Final Report

Scotts Valley Energy Office and Human Capacity Project

Scotts Valley Band of Pomo Indians

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Acknowledgments

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Executive Summary

The Scotts Valley Band of Pomo Indians was a federally recognized Tribe with a current membership of 243 Tribal members. The Tribal offices are located in the city of Lakeport, Lake County and the City of Richmond, Contra Costa County in California. The member population was concentrated in five counties of California (Alameda, Contra Costa, Lake, Mendocino and Sonoma Counties). Lake County itself was basically a low-income, retiree community with a population of 64,800.

The Primary goal of this project was to develop a Scotts Valley Energy Development Office (SVEDO). This office will further support the mission of the Tribe's existing leadership position as the DOE Tribal Multi-County Weatherization Energy Program (TMCWEP) in creating jobs and providing Tribal homes and buildings with weatherization assistance to increase energy efficiency, occupant comfort and improved indoor air quality. This office has also spearheaded efforts to move the Tribe toward its further strategic energy goals of implementing renewable energy systems through specific training, resource evaluation, feasibility planning, and implementation. Human capacity building and continuing operations are two key elements of the SVEDO objectives.

Therefore, the project will 1) train and employ additional Tribal members in energy efficiency, conservation and renewable resource analyses and implementation; 2) purchase materials and equipment required to implement the strategic priorities as developed by the Scotts Valley Tribe which specifically include implementing energy conservation measures and alternative energy strategies to reduce energy costs for the Tribe and its members; and 3) obtain a dedicated office and storage space for ongoing SVEDO operations.

Project Overview

In August of 2008, the Scotts Valley Band of Pomo Indians Strategic Energy Plans mission statement was "…*to promote energy efficiency and create employment opportunities and economic opportunities on Tribal lands through energy resource and energy efficiency development*." The Strategic Energy Plan was written before the Obama administration ARRA funding became available when the high costs of energy exploded, this was a wakeup call for most Tribes across the country to find assistance to alleviate the high costs of energy in Indian Country. The seed was planted during an Energy Workshop put on by the Department of Energy for Northern CA Tribes, and because the Scotts Valley EPA and Housing Departments were already performing some weatherization retrofits on their Tribal housing stock and the only local Tribe pursuing weatherization training. At the DOE Energy Workshop there was a lot of discussion on how the Tribes should collaborate and partner on grant projects and many of the Tribes supported the Scotts Valley Tribes idea of taking the lead to create an energy business that would provide weatherization and energy assessments to Tribes needing this service. This idea of creating an Energy Business was presented to the Tribal Council and they supported and approved the Environmental Department to initiate this economic development. Many of these strategies were implemented using grant funding from the SVHA (Scotts Valley Housing Authority), IHP (Indian Housing Plan); the DOE EECBG; the SVHA ARRA IHP and the initial establishment of a Tribal Multi-County Weatherization Energy Program (TMCTWP). The effectiveness of the TMCTWP has created a need for the development of an Energy Office/Center continued implementation and training in the renewable and energy efficiency fields. During the next 4 years from 2009 – 2013 four federal grants were written and funded for weatherization and energy assessment training, Wx apprenticeship, creating a certified Tribal workforce, performing energy retrofitting on Tribal homes and facilities, energy program development, energy business development and energy outreach and education. With all these activities accomplished the next step was to create a sustainable business that would not only be profitable, but would create green jobs for its trained certified Tribal workforce.

Project Objectives

The objectives of this project were to develop a Scotts Valley Energy Development Office (SVEDO) that will increase human capacity building and continue operations that are required to implement the Tribal energy strategic priorities. The project was established to train and employ additional Tribal members in energy efficiency, purchase materials, and obtain a dedicated storage office space. This office lead efforts to move the Tribe towards its further strategic energy goals in creating jobs and providing Tribal homes and buildings with energy assessments, along with weatherization assistance to increase energy efficiency, occupant comfort and improved indoor air quality.

TASKS TO BE PERFORMED

1) Establish the Scotts Valley Energy Development Office

The Scotts Valley Energy Development Office is currently part of the Scotts Valley EPA and Natural Resources Office. Due to the increasing size and scope of the SVEDO, space currently donated by the Scotts Valley Tribe has become inadequate. With the addition of the requested equipment and material stock, new storage and operational space was required. Therefore, we are requesting funding to lease up to 2,500 square feet of additional storage and office space for a period of two years. Having a space dedicated to this program will allow for the development of a "storefront" that can be marketed to the target communities as a resource to assist in navigating the required programs that will maximize their access to weatherization assistance and implementation services. Additionally, this space will provide a location to securely store and inventory all of the required materials, supplies and equipment necessary for the implementation of building performance analyses and retrofit activities.

2) Program Administration

The Scotts Valley Tribe will administer the project, and the overall management and implementation will be overseen by the Scotts Valley Tribal Administrator, Chief Fiscal Officer, Housing Director and Program Energy Manager. The Program Energy Manager will serve as key contact on this project; oversee daily grant activities, human resources training, outreach, quarterly reporting and grant compliance. The Tribal Administrator will be responsible for ensuring implementation of grant objectives are being performed accordingly with grant compliance and fiscal management. Under Environmental and Housing, both departments will provide essential consultation and assistance with program goals and objectives in the areas of outreach and education. Existing housing and energy staff currently provide weatherization services operated out of the Housing Department. Currently (3) staff and (4) Tribal Members have completed Basic Weatherization Training and (2) staff and (1) Tribal Member from another Tribe have received Building Performance Building certification.

3) Energy Analyst and Retrofit Training for up to Eight Tribal Members

This will allow for the expansion of the workforce of Tribal members trained under the MCTWP grant. These additional trained members will serve as the core of the expansion of the SVEDO program. SVEDO trainees will complete a minimum of the following training components:

- Combustion Appliance Safety Training
- Blower Door Training
- Duct Blaster Training
- Walk-Through Energy Auditing (ASHRAE Level I) Air Sealing, Insulating Existing Homes
- Deep Energy Reduction
- Retrofitting Attics & Retrofitting Crawl Spaces
- Lighting Controls
- Basic Solar Resource Assessment and Design
- Integrating Energy Efficiency and Renewables
- Building Performance Institute, Inc. Building Analyst Professional and Building Envelope
- Energy Auditing Techniques for Small and Medium Commercial Facilities
- Basic Excel for Energy Calculations
- On-the-job trainings as part of the "Element 2" building energy analysts

The effectiveness of the SVEDO will also be measured quantitatively. Air and Duct sealing will be verified by completing pre- and post- air sealing, blower door, and duct blasting tests. The results of these tests will be measured as a percentage decrease in building infiltration. Other retrofit energy benefits will be measured in terms of energy savings. To accomplish the verification process, energy use for upgraded residences and facilities will be monitored through utility billings for the year following implementation and compared to the pre-retrofit year. Any change in occupancy or use of the building will be noted so that these parameter changes can be noted in the final evaluation of efficiency.

4) Energy efficiency, conservation and renewable resource evaluations, weatherization retrofit implementation, on Tribal and non-Tribal homes and commercial buildings

This program component has allowed for "hands on" work experience for the recently trained SVEDO personnel. This staff conducted in-depth energy analyses on residential and commercial structures including: 1) Utility billing analyses; 2) Walk through electrical audits to identify large electrical energy loads and opportunities for electrical load upgrades and energy management; 3) Continuous load monitoring as necessary; 4) Building envelope assessments including blower door testing and duct blasting, condition and configuration evaluation; 5) Combustion appliance safety and efficiency testing; and 6) Retrofit economic assessment and prioritization;

During energy evaluations, building occupants have been provided energy outreach materials developed by the existing Scotts Valley Energy Development Office. These materials will help inform residences and businesses about energy conservation and efficiency opportunities as they

relate to their personal choices and habits. The energy evaluation crews consisted of two Tribal Weatherization trainees overseen by a Licensed Energy Professional.

Based on the results of the energy evaluation, a brief retrofit prioritization alternatives analysis was conducted to rank potential retrofit actions. Retrofit alternatives were evaluated based on: Total projected energy savings; Energy rebates and incentives; Simple payback period; Life-cycle savings; Return on investment; and Total available retrofit budget; Energy conservation, water conservation efficiency retrofits may include, but are not limited to:

- Energy efficient appliance upgrades;
- Envelope sealing;
- Attic, wall and floor insulation; Lighting upgrades;
- Fenestration upgrades;
- Energy management systems; Occupancy sensors;
- Thermostatic turn-downs and controls; Mechanical systems upgrades
- Water saving measures

The order in which retrofit actions were completed was determined in the alternatives ranking exercise, until the allocated funds were expended. The alternatives ranking and related analyses was overseen by a licensed energy professional. High priority retrofits that cannot be successfully implemented exclusively within the allocated budget were provided funding supplements through existing grant funds (EECBG, EPA Environmental Justice, Housing and DOE Tribal Weatherization Program) or additional grants sought for the purpose of implementation. The retrofit crews consisted of up to four SVEDO trainees overseen by a Licensed Energy Professional.

This project has directly supported the capacity building and development goals of the Scotts Valley Energy Development Office. One of the long term goals of the Scotts Valley Band of Pomo Indians was to implement a trained and certified workforce for the Weatherization Program to serve Tribal members on and off the reservation/rancheria; another was to implement a trained and certified workforce to do solar installation Under the current program, energy evaluations and retrofits will be completed by program trainees and graduates teamed with energy professionals and contractors thus providing program participants with valuable, real world, hands-on experience needed to eventually become Licensed Energy Professional.

5) Develop a Tribal Weatherization Assistance Program (WAP) Plan

The Scotts Valley Tribe will be applying next year to become a Tribal Weatherization Assistance Program (WAP) to serve low-income Tribal homes and non-Indian homes to assist in permanently reducing their energy bills by making their homes more energy efficient. Funds received will be used to improve the energy performance of dwellings of needy families using the advance technologies and testing protocols available in today's housing industry. The U.S. Department of Energy (DOE) provides funding to states, U.S. overseas territories, and Indian

Tribal governments, which manage the day-to-day details of the program. These governments, in turn, fund a network of local community action agencies, nonprofit organizations, and local governments that provide these weatherization services in every state, the District of Columbia, U.S. territories, and among Native American Tribes.

The energy conservation resulting from these efforts of state and local agencies helps our country reduce its dependence on foreign oil and decrease the cost of energy for families in need while improving the health and safety of their homes. During the past 33 years, WAP has provided weatherization services to more than 6.4 million low-income households. Families receiving weatherization services see their annual energy bills reduced by an average of about $437, depending on fuel prices. Because the energy improvements that make up weatherization services are long lived, the savings add up over time to substantial benefits for weatherization clients and their communities, and the nation as a whole.

The development of this WAP Plan will be built upon servicing the local and regional Indian Tribes located in Northern California that have been ignored and underserved due to many factors involved.

6) Purchase Equipment

In order to further the goals of the SVEDO, specific equipment acquisitions are necessary. The following list of equipment has been compiled to facilitate the immediate needs of the SVEDO: 1) Full Size Truck; 2) Cellulose Insulation Blower; 3) Small Hand Tools; and 4) Personal Safety Equipment.

Description of Activities Performed

As part of continuing to build Scotts Valley Tribal workforce, I coordinated Building Performance Institute (BPI) trainings for Building Analyst Professional with Ourevolution Energy and Engineering group for four Tribal members. Three Tribal members passed certification for BPI Building Analyst Professional. Currently, we now have five BPI Building Analyst Professional certified energy auditors as part of the Scotts Valley Tribal workforce. Certification for BPI Building Analyst Professional was very important for our developing team to establish a strong foundation for residential energy work and enhance our chances for economic development. Through our rigorous training, we have bolstered our knowledge to improve our quality assurance plan, energy performance standards, and conservation efforts for residential homes. I would like to thank the Cloverdale Rancheria and their Tribal members for graciously allowing the students the opportunity to work "hands-on" to do our Building Analyst Professional testing. http://www.ourevolution.com/index.asp

Figure 1. Basic Weatherization Graduates

We also continued to build our workforce and weatherization knowledge through our partnership with the Energy Efficiency Training Academy (EETA). We had seven Tribal members successfully completed all three courses of weatherization trainings that consisted of Basic Weatherization, Duct Blaster and Blower Door Diagnostics, Combustion Appliance Safety (CAS) Inspection trainings. The Basic Weatherization course consisted of (Introduction to Weatherization, Construction Nomenclature, Heat Transfer Basics, Lead-Safe Weatherization Practices, Safety Practices, etc.). The Combustion Appliance Safety course consisted of the "House as a System" (Gas Combustion Basics, Carbon Monoxide, Combustion Appliances, Gas Leaks, Combustion Appliances Zone, etc.). The Duct Blaster and Blower Door Diagnostics course consisted of the "Whole House" Retrofit Weatherization (Appliance Testing, Duct & Shell Testing, Shell Diagnostics & Sealing using a Blower Door, Safety, etc.).

http://www.eetanorcal.org/eetanorcal/course_descriptions.html

Building on our energy assessment and weatherization trainings, we decided to start to expand our knowledge in solar installation. We had Three Tribal members complete a 5 day /40 hours intensive solar training

with the Solar Living Institute. This course was designed to meet the learning objectives for the North American Board of Certified Energy Practitioners (NABCEP) Entry Level Solar Exam and was an intensive training course that offers hands-on practice in the essentials of photovoltaic technology. Learning solar will continue to build and enhance our strategic goals of a well rounded Energy Office. http://www.solarliving.org/

Our Energy Department had the honor of conducting outreach and education to our local Tribal community. We presented at several Tribal community events such as the 2012 Hopland Earth day and 2012 Inter-Tribal Environmental campout. I presented on the basics of energy efficiency, energy conservation, and energy consciousness to our young Tribal youth. I also presented on natural sustainable energy sources and established a dialogue with our local community on their views of energy. We had an energy information booth at several Tribal community events such as the Lake County Tribal Health Fair 2012 and Tule Boat Festival 2012. I presented on energy efficiency philosophies, weatherization practices, and solar cooking at home. I also presented on natural sustainable energy sources (passive solar, indoor air quality, wind, composting, food security, local resources) and established a dialogue with the kids on their views of energy. We held an energy drawing contest at the Tule Boat Festival and used the NEED curriculum to explain energy sources. http://www.need.org/

Through our outreach and education, we were humbly invited to be a representative for Scotts Valley Band of Pomo Indians on the Upper Lake High School's Alternative Energy and Sustainable Agriculture education program advisory committee. I plan to help assist with energy education as they develop their curriculum.

I proudly represented my Tribe and the work our team has done at the annual 2011, 2012 Department of Energy Tribal Energy Review and learned about some very cool and innovative projects that other Tribes are doing. I used my time well and networked and got some new ideas from other presenters. This was a good event that I wish other funding agencies would do, this really helps Indian county network among professionals.

I present at the annual 2012 Region 9 Tribal EPA conference. I co-presented with Grids Alternative on our experience with their group and how it could benefit other Tribes with residential solar. We were able to create some solar jobs and gain experience with our Tribal members through our past and current grants with Grids Alternative.

We attended a gray water workshop sponsored by the Pinoleville Band of Pomo Indians on their straw-bale homes. This was good workshop and that allowed us to get our hands dirty, establish a stronger partnership, learn new techniques for wastewater use, and get ideas how we could better use resources on our own Tribal homes.

To enhance our business knowledge and business plan, I received a scholarship to attend the California Indian Manpower Consortium, Inc. 2012 Leadership Training for Entrepreneurial Economic Development and attended the Resources for Native Development Business training. These courses greatly strengthened my knowledge on entrepreneurship development and

marketing, financial statements, and financial management. Was a great learning experience and crash course in business start-ups. http://www.cimcinc.org/cimc_entrepreneur.htm

As we have conducted energy assessments and performed weatherization retrofits, we have noticed indoor air quality issues. We know this there was a big need for indoor air quality education and assessment so we started to get ourselves educated. Our energy department and housing department both received scholarships for indoor air quality training with the Institute Tribal Environmental Professionals. We also attended the Clean, Green, Healthy Tribal Schools workshop that included topics such as asthma, chemicals, lead, asbestos, and overall indoor air quality. Common indoor air contaminants include radon, secondhand smoke, mold, irritant and allergenic asthma triggers, combustion by-products and volatile organic compounds. Indoor air quality education and sampling was another service that we would like to provide in the future along with energy assessments and weatherization. http://www4.nau.edu/itep/

We attended several PG&E workshops focused on energy auditing, calculations, equipment, and energy saving techniques. These workshops have given me some great resources and knowledge to directly apply in the field and office.

We attended the annual ACI conference, California Home Performance Conference trade show, we learned of new products and businesses that may help with our growth and development as an energy program.

Our local housing authority, Northern Circle Indian Housing held a tuition-free training at the Hopland Band of Pomo Indians reservation. We learned about maintenance management of interior/exterior homes, inspections, building security, and workplace safety.

This grant has allowed us the privilege of purchasing the much needed equipment, transportation, and storage space we have needed to help establish our Scotts Valley Energy Development Office. We purchased Chevy Van G-2500 and completely outfitted our van with storage tool box, roof rack, and center storage console. We also purchased Cellulose Insulation Blower, Hand tools, and Safety equipment. EnergyPro software was purchased for energy performance modeling. We have established a dedicated storage space that has allowed us to label, inventory, and get organized with a good workflow.

We applied for a grant, DE-FOA-0000641, Program Year 2012 Weatherization Formula Grant Titled: Collaborative Tribal Weatherization Demonstration Project Program for Low Income Native American Families living on Tribal Lands in Northern and Central California. This was for a Tribal weatherization assistance program in partnership with the Scotts Valley Band of Pomo and the Hoopa Valley Tribe. Unfortunately, we did not receive funding for this project.

This may be discouraging but we do want to continue to move forward and establish funding for a Weatherization Assistance Program.

We applied for a grant from USDA, RDBCP-2012-RBOG, Rural Business Opportunity Grant specifically for a feasibility study for our energy program. This feasibility study was meant to help assist in gathering the data needed to establish a weatherization assistance program and find creative ways to sustain our energy business. Unfortunately, we did not receive funding for this project. We are going to continue to apply.

To further our goals and capacity building job development this project assist in implementing it trained and certified workforce for the weatherization program serving Tribal members, by providing on-the-job training and education on energy conservation and energy saving costs. The two objectives listed below are opportunities available to reach these goals.

Energy Assessments and Retrofits

1.) The homeowner has to fill out application to requesting an energy assessment and submit to the SVEDO.
2.) Set up appointment with SVEDO to explain the energy audit process, listen to concerns/questions, and hand-out energy education brochures.
3.) Sign agreement to enter home to conduct energy assessments, energy efficiency retrofits, and request one year energy bill to establish a baseline.
4.) Perform walk-through with certified BPI technician at home sites prior to conducting energy audits.
5.) Set-up scheduled to have the certified energy audit team to perform the energy assessment.
6.) Set-up schedule with the homeowner to go over the final energy audit report to identify energy efficiency retrofits on the home.
7.) Set-up scheduled to have the energy efficiency retrofits done by the weatherization technicians.
8.) Set-up scheduled to redo blower door test for air leakage after all energy efficiency retrofits are complete.
9.) Request a final homeowner electric bill to calculate and compare the energy savings costs. Share energy saving costs with homeowner.

Weatherization Training

1.) Identify potential Tribal members interested in receiving certification weatherization.
2.) Provide an updated schedule and description of weatherization courses held throughout the year 1. Basic Weatherization, 2. Blower Door and Duct Blaster, and 3. Combustion appliance safety.

3.) Attend mandatory energy orientation presented by qualified energy staff on an overview of program expectations, outcomes and safety measures.
4.) A selection was made on who will be attending the weatherization training after going through the orientation.
5.) After determination was made for the weatherization training a signed agreement was required upon receiving travel funds for completion of course.
6.) Upon completion of passing all three weatherization courses, SVEDO will work with certified members to assist with jobs and advanced energy trainings.

During this grant we performed nine home energy assessments with hands-on training by our Ourevolution Energy & Engineering contractors. The on-site energy audit was conducted by the Ourevolution and Scotts Valley team. These assessments summarize the main findings and recommendations associated with the residential home energy assessments. A residential home energy assessment consists of six main tasks: 1. BPI compliant on-site energy audit, 2. Identify existing conditions that negatively affect health and safety and recommend mitigations, 3. Identify energy conservation and efficiency opportunities, 4. When appropriate, develop in EnergyPro home performance model to quantify potential energy savings associated with target energy conservation measures, 5. Develop a comprehensive work scope and specifications based on health and safety mitigations and prioritize energy conservation measures, 6. Identify available funding sources to financially assist in project implementation. The interior inspection includes assessment of all conditioned spaces for moisture issues, thermal boundary, and bypass areas. The electrical system audit includes assessment of the type, condition and potential energy savings associated with lighting, appliances other plug loads. The field assessment of the homes included the testing of the homes combustion appliance zone, vented in unvented combustion appliances determine and quantify performance and efficiency. This will help to identify and mitigate potential hazardous conditions. Three processes were completed to assess combustion appliance performance; these were CAZ worst case depressurization vented combustion appliance safety testing, blower door testing, and duct leakage testing. Test results and recommendations are made and prioritized according to energy model payback and savings. After weatherization retrofits are completed and blower door test-out was performed, results are recorded along with new energy bill to see if specifications were achieved.

Results and Recommendations of Energy Assessments for nine tested homes

House #1) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Small gas leak was detected at the main propane tank connection fitting/soapy water was used to verify the pin-hole leak. It was recommended that the homeowner work with appropriate supplier to remediate this condition. Earthquake strapping was observed only on upper portion of water heater leaving the unit prone to kick out/recommend installing second earthquake strap. The downspout discharge of drainage systems are too close to house/discharge should be connected to a subsurface drainage system extending to a minimum of three feet down gradient from house. Hot water lines and crawlspace

were not insulated/oh waterline should be insulated with a 1 ½ inch closed cell insulation covering. No insulation of weather stripping was noted on the attic hatch. The home contains a combination of approximately 37 Incandescent bulbs in various fixtures. Replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp.

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated: Duct Sealing – Improve from 14% leakage to 6% leakage.

The results of the energy performance modeling indicate that with an investment of approximately $500 may yield energy savings of 2.9% equating to approximately $47 per year. The relatively low annual return and 10-year payback make this measure a low priority. We recommend addressing all health and safety and maintenance issues detailed in this report prior to implementing duct sealing.

House #2) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Exposed wiring was noticed in attic/all connection should be made within a covered junction box. Earthquake strapping was observed only on upper portion of water heater leaving the unit prone to kick-out/recommend installing second earthquake strap. Hot water lines and crawlspace were not insulated/oh waterline should be insulated with a 1 ½ inch closed cell insulation covering. No insulation of weather stripping was noted on the attic hatch. The home contains a combination of approximately 34 incandescent bulbs/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp. The largest contributor to overall leakage was the unsealed whole-house fan, swamp cooler penetrations, plumbing penetrations in kitchen and bathroom, crawlspace plumbing and electrical penetrations, attic crawlspace in the electrical penetrations.

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated:

- Complete building air sealing to the minimum ventilation requirement of 1800 CFM.
- Complete attic insulation to a minimum of R-30
- Complete crawlspace insulation to a minimum of R-19
- Upgrade heating system to a central heat pump system
- Upgrade domestic water heating system to a heat pump type electric water heater

The results of the energy performance modeling indicate that a total investment of approximately $7,500 may yield energy savings of up to 50% equating to approximately $2240 per year in energy costs. The annual return yields a 3.4-year payback making these opportunities significant.

House #3) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Broken attic hatch/replacement. Plumbing penetrations in kitchen and bathroom, crawlspace plumbing and electrical penetrations, attic crawlspace in the electrical penetrations. The downspout discharge of drainage systems are too close to house

/discharge should be connected to a subsurface drainage system extending to a minimum of three feet down gradient from house. The home contains a combination of approximately 21 incandescent bulbs/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated:

- Upgrade single paned, metal-framed windows to dual paned, non-metal framed windows
- Upgrade heating and cooling systems to a high efficiency equivalent (95% AFUE, 14 SEER)

The results of the energy performance modeling indicate that a total investment of approximately $6,300 may yield energy savings of up to 15% (7.2% from window upgrade, 8.5%from heating system upgrade). This savings equates to approximately $455 per year in reduced energy costs. The annual return yields a 12-year payback making these opportunities significant. Additionally, the proposed upgraded windows will have reduced condensation issues and will provide fresh air seals which will improve the overall indoor air quality.

House #4) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Undiluted CO on exterior home was measured at over 1000 ppm/due to the location of this discharge and levels of CO measured we recommend reconfiguring the exhaust flue to discharge at roof level. Duct testing results from the home indicated that it fails the BPI standards for total duct leakage therefore duct sealing was recommended. Hot water lines were not insulated/all accessible water lines should be insulated with the 1 ½ inch closed cell insulation covering. Exhaust piping from the kitchen exhaust fan discharges directly into the attic space/this discharge should be moved to location the exhaust to the exterior of the attic space. The home contains a combination of approximately 8 incandescent bulbs/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp.

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated:

- Complete duct sealing to 6% of rated fan capacity
- Upgrade domestic water heating system to a heat pump type electric water heater

The results of the energy performance modeling indicate that a total investment of approximately $2,298 may yield energy savings of 16.6% equating to approximately $2418 per year in energy costs. The annual return yields an approximately 1-year payback making these opportunities significant and cost effective.

House #5) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Insulate ductwork was degraded/replace all duct tape with mastic or other approved material. Domestic water heater near end of serviceable life/energy star heat pump style water heater should be installed replacing this unit. Downspout discharge to close to house/discharge should be connected to the subsurface drainage system or extend to a minimum of three free down gradient from house. Bypass noted at plumbing

penetrations/seal to prevent further adverse conditions. The home contains a combination of approximately 31 incandescent bulbs; two four-inch T-12/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp.

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated:

- Complete air sealing to the minimum ventilation requirement
- Upgrade domestic water heating system to a heat pump type electric water heater

The results of the energy performance modeling indicate that a total investment of approximately $3,000 may yield energy savings of 10.4% equating to approximately $1,030 per year in energy costs. The annual return yields an approximately 3-year payback making these opportunities significant and cost effective.

House #6) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Earthquake strapping was observed only on upper portion of water heater leaving the unit prone to kick-out/recommend installing second earthquake strap. Penetrations from kitchen exhaust, swamp cooler, fireplace insert, recessed lighting, plumbing penetrations in kitchen and bathroom/ seal penetrations. No weather stripping or insulation noted on attic catch/weather stripping and insulation recommended. The home contains a combination of approximately 33 incandescent bulbs/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp.

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated:

- Complete building air sealing to the minimum ventilation requirement of 57.3 CFM.
- Complete attic insulation to a minimum of R-38
- Complete wall insulation to a minimum of R-13
- Upgrade heating/cooling system from electric baseboard and “swamp” cooler to a central heat pump system
- Upgrade single paned windows to dual paned equivalent

The results of the energy performance modeling indicate that the most cost effective upgrade was adding wall insulation. With an estimated cost of $1,965, this upgrade has an estimated annual energy savings of $1,675 (19.1% annual energy savings). According to the Energy Pro output, the second most cost effective measure was upgrading the existing heating and cooling systems from electric resistance and evaporative cooling to a packaged heat pump system. The estimated cost for this upgrade was $2,800 and the annual energy savings was $2,415 (31% annual savings). Window replacement yields approximately 13% annual energy savings, but was the most expensive individual measure. Window upgrades have an approximately 4.5 year payback. Air sealing yields 7.8% energy reduction and an approximately 3 year payback and will dramatically improve occupant comfort. The least cost effective measure was adding additional roof insulation. This measure yields only a 0.3% annual energy reduction therefore was not recommended. With a total investment of approximately $12,000 the combined measures (excluding attic insulation) may yield energy savings of up to 48% equating to approximately $4,285 per year in energy costs. The annual return yields a 2.8-year payback making these

opportunities significant.

House #7) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. No weather stripping was noted on attic hatch/weather stripping recommended on attic hatch. Un-insulated copper water pipe was noted in the crawlspace/all hot water piping should be insulated with a minimum of 1 inch closed cell foam insulation.

Due to the current condition of the home, and the energy performance specifications of the existing mechanical equipment, no significant energy saving measures were justified the creation of a building energy performance model. We recommend completing the work scopes described above.

House #8) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. A small gas leak was detected at the valve for the propane fire insert located in the kitchen/this condition should be mitigated by a qualified professional. Priority air sealing, attic hatch, recessed lighting, plumbing penetrations in kitchen and bathroom/ seal attic catch lighting plumbing penetrations. The home contains a combination of approximately 5 incandescent bulbs/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp.

Due to the "new" condition of the home, and the energy performance specifications of the existing mechanical equipment, no significant energy saving measures were identified that justified the creation of a building energy performance model. We recommend completing the work scopes described above.

House #9) No CO detectors were observed in field assessment/ one CO detector should be installed at central location within home. Leakage measured 20% greater than minimum ventilation requirements, significant air leakage was found at the following locations, attic hatch, plumbing and electrical penetrations in attic, penetrations under kitchen and bathroom cabinets/seal all penetrations. No insulation and crawlspace/ insulate crawlspace to R-19. The home contains a combination of approximately 17 incandescent bulbs/replacing incandescent lamps with CFL will reduce energy usage by up to 65% per lamp.

An Energy Pro building energy performance model was completed as part of this study. The following energy performance improvements were simulated:

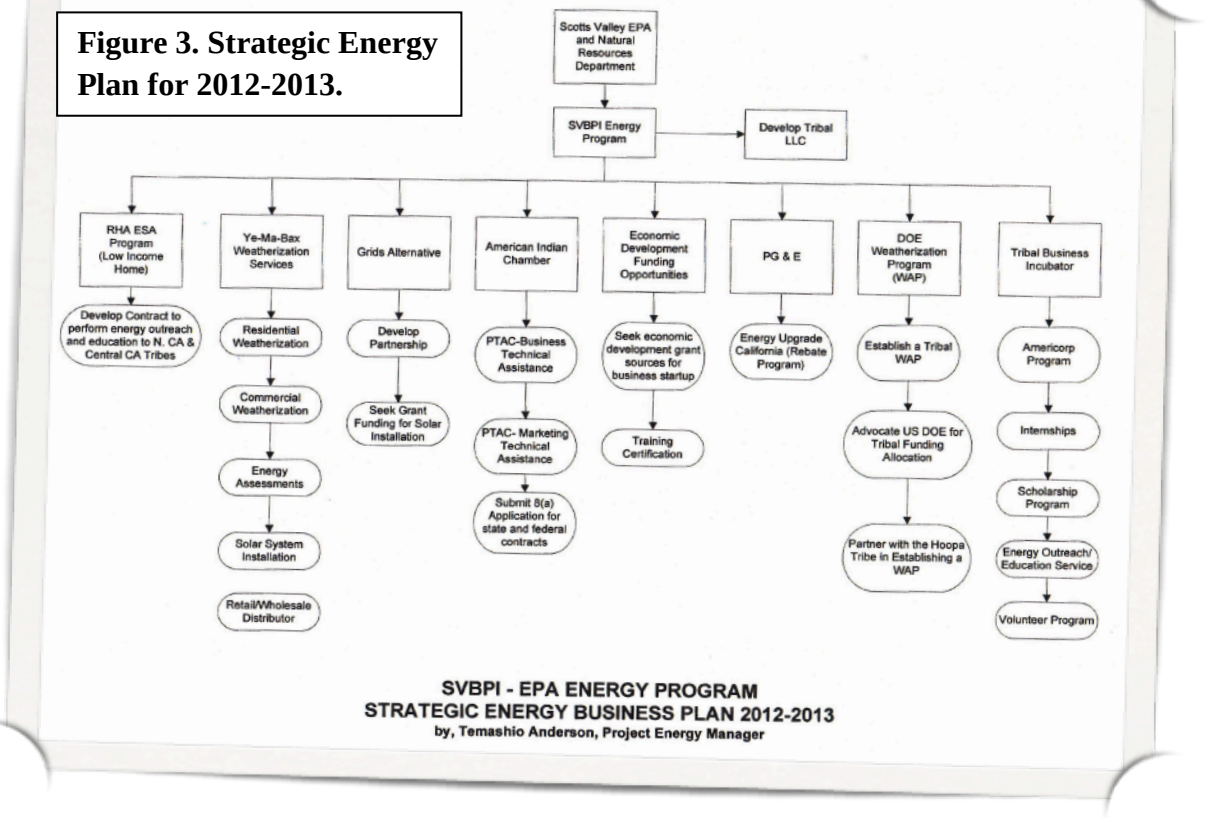
- Whole House Air Sealing – Reduce leakage to the minimum ventilation requirement (2162CFM50)
- Crawlspace Insulation – Insulate crawlspace to R-19
- Remove garage refrigerator

All of the proposed energy efficiency upgrades have significant effects on the energy consumption of the home. The largest effect was achieved by insulating the floor to R-19 (12.8% savings, $210 per year). The easiest of the measures was to remove the garage refrigerator. Completing this measure yields and approximate annual savings of $397. Completing air sealing will likely increase the comfort of the home, it has minimal effects in terms of the

energy performance model. We recommend implementing all of the health and safety and general maintenance items in addition to crawlspace insulation and secondary refrigerator removal.

Blower door test-out showed improvement and brought most of the homes in minimum ventilation requirements.

Figure 3. Strategic Energy Plan for 2012-2013.



Conclusions and Recommendations

In conclusion, With the first inception of the Scotts Valley Strategic Energy Plan in 2008, I think we are headed in the right direction. Each new home we continue to build our experience and expertise. This comes with both success and a learning curve. It has been gratifying to know that we are improving the quality of home comfort from the work we do. I would like to thank all the Tribal members who have invested their time and energy to learn a new skill and improve people lives.

The Scotts Valley Energy Program has fulfilled its commitment under this Department of Energy grant in educating and training its Tribal community in energy efficiency and energy conservation.

We are still pushing forward in our business ventures to developed an effective business structure that was sustainable and healthy that respects our culture.

Currently, we are working with our local utility company to offer weatherization opportunities for the Tribes in our service area. Also, continuing to provide more hands on training opportunities with Tribal members and strengthen internal human capacity.

Through our own journey of growth and learning, we learning that you have find the answers you are looking for, I mean don't be afraid to ask for help. Continue to network, networking creates opportunities, friendship, and support. Work hard for your people and go the extra mile, treat them like your own family.

Lessons Learned

Some lessons learned through the trial and errors of the process of developing a Tribal Energy Office. Here was a list:

- Energy software modeling, get as much help to get your models correct, find a good contact to get support.
- Need to have full commitment and support from Tribal Council
- need to set up business accounts, this would include some type of financial spreadsheet software for the business only
- Create a separate economic development board to provide oversight of business activities, decisions-making, business transactions, and business development
- Develop an on-going training program for the business
- cross-train workers
- Re-invest profits into the business, work toward sustainability
- Having a workable facility for the business site
- Stay on top of market research
- Always maintain good Communication