificate of Insurance Required Yes ( ) No ( )

County Manager Review:

Comments:

Reviewed by: GUNCOUNTY1\mbirnie Discharge Date: 11/18/2014

( ) Consent Agenda ( ) Regular Agenda (●) Worksession Time Allotted: 20 minutes

Agenda Date: 11/25/2014 Follow Up Agenda Date:

Revised April 2013

Gunnison County Strategic Plan
Protect the Environment

Strategic Result #4:
County-owned assets will be identified for potential designation towards renewable energy sources.

Gunnison County owned assets (roofs, land, etc.) which have potential for renewable energy development have been surveyed and classified by the following criteria:

- **What energy source is available or has the most potential for development:**
  - Photovoltaic (PV)
  - Solar thermal
  - Geothermal -or more accurately Ground Source Heat Pumps (GSHP) or Water Source Heat Pumps (WSHP)
  - Wind
- **Is access clear:**
  - Would development interfere with current use?
  - Would development conflict with future other development of the area?
- **Is the source economically viable now or in the future**
- **Renewable energy source must be real; tested, able to be implemented, and proven as a legitimate replacement or supplement to traditional energy sources.**

Solar Thermal and Wind –

There has been a huge swing taking place in the renewable energy world over the last 2 years or so, the cost of PV has been dropping dramatically. The cost of purchasing and installing PV panels for commercial scale projects (50+ Kw) is about $2.60 per Watt dc. Compared to solar thermal which costs between $4-8 per Watt dc depending on how the system is operated and works with the facility's HVAC system, also solar thermal has higher maintenance costs than PV. This is a huge change in the industry, for the last 30 years solar thermal has outperformed PV. For commercial scale projects solar thermal is not as cost efficient as PV for the same output. However, where solar thermal can be installed with minimal piping and controls, such as with low mass sunrooms, solar thermal is more cost effective than PV.

Wind generation costs similar to PV at between $2-4 per Watt dc, with the lower prices obtained through scale, but the Gunnison Valley floor is a poor location for wind turbines, according to the USGS wind development in the Gunnison valley is 'low' to 'marginal' potential given our average wind conditions.

With these findings solar thermal and wind energy development were ignored for this survey.

Ground Source Heat Pumps – or Geothermal

GSHP uses electricity to run the pumps and pull free heat (or cooling) out of the ground, they can achieve 400% efficiency meaning that for every 1 unit of energy consumed running the pumps and compressors 4 units of heat is returned for use in the facility. Given that the City of Gunnison has very low electricity rates the value is even greater compared to natural gas rates. GSHP is a very good option for Gunnison County facilities.

Blackstock Government Center

Potential energy sources:

- PV
- GSHP

The low-slope roof system at the South end of the Blackstock building is a good location for PV panels. Panels could be set on the roof but would be un-seen from ground level due to the parapet wall which would also offer some protection from damage. The area gets exposure all day with no shading from trees or nearby buildings. An estimate was run on the solar potential of this site using software from the National Renewable Energy Lab, the software estimated a 55kW system could be developed at a cost of $2.60/W dc. This translates to a cost of $0.10/kWh. Currently our electricity costs from the City of Gunnison are $0.07/kWh. This system would produce about 89,000 kWh per year of electricity, the months it would produce the most correspond to the facility's highest electricity usage in the summer months for cooling. This system could produce about 40% of the electricity used at the facility during summer months, during winter months it would produce about ½ that.

The City electricity rates are very low, which makes the development of PV electric generation financially not beneficial. Outside of the City Gunnison, County Electric Association rates are much higher at $0.13/kWh, the average for Colorado is $0.12/kWh. If the City of Gunnison rates were to rise closer to the average rate PV would become financially beneficial.

GSHP energy could be developed at the Blackstock building utilizing vertical wells or possibly a horizontal system placed on the grassy area (formerly Pine Street) between Blackstock and the Family Services Center. Horizontal systems cost on average about ½ what vertical loop systems cost, the challenge is having enough space, the large open space on Pine Street gives the Blackstock building a great advantage. There are several applications that could be utilized but the most cost effective would be a water to water system which delivers hot or cool water to the air handlers that are already in place in the facility. The heat pumps would be simply replacing the two boilers and chiller that are in place now. The chiller at Blackstock is nearly 30 years old and the boilers are 14 years old, the chiller had major re-work done 8 years ago including

new compressors the life expectancy of the compressors is 23 years, the boiler life expectancy is 20 years. The heat pumps and equipment needed to convert to geothermal would be less expensive than replacing the current equipment. There are options for how to pay for the loop field; we could finance it and pay for it outright as we are at the Courthouse, we would re-coup the cost of the installation over a period of time through energy cost savings, or we could secure a 'Power Purchase Agreement' in which a company would build the loop field and commit to selling us energy off of the loop field for a fixed cost per kW for a period of time. This is very similar to a model that is becoming common in the installation of PV systems, the owner buys power not the system. Often there is an option to buy the system after 6 years when the installing company has depreciated it fully usually for about 30% less than the original installation costs.

I recommend that the County consult a professional geothermal mechanical engineer to estimate the cost of a GSHP system for the Blackstock building. If a GSHP heating and cooling system was installed it would setup the facility for future use of PV electricity if the cost of PV became more favorable compared to the City grid since the energy used for GSHP is electricity.

Family Services Center

Potential energy sources:

- PV
- GSHP

The Family Services Center has a low slope roof system over the entire building which would provide a good location for mounting PV panels. There are mature trees along the East side of the facility which would shade panels along that side of the building so a PV array would have to be setback from that location limiting the roof area available for PV. Adjusting for the setback, an estimate was run on the solar potential of this site using software from the National Renewable Energy Lab, the software estimated a 62kW system could be developed at a cost of $2.60/Wdc. This translates to a cost of $0.10/kWh. Currently our electricity costs from the City of Gunnison are $0.07/kWh. As stated in the summary of PV potential at Blackstock, unless the cost of PV continues to fall or the electricity rates for the City rise, PV is not financially beneficial to build. The system at Family Services would be larger than the system at Blackstock and the energy use is lower, primarily because it is much smaller so the estimated system could provide up to 60% of the energy used at this facility in the summer and about 30% in the winter.

GSHP is a good fit at this facility, see the narrative under the Blackstock page. The boilers at Family services are 5 years old so new equipment costs could not be offset by the replacement costs we will already have to incur as at Blackstock. A loop field could be sized to handle both facilities and would give the county a cost advantage by building to a larger scale. Each facility would have its' own compressors but would share the loop field and pump station, this is similar to how Mesa State developed a multi-facility GSHP system.

Public Safety Center

Potential energy sources:

- PV
- GSHP

The Public Safety Center is an energy intense facility. It must be conditioned 24/7 365 days a year and requirements for constant air exchange demand continual heating or cooling of outside air. With such a high energy demand alternative energy investments at this facility will pay back capital costs more quickly than other facilities. As with the other facilities located within the City limits, PV does not make sense at this point but the low electricity rates make geothermal more attractive.

If a GSHP loop field could be placed in the lot to the East of the facility on Fairgrounds property there is plenty of space for a horizontal loop field which costs about half that of a vertical loop field . Because of the nature of the facility there is also an option to utilize a hybrid system which utilizes the sewer water as a heat source with a heat pump. There is constant water use at the facility with showers, toilets, laundry, and kitchen facilities, that water whether heated or cold has potential as a transfer medium for a heat pump without the cost of drilling wells or burying horizontal lines. Utilizing this free energy as a supplement to the loop field would allow for a smaller loop field and lower capital expenditure upfront. GSHP heating and cooling is a ‘low density’ energy source, meaning it produces a steady stream of energy but is limited in its’ ability to produce large amounts of energy quickly as can be achieved with burning natural gas in a large boiler. The design and use of the Public Safety Center as a place that maintains temperature at a fixed set point all the time suits GSHP, the system can provide steady heat or cooling all the time and maintain high efficiency.

Gunnison Crested Butte Regional Airport

Potential energy sources:

- PV
- GSHP

The Airport is an efficient building but uses a large amount of energy for several reasons: it is a large facility at 60,000 sq.ft., it operates at long hours which limits the available time for temperature setback, it has large garage doors that open to the tarmac when flights arrive letting out the heat, and finally because the main areas of the building are heated with in-floor radiant heat, setting back the temperature is of very limited value because the slab takes time to warm up and cool down. The radiant heat is a good fit with GSHP because it works best with a steady ‘low density’ energy source. There is plenty of land available for development of GSHP at the site. There are several water sources on the property which could be investigated for potential locations for a loop to be submerged. WSHP loops submerged in water features are inexpensive to install and have high efficiency. The distance from the water to the terminal may cause complications but it is still worth investigating.

Public Works

Potential energy sources:

- PV
- Geothermal
- Solar thermal

The main Public Works facility in Gold Basin Park is a good candidate for PV development because it has large flat roof surfaces with no obstructions to cause shadows. A large PV array could be mounted on the roof of the facility efficiently at a cost of about $2.60/Wdc, which converts to a cost of about $0.10/kWh. Public Works is on the City grid so low electricity rates of $0.07/kWh make building a PV array financially not beneficial at this point in time.

The south wall of the facility may be a good location for a simple solar thermal collector. Because of the simplicity of the heating system for the wash bay and main garage bay in the facility the high costs usually associated with solar thermal systems may not be as large at the Public Works building. A hot air solar collector (or Trombe wall) could be constructed on the south side which would take cool air from the floor level and as the air is heated it would rise to the top of the collector and back into the facility, or a fan system could be incorporated to move more air depending on design. Care would need to be taken to integrate a system like this into the controls sequence for the current HVAC system otherwise the efficiency of the current system could be impacted resulting in lower efficiency and reduced energy savings accomplished.

GSHP development may require further permission from DOE because of the conditions of the site, however GSHP should be investigated for the site. Water source heat pumping (WSHP) may also be possible if water bodies on the adjacent airport property could be utilized as remote locations for loop fields.

Antelope Hills Pump Station

The pump station is on GCEA grid so PV may be an option at this site to offset electrical costs.

Dos Rios Water Treatment

Heating the facility with a geothermal like heat pump – water source heat pump- which would take heat out of the incoming water or treatment ponds may be an efficient heat source. A heat pump could be coupled with PV in the future depending on electricity cost and cost to install panels.

CB shop

The Crested Butte shop could be a good candidate for PV power, however the proximity to the hillside to the West will limit solar gain in the afternoons so there would be a penalty against the potential power an array could produce. A study would have to be conducted to measure the exact amount of solar gain is available at the site. It is likely that the end cost of power produced by the array would be more than the $0.10 average we have found at sites with unobstructed solar potential.

The shop is heated with a boiler that runs on waste oil currently. Restrictions on oil burners may make it impossible to replace the boiler with another oil burner when it need replaced. A geothermal heat pump should be looked at as a potential heat source. GCEA currently has rebates for GSHP systems for space heating and water heating.

Doyleville shop

The Doyleville shop is a good candidate for PV, it has clear skies all around with no obstructions. Electricity use at the shop is sporadic so the PV system would only work with an energy buyback program with GCEA as energy may not be used at the same time or rate that it is produced on site, GCEA currently does not offer energy buyback with PV systems.

The shop currently gets supplemental heat from a simple hot air solar collector mounted on the south wall. Facilities along with Mike Pelletier has plans to make the heater more efficient and hopes to complete the work by the end of the year.

Marble Shop, Marble State Bank, and Somerset Shop

These properties were not considered at this time.