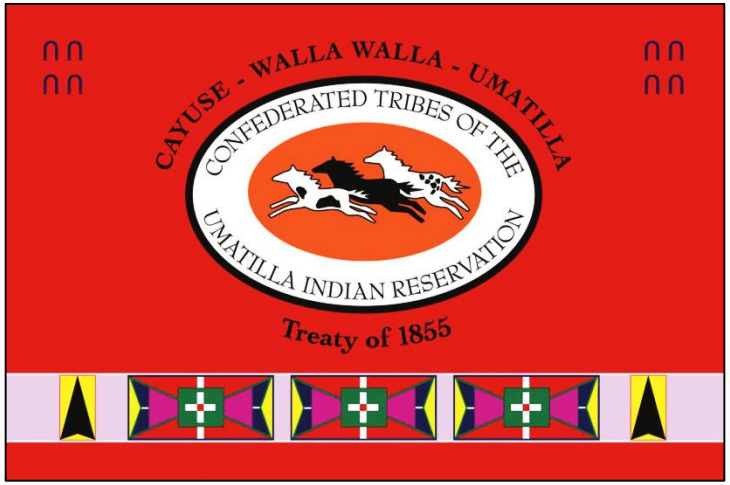
Confederated Tribes of the Umatilla Indian Reservation



Ántukš-Tińqapapt Solar PV Array and LED Lighting Retrofit

Patrick F. Mills, PMP®

U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

December 2018 Program Review

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR)

- The CTUIR consists of the Cayuse, Umatilla and Walla-Walla Tribes
- Treaty of 1855 with US Government reserved rights and resources for members of the three tribes
- More than 3,000 enrolled Tribal Members
- Umatilla Indian Reservation:
  - Located in northeastern Oregon
  - Established by Treaty of 1855
  - Area reduced in late 1800s due to Federal legislation
  - Final area roughly 270 sq. miles
  - Home to nearly 1,500 Tribal Members as of Jan. 2014

CTUIR Tribal Government

- The CTUIR is governed by a Constitution and By-laws adopted in 1949
- The governing body is the nine member Board of Trustees, elected every two years by the General Council (CTUIR Tribal Members age 18 and older)
- The CTUIR is now a full service tribal government with:
  - *Natural Resources (Energy and Environmental Sciences, Water Resources, Fisheries, etc.)*
  - *Children and Family Services*
  - *Planning and Public Transit*
  - *Economic and Community Development*
  - *Public Safety*
  - *Public Works*
  - *Education*
  - *Housing*
  - *Communications*
  - *for a complete listing, visit http://ctuir.org/*

CTUIR Nixyáawii Governance Center

Project Objectives

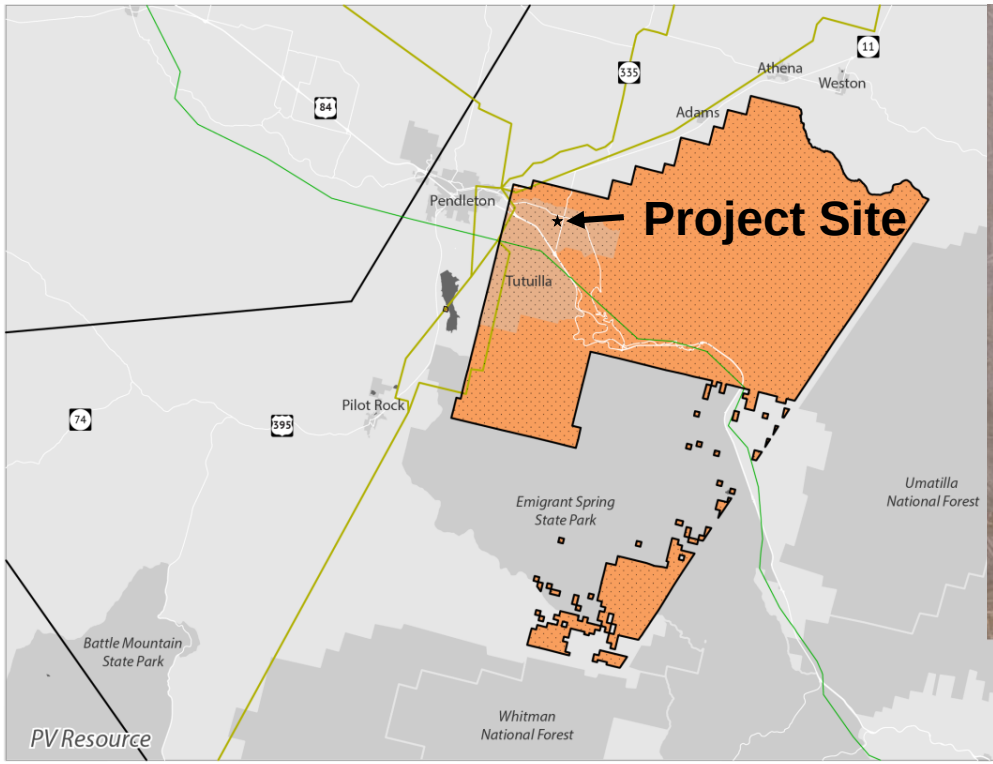
1. Replace fluorescent lighting with high efficiency LED lighting in three tribal buildings
   - 332 individual light fixtures
2. Install 97 kW_{DC} nameplate capacity solar photovoltaic (PV) array
   - 276 commercial solar modules
   - Fixed/stationary ground-mounted racking
   - Footprint approximately 300 ft by 20 ft
   - Two 3-phase transformerless grid-tie inverters
   - Aggregated net metering agreement with local utility
3. Develop custom operations and maintenance (O&M) manual for solar PV array system
4. Monitor actual system performance for 12 months and compare against baseline estimates

Project Overview

- Buildings effected by LED lighting retrofit
  - Field Station Science and Engineering Laboratory (4,000 sq. ft)
  - Public Transit Center Maintenance Shop (8,800 sq. ft)
  - Public Transit Center Bus Barn (6,380 sq. ft)
- 149,203 kWh of combined energy demand reduction annually (baseline estimate)
- Nearly 22.8 tons per year of reduced CO_2 emissions (baseline estimate)
- $12,361 of net annual cost savings (baseline estimate)
- Funding:
  - CTUIR ($63,413)
  - DOE ($133,705)
  - Energy Trust of Oregon ($71,088)
  - Wildhorse Foundation ($20,000)
- Final project budget: $288,206

Project Location

- Nixyáawii Governance Center campus on the Umatilla Indian Reservation (5 miles east of Pendleton, Oregon)



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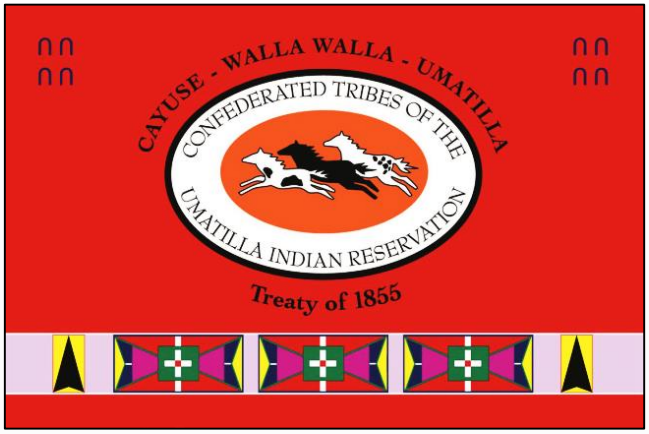
(Right) Aerial image of the Nixyáawii Governance Center campus

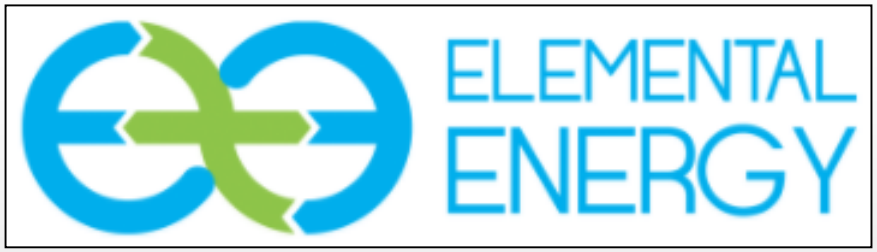
(Left) PV resource availability for the Umatilla Indian Reservation

Project Participants

- The Confederated Tribes of the Umatilla Indian Reservation – Project management and support



- Elemental Energy, LLC – Solar PV array system installer



- Gordon's Electric, Inc. – Lighting replacement specialists

Project Status Update – LED Lighting Retrofit

- Task completed January 2018

Image of Field Station environmental laboratory lit using newly installed high efficiency LEDs

Project Status Update – Solar PV Array Installation

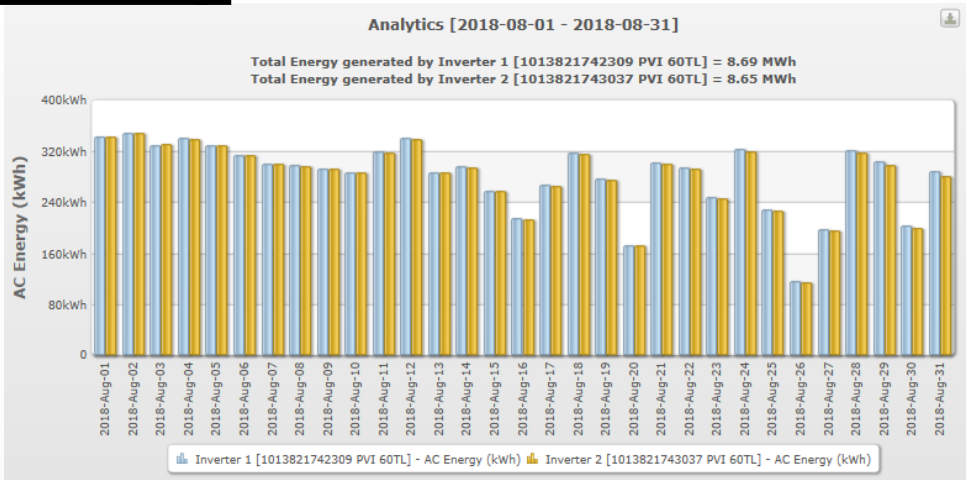
- Zero-cost change order increased final system nameplate capacity to 97.98 kW_{DC}
- System installed and commissioned June 29, 2018
- O&M manual complete

(Top) CTUIR and Elemental Energy staff preparing to install the final solar module

(Bottom) The completed Ántukš-Tińqapapt ("sun trap") Solar PV Array

Project Status Update – Solar PV Array Performance Monitoring

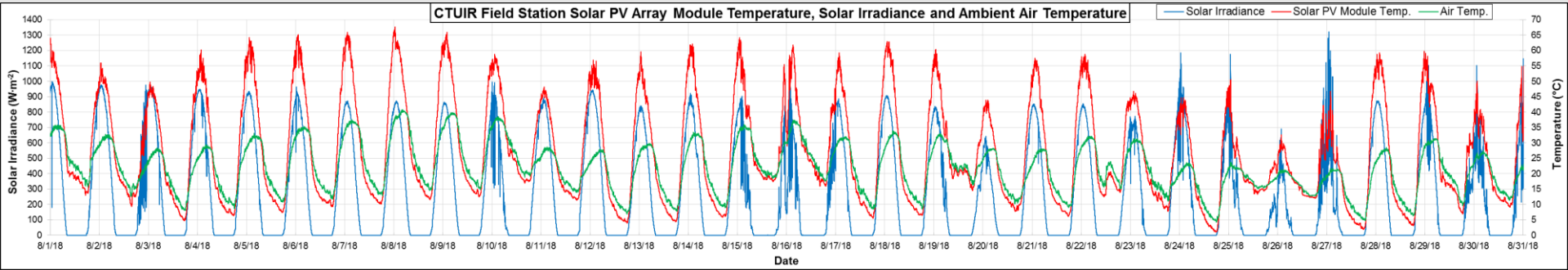
- SolrenView solar system monitoring service purchased
- 70,554 kWh of AC-energy generated as of November 30, 2018
- Overall system efficiency determined by comparing against actual solar irradiance measured onsite using Hukseflux LP02 ISO-second-class pyranometer with Campbell Scientific CR1000 data logger system



(Top) Solar PV array AC Energy generated by day during August

(Middle) Hukseflux LP02 pyranometer

(Bottom) Solar irradiance and temperature data collected during August



Project Results: June 12-Nov. 9, 2018 Evaluation Period

- 8,965 kWh of energy savings attributed directly to LED lighting retrofit (projected annual savings of 21,515 kWh)
- 65,996 kWh of energy generated by solar PV array
- Actual AC-energy output of the solar system is approx. 25% of the average total available solar energy for the area (measured onsite using pyranometer with solar module temperature-power coefficient corrections applied to dataset)
- 74,960 kWh of combined energy demand reduction (projected annual reduction of 162,179 kWh)
- 11.4 tons of reduced CO_2 emissions (estimated annual reduction of 24.7 tons)
- $5,892 of total realized cost savings for CTUIR when compared to energy expenses for same timeframe during 2017 (projected annual energy bill savings of $14,141)
- 4.5 year ROI for CTUIR (20.4 years for total project)

Future Plans and Lessons Learned

- Continue to monitor and report solar PV array performance, energy savings and cost savings through June 2019
- Continue to work with local utility to ensure maximum savings are obtained
- Ensure that utility specific effective grounding requirements will be satisfied by the solar system contract
- Include contingency funds in the project budget to cover soft costs (about 7% of expenses with this project were unplanned)
- Involve the Tribal Employment Rights Office early on in the planning stage
- Incentivize contractors to complete work on schedule

Background Information and Past Activities

- Strategic Energy Planning Workshop with NREL (2016)
- Professional energy audit of tribal facilities (2016)
- CTUIR involvement with other renewable energy projects:
  - Investment into 103 MW Rattlesnake Road Wind Farm (2005)
  - Installation of 50 kW wind turbine at Tamástslikt Cultural Institute (2014)
  - Installation of 123 kW solar PV array at Tamástslikt Cultural Institute (2016)
  - Completed Umatilla Indian Reservation Geothermal Resources Assessment – Phase 1 (2018)
- Environmental restoration service investments:
  - ORELAP/NELAP accredited environmental laboratory
  - Native plant revegetation capabilities

Questions?

Confederated Tribes of the Umatilla Indian Reservation

Department of Natural Resources, Energy & Environmental Sciences Program

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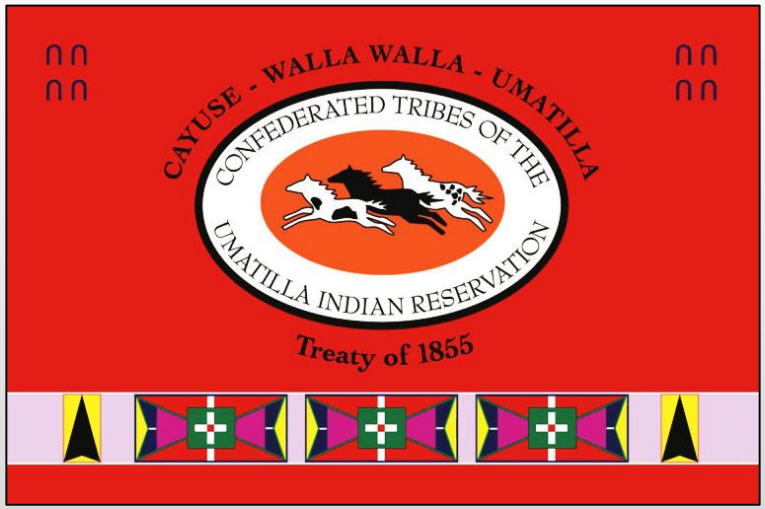

Building a legacy of environmental stewardship