

**Little Big Horn College Health and Wellness Center
45 kilo-Watt (kW) Solar Array**

**Little Big Horn College
Crow Agency, MT**



**DOE Office of Indian Energy
Award # DE-IE0000046**



Table of Contents

Executive Summary	3
Project Overview an Objectives	4
Project Management	4
Description of Activities Performed	5
Conclusion and Outcomes	7
Lessons Learned	8
Appendix: 2017 Program Review Presentation	

Executive Summary

The Crow Tribe Reservation, headquartered in Crow Agency, is the largest reservation in Montana, encompassing approximately 2.2 million acres. The eastern boundary of the Crow Reservation lies within the Ft. Union Coal Field. The Crows own 978 billion tons of high quality, low sulfur coal. The Crow Tribe, working in partnership with Westmoreland Resources, has been mining coal for the last 50 years. The income from coal development is distributed to Tribal members in quarterly per capita payments.

Little Big Horn College (LBHC) in Crow Agency is the Crow Tribe's institution of higher education. Chartered in 1980 by the Crow Tribe as a public two year community college, LBHC is also a 1994 land grant institution as designated by the 1994 Land Grant Act. The college is affiliated with the American Indian Higher Education Consortium, a community of 37 tribal colleges working to strengthen tribal nations and make a lasting difference in the lives of Native Americans. LBHC is the major "change agent" on the Crow Reservation and is striving to introduce alternative energy as a major resource of environmental and economic development.

The Little Big Horn College was selected for a grant through the US Department of Energy's Office of Indian Energy to install a 45 kW photovoltaic (PV) solar array on the Health and Wellness Center on campus.

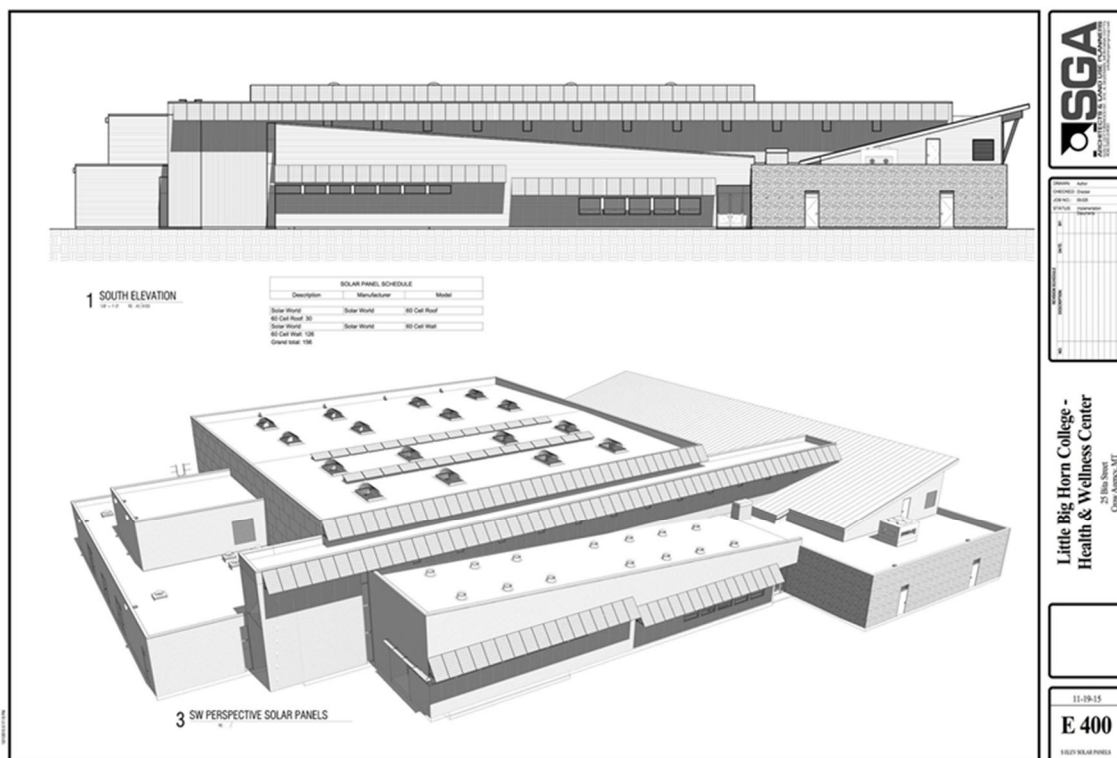
The economic savings generated by this project will be reinvested in the campus and specifically towards the development of additional renewable energy technical training course offerings for the Crow Nation. The array at the Health and Wellness Center is the first major commitment as the Little Big Horn College community works towards a net-zero energy profile and greener future.



Project Overview and Objectives

The Little Big Horn College is committed to becoming the first net-zero emissions “green” tribal college campus in the United States. The first of what is hoped to be additional solar arrays will be the exemplar by which future growth on campus is measured. Dollar savings from the reduction of electricity purchased will allow LBHC to continue to retrofit existing campus buildings and improve and expand energy systems.

With this, the objective of the project is to install a 45 kW photovoltaic solar array on the roof and as awnings at the 25,000 square foot Health and Wellness Center on the campus of the Little Big Horn College (LBHC) in Crow Agency, Montana. The installation will displace greater than 16% of the current electricity requirements at the Health and Wellness Center and save LBHC more than \$6,600 in operating costs annually.



Project Management

After award of the grant, the selected Vendor was contracted to complete the project including installation of system and two-year operations and maintenance contract. The most critical handoff of responsibilities came during the final phase of installation, when the Vendor's electrical subcontractor will assume responsibility for the AC-side tie-in. The electrical subcontractor was contracted to oversee the tie-in, though the Vendor's representative remained on-site in preparation for eventual connection to the grid.

The selected Vendor was Occupational Safety and Health Administration (OSHA) and National Electrical Code (NEC) compliant in all aspects of their approach to PV projects and followed the

guidelines for safety on a job site. These guidelines included, but were not limited to fall protection, head and ear protection and additional safety measures around electricity.

The Vendor used only Underwriters Laboratories (UL)-listed and fully-warranted products to ensure that their PV systems were of the best quality and backed up by the best warranties.

The Vendor's PV systems were designed for 25-year plus life spans. The PV manufacturer provided a 25-year Linear Power Production Warranty guaranteeing by year twenty-five the actual power output will be no less than 83% of the labeled power output. Inverters came with 15-year manufacturers' warranties and available technical support to assist with questions concerning operation.

The Vendor certified that the project is designed and engineered so as to meet the intended purpose, ensures public safety, and complies with applicable laws, regulations, agreements, permits, codes, and standards. All racking is installed per manufacturers' engineering requirements. Inverter and solar panels are installed per manufacturer's requirements. All electrical work meets the NEC standards.

The PV System includes UL listed equipment procured through reputable vendors. Balance of system (BOS) equipment was sourced from established companies and procured through wholesale distributors to ensure direct access to all material manufactures and to ensure parts of system are available if needed.

The Vendor maintained open and direct lines of communication through the duration of the project with the Recipient Business and Technical contacts and continued to email or call the appropriate contact as needed to successfully complete the project.

Description of Tasks Performed

Task 1: Purchase and Delivery

The Recipient's selected Vendor ordered all equipment necessary for the completion of this project upon execution of the grant agreement by the Department of Energy (DOE). Purchasing was dependent on product availability and delivery date as pre-install component storage was a risk for the project. Successful installation of 45 kW PV solar array was dependent on purchase, delivery and secure storage of necessary equipment.

The selected Vendor sourced the necessary equipment from reliable suppliers with proven history of on-time delivery. Storage of equipment on-site was not advised due to crime concerns. Little Big Horn College designated one employee to sign for all deliveries made prior to installation. Little Big Horn College provided the Vendor with a lockable space at or near the Health and Wellness Center for secure storage and safe staging of project.

The purchase and delivery included the following subtask:

Subtask 1.1: Purchase and Delivery

Subtask Summary: The Vendor sourced from reputable suppliers all materials for PV installation. Materials were delivered to the designated space and secured on campus.

Task 2: Installation and Operation

The Vendor installed the 45 kW PV solar array on the Health and Wellness Center on the Little Big Horn College campus.

After training two Tribal installation technicians and receiving shipments of all components and necessary materials from reputable suppliers, the selected Vendor and necessary subcontractors completed the installation of the 45 kW PV solar array on campus.

The installation included the following subtasks:

Subtask 2.1: Tribal Installation Technician Training

Subtask Summary: Vendor trained, over a period of two months, two enrolled tribal installation technicians to be employed during installation.

Subtask 2.2: Rental of Equipment

Subtask Summary: Vendor rented all necessary equipment to complete the installation.

Subtask 2.3: Installation of Array

Subtask Summary: Vendor installed designed PV system.

Subtask 2.4: Wiring and Conduit

Subtask Summary: Vendor installed wiring and conduit for designed PV system

Subtask 2.5: Subcontract AC-side electrical tie-in

Subtask Summary: Qualified sub-contractor will connected the designed PV system into the AC-side tie-in.

Subtask 2.6: Connection to Grid

Subtask Summary: Vendor and Electric Cooperative connected the PV system to the grid, completing the installation and project.

Task 3: Continuing Education, Operations and Maintenance

Per contract, Vendor will oversee Operations and Maintenance (O&M) for array for two years, and will train staff in operation and maintenance.

Vendor will twice yearly make scheduled operations and maintenance visits to the Little Big Horn College for two years. Vendor will train academic staff in solar theory, contribute to the development of curriculum for the Sustainable Energy center on campus. Vendor will train maintenance staff in operating the array at peak performance to take over after 2-year O&M contract is complete.

The Continuing Education, Operations and Maintenance includes the following subtasks:

Subtask 3.1: Recipient Academic Technician Education

Subtask Summary: Vendor will work with LBHC academic staff in solar theory and fundamentals as they develop the Sustainable Energy center on campus.

Subtask 3.2: Recipient Operations and Maintenance Training

Subtask Summary: Vendor will train two LBHC maintenance staff in operating and maintaining the peak performance of the PV array for eventual “take-over” of responsibilities after two years.

Subtask 3.3: Scheduled Operations and Maintenance

Subtask Summary: Vendor will twice yearly perform on-site scheduled operations and maintenance of the entirety of the PV system for a period of two years following the completion of the Project.



Conclusions and Outcomes

The Little Big Horn College Solar Project is complete. Several tasks were accomplished with this project:

- Took the first steps toward zero net gain for our campus;
- Made the community aware of the feasibility of solar energy;
- Saved thousands in energy costs for our campus;
- Made some new partners that can assist with moving alternative energy forward on the Crow Reservation and surrounding community; and
- Completed TERO and on-the-job training

The main goal of this project was to move the Crow Tribe and members of Big Horn County out of the fossil fuel era toward alternative energy opportunities. The following initiatives are being pursued for the future:

- Solar capacity – build individual home arrays – build commercial solar farms
- Wind capacity – develop our class 7 wind capacity – both commercial and individual applications
- Hydro capacity – assist the tribe in completing this project

Specifics of the Installed System:

- 158 Solar World 285-kW panels arranged with 122 in landscape awning (35° along multiple south-faces of the building and 36 ballasted (°15) on the upper roof. To increase public awareness of system.
- Fronius 20 kW x2 / Fronius 10 kW inverters

- System complements installation of solar-powered parking lights via USDA funds and LEED Gold status building, LBHC commitment to net-zero campus goal
- 46 kW, 68,100 kWh per year, \$12-14,000 savings annually / 1,466,081 kWh, \$277,115 in total energy production at \$.10/Wh



Lessons Learned

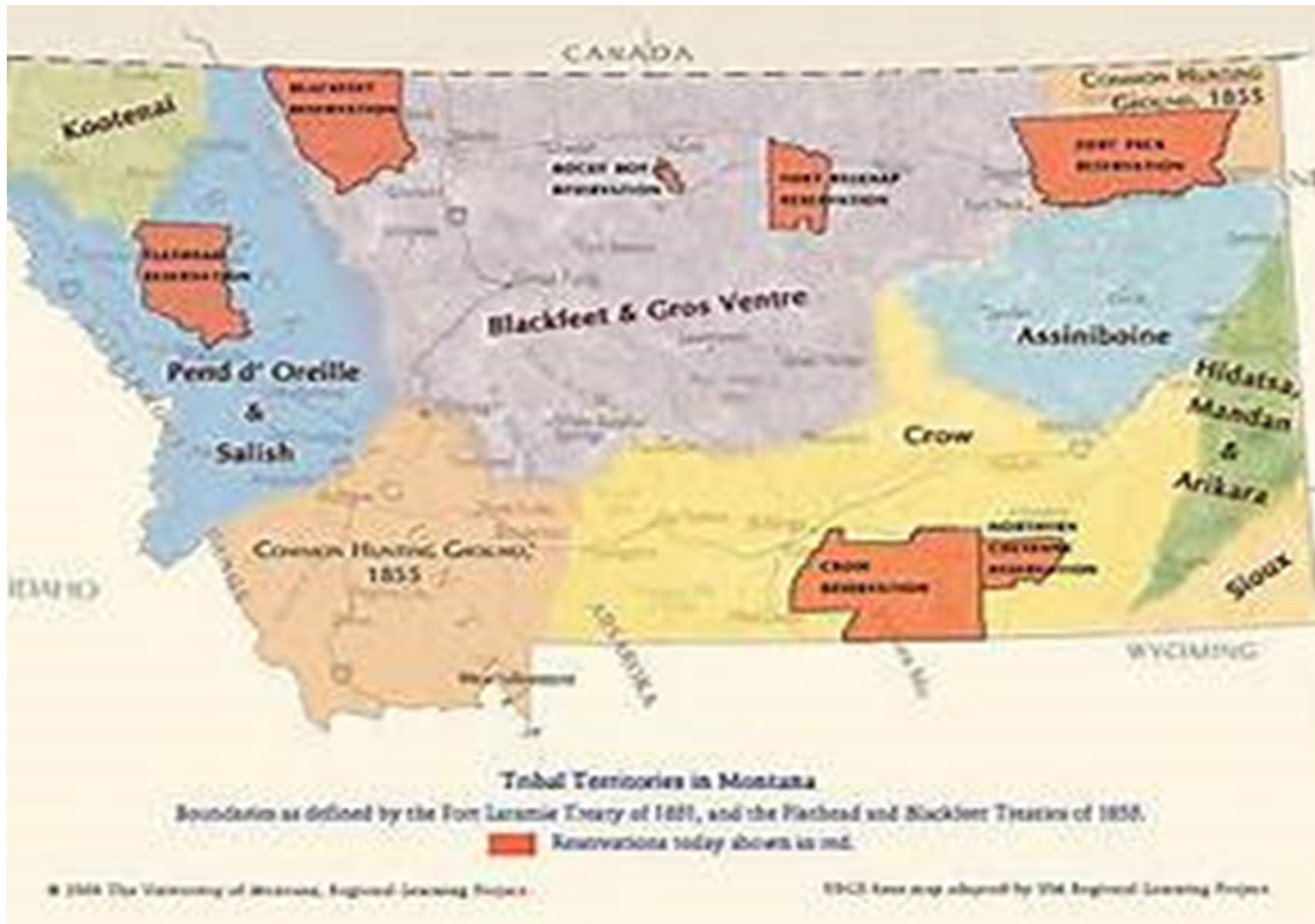
Internal staff turnover within Little Big Horn College was a challenge for the completion of project. With this, whenever possible for future projects, it will be important to take steps to complete project transitions to new project management team members prior to the departure of the incumbent staff members.



**Appendix:
2017 Program Review Presentation**

Summary

Crow Tribe of Indians of Montana

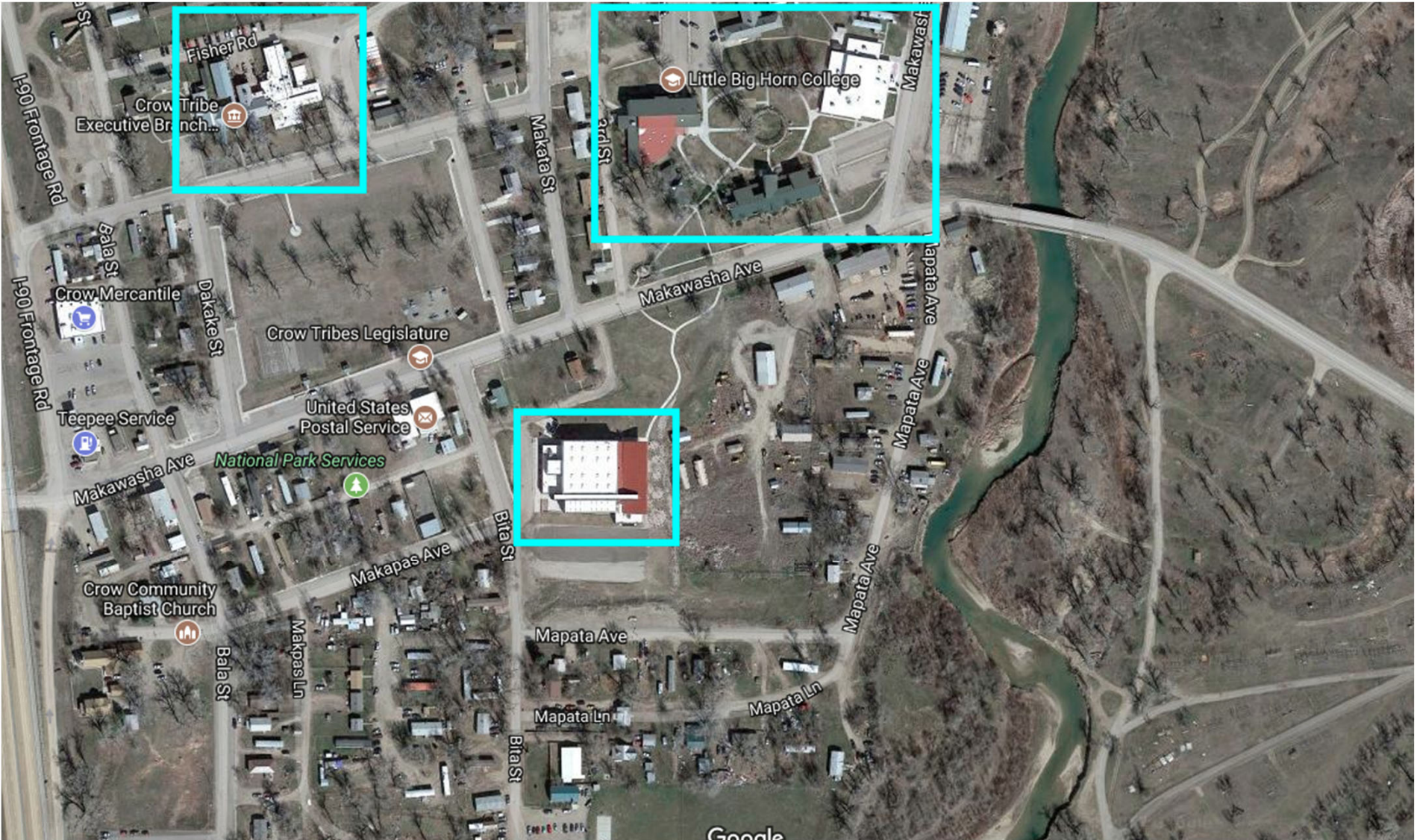


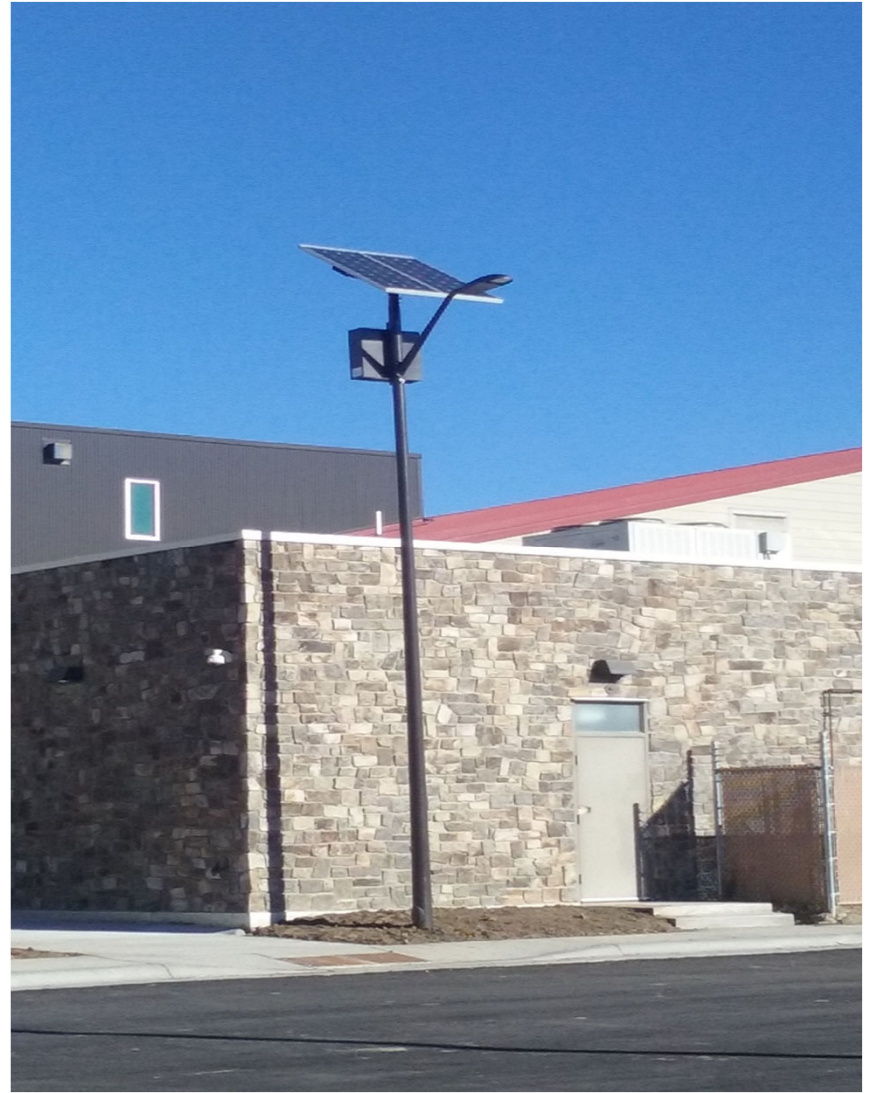
The Crow Tribe Reservation, headquartered in Crow Agency, is the largest reservation in Montana, encompassing approximately 2.2 million acres. The eastern boundary of the Crow Reservation lies within the Ft. Union Coal Field. The Crows own 978 billion tons of high quality, low sulfur coal.

The Crow Tribe, working in partnership with Westmoreland Resources, has been mining coal for the last 50 years. The income from coal development is distributed to Tribal members in quarterly per capita payments.

Project Overview

- Little Big Horn College in Crow Agency is the Crow Tribe's institution of higher education. Chartered in 1980 by the Crow Tribe as a public two year community college, LBHC is also a 1994 land grant institution as designated by the 1994 Land Grant Act. The college is affiliated with the American Indian Higher Education Consortium, a community of 37 tribal colleges working to strengthen tribal nations and make a lasting difference in the lives of Native Americans. LBHC is the major "change agent" on the Crow Reservation and is striving to introduce alternative energy as a major resource of environmental and economic development.





46 kW Solar Array

LBHC Health and Wellness Center

- Little Big Horn College, Crow Agency
- Harvest Solar, Bozeman, Montana
- Thunderbird Development, Bozeman, Montana
- Doug Morley, professional architect
- Big Horn Electric Coop, Hardin, Montana
- Yellowstone Electric, Inc, Billings, Montana
- Crow Tribe of Indians
- Department of Energy, Office of Indian Energy

PROJECT OBJECTIVES

Ultimate Goal: “Zero Net Use” Green Campus - 100% Renewable

Funding for rest of the campus buildings

Curriculum Development - Colstrip Retraining Funds

- AA degree in energy research and development
- Wind technician certification
- Solar technician certification
- Hydro technician certification

Lead planning & development of community energy future.

Relevant Background Information

- 46 kW PV solar installation on the LEED-certified Health and Wellness Center on the campus of Little Big Horn College (68,100 kWh:year)
- 25% of funding from Crow, 75% from Department of Energy
- 20% annual net-metered offset, representing \$1,000-\$1,200 in savings per month (\$12,000-\$14,400 per year)
- 4.5-year Return on Investment with 20+ years of savings
- Big Horn County Co-op and net-metering policy (10 kW)

- Northwest Energy has started several small solar farms in Montana.

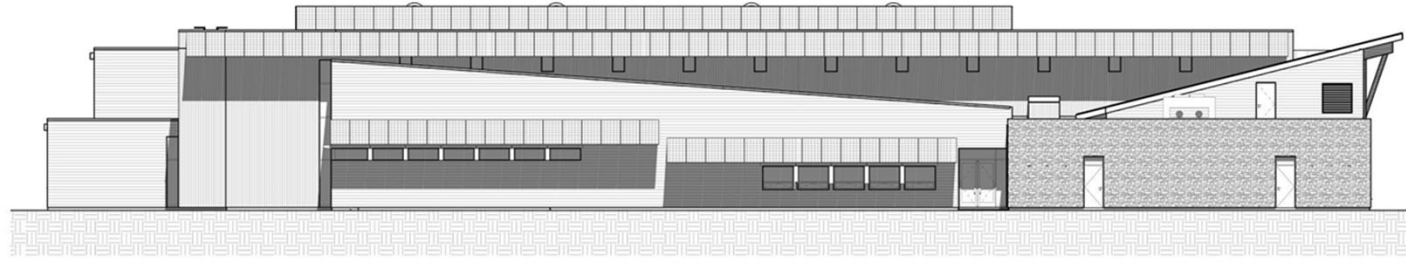
Project Outcomes

The Little Big Horn College Solar Project is 95% completed. Activities to be completed are hooking into the grid, training and maintenance. To be completed Spring, 2018 unless weather permits.

- We accomplished several tasks with this project; we took the first steps toward zero net gain for our campus, we have made the community aware of the feasibility of solar energy, we have saved thousands in energy costs for our campus and we have made some new partners that can assist with moving alternative energy forward on the Crow Reservation and surrounding community
- TERO and on-the-job training

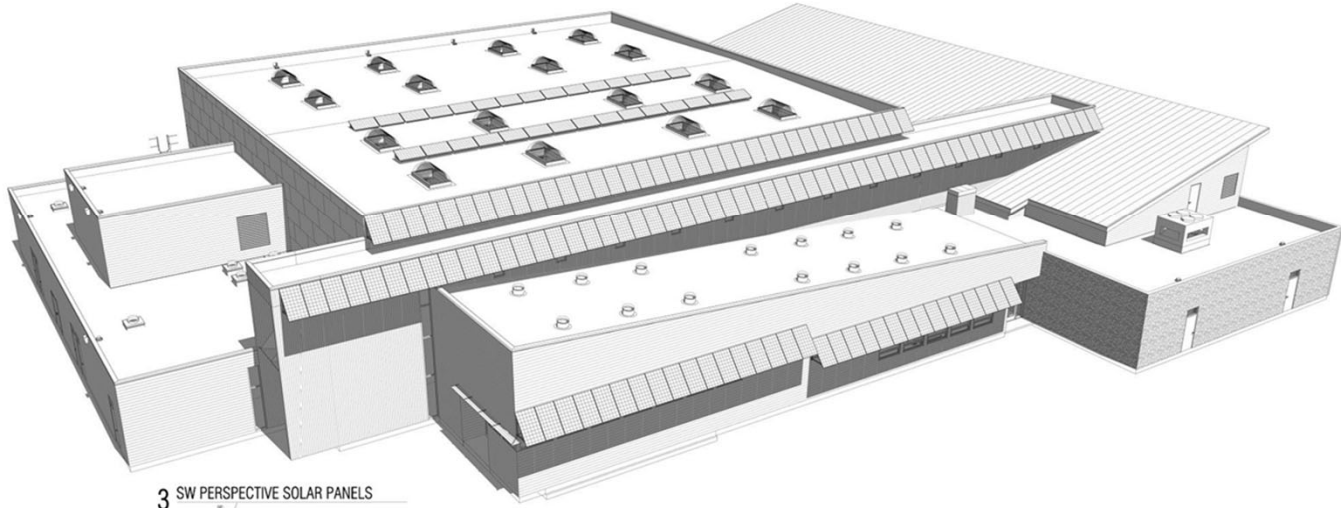
System Specifics

- 158 Solar World 285-kW panels arranged with 122 in landscape awning (35° along multiple south-faces of the building and 36 ballasted (°15) on the upper roof. To increase public awareness of system.
- Fronius 20 kW x2 / Fronius 10 kW inverters
- System complements installation of solar-powered parking lights via USDA funds and LEED Gold status building, LBHC commitment to net-zero campus goal
- 46 kW, 68,100 kWh per year, \$12-14,000 savings annually / 1,466,081 kWh, \$277,115 in total energy production at \$.10/Wh



1 SOUTH ELEVATION
18'-11" R. 41,400

SOLAR PANEL SCHEDULE		
Description	Manufacturer	Model
Solar World	Solar World	60 Cell Roof
60 Cell Roof		30
Solar World	Solar World	60 Cell Wall
60 Cell Wall		126
Grand total: 156		



3 SW PERSPECTIVE SOLAR PANELS



DESIGNED	Author
CHECKED	Owner
JOB NO.	6835
STATUS	Preparation
BY	
DATE	
REVISIONS	
DESCRIPTION	
NO.	

**Little Big Horn College -
Health & Wellness Center**
25 Bita Street
Crow Agency, MT



11-19-15
E 400
SEELY SOLAR PANELS











The Future

The main goal of this project is to move the Crow Tribe and members of Big Horn County out of the fossil fuel era toward alternative energy opportunities.

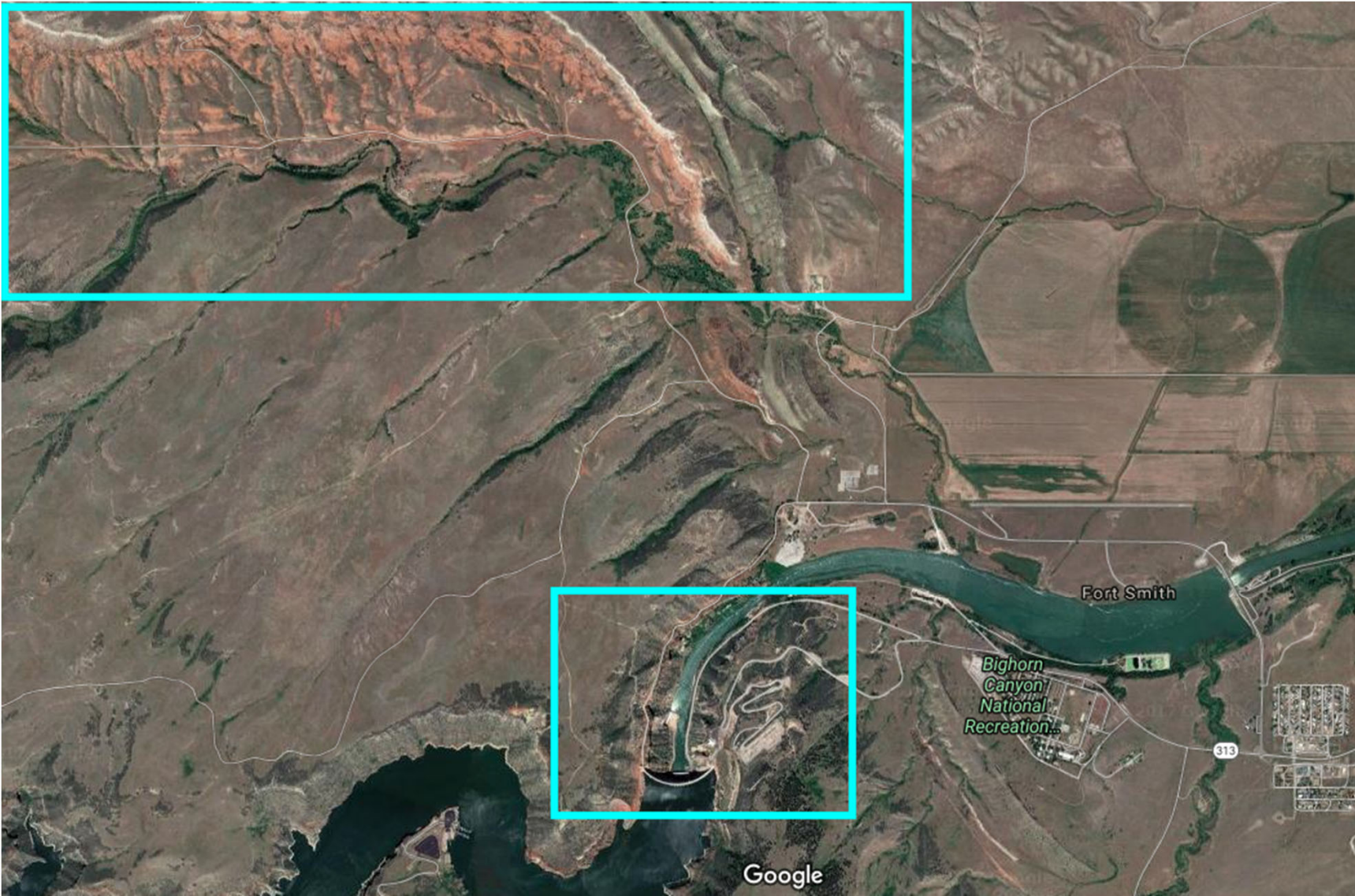
- Solar capacity – build individual home arrays – build commercial solar farms
- Wind capacity – develop our class 7 wind capacity – both commercial and individual applications
- Hydro capacity – assist the tribe in completing this project

Challenges

- Communication
- Social and political change

New Projects

- Afterbay - Tribal hydroelectric (in development)
- Wind - Grapevine 212 MW “shovel ready”
- Little Big Horn College, the Crow Tribe and Thunderbird Development won a 2016 BIA Division of Energy and Mineral Development grant to assess the energy potential of Crow-controlled solar and woody biomass resources. The study will provide the Crow with the data to both replace fossil fuel-generated electricity with solar and/or biomass as well sell solar resources to the local and national electricity grids.





rendering by Cypress Creek Renewables

30 acre, 3-MegaWatt solar farm just outside the boundaries of the Crow Reservation near Hardin. Will provide electricity to approximately 540 homes.

Utilizing Bureau of Indian Affairs Division of Energy and Mineral Development grant, the Crow Tribe is exploring the potential for renewable resource development on the MW and greater scale.

Contact Information

David Small
Dean of Administration
Little Big Horn College
8645 South Weaver Dr.
Crow Agency, MT 59022
Ph.406-638-3110
smalld@lbhc.edu

John Bailey
Thunderbird Development
PO Box 6667
Bozeman, MT 59771
406-600-7415
jb@thunderbirddevelopment.com