

Recipient Organization: Blackfeet Community College BFCC

Project Title: Blackfeet Community College Renewable Energy Project

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DOE Share: \$183,960

Recipient Cost Share: \$20,441

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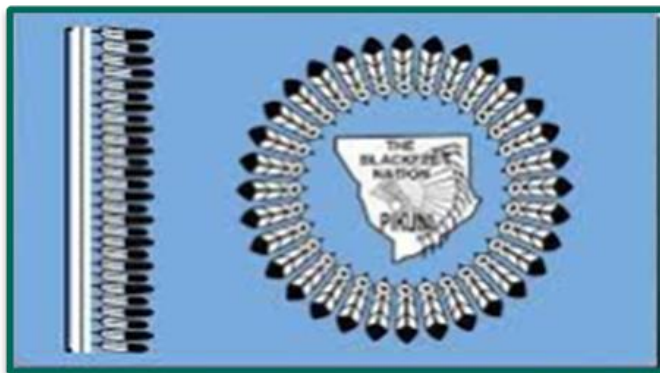
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1.0 Executive Summary

The Blackfeet Community College (BCC), under Topic Area 1.a. Energy Generating System(s), received funds to install solar photovoltaic (PV) systems to support four existing campus buildings. Blackfeet Community College seeks to bring renewable energy benefits to the Blackfeet Reservation Community.

BCC’s Institutional Development Department installed four grid-tied, solar photovoltaic (PV) systems on campus facilities totaling approximately 53.2 kW-DC. The four BCC buildings located in Browning, Montana provide the college campus with workout facilities and office and educational space: Red Fox Business Division, Little Star Blackfeet Child Care, Medicine Shield Fitness Center, and the Muskrat Lodge Media Center. These solar PV systems proposed to reduce the amount of electric energy purchased from the local utility by approximately 66%, equating to roughly \$5,500 in annual cost savings. In 12 months, Blackfeet Community College Renewable Energy Project produced 63.053 MWh from March 22 to March 23 which would reflect a savings of \$4,665.92.

The solar PV installations provided hands-on paid job training opportunities for 10 college students as well as community members in solar PV technology installation with 8 trainees completing the full training.



2.0 Background

Blackfeet Community College is located on the Blackfeet Reservation which includes 1.5 million acres managed by the Blackfeet Tribal Business Council. Energy research and planning began at BCC in 1998 to support the USDA Extension program to launch and maintain an off-grid greenhouse with upgrades to the water system using wind power generation. In 2001, Wind Turbines were installed to power the Vo-ed Workforce facility. BCC built the LEED Platinum South Wind Lodge 14,060 sqft in 2010. The facility is a smart building with a solar array with production capacity of 17.5 kw. The facility was the first LEED platinum facility on a college campus in Montana. The Blackfeet Tribe and Blackfeet Community College have partnered in the past to launch renewable energies on the reservation to support residential use of wind energy. Past wind energy projects have had significant challenges regarding operations and maintenance. The PV systems newly installed with this project will continue the energy efforts by serving as demonstration projects for students and community education as well as serve as a living facility lab for energy training opportunities.

BCC is chartered by the Blackfeet Tribe and is a fully accredited Higher Education Institution by the Northwest Commission on Colleges and Universities. BCC is a 1994 Land Grant Institution. BCC staff and faculty have a long history of coordinating research and partnerships that advance learning through the BCC mission and vision. The campus extends east with 696 acres that has the potential to engage students through BCC Academic Programs and trainings that are reflective of Blackfeet tribal resource management to promote workforce initiatives.

The Blackfeet Tribe is represented by more than 17,000 enrolled members with ancestral ties reaching as far as Canada and throughout the United States and has been in existence for more than 10,000 years. Nearly half of the members still reside on the Blackfeet Reservation with a land base of 1.5 million acres, known as our homeland today. Over the past ten years, the population has grown in every reservation community (Browning, Babb, St. Mary's, East Glacier, Starr School, Seville, and Heart Butte) by 21.7% with new members and non-member households. In 2010 the population of the Blackfeet Indian Reservation was 10,405. Between 1990 and 2010 the population of the reservation grew by 1,856 (21.7%) or about 93 persons per year. This is a higher growth rate than Glacier County which grew by 10.5%, but slightly lower than the State of Montana with a growth rate of 23.8%.



3.0 Project Objectives

For Blackfeet Community College, the solar projects are part of a longer phased energy plan for campus. The project will serve as a demonstration of solar on larger facilities. The four installations are the first facility upgrade demonstrations on campus. The upgrades will support energy cost savings for facilities prioritized for long-term use.

The project scope installed solar PV on four buildings on the Blackfeet Community College Campus located in Browning, MT. Campus facilities identified were prioritized for installation because of their location on campus, roof orientation, and all four have new roofing. The facilities on the BCC campus in Browning, MT include the Red Fox-Business Division, Little Star Blackfeet Child Care, Medicine Shield Higher Education Fitness Center, and the Muskrat Lodge Media Center.

The primary scope of work consists of the development, design, EPC (Engineering, Procurement, Contracting), installation, training, and commissioning of approximately 53.2 kW-DC of Solar PV generating systems on four campus buildings. Students of BCC and tribal job trainees assisted the vendor with the installations, gaining valuable hands-on experience and workforce development. System performance has been monitored for at least one year following interconnection. Results include paid training for students/trainees for the duration of installation and significant annual electricity savings for BCC.

Conversations with the local utility, a local electrician, and state entities to ensure compliance were completed with all parties including BCC site visits. Site-work, did not include electrical upgrades as they were not determined necessary. Interconnection and single line diagrams were submitted to the utility to complete interconnection agreements upon completion of designs. The vendor completed the procurement and equipment purchasing for the project to begin training, and installation of the approximate 53.2 kW-DC of solar PV generation systems on four BCC facilities. The vendor also conducted quality assurance and quality control checks, commission systems, inspection requirements, and obtained permission to operate (PTO) from the utility. The vendor continues to monitor system production and collect utility bills to analyze system performance.



4.0 Description of Activities Performed

Blackfeet Community College project partnerships include GRID Alternatives, Bonneville Environmental Fund and First Interstate Bank. Partners provide technical support, financial support and project planning support. The team worked to address tasks and milestones to implement the project.

In October 2020 the Blackfeet reservation experienced a significant spike in Covid-19 infections and it raised a concern about impacts on the project timeline. The time to advertise with a limited workforce and unknown materials availability, moved BCC forward to get the project design and implementation underway. GRID Alternatives was procured through a sole source installation contract due to the concerns of impacts from the Covid-19 pandemic. The contractor signed to provide installation, renewable energy training, O&M Training, warranty, and technical data support.

The BCC team worked closely with partners to meet the required 50% match requirement and were awarded funds from the Bonneville Environmental Fund and First Interstate Bank. However, in January of 2021 Blackfeet Community College requested a cost share reduction to address concerns with challenges of the COVID-19 pandemic. The news of a granted cost share reduction from the requirement of a 50% cost share match to a 10% requirement was delivered personally by the Deputy Secretary of Energy Mark W. Menezes to the Blackfeet Nation. The Deputy Secretary did a presentation to Blackfeet Tribal Business Council and Blackfeet Community College Board of Trustees and BCC project staff. News of the reduction award was timely as it lifted morale for the tribal leadership and the project staff at a very difficult time for the reservation.



Figure 1 BCC Board of Trustees and Administration and Deputy Secretary of Energy Mark W. Menezes
Figure 2 Blackfeet Tribal Business Council and Deputy Secretary of Energy Mark W. Menezes

In February 2021 Blackfeet Community College met with the GRID Alternatives Design Team to collect some final data on meters and facilities and worked with Glacier Electric to finalize interconnection agreements. GRID started to work toward final drawings and training plan with BCC Team.

GRID Alternatives worked with a local electrician on evaluation of existing electrical conditions. It was determined there were no upgrades required on BCC facilities to prepare for the solar installation. With this determined GRID began procurement of equipment to be shipped to Browning by anticipated May 24, 2021. Following with a week for mobilization. Project installation and training was scheduled for June 7, 2021.

Trainees were selected in May and all trainees were invited to participate in a week-long OSHA 10 virtual training along with several other institutions. BCC Installation was planned June 7-July 2, 2021. The timeline worked out for trainees to engage in additional training that added value through safety training. There was high interest in the BCC training with a total of 14 applications, 8 BCC students, current and alumni, were selected through a sign up, survey and interview process implemented by BCC and GRID Alternatives.



First weeks training was intense in the classroom for online delivery. A pre-assessment was implemented to inform a student-centered delivery and schedule. An orientation week included homework involving simple applied research exercises by collecting personal energy use bills. Also included was basics in construction and electrical basics followed by safety, solar, and efficiency training. The introduction to climate change session was included to engage meaningful learning to the orientation week. Other topics covered Tribal Energy and Policy. The week led up to renewable energy focused topics net metering, off-grid system basics, soft skills & resume building, and system sizing. Orientation week finalized with employee prep activities such as resume building, NABCEP introduction. Students then sized a system using their bills as a final exam for the classroom portion of the training. The team then worked with students to cover logistics for the installation hands-on training that would be completed with the following 2 weeks. Installation training included safety, small heavy equipment training, and students completed the installation from start to finish.



Training on racking and wiring were delayed a few days, due to late equipment delivery on the racking. The schedule was organized to do the prep work as far as safety equipment installation on the roof and accessing the roof with OSHA compliance. Smaller installation scopes were implemented throughout

the hands-on section of the training to overcome the delay in delivery. Eight students completed the full training with GRID Alternatives on the BCC installation.



Each building has its own utility meter and interconnection. Glacier Electric Co-op inspected the system on June 30th and provided permission to operate, systems were energized on August 1, 2021. The Solar Edge data communication system is connected, and internet-based communications were confirmed.

GRID Alternatives worked with BCC IT and all monitoring systems are working. As of March 21, 2022, 3 out of 4 buildings successfully connected for monitoring. As of March 23, 2022, the monitoring system is working at BCC. Below is a screenshot from the SolarEdge portal that shows each system is online and producing. They are fully registered in the system and we have the ability to view details in real time. below Solar edge monitoring view example

Site Name	Address	Highest Alert	Peak Power [kWp]	Yesterday's Energy [kWh]	Today's Energy [kWh]	This Month Performance [kWh/kWp]
BCC Red Fox	Southeast Boundary Street 504	2	29.4	140.92	77.11	73.13
BCC Little Star	Southeast Boundary Street 504	✓	10.5	55.19	29.89	52.02
BCC Medicine Shield	Southeast Boundary Street 504	✓	10.5	60.07	34.04	77.58
BCC Muskrat	Southeast Boundary Street 504	✓	2.8	15.28	7.18	81.06

Figure 1 sample solar edge screen view for BFCC Staff the table demonstrates data from March 23, 2022 the alert shown due to an optimizer not communicating.

Initial monitoring system status showed Medicine Shield communicating and showing no issues, total production showed 7.45 MWh. Muskrat communicating and showing no issues, total production showed 1.89 Mwh. Little Star and Red Fox showed to be fully operational, however, the network connection at both sites was not allowing the monitoring data to be transmitted to the Solar Edge monitoring portal. GRID provided extra repeaters and antennas to help with signal strength. GRID visited the site in early September to troubleshoot the communications. GRID met with the BCC IT department and worked to correct the issue based on a Solar Edge LAN Communications Troubleshooting guide. GRID verified that there was an independent ethernet connection with a status IP address for each site, but the communication equipment did not connect. All troubleshooting efforts did not correct the network connection. Next steps were to, try to hardwire the gateways directly to the router, provided there are routers with empty ports at each building, or, another option could be to transmit to the IT room using the additional repeaters that are onsite. GRID worked with the BCC IT department to fix the connection problem without hardwiring.

BCC Campus Internet connection was interrupted for a week in June 2022 and continued to experience short term disconnections, due to a renovation of campus facilities. The project will not be affected in the future. The main server was re-routed, reconfigured and relocated to another facility. The reconnection issues took about 2-3 days to resolve.

After a GRID Trainee went through the system and data it was found BCC has all data since March of 22 for all four systems. Including June, conveniently Solar Edge Inverters store data for up to a month potentially long enough to keep track of production in June when the systems went offline for a few days. The systems were offline but still producing. Red Fox and Little Star each have a month or two of no data other than that everything is recorded and added up.

5.0 Conclusions and Recommendations

Project staff is proud of the workforce training hands on experiential design. The training had a high recruitment rate of 14 applications, accepted a target of 10 trainees and was successful with an 80% retention rate. Two students were hired by the company and continued on to other tribal communities and are now working in the renewable energy field. The monitoring technology SolarEdge is easy to use and readily accessible through a phone app. This makes it convenient for staff and could eventually be used as a teaching resource for future training in analyzing data.



The training resulted with 2 new energy employees applied from the BCC Installation trainee pool. BCC has ready access and support from GRID employees in the community for project support data analysis and reporting requirements from the project from 1 of the trainees. The other trainee has continued on to work on installations in other Native Communities joining the renewable energy workforce.



Over the last 13 months (March 2022-March 2023), the total energy production from the four roof mounted systems was 63.05 MWh. Production data was collected from the SolarEdge monitoring software from GRID expertise in the community. March 22-March 23 was collected to demonstrate a 12 months of production data.

Site	3/22	4/22	5/22	6/22	7/22	8/22	9/22	10/22	11/22	12/22	1/23	2/23	3/23	Total MWh
Red Fox	2.77	3.34	3.74	3.81	4.35	4.06	3.09	2.56	1.23	0.69	1.37	1.60	2.54	32.42
Medicine Shield	1.19	1.42	1.58	1.61	1.86	1.75	1.33	1.10	0.52	0.22	0.59	0.68	1.06	13.76
Little Star	0.91	1.45	1.56	1.62	1.86	1.70	1.23	0.95	0.44	0.24	0.48	0.61	1.02	13.21
Muskrat Lodge	0.31	0.40	0.45	0.45	0.51	0.46	0.33	0.26	0.13	0.06	0.13	0.17	0.28	3.66
														63.05

Cost savings were estimated from the production x cost per kWh. Blackfeet Community College has produced the proposed target and will continue to monitor through Solar Edge.

	Month	Usage(additive month to month)	Production (kWh)	Cost Savings		Month	Usage(additive month to month)	Production (kWh)	Cost Savings		
										Red Fox	Apr 22
May 22	11304	3741	\$276.83	May 22	97982	1566	\$115.88				
Jun 22	11378	3813	\$282.16	Jun 22	98096	1621	\$119.95				
Jul 22	11375	4359	\$322.57	Jul 22	97962	1867	\$138.16				
Aug 22	11315	4065	\$300.81	Aug 22	97263	1704	\$126.10				
Sep 22	11318	3092	\$228.81	Sep 22	96995	1234	\$91.32				
Oct 22	11339	2560	\$189.44	Oct 22	97060	953	\$70.52				
Nov 22	11400	1230	\$91.02	Nov 22	97459	448	\$33.15				
Dec 22	11572	695	\$51.43	Dec 22	98895	245	\$18.13				
Jan 23	11766	1374	\$101.68	Jan 23	552	481	\$35.59				
Feb 23	11912	1602	\$118.55	Feb 23	2032	619	\$45.81				
Mar 23	12087	2547	\$188.48	Mar 23	3224	1022	\$75.63				
TOTAL	-		32420	\$2,399.08	TOTAL	-		13210	\$977.54		

	Medicine Shield				Muskrat Lodge				
	Month	Usage (additive month to month)	Production (kWh)	Cost Savings		Month	Usage (additive month to month)	Production (kWh)	Cost Savings
	Apr 22	73410	1422	\$105.23		Apr 22	65619	401	\$29.67
	May 22	74967	1582	\$117.07		May 22	64608	451	\$33.37
	Jun 22	75994	1614	\$119.44		Jun 22	63324	454	\$33.60
	Jul 22	76339	1862	\$137.79		Jul 22	62127	517	\$38.26
	Aug 22	76106	1751	\$129.57		Aug 22	60505	461	\$34.11
	Sep 22	75863	1336	\$98.86		Sep 22	58995	336	\$24.86
	Oct 22	75890	1104	\$81.70		Oct 22	57908	262	\$19.39
	Nov 22	76600	520	\$38.48		Nov 22	57112	133	\$9.84
	Dec 22	78949	227	\$16.80		Dec 22	57059	63	\$4.66
	Jan 23	81620	591	\$43.73		Jan 23	57278	130	\$9.62
	Feb 23	83843	683	\$50.54		Feb 23	57217	172	\$12.73
	Mar 23	85868	1068	\$79.03		Mar 23	56945	283	\$20.94
	TOTAL	-	13760	\$1,018.24		TOTAL	-	3663	\$271.06

Total Solar Production (kWh)
63,053

Estimated Annual Production (kWh) (per PV Watts)
66,751

Total Cost Savings
\$4,665.92

The project publications can be found in Inside Higher Ed, Rural Montana Magazine, and most recently the Associated Press. From the project BCC has been able to increase partnerships. Presentations brought interest in renewable energy implementation from the community through the Gifts of Scarface conference from a local non-profit and tribal program. Institutional Development worked with the Workforce Division to raise a \$100,000 grant to provide 2 trainings on renewable energy engaging in a spring basic electrical and maintenance training and another slated for May 2023 to use the BCC installation as an energy maintenance training.



6.0 Lessons Learned

The project was awarded and completed during the COVID-19 pandemic. Challenges included at least 2 spikes in cases in the community as well as impacted staff with closed campus and emergency response. The cost share reduction awarded in 2021 helped BCC to set aside a small amount of funds for future O&M of the equipment beyond the award after the pandemic started to subside in the community.

The COVID-19 pandemic was the biggest challenge in planning with the project implementation with an uncertain future from semester to semester for campus. BCC fared through the fluctuation of pandemic campus response measures. Recruiting and safety were carefully handled to keep students and trainers safe.

Planning and partnerships were strong through the project. The project partners were engaged in every aspect of the project from the planning and training to the installation phase. The strength and skills of the team contributed to the design of the orientation and training were the strength in being able to meet the pandemic challenges. The planning was thorough, however flexible enough to adjust to unanticipated challenges.

The Blackfeet Community College is a non-profit organization. Cost savings and skills training were both accomplished with the project model which will serve the campus and community. The monitoring system and living lab continues to offer the training infrastructure and model savings from the installation. When the value of the project is calculated, student training infrastructure and training opportunities would be a definite value to the college with the cost savings.

The college would benefit from an Energy Tech or Energy coordinator FTE that can continue to support projects. The maintenance staff were able to participate, but could not commit to the full training. However, an O&M manual provided will serve Facilities management and staff in maintenance. IT staff was hands-on with installation of monitoring and were helpful in implementation of the solar edge.