COVER PAGE

Recipient Organization:	Tolowa Dee-ni' Nation
Project Title:	Renewable Solar Energy of Rowdy Creek Fish Hatchery
Date of Report:	October 30 th , 2021
Award Number:	DE-IE0000111
Total Project Costs:	\$536,472.17
Technical Contact:	Jennifer Jacobs, Tolowa Dee-ni' Nation Fisheries Division Manager, 140 Rowdy Creek Rd. Smith River, CA, 707-487-9255 ext. 1158, Jennifer.jacobs@tolowa.com
Project Partner:	Rowdy Creek Fish Hatchery, <u>rowdycreek.fishhatchery@frontier.com</u> Greenwired [®] Renewable Energy Solutions, jamie.greenwired@gmail.com



ACKNOWLEDGMENT

This material is based upon work supported by the Department of Energy, Office of Indian Energy Policy and Programs, under Award Number DE- IE0000111.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

1. Table of Contents:

Executive Summary	3
Project Objectives	3
Description of Activities Performed	3-5
Conclusions and Recommendations	5-7
Lessons Learned	8

2. Executive Summary:

A Strategic Energy Plan was completed by the Tolowa Dee-ni' Nation (TDN) in 2017, whereby the TDN formally committed to continuing its tradition of environmental stewardship by incorporating renewable energy power sources and green building practices into its current and potential development through environmentally friendly energy planning and policy. The plan was developed with technical assistance provided in August 2016 by the Alliance for Sustainable Energy, which is part of the National Renewable Energy Lab for DOE. The Tolowa Dee-ni' Nation developed a solar photovoltaic approximately 113.88 kW clean energy system to meet electric power needs at the Tribally-owned and operated Rowdy Creek Fish Hatchery (RCFH) located in Smith River (pop. 871) in northernmost California. Installation of the solar system replaced an estimated 84% of electrical energy usage with a renewable solar source, significantly reducing the hatchery's carbon footprint.

The grid-tied system eliminated an estimated 94% of the total annual utility costs for electricity. The project will resulted in significantly reduced electricity costs, has benefited the environment due to a reduced carbon footprint, and has served as a cornerstone for future energy efficiency projects for the TDN. The Tolowa Dee-ni' Nation has set a goal of reducing total energy usage by 20% within the next five years (TDN Strategic Energy Plan 2017).

The project also provided workforce training to Tribal Citizens in solar system installations. The contractor utilized the Tribal Employment Rights Office to secure Tribal citizens for site preparation, construction, installation, and system maintenance training.

3. Project Objectives:

The primary goal of the project was to install solar panels and equipment at the Rowdy Creek Fish Hatchery in order to produce power needed to operate the facility. The Rowdy Creek Fish Hatchery struggles annually to secure funding for operational costs. The solar system was needed to reduce the monthly electrical bill which totals approximately 20% of the annual operational costs. To meet the objective of reducing annual electrical costs and to continue TDN's tradition of environmental stewardship the following tasks were completed.

4. Description of Activities Performed:

Task 1.0: Project Administration, Oversight, and Reporting

Task 1 Summary: Grant notice and contract was reviewed by Tolowa Dee-ni' staff (Grants and Contracts Office and Department of Natural Resources) with recommendation to and approval by the Tribal Council; General administrative activities were confirmed and initiated; Project Team was convened, roles were confirmed, and meeting schedule for duration of the project was established;

Vendor was notified of grant award and formal professional services contract was invited; Reporting occurred; and TDN attended/participated in DOE convening in Denver, CO.

Milestone 1.1: Responded to conditions in grant award notice and sign contract with DOE Milestone 1.2: Assigned Tribal administrative and fiscal responsibilities Milestone 1.3: Convened initial meeting of Project Team and established meeting dates Milestone 1.4: Informed Tribal Council regarding project progress

Task 2.0: Secure Vendor Contract

Task 2 Summary: Vendor Contracts were requested for vendor and a heavy equipment operator. After it was received and upon team satisfaction the contract was sent to the Department of Energy Project Manager for review; upon completion of requested changes/amendments to the contract and subsequent approval by DOE, the Project Team met to approve the contract and submitted it to the Tribal Council for review in formal session with a recommendation for approval.

Milestone 2.1: Vendors were notified to submit contract for Tribal review, showing final detailed costs, project personnel, and specific timeline for project implementation **Milestone 2.2:** TDN notified vendors to submit contract for review

Milestone 2.3: Tolowa Dee-ni' Nation Tribal Council issued the formal contract for Vendor professional services and authorized project to proceed

Milestone 2.4: TDN Submitted procurement information to DOE for formal modification and Contracting Officer approval.

Task 3.0: Approval of Project Engineering and Design

Task 3 Summary: TDN authorized vendor to provide Del Norte County Planning Office and Pacific Power with renewable energy system engineering and design for review/ approval

Milestone 3.1: The Building Permit application was submitted by vendor to Del Norte County Planning Office for review and approval

Subtask 3.1.1 Del Norte County Planning Office issued approval for county development permit

Milestone 3.2: Interconnection Application was submitted by vendor to Pacific Power for review and approval

Subtask 3.2.1 Pacific Power approved Interconnection Application

Task 4.0: Installation of Renewable Energy System

Task 4 Summary: Preparation of project site was conducted in order for installation of solar energy system components to take place; renewable energy efficiency system was installed by vendor with direct project oversight by Project Team

Milestone 4.1: Rowdy Creek Fish Hatchery project site was prepared for project implementation

Subtask 4.1.1 Heavy equipment was brought in to remove blackberry bushes and grade the site

Subtask 4.1.2 Debris (branches, leaves) were removed from roof of building Subtask 4.1.3 Trenches were prepared to accommodate solar array

Milestone 4.2: Renewable energy system was fully installed with approximately 28 roof-mounted solar panels and approximately 284 ground-mounted panels and connections were put in place

Task 5.0: Final PV System Commissioning, Inspection and Launch occurred

Task 5 Summary: New Renewable Energy System Received Final Approval for OperationMilestone 5.1: System inspection was completed with no adverse findings and systemwasdeployed

Subtask 5.1.1 Del Norte County final inspection and approval was receivedSubtask 5.1.2 Pacific Power Interconnection process was completedMilestone 5.2: Utility interconnection processing was completed and system launchwasapproved

Milestone 5.3: New Solar Photovoltaic Renewable Energy System was launched **Milestone 5.4:** System was monitored for 12 months

5. Conclusions and Recommendations:

The project resulted in the Tolowa Dee-ni' Nation developing and installing a solar photovoltaic approximately 113.88 kW clean energy system to meet electric power needs at the Tribally-owned and operated Rowdy Creek Fish Hatchery. This has allowed the TDN to meet the goals of the project by reducing the operational costs associated with electrical use and reducing the carbon footprint at the RCFH. The project also contributes to the Tolowa Dee-ni' Nation's Strategic Energy Plan's set a goal of reducing total energy usage by 20% within the next five years.

The 12 months of monitoring provided valuable information on how these goals were met. The average cost per day for electricity before the solar system was installed was \$42.95 (based on 2019 billing data). The average cost per day for electricity post solar installation during the 12 month monitoring period was \$2.57. This means that there is 94% financial savings on the electric bill at the hatchery post project implementation. The main goal of the project was to reduce the electrical expenses associated with operation of the hatchery and therefore this is an incredible accomplishment. Over the 12 month monitoring period the system production was 147,229,840 Wh. The system production was enough to reduce the electrical usage at the hatchery by approximately 84%. The system production also assisted with the Tolowa Dee-ni' Nation's goal of reducing energy usage. According the the United States Environmental Protection Agencies Greenhouse Gas Equivalencies Calculator the amount of enegry produced by the system would be equivalent to reducing CO₂ emissions from 22.7 passenger vehicles driven for one year or 12.6 homes' energy use for one year. The carbon sequested by the system production would be equal to 1,725 tree seedlings grown for 10 years or 128 acres of U.S. forests in one year.



Figure 1: Average Cost per Day, in Dollars, by Billing Month Period to Operate the Rowdy Creek Fish Hatchery Before Solar Installation and After Solar Installation



Figure 2: Watt Hours Produced by the Solar System at Rowdy Creek Fish Hatchery during the 12 Month Monitoring Period





Figure 3: 2020 System Production. Note: System Launch Occurred on May 6, 2020

Figure 4: 2021 System Production. Note: From July 9 to August 19 System Lost Communication and While Power was Generated Data was Excluded from Dashboard Monitoring due to the Communication Failure of the Network



 Figure 5: Landscaped Solar Array at Rowdy Creek Fish Hatchery

 Environmental Benefits



Figure 6: Environmental Benefits of Converting to Solar System Production Use from Electrical Use at the Rowdy Creek Fish Hatchery to Date

Figure 4: Solar System Production Comparison 2020 vs. 2021

6. Lessons Learned:

The Renewable Solar Energy of Rowdy Creek Fish Hatchery project faced a few challenges during implementation. The first challenge was associated with placing infrastructure. The Rowdy Creek Fish Hatchery is one of only two private hatcheries in the state of California. The facility was built in the early 1970's by a group of individuals who did not have a background in aquaculture and a lot of the plumbing is outdated and no plumbing schematics exist. During placement of the frames for the panels workers hit one of the water pipes at the facility. This was addressed quickly by the TDN's Public Works and Facilities staff. The pipe that was hit was repaired quickly and work was only delayed by about half a day. Luckily this did not affect hatchery operations and the lessons learned are to have a survey done before pursuing construction on properties that may have underground infrastructure.

Another issue had to do with the voltage was derived at the hatchery. We learned that the single phase 240V that existed at the hatchery would not work for interconnection of the solar system. Therefore there were work and costs associated with having to change over to a three phase 208V. This also resulting in Pacific Power requiring another power pole be installed. These challenges were addressed by hiring a sub-contractor to install the power pole and change over the system. The project was slightly delayed but not to the point of requiring extension of the grant. The lesson learned is that in the future when pursuing these projects to make sure the facility that is converting over has the proper voltage to transition over to the solar system.

The last issue that occurred, but was outside of the 12 month monitoring period, was communication loss to the dashboard. The component of the system that relays data to the online dashboard failed. Therefore, though energy was being produced and utilized, we were unable to collect the data on the amount being produced. This can be seen in Figure 4 above where July and August appear to have not produced as much as they should for being some of the sunniest months in our area. The communication component that failed was replaced and within the warranty timeline. There was also discussion of extending the Wi-Fi and routing to that if the component were to fail again.